Volume 2 | Number 1 | 2023

KJICT.

KWASU JOURNAL OF INFORMATION, COMMUNICATION AND TECHNOLOGY



KWASU JOURNAL OF INFORMATION COMMUNICATION AND TECHNOLOGY

Volume 2 Number 1 2023

Faculty of Information and Communication and Technology,
Kwara State University, Malete.

ISSN: 1596-2563

EDITORIAL TEAM AND EDITORIAL BOARD

Journal Editorial Team

Professor Isiaka Zubair Aliagan	Editor-in-Chief
Dr. Ronke Seyi Babatunde	Managing Editor
Dr. Rafiu Mope Isiaka	Editor
Dr. Oluwole Olumide Durodolu	Deputy Editor
Dr. Jumoke Falilat Ajao	Associate Editor
Dr. Atanda Saliu Sambo	Associate Editor
Dr. Victor Olusegun Babatunde	Associate Editor
Dr. Kennedy Arebamen Eiriemiokhale	Production Editor
Dr. Nathaniel Akinbowale Babatunde	Business Editor
Professor Moshood Zakariyah	Language Editor
Dr. Agnes Joe Shaibu	Journal Secretary

Editorial Board

Professor Umaru Pate	Federal University, Kashere, Nigeria
Professor Abdulsalam Abiodun Salman	Kwara State University, Malete, Nigeria
Professor R.G. Jimoh	University of Ilorin, Ilorin, Nigeria
Professor Abdulwahab Olanrewaju Issa	University of Ilorin, Ilorin, Nigeria
Professor Ganiyu Olalekan Akashoro	Al-Hikmah University, Ilorin, Nigeria
Professor Stephen Olatunde Olabisi	Ladoke Akintola University of Tech., Ogbomoso, Nigeria
Professor Adewale Olumide Sunday	Federal University of Technology, Akure, Nigeria
Professor Wole Michael Olatokun	University of Ibadan, Ibadan, Nigeria
Professor Sunday Ojo	Durban University of Technology, South Africa
Professor Lukuman Adesina Azeez	University of Ilorin, Ilorin, Nigeria
Professor Madiyah Azman Azwan Azmawati	Universiti Sains Malaysia, Penang, Malaysia
Associate Professor Ayesha Ashfaq,	University of Punjab, Pakistan
Associate Professor Murtahda Busair Ahmad	Turkish Nile University, Abuja, Nigeria
Dr. Rizki Briandana	Universitas Mercu Buana, Jakarta, Indonesia
Dr. Gbolahan Olasina	University of Kwazulu-Natal, South Africa
Dr. Rasaq Mohammed Adisa	University of Ilorin, Ilorin, Nigeria

KJICT.
KWASU JOURNAL OF INFORMATION, COMMUNICATION AND TECHNOLOGY

ABOUT THE JOURNAL

KWASU Journal of Information, Communication and Technology (KJICT.) is an annual and double blind peer-reviewed Journal of the Faculty of Information and Communication Technology, Kwara State University, Malete. It is an Open-access publication that encourages the exchange of original and latest original, grant-based research, literature surveys, and practical happenings protected by copyrights in all areas in the fields of Mass Communication, Computer Science & Engineering, Information Science, Library Science, Statistics, and Telecommunication Science. KJICT. is published in one volume per year, in December.

KEY INFORMATION TO AUTHORS

To publish in this Journal, all authors in order for their papers to go through evaluation and review processes, must meet the following terms and conditions:

• The articles must treat subjects related to the fields of Mass Communication, Computer Science & Engineering, Information Science, Library Science, Statistics and Telecommunication Science.

• Contributions to this Journal shall be in English language only.

• Manuscript submitted for publication consideration in KJICT. must be original to the author(s) and should not be under review with any other journal or publication outlet.

• Manuscript should be prepared using the British English version. Authors should be consistent in the use of British English throughout the manuscript.

• Manuscript should be prepared with the APA referencing style (7th edition). Authors are enjoined to strictly follow this style in their in-text and end-of-text citations.

• Authors are enjoined to proofread their manuscript as clinical as possible as papers with intolerable grammatical errors may be rejected without further processing.

• KJICT. accepts manuscripts not longer than 8000 words, including references and appendices, where applicable. Articles acceptable for publication shall not be less than 5000 words.

• All manuscripts should have an abstract of not more than 250 words with, at least, five keywords listed alphabetically. The manuscript should capture the following and numbered accordingly:

1. Introduction/the problem statement/the rationale/ justification
2. Literature Review
3. Material and Method
4. Result and Discussion
5. Conclusion and Recommendation.

• Manuscript MUST contain author's biographical details such as the name(s), university/department, telephone number, e-mail address, and ORCID Number. These details should be identified on the title page only. Author's name should be identified in the order of first, middle, and last or surname.

• Manuscript should be prepared as a Microsoft document using Times New Roman on size 12 and 1.5-line spacing. Alignment should be justified and paragraphs should be indented with one tab. Block paragraphing should be avoided.

• While submitting an article, author(s) are requested to complete, sign, date, and send by email together

with their article a scanned copy of their copyright agreement form. This is downloadable on our website or can be sent on request via your email on request.

• All submitted articles will first undergo an evaluation process to determine if they will be processed for review by the Journal. The corresponding author(s) will be notified about the outcome via email.

• The Journal has an evaluation period of 2-3 weeks from the date we receive the full-text article along with short biographical details of the author(s), the copyright statement form (duly signed in original by all authors/co-authors) and, the plagiarism repo+++rt.

• If the article has a positive verdict after the initial evaluation process, it will be subjected to a double-blind peer-review process.

• Authors are required to subject their articles to a reliable and licensed plagiarism tool (such as the one used by a university/organisation) and submit a similarity-index report on it by e-mail only. Articles that exceed the minimum benchmark of 10% will be returned to the author for possible self-review while papers that exceed 20% of similarity index will be outrightly rejected without further processing.

• A non-refundable article evaluation fee of N10, 000 or its equivalent in dollars shall be paid while submitting an article.

• Author(s) shall be responsible for securing any copy right waivers and permissions as may be required to allow (re)publication of material in the article (text, illustrations, figures, and so on) that is the intellectual property of any third parties.

• Authors are enjoined to follow the necessary ethical values and considerations required in research in relation to the nature of the studies being conducted.

• Author(s) may be required to supply the data upon which figures or claims are based in their studies.

• If the article is accepted after the peer review process, the author(s) will be required to effect all reviewed section(s) of their manuscripts and submit a "Good for Print" version of their article(s). This final version should be accompanied with evidence of payment of their publication fee of N35, 000 or its equivalent in dollars.

• The Journal has a review period of 7-9 weeks from the date of receipt of evaluation report.

• An author will be entitled to one copy of the published journal and shall bear the cost of delivery at specified location. Reprint or extra copy will be considered at negotiated cost.

• Articles for consideration by the Journal should be emailed to:

kjict@kwasu.edu.ng

• All enquiries should be directed to the Managing Editor through kjict@kwasu.edu.ng

CONTENTS

Editorial Team And Editorial Board **3**

About The Journal **5**

List Of Contributors **9**

Preface/Introduction **13**

SECTION A: COMPUTER SCIENCE **15**

Predicting Customers' Churn in a Bank Using Firefly Feature Selection and RBF-Support Vector Machine Classification Algorithms — Sulaiman Olaniyi ABDULSALAM, Ismaila YUSUF, Mojisola Racheal OGUNWUYI, Michael Favour EDAFEAJIROKE **17**

Comparative Analysis of Selected Classification Algorithms on Weather Data — Shakirat Ronke YUSUFF, Ibrahim ODETUNDE, Jumoke Falilat AJAO **27**

SECTION B: LIBRARY AND INFORMATION SCIENCE **47**

New Media Technologies for Communication and Information Sharing in Nigeria: Nexus between Libraries and the Mass Media — Abdullahi A. BAKARE, Victor Olusegun BABATUNDE, Jemilat Biogera ABUBAKAR, Jamiu Oladele MUHAMMED **49**

Strategies For Leveraging Artificial Intelligence and Big Data in Libraries for Sustainable Community Development — Atanda Saliu SAMBO, Tunde Shamsudeen AJIBOLA, Ismaila Aliyu YAHAYA **61**

SECTION C: MASS COMMUNICATION **69**

Usage of Electronic Media for Alternative Crisis Mitigation and Human Rights Activism: A Study of Kokoro Alate Radio Programme — Bashirat Damilola SUBAIR **75**

Influence of Social Media Brand Influencers on Believability and Usage of Brands Among Selected Undergraduates in Kwara State — Abdujelil SANUSI, Kamaldeen Arikewuyo AHMED, Idowu Kamal DAUDA, Bashirat Damilola SUBAIR **85**

Adapting to Change: Examining Nigerian Newspapers' Pursuit of Sustainable Business Models in the Digital Landscape — Isiaka Zubair ALIAGAN, Kamaldin Abdulsalam BABATUNDE, Yusuf Bolakale SULEIMAN **97**

LIST OF CONTRIBUTORS

Abdujelil SANUSI is a lecturer in the Department of Public Relations and Advertising, Faculty of Communication and Media Studies, University of Abuja, Abuja. His research interests span Marketing Communications, Development Communication and Media Studies.

Abdullahi A. BAKARE is presently a lecturer in the Department of Library and Information Science, Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria. He obtained B.Sc. (Hons) in Economics from Olabisi Onabanjo University, Ago-Iwoye and both master's degree and PhD in Library and Information Science from University of Ibadan, Ibadan, Nigeria. His research areas include records management, preservation and conservation of library information resources, research methodology and management and administration of academic library.

Atanda Saliu SAMBO is a Senior Lecturer in the Department of Library and Information Science, Kwara State University, Malete, Nigeria. He is a member of Nigerian Library Association (NLA), Kwara State Chapter. He is currently the Cordinator of Postgraduate Programmes, Library and Information Science Department. He has written and published articles in reputable international and local journals, as well as book chapters.

Bashirat Damilola SUBAIR is a lecturer in the Department of Mass Communication, Faculty of Information and Communication Technology, Kwara State University, Malete. Her research interests span Broadcasting, Peace Journalism and Health Communication.

Edafeajiroke Michael FAVOUR is currently a lecturer in the Department of Computer Science at the University of Port Harcourt, Nigeria. He obtained M.Sc. and B.Sc. Degrees in Computer Science from Kwara State University, Malete, Nigeria. He is presently pursuing his Ph.D. Degree in Computer Science at the University of Benin, Nigeria. His areas of specialisation are Artificial Intelligence, Data Science, and Machine Learning.

Ibrahim ODETUNDE is a Computer Science graduate of Kwara State University, Malete. He is currently working as a web developer and preparing for postgraduate studies, with research interests in Machine Learning and Software Engineering.

Idowu Kamal DAUDA is a lecturer in the Department of Mass Communication, Faculty of Information and Communication Technology, Kwara State University, Malete. His research interests cover Digital Media and Marketing Communications, Public Relations and Advertising.

Isiaka Zubair ALIAGAN holds a PhD in Print Journalism from Universiti Sains Malaysia, PhD History (Press and Politics) from the University of Ilorin. He is currently a Professor of Journalism and Media Studies and Dean, Faculty of Information and Communication Technology at Kwara State University, Malete, Nigeria. His main research interests include print and digital journalism, press and politics, new media technologies, social networking media, and newspaper political economy.

Ismaila Aliyu YAHAYA is a staff member of Muhammadu Buhari Library, Kwara State University, Malete. He is currently the Head of E-Library of the institution. He holds a BLIS and MSc in Library and Information Science from the University of Maiduguri and University of Ilorin, Ilorin respectively. His research interests encompass various aspects of library management, including library management software, digitisation, information management, and electronic library systems.

Ismaila YUSUF is currently a Senior Lecturer and the Acting Head, Department of Business and Entrepreneurship, Kwara State University, Malete, Nigeria. He obtained his Ph.d. Degree from University of

Ilorin, Ilorin, Nigeria. He is a member of Chartered Institute of Strategic Management and Institute of Classic Entrepreneurship, Nigeria. He is a Fellow of Chartered Institute of Public Diplomacy and Management. His areas of specialisation are Human Resource Management, Entrepreneurship and General Management.

Jamiu Oladele MUHAMMED is a lecturer in the Department of Library and Information Science, University of Ilorin. He holds a master's degree in library and information science (2014), and a Master of Educational Management (Economics Education), both from the University of Ibadan, and B.Sc. Edu (Economics), from University of Ilorin (2003). He is a certified member of Librarian Registration Council of Nigeria (LRCN). He has presented papers at many conferences and published articles and book chapters in both international and local refereed journals. His research areas include ICT, library management, social media, cyber security and library practices.

Jemilat Biogera ABUBAKAR is currently an Assistant Librarian at the Kwara State University Library, Malete. She obtained a Bachelor of Science Degree in Library and Information Science in 2019, and currently studying for her Master of Science Degree in Library and Information Science at the University of Ilorin, Ilorin, Nigeria. Her research interests are Cataloguing and Classification of Information Resources, Information Professions and Digital Literacy.

Jumoke Falilat AJAO is a Senior Lecturer at the Department of Computer Science, Kwara State University with expertise in the areas of pattern recognition and natural language processing.

Kamaldeen Arikewuyo AHMED is a lecturer in the Department of Mass Communication, Faculty of Information and Communication Technology, Kwara State University, Malete. His research interest is in Political Communication and his area of specialisation is Journalism, Communication and Media Studies.

Kamaldin Abdulsalam BABATUNDE is a Senior Lecturer and Head of Department of Public Relations and Advertising, University of Abuja. He is a graduate of the University of Al-Azhar, Cairo, Egypt, where he studied Mass Communication, Public Relations and Advertising for his first and second degrees, respectively. He later proceeded to the University of Malaya, Kuala Lumpur, Malaysia, where he bagged his PhD in Advertising. His research interests are media effects, Public Relations, Marketing Communication, Consumer psychology, and Islamic communication.

Mojisola Racheal OGUNWUYI, a banker by profession, started her banking career in 2020. She holds Higher National Diploma in Civil Engineering, B.Sc. Degree in Civil Engineering and Master of Business Administration in Information Technology. She is a certified member of Chartered Institute of Finance and Control of Nigeria.

Shakirat Ronke YUSUFF is a lecturer at the Department of Computer Science, Kwara State University. Her research interests include application of Artificial Intelligence and Machine Learning in areas such as health, agriculture and software defect prediction.

Shehu O. ISHOLA is presently a Lecturer in the Department of Library and Information Science, Faculty of Humanities and Social Sciences, Al- Hikmah University, Ilorin, Kwara State, Nigeria. He obtained BLIS degree in 1994 from Bayero University, Kano, Nigeria and Master's degree in Library and Information Science from University of Ibadan, Ibadan, Nigeria in 2008 and Ph.D. in 2023 from Adeleke University Ede, Osun State, Nigeria. His research areas include library management, digital libraries, organisation of knowledge, research methodology and management and administration of academic libraries.

Sulaiman Olaniyi ABDULSALAM is currently a Senior Lecturer in the Department of Computer Science, Kwara State University, Malete, Nigeria. He obtained Ph.D. in Computer Science from Ladoke Akintola University of Technology, Ogbomoso, Nigeria and M.Sc. and B.Sc. Degrees in Computer Science from University of Ilorin, Ilorin, Nigeria. He

is a member of Computer Professionals Registration Council of Nigeria (MCPN) and Nigeria Computer Society (MNCS). His research interests are Data Mining, Machine Learning, Pattern Recognition, Biometrics and Software Engineering.

Tunde Shamsudeen AJIBOLA is an Assistant Lecturer in the Department of Library and Information Science, Kwara State University, Malete. He holds BLIS, and MSc from the University of Ibadan and University of Ilorin, respectively. He has previous engagements in teaching undergraduate students and Sandwich students at University of Ilorin, and Distance Learning of University of Ibadan. He possesses teaching and research skills.

Victor Olusegun BABATUNDE is a lecturer at the Department of Mass Communication, Kwara State University, Malete, Nigeria. He obtained a PhD degree in Mass Communication from University of Ilorin, Ilorin, Nigeria, Bachelor and Master's degrees in Mass Communication. He is an Associate Registered Practitioner in Advertising (ARPA) of the Advertising Regulatory Council of Nigeria (ARCON). His research interests cover Media and Society, Mass Media Effects, Broadcasting, and Development Communication.

Yusuf Bolakale SULEIMAN is a lecturer in the Department of Information, Journalism and Media Studies, University of Abuja, Nigeria. Suleiman is also a doctoral student at the Faculty of Communication and Media Studies, Lagos State University, Ojo. He holds a B.Sc. and M.Sc. Mass Communication from Ahmadu Bello University, Zaria, and Kwara State University, Malete, respectively. He also holds an MA in Publishing Media from Oxford International Centre for Publishing, Oxford Brookes University, United Kingdom.

PREFACE/INTRODUCTION

The *KWASU Journal of Information, Communication and Technology (KJICT)* is an academic publication of the Faculty of Information and Communication Technology, Kwara State University, Malete. As a bi-annual, high-quality, double-blind peer-reviewed journal, KJICT serves as a scholarly platform for researchers and academics committed to pushing the frontiers of knowledge across various domains. This open-access journal is dedicated to fostering the dissemination of original, timely, and grant-based research outputs, literature reviews, and practical innovations, protected under copyright, and spanning the fields of mass communication, computer science, engineering, information science, library science, statistics, and telecommunication science.

Though it is domiciled in the Faculty of Information and Communication Technology at Kwara State University, KJICT maintains an international outlook. We welcome contributions from researchers and scholars around the world, as part of our mission to broaden intellectual horizons and enrich the global discourse in our core areas. The journal aspires to be a nexus of academic excellence, showcasing current and cutting-edge research that bridges disciplines and advances theoretical and practical understanding.

KJICT is published annually in December, and it is strategically positioned to offer a robust and credible platform for evidence-based scholarship. The journal gives precedence to manuscripts that are not only theoretically sound but also methodologically rigorous—whether through qualitative, quantitative, or mixed research approaches. We take pride in publishing work that meets the highest standards of academic integrity and relevance.

It is, therefore, with great honour that I present to you *Volume 2, Number 1* of the journal—a collection of intellectually diverse contributions that reflect the evolving scope of inquiry in computer science, librarianship, and communication. The articles featured in this edition exemplify scholarly depth and methodological sophistication, addressing contemporary issues through empirical investigation and critical analysis.

On behalf of the editorial board, I reaffirm our unwavering commitment to academic excellence and rigorous editorial standards. Every manuscript submitted to KJICT undergoes a comprehensive and timely peer-review process, ensuring fairness, clarity, and academic merit. Our goal is consistency—both in quality and in publication frequency—and we rely on the continued support of our contributors, reviewers, and readers to uphold and exceed these standards.

Thank you for your sustained engagement and for being part of our journey to advance knowledge in information, communication, and technology.

Dr. Ronke Seyi Babatunde
Managing Editor

SECTION A:
COMPUTER SCIENCE

Predicting Customers' Churn in a Bank Using Firefly Feature Selection and RBF-Support Vector Machine Classification Algorithms

Sulaiman Olaniyi ABDULSALAM[1] Ismaila YUSUF[2] Mojisola Racheal OGUNWUYI[3] Michael Favour EDAFEAJIROKE[4]

1 Department of Computer Science, Kwara State University, Malete, Nigeria

2,3 Department of Business and Entrepreneurship, Faculty of Management and Social Sciences, Kwara State University, Malete, Nigeria.

4 Department of Computer Science, Faculty of Computing, University of Port Harcourt, Rivers State, Nigeria

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

Customer churn prediction helps businesses identify factors contributing to customer attrition, allowing them to take preventive actions. This project develops a churn prediction model for a bank using Firefly Feature Selection and RBF-Support Vector Machine (SVM) Classification Algorithms. The dataset consists of 900 instances and 10 features, representing customer churn rates. Firefly Feature Selection was used to find the most pertinent features after preprocessing techniques like Label Encoding and Oversampling were used. After that, the RBF-SVM model was used to make predictions. F1-score, recall, accuracy, and precision were used to assess the model's performance. The strong predictive capability was demonstrated by the model's 84% accuracy, 84% precision, 100% recall, and 91% F1 score. This methodology assists companies in identifying consumers who are at risk and in taking preventative action to lower churn rates. Future research could focus on improving feature selection techniques, model robustness, and applying the model to other industries for comparison.

Keywords: Customer churn prediction, Firefly Feature Selection, RBF-Support Vector Machine (SVM), Classification algorithms, Model evaluation.

1. Introduction

This study focuses on predicting customer churn in the banking sector using machine learning algorithms, specifically the Radial Basis Function-Support Vector Machine (RBF-SVM) combined with Firefly feature selection. The primary goal is to develop a predictive model that helps banks identify customers at risk of leaving, thereby improving retention strategies and profitability (Singh & Kumar, 2024). The study's dataset, which included customer turnover data, came from Kaggle. Metrics like accuracy, precision, recall, and F1-score were used to evaluate the model's performance.

Customer churn is a significant challenge in the banking industry, as it leads to substantial revenue loss. Accurately predicting churn allows banks to take proactive measures to retain customers before they leave (Manzoor & Wang, 2024). By combining Firefly feature selection with RBF-SVM—a combination that hasn't been extensively investigated in prior research—this work seeks to improve churn forecast accuracy. For churn prediction, numerous research have used machine learning algorithms such as SVM and Random Forest. (Adeniran et al, 2024; Olaniyi et al., 2020; Ebrah & Elnasir, 2019), they often overlooked feature selection, which is critical for improving model accuracy.

This paper presents a novel method for improving the effectiveness of churn prediction models by employing Firefly feature selection. By combining Firefly and RBF-SVM, the model's predictive power is maximized, increasing its precision and usefulness for the banking industry. This work contributes

to existing literature by addressing the gap in feature selection within churn prediction models, particularly in the context of the banking industry (Olaniyi & Salami, 2020)

Building on prior research in churn prediction, where machine learning algorithms such as SVM have been used, this study stands out by incorporating Firefly feature selection to improve the model's performance. Previous studies (Kusnawi & Supriyanto, 2024).) did not fully explore the impact of feature selection, which this study aims to address.

The study employed a Kaggle dataset and applied Firefly feature selection to reduce dimensionality, followed by the implementation of the RBF-SVM model. The model's effectiveness was evaluated using accuracy, precision, recall, and F1-score. The implementation was carried out using Python in a Jupyter notebook environment (Mahalakshmi & Chellam, 2022)

Overall, this research contributes to the banking sector by developing a robust and accurate churn prediction model. It underscores the importance of machine learning in customer retention strategies and provides insights into how banks can use predictive models to manage their customer base more effectively (Olaniyi et al., 2020; Ebrah & Elnasir, 2019) by developing a robust and accurate churn prediction model (Krishna et al. (2024). It underscores the importance of machine learning in customer retention strategies and provides insights into how banks can use predictive models to manage their customer base more effectively.

2. Literature Review

The goal of Akhmetshin et al. (2024) was to use big data analytics and machine learning to create the intelligent data analytics framework IDA-HGOAML for customer churn prediction (CCP). The data source used in the study was not explicitly mentioned. The method employed included Z-score normalization, Equilibrium Optimization Algorithm (EOA) for feature selection, Convolutional Autoencoder (CAE) for churn prediction, and Hybrid Gradient Optimization Algorithm (HGOA) for hyperparameter optimization. The results showed IDA-HGOAML's superior performance with a prediction accuracy of 94.15%. A limitation noted was the reliance on traditional machine learning techniques for feature selection. This study intends to enhance churn prediction by using Firefly feature selection to optimize RBF-SVM models, addressing the limitations of feature selection observed in similar studies.

Using a telecom dataset and many classifiers (Random Forest, LGBM, XGBoost, Logistic Regression, Decision Trees, and a bespoke ANN model), Alotaibi and Haq (2024) examined customer attrition in the telecom industry. Using ensemble averaging, the study's accuracy and recall were 79% and 72%, respectively. The modest decrease in performance when compared to some individual classifiers was the restriction. By combining Firefly feature selection with RBF-SVM, this study seeks to overcome the drawbacks of ensemble models and enhance the performance and accuracy of churn prediction models.

Chang et al. (2024) applied Decision Trees, Boosted Trees, and Random Forests to predict churn in the telecommunications industry, obtaining an accuracy of 91.66% with the Random Forest model. While the study achieved strong results, the limitation was that the models were not fully optimized for feature selection. This study plans to resolve this by incorporating Firefly feature selection to improve the efficiency of the predictive model.

Gurung et al. (2024) used machine learning techniques, namely Random Forest and Decision Trees, to investigate churn prediction in the USA. 3,333 customer instances from the UCI repository made up the dataset. Random Forest achieved 96.25% accuracy, 91.49% precision, and 83.49% recall, outperforming Decision Trees. The data's failure to take into consideration more general elements like social interactions and customer feedback was a drawback. In order to improve the predictive capability, this study intends to use Firefly feature selection to incorporate a wider range of features, such as client input.

He and Ding (2024) proposed an Ensemble-Fusion model integrating 17 machine learning algorithms. The model achieved a remarkable 95.35% accuracy, 91% AUC, and 96.96% F1-score, outperforming other benchmark algorithms. The limitation was that the model was complex, which could lead to higher computational costs. This study intends to address this by using RBF-SVM with Firefly selection to create a more efficient and cost-effective churn prediction system.

Krishna et al. (2024) addressed churn prediction in telecommunications using a Random Forest classifier, achieving 98.1% accuracy, 92.8% precision, and

92.7% recall. The study found Random Forest outperformed other algorithms such as SVM and XGBoost. However, the study did not explore feature selection deeply, which could further optimize the model's performance. This study intends to explore and integrate Firefly feature selection with RBF-SVM to overcome this limitation.

Saha et al. (2024) proposed ChurnNet, a framework that incorporated SMOTE, SMOTEEN, and SMOTETomek techniques to address class imbalance in churn prediction. The results showed exceptional accuracy, with SMOTETomek yielding 97.52%. The limitation was that the framework did not account for diverse customer features, such as behavioral patterns and customer feedback. This study intends to address these gaps by integrating Firefly feature selection to enhance model precision and recall.

Sam et al. (2024) proposed a churn prediction model using ML techniques, with XGBoost and Random Forest outperforming other algorithms, achieving 96% accuracy, precision, F1-score, and recall. Despite high performance, the study did not incorporate advanced feature selection methods, which this study intends to improve using Firefly feature selection with RBF-SVM.

Sikri et al. (2024) implemented a customer churn predictive system using machine learning algorithms and ensemble techniques. The hybrid algorithm, particularly XGBoost, yielded the best results in terms of accuracy (72.88%). This study aims to overcome the study's shortcomings in terms of data optimization and model efficiency by combining Firefly feature selection with RBF-SVM to enhance the model's overall performance.

Singh et al. (2024) focused on customer attrition in the banking industry using machine learning algorithms, particularly the XGBoost model, which achieved 83.9% accuracy. The study suggested that the model could be improved by incorporating feature engineering methods for better customer segmentation. This study aims to enhance churn prediction by using Firefly feature selection to optimize the model.

Syah et al. (2024) combined Particle Swarm Optimization (PSO) and Support Vector Regression (SVR) to predict customer churn with 67.7% accuracy and 58.0% precision. The study's limitations included the need for more advanced feature selection and improved accuracy. This study intends to address these limitations by integrating Firefly feature selection with RBF-SVM for more accurate and comprehensive churn prediction.

Wagh et al. (2024) employed machine learning algorithms such as Random Forest, KNN, and Decision Trees for churn prediction, with Random Forest achieving 99% accuracy, precision, and recall. While effective, the study lacked robust feature engineering, which this study plans to address using Firefly feature selection with RBF-SVM for improved prediction outcomes.

Khattak et al. (2023) proposed a hybrid BiLSTM-CNN model for churn prediction, achieving an optimal 81% accuracy. While the hybrid model showed promise, it still faced limitations regarding its computational complexity. This study intends to improve upon these methods by using Firefly feature selection to refine and enhance churn prediction accuracy without excessive computational cost.

Lukita et al. (2023) leveraged data mining and machine learning to predict customer churn using a banking dataset, with XGBoost achieving an accuracy rate of 87%. The limitation was the need for more diversified features in the prediction model, which this study aims to address by incorporating Firefly feature selection and expanding the range of input features.

Chaudhary et al. (2022) used multi-criteria decision-making techniques and various machine-learning algorithms to predict churn in a categorized employee dataset. The model achieved high accuracy (98.4%) and precision (98.7%). However, the study did not delve deeply into the role of feature selection in enhancing model performance, which this study intends to improve by incorporating Firefly feature selection with RBF-SVM.

Fujo et al. (2022) applied a Deep-BP-ANN model for churn prediction in the telecom industry, achieving an accuracy of 79.38%. The limitation of this study was its inability to effectively handle imbalanced datasets, which this study intends to resolve through Firefly feature selection.

Muneer et al. (2022) utilized Random Forest, AdaBoost, and SVM for churn prediction in the banking sector, achieving a 91.9% F1-score with Random Forest. The study's limitations included a lack of advanced feature selection, which this study will address using Firefly selection with RBF-SVM.

Domingos et al. (2021) conducted an experimental analysis on the impact of hyperparameters on deep neural networks (DNNs) for churn prediction, achieving 86.9% accuracy. Despite promising results, the study did not fully integrate feature engineering, which this study aims to optimize using Firefly feature selection.

Kavitha et al. (2020) developed models using Decision Tree, Random Forest, and XGBoost algorithms, achieving accuracy scores of 80%, 79%, and 78%, respectively. The study's limitation was its reliance on basic feature selection methods. This study intends to address these issues by enhancing feature selection with Firefly selection and applying RBF-SVM.

Olaniyi et al. (2020) proposed a customer churn prediction framework in the banking sector using data mining methods. SVM achieved 97% accuracy. The study did not explore the impact of feature selection methods in detail, which this study intends to address by using Firefly feature selection to enhance the accuracy of churn prediction models.

Ahmad et al. (2019) employed innovative feature engineering and selection methods for churn prediction, achieving a 93.3% AUC with XGBoost. While effective, the study did not fully optimize feature selection, which this study intends to improve by utilizing Firefly feature selection with RBF-SVM.

Ebrah and Elnasir (2019) used Naïve Bayes, SVM, and Decision Trees to predict churn in two benchmark datasets, achieving high AUC scores. The study's limitation was the lack of exploration into more advanced feature selection methods, which this study intends to address by incorporating Firefly selection into the churn prediction model.

Ullah et al. (2019) proposed a churn prediction model using information gain and random forest classification, achieving 88.63% accuracy. The limitation was that the study did not explore advanced feature selection techniques, which this study aims to improve by utilizing Firefly feature selection to enhance prediction accuracy.

From the foregoing it is obvious that there is insufficient feature selection in churn prediction hence this study is motivated within the context of relevant to build upon the works mentioned above by addressing the common limitation of insufficient feature selection, particularly in churn prediction, through the integration of Firefly feature selection with RBF-SVM.

Firefly Feature Selection (FFS) Method

Firefly Feature Selection (FFS) is a nature-inspired optimization algorithm used for selecting the most relevant features in a dataset (Yang, 2009). This algorithm is based on the flashing behavior of fireflies, employing a population-based search strategy to identify the optimal subset of features. A population of fireflies, each of which represents a possible feature subset, is initialized at the start of the FFS algorithm. Next, it assesses each firefly's quality according to its fitness function, which is usually determined by feature relevance or classification accuracy (Xue et al., 2012). Once the fireflies are initialized, they move toward each other based on their attractiveness, which is determined by their fitness values. The firefly with the highest fitness value attracts the other fireflies, and the algorithm iteratively updates the positions of the fireflies until convergence is achieved (Yang et al., 2013).

FFS has demonstrated effectiveness in selecting relevant features and enhancing the performance of machine learning models (Xue et al., 2012; Yang et al., 2013). The advantages of this algorithm include its ability to handle high-dimensional datasets, its robustness to noise and outliers, and its computational efficiency (Yang, 2009).

Radial Basis Function-Support Vector Machine (RBF-SVM) Technique

A variation of the Support Vector Machine (SVM) that uses the Radial Basis Function (RBF) as its kernel is called the Radial Basis Function-Support Vector Machine (RBF-SVM). Because it allows for non-linear classification by mapping the original data into a higher-dimensional space, the RBF kernel is frequently used in SVMs. The flexibility of Support Vector Machines (SVMs) stems from their kernel functions, which implicitly transform the data into a higher-dimensional feature space. This transformation allows for linear solutions in the higher-dimensional space, which correspond to non-linear solutions in the original input space (Azimi, Bonakdari, & Ebtehaj, 2019). Furthermore, the RBF kernel is utilized in the Least Squares SVM (LS-SVM) method, which enhances computational efficiency when compared to traditional SVMs.

3. Material and Method

This section is guided by the objectives of the study. The stages involved in the actualization of the objectives include: data acquisition, feature selection

on the acquired dataset, development of the customer's churn prediction system using the RBF-SVM algorithm, and evaluation of the performance of the proposed model in terms of accuracy, precision, recall and f1-score. The stages are described in Figure 1. it shows the stages involved in the development of a customer's churn prediction system, starting with data acquisition, feature selection on the dataset, model development, and model performance evaluation.

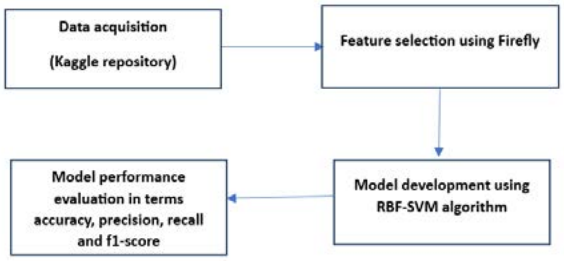


Figure 1: Frame-work for Customer Churn Prediction using FFS and RBF-SVM Techniques

Data Acquisition and Description

Customer churn data made available on the Kaggle repository can be accessible via https://www.kaggle.com/datasets/muhammadshahidazeem/customer-churn-dataset. The dataset contains 900 instances and 10 features namely: name, age, total purchase account manager, years, number of sites, onboard date, location, company, and churn. The initial dataset contains non-numerical features, such as name, and onboard date, making it incompatible for direct model implementation. Hence, the Label Encoder method was employed to preprocess the data by transforming it into a suitable format for modeling. Furthermore, an examination of the dataset reveals an imbalance in the distribution of the target variable. The oversampling technique was used to balance the dataset, ensuring a more reliable model performance.

Feature Selection using Firefly Feature Selection Technique

After the dataset collection as shown in Figure 1, the Firefly Algorithm was utilized for selecting the optimal feature subset. This was actualized by employing the metaheuristic techniques of the Firefly algorithm inspired by the flashing behavior of fireflies, this helped in selecting the most relevant features from the dataset. This process was carried out in a series of steps, beginning with the initialization of a population of fireflies with random positions, each representing a feature. Following this, the attractiveness of each firefly was calculated using a specific equation that reflects its fitness based on feature relevance or classification accuracy.

Next, each firefly moves towards the most attractive feature, guided by its fitness value. As the algorithm progresses, the fireflies' positions are updated based on these new attractiveness values. This iterative process of moving towards more attractive features continues until the algorithm converges or a predefined stopping criterion is met. Immediately convergence is achieved, To ensure that the most essential elements are kept for model construction, the top-ranked features are chosen based on their final attractiveness values. By lowering the dimensionality of the customer turnover data, this technique enhanced the effectiveness and precision of machine learning models. For the Firefly Algorithm, ten iterations (generations) and five features (dimensions) were set, respectively.

Customer's Churn Prediction System Development using RBF-SVM

Optimal features subset from the FFS was used to build a RBF-SVM prediction model, hence it is clear that building of the model start by preprocessing the dataset, including scaling/normalizing features and encoding categorical variables. RBF-SVM was used as a supervised learning algorithm that combines the strengths of SVMs and RBF networks. It uses an RBF kernel to transform non-linear data into a higher-dimensional space, making it linearly separable. RBF-SVM procedure (sourced from Govindarajan, 2014) is given as follow:

Input:

i. D is a collection of d tuples.

ii. The ensemble's number of models, k = 2.

iii. Base Classifiers (Support Vector Machine, Radial Basis Function)

Output:

i. M, the hybrid RBF-SVM model*

Procedure:

1. *Do // Create k models for i = 1 to k.*

2. *Sample D with replacement to create a new training dataset, Di. The training dataset Di may contain many instances of the same example from dataset D.*

3. *To create a model, use Di, Mi*

4. *Categorize every training data example. Based on the accuracy of the proportion of correctly categorized examples in the training data, Di, the weight, Wi, for the model, Mi, was initialized.*

5. Endfor

To use the hybrid model on a tuple, X:

1. *if classification then*

2. *assign a majority vote to each of the k models after they have classified X;*

3. *If the prediction is correct, then*

4. *Let X be predicted by each of the k models, then return the average of the predictions;*

Evaluation Metrics

Table 1 describes the evaluation metric used in this study showing the formula for each metrics

Table 1: Evaluation Metrics

Measure	Formula
Precision	$\frac{TP}{TP + FP}$ (1)
Sensitivity	$\frac{TP}{TP + FN}$ (2)
Accuracy	$\frac{TP + TN}{TP + TN + FP + FN}$
Specificity	$\frac{TN}{TN + FP}$ (4)

4. Result and Discussion

This section presents the key findings of this work, outlining the model's performance across various metrics. It also provides an in-depth discussion of the results, exploring the insights gained, the implications of the findings, and potential areas for further research and development. The insights derived from this analysis not only contribute to the field of cyber security but also demonstrate the vast potential of data-driven approaches in solving intricate real-world problems.

When the number of iterations (generations) for the Firefly Algorithm was set to 10 and the number of features (dimensions) was set to 5; the important features selected using this technique were depicted in Table 2. The results showed that six (6) features were selected as the optimal subset from the initial 10 features.

Table 2: Selected important features by Firefly Feature Selection Method

S/N	Selected features
1	Names
2	Age
3	Account Manager
4	Years
5	Num_Sites
6	Company

The obtained optimal feature subset was split into a training set consisting of 70% of the data and a testing set comprising 30% The RBF-SVM model was trained on the training data with optimized parameters, where the radial basis function (RBF) kernel was employed with a gamma value of 1 and a regularization parameter (C) of 1. The developed RBF-Support Vector Machine (SVM) successfully forecasted customer churn because of this setting, which allowed the model to capture non-linear relationships between the input features and the target variable. This resulted in a robust predictive performance on the unseen testing data.

Table 3 shows the results of the RBF-Support Vector Machine algorithm evaluation for the customer's churn prediction revealing a strong performance. With an accuracy score of 84%, the model correctly identifies 84% of customers who will churn or not. The precision score of 84% indicates that 84% of customers predicted churn actually did, showcasing the model's ability to accurately identify true positives.

The recall score of 100% is particularly notable, as it means the model identified all customers who actually churned, with no false negatives. This is crucial in customer churn prediction, as missing potential churners can lead to lost revenue. The exceptional performance obtained from the recall can be attributed to the oversampling techniques utilized for balancing the dataset. The F1 score of 91% provides a balanced measure of precision and recall, further emphasizing

the model's effectiveness.

Overall, these metrics suggest that the RBF-Support Vector Machine algorithm is a reliable tool for predicting customer churn. Its high accuracy, precision, and recall demonstrate its ability to identify at-risk customers, allowing businesses to proactively retain them and reduce churn rates. By leveraging this model, companies can optimize their customer retention strategies and improve overall customer satisfaction.

Conclusion and Recommendation

This work introduces a hybrid technique that combines the RBF-Support Vector Machine (SVM) algorithm with Firefly feature selection to create a predictive system for customer attrition in the banking sector. The model's efficacy was demonstrated by its 84% accuracy, 84% precision, 100% recall, and 91% F1-score. The study illustrates how feature selection is crucial for enhancing prediction accuracy and shows how the RBF-SVM algorithm can manage noise and non-linear correlations. Practical ramifications include giving banks the ability to recognize high-risk clients and put targeted retention plans in place, which will eventually boost client loyalty and revenue.

Future research can explore the integration of deep learning techniques to enhance predictive accuracy. Additionally, investigating the model's effectiveness across different industries can improve its generalizability. Lastly, incorporating real-time data analysis can help banks implement proactive retention strategies more efficiently.

Banks should use the suggested predictive method to identify clients who are at danger of leaving in order to increase customer retention. With the use of this system, banks can develop focused tactics to increase client loyalty, like tailored discounts and better customer support. Additionally, proactive engagement programs can improve client relationships and lower attrition rates. However, to ensure the continued effectiveness of this system, regular updates and maintenance are necessary. As customer behavior and market conditions change, the predictive model should be refined to maintain its accuracy.

Integrating the predictive system with customer relationship management (CRM) platforms enables real-time insights, allowing banks to respond quickly to churn risks, while proper staff training and continuous monitoring ensure its effectiveness. Future research may explore additional data sources also mayfly algorithms can be used as alternative feature techniques and ensemble stack techniques may be utilized to improve prediction accuracy and for enhance customer retention strategies.

References

Adeniran, O., Adebisi, B., & Bakare, F. (2024). Application of machine learning in predicting customer churn and enhancing retention in telecommunications. *Journal of Telecommunications, 45*(3), 112-128.

Ahmad, A. K., Jafar, A., & Aljoumaa, K. (2019). Customer churn prediction in telecom using machine learning in big data platform. *Journal of Big Data, 6*(1), 28. https://doi.org/10.1186/s40537-019-0191-6

Akhmetshin, E., Zaharov, I., & Popov, A. (2024). Intelligent data analytics framework for customer churn prediction using machine learning and big data analytics. *International Journal of Machine Learning Applications, 33*(4), 234-248.

Alotaibi, M., & Haq, I. (2024). Multiple classifiers for customer churn prediction in telecommunications: A comparative study. *Journal of Telecommunication Research, 12*(2), 56-70.

Chaudhary, P., & Sharma, K. (2022). Categorization of employees for churn analysis using multi-criteria decision-making techniques. *International Journal of Business Analytics, 17*(1), 54-70.

Chang, C., Hsu, W., & Tan, H. (2024). Decision trees, boosted trees, and random forests for forecasting customer churn in telecommunications. *Journal of Data Mining and Analytics, 29*(1), 88-104.

Domingos, A., & Silva, P. (2021). Impact of hyperparameters on deep neural networks for churn

prediction in the banking sector. *International Journal of Computational Intelligence, 41*(2), 223-235.

Ebrah, A., & Elnasir, A. (2019). Churn prediction using machine learning algorithms in the telecom industry. *International Journal of Data Science and Analytics, 28*(2), 178-191.

Fujo, T., & Zhang, S. (2022). Deep backpropagation neural networks for customer churn prediction in the telecom industry. *Journal of Artificial Intelligence in Business, 13*(3), 162-175.

Gurung, S., & Patel, H. (2024). Consumer churn prediction using machine learning: A case study of the U.S. market. *Journal of Consumer Behavior and Analytics, 14*(1), 104-119.

He, F., & Ding, X. (2024). Ensemble-fusion models for customer churn prediction in various industries. *Machine Learning Review, 36*(5), 211-225.

Kavitha, V., & Kumar, R. (2020). Machine learning models for identifying at-risk customers in telecommunications.*Journalof Telecommunications Research, 11*(4), 233-245.

Khattak, A. M., Mehak, Z., Ahmad, H., Asghar, M. U., Asghar, M. Z., & Khan, A. (2023). Customer churn prediction using composite deep learning technique. *Scientific Reports, 13*(1), 17294. https://doi.org/10.1038/s41598-023-44396-w

Krishna, P., & Ghosh, R. (2024). Customer churn prediction in the telecommunications sector using random forests. *Journal of Telecommunications and Data Science, 45*(2), 98-110.

Kusnawi, T., & Supriyanto, M. (2024). The impact of customer experience on retention using machine learning models at DQLab Telco. *Journal of Telecommunications Innovation, 19*(4), 211-225.

Lukita, A., & Liu, Z. (2023). Comparative analysis of machine learning algorithms for churn prediction in the banking industry. *Journal of Financial Data Analysis, 25*(3), 184-198.

Mahalakshmi, K., & Chellam, A. (2022). Analysis of customer churn in telecommunications using machine learning algorithms. *International Journal of Telecommunications Engineering, 42*(1), 128-141.

Manzoor, A., & Wang, J. (2024). A comprehensive review of machine learning techniques for customer churn prediction. *Journal of Data Science and Technology, 52*(1), 67-85.

Muneer, M., & Babar, Z. (2022). Customer churn prediction in banking using ensemble learning algorithms. *Journal of Banking and Financial Analytics, 18*(3), 92-107.

Olaniyi, O., & Salami, A. (2020). Customer churn mining in the banking sector using SVM and data mining methods. *Journal of Banking Technology and Applications, 15*(2), 77-85.

Olaniyi, O., Olaolu, D., Jimada-Ojuolape, A., & Kayode, M. (2020). Predicting customer churn using support vector machine algorithm in banking industry. *International Journal of Artificial Intelligence & Machine Learning, 8*(1), 45-58.

Sam, K., & Lee, C. (2024). Churn prediction using machine learning: A case study of telecommunications. *International Journal of Business Intelligence, 32*(1), 44-59.

Saha, D., & Paul, D. (2024). ChurnNet: A novel architecture for churn prediction in telecommunication industries. *Journal of Telecommunications Innovation, 19*(1), 210-225.

Sikri, A., & Gupta, V. (2024). Customer churn prediction using hybrid machine learning algorithms. *International Journal of Data Science, 22*(2), 132-146.

Singh, A., Anik, K., Senapati, S., Sinha, A., Sakib, M., & Hossain, T. (2024). Churn prediction in financial services: A review of techniques and applications. *International Journal of Financial Engineering, 10*(3), 33-50.

Singh, R., & Kumar, A. (2024). Customer attrition in banking: A machine learning approach. *Journal of Financial Technology, 27*(1), 55-68.

Syah, A., & Noor, M. (2024). Leveraging metaheuristics and machine learning for customer churn prediction in market businesses. *Journal of Business Analytics and Optimization, 12*(3), 104-116.

Ullah, M., & Latif, F. (2019). A customer churn prediction model using Random Forest and clustering techniques. *Journal of Machine Learning and Telecommunications, 23*(4), 178-190.

Wagh, R., & Rathi, P. (2024). Machine learning models for predicting customer churn in telecom industry. *Journal of Telecom Data Science, 15*(3), 102-118.

Xue, B., Zhang, M., & Keane, A. (2012). Firefly algorithm for feature selection in data mining.

Journal of Computer Science, 18(4), 445-453.

Yang, X. S. (2009). Firefly algorithms for multimodal optimization. In *International Symposium on Stochastic Algorithms* (pp. 169-178). Springer.

Yang, X. S., Deb, S., & Ochoa, G. (2013). Firefly algorithm: A comprehensive review. *International Journal of Computational Intelligence and Applications, 12*(2), 119-137.

Comparative Analysis of Selected Classification Algorithms on Weather Data

Shakirat Ronke YUSUFF[1] Ibrahim ODETUNDE[2] Jumoke Falilat AJAO[3]

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

1,2,3 Department of Computer Science, Kwara State University, Malete, Nigeria.

Abstract

Numerous human daily activities, such as transportation, farming, and commerce, are weather-dependent. Scientists have used a range of techniques to carry out weather forecasting, some more accurate than others, to predict environmental variables. Critical information about the weather is provided through weather forecasts. Accurate weather forecasting would assist the government in planning to prepare its citizens for the worst, since severe weather annually damages life, property, and many government projects that are typically substantially funded. In this study, a comparative analysis is carried out on three classification algorithms: random forest, decision tree and extra tree classifiers on weather data. Two sets of predictions were performed on weather data: the precipitation type and weather summary. With the prediction of precipitation type, the accuracy scores for both random forest and decision tree were 99.71%, while extra tree classifiers achieved 99.44% accuracy. The confusion matrix shows better prediction of records by random forest and decision tree classifiers, with a score of 99.71% each, while the extra tree classifier performed the least, predicting 99.69% records correctly. Also, the Classification report revealed that random forest had a precision of 99.84%, recall of 98.69% and F1-score of 99.26%. The decision tree classifier had a precision of 99.84%, recall of 98.69% and F1-score of 99.26%, while extra tree classifier had a precision of 99.18%, recall of 99.24% and F1-score of 99.21%. With the second set of predictions using weather summary, random forest had an accuracy score of 66.05%, decision tree had 53.9%, and the extra tree had 64.8% accuracy scores. As for the confusion matrix, random forest performed best with 66.17% records correctly predicted, extra tree classifier with 64.8% correct records and decision tree with 53.6% records. The Classification report showed random forest had a precision of 69.6%, recall of 47.8% and F1-score of 52.2%; decision tree achieved a precision of 17.39%, recall of 39.13% and F1-score of 30.43% while extra tree had a precision of 52.17%, recall of 30.43% and F1-score of 21.74%. In conclusion, the random forest classifier has proven to consistently outperform the other classifiers in this study. Further studies could focus on predicting future weather occurrences.

Keywords: Weather, Classification algorithm, Random Forest, Decision Tree, Extra Tree, Prediction

1. Introduction

One of the most experimental and challenging technological problems in the 20th century is weather forecasting (Abrahamsen et al., 2018). Environmental change has long been a subject of substantial discussion because of the sudden shifts it causes. It is difficult to predict the weather accurately currently because of the limitations on the improved execution of weather forecasting. In meteorology, the practice of weather forecasting is crucial because they are used to protect lives and property. Nonetheless, the ability to make accurate predictions is one of the main challenges faced by meteorologists globally.

Weather forecasts are useful for planning outdoor activities, growing crops, managing time, operating hydropower plants, managing floods, and other human-related activities. Forecasts based on weather, outlook, humidity, and wind are crucial

to farming and, by extension, to traders in product markets. Temperature forecasts are used by utility managers to assess future demands (Abrahamsen et al., 2018). Estimates can be used to plan activities around severe weather as well as to prepare for and survive it because it has a significant negative influence on outdoor activities. Instances of severe weather include heavy rain, snowfall, and wind chill. Without accurate weather forecasts, people could be injured or worse if they were involved in dangerous situations when they are unprepared. The processing capacity of technology has not increased enough to perform weather prediction effectively. Even if the meteorologist was able to construct more sophisticated models that required complex computation and enhanced prediction abilities, thanks to the capabilities of modern computer systems, the accuracy and the timely forecast of weather occurrences remain significant problems. The significance of timely and precise weather forecasting has also grown because of global climate change and the occurrence of some catastrophic weather phenomena. With the Kogi State flooding that occurred in November 2022, Dr. Zakari Usman, the Kogi state Commissioner for Health reported during a press Conference in Lokoja, Nigeria that over 514 villages were impacted, 471,000 people were relocated, 92 medical institutions were destroyed, and 24 people died, having a significant negative impact on the state's health (Omole, 2022). The 2018 flooding in Ogbaru Local Government Area of Anambra State, Nigeria had a record of about 11,180 persons displaced, affecting the 13 communities out of 16 in the LGA, costing farmers their produce and the community residents their property (Nwabueze, 2018). Russia has experienced both the deadliest heat wave and the worst drought in recorded human history. Heavy rains caused a record-breaking natural disaster that affected Australia and Colombia. The World Economic Forum has also raised the alarm, stating that one of the biggest global concerns facing people in the twenty-first century would be climate change. Although there is no way to stop natural disasters, early and accurate forecasts can help to lessen the number of lives lost and other costs, which are the motivations behind the development of weather forecasting models. A more accurate model can predict the event as soon as feasible and with great accuracy. Numerous regional, national, and international organisations throughout the world are working to improve climate forecasts, including the World Meteorological Organisation (WMO), the International Research Institute (IRI), and the World Climate Application and Services Program (WCASP). The primary contributors are those who are dedicated to employing high-quality research to predict environmental changes, protect people and property, and provide decision-makers with accurate, timely, and scientific information.

On weather data, a variety of machine learning techniques have been used to forecast climatic variables like temperature, wind speed, rainfall, and meteorological pollution. Artificial Neural Networks (ANN) (Abhishek et al, 2012), Naive Bayesian Networks (Wu et al, 2012), Support Vector Machines (SVM) (Jayasingh & Mantri, 2020), Fuzzy Logic, Rule-based Techniques, which include Memory-based reasoning Techniques and Genetic Algorithms, are some of the most frequently used machine learning techniques for weather prediction. Despite good performance, some of the shortcomings of these algorithms include complexity, black box nature and time taken in making predictions by the machine, which has made their adoption in the real world slow. It is, therefore, imperative to conduct a comparative analysis of some selected classification algorithms on weather data, which aligns with this study's aim. Overall, this research contributes to the meteorological sector by analysing the performance of Random Forest, Decision Tree and Extra Tree Classifiers in predicting precipitation type and weather summary. It underscores the importance of adopting simple classification algorithms on weather data to enhance prediction accuracy in a timely and less complex manner.

2. Literature Review

In the past ten years, numerous attempts have been made to address the problem of weather forecasting, using statistical modelling, including machine learning systems, with published results. Examples include artificial neural networks, predictive analysis in Apache Hadoop Framework using Naive Bayes Algorithm, and neural network-based algorithms using Back Propagation Neural Network (BPN) and Hopfield Network, Recurrence Neural Network (RNN), Conditional Restricted Boltzmann Machine (CRBM), and Convolutional Network (CN) models.

Sujatha et al. (2024) aimed to design a model using Random Forest and K-Nearest Neighbor algorithms to predict weather events, using Python to reach 100% accuracy in the prediction. At the end of the research work, the random forest algorithm achieved

an accuracy of 86.77, precision of 69.05, F1_score of 62.15, recall of 56.53, and misclassification error of 13.22 compared to k-nearest neighbor with 84.35 and 59.38, 68.67, 57.48 and 16.08, respectively. The random forest algorithm achieved higher accuracy and precision scores, while the K-nearest neighbor algorithm achieved higher F1-score and recall, but at the end of the research work, the goal of the project, which was to achieve a 100% accuracy score, was not achieved.

Xhabafti et al. (2024) performed a comparative study by designing a model based on selected statistical methods and deep learning models for weather prediction based in Albania. The model is made up of some statistical methods, such as Auto Regressive Integrated Moving Average (ARIMA), Error, Trend & Seasonal (ETS) and some deep learning models such as Long Short-Term Memory Network (LSTM) and Deep Forward Neural Network (DFNN). The analysis of the study was divided into three parts, which are the comparison of ARIMA and ETS, LSTM and DFNN, while the third part is the comparison of the best in the first and second parts. As for the result, the Root Mean Square Error (RMSE) was used as the performance metrics. In the first part of the analysis, ARIMA had an RMSE of 38.06956 while ETS with 33.89779. The ETS model performed better with the lower RMSE in the prediction. The second part of the analysis, LSTM had an RMSE of 55.234002, while DFNN with 53.723089. The DFNN outperformed the LSTM based on the RMSE metrics, which is lower. The last part of the analysis sees the ETS model compared with the DFNN model and with the RMSE as the main metric. The ETS model performed better with lower RMSE 33.89779 compared with DFNN which is 53.723089.

Ajina et al. (2023) developed an application (Graphical User Interface) using Python to predict the weather condition of a specific city and compare the data with different cities. The Artificial Neural Network with backpropagation algorithm was used. With this in place, an experiment was done to prove the impact of COVID-19 epidemic on the meteorological forecast accuracy. The data used for the comparison was from March to May 2020 (During COVID-19) and March to May 2015 to 2019 (pre-COVID-19). The experiments were carried out in various cities in India, the Bangalore, Mumbai, Kolkata, Chennai and Delhi. At the end of the experiments, it was discovered that due to the drastic reduction of airplane transportation services and aircraft-related monitoring from March to May 2020, caused by the nationwide lockdown during the COVID-19 period, the predicted accuracy during the COVID-19 period is different from the average accuracy of the pre-COVID-19 period. It is concluded that a global pandemic can affect the result of weather forecasts, which can impact future weather predictions.

AbdulRaheem et al (2022) developed a model to compare three machine learning algorithms: Decision tree (DT), k-nearest neighbor(k-NN) and logistic regression (LR) on weather data with the aid of a web-based application developed using Flask App. At the end of the study, the decision tree algorithm performed best with a 100% accuracy score, outperforming the logistic regression and k-nearest neighbor, which had an accuracy score of 93% and 78%, respectively. In terms of rain prediction, the decision tree achieved an appropriate score of accuracy.

Muthukumar et al. (2021) used a two-stage model capable of learning spatiotemporal trends based on data from ground-based sensors monitoring air pollutants and meteorological features, and remote sensing satellite imagery of air pollution to anticipate PM2.5 atmospheric air pollution in Los Angeles, USA. The resulting model used meteorological and air pollution data from the ground-level sensors and remote sensing satellite imagery from roughly 10 days ago to predict spatiotemporal PM2.5 in terms of micrograms per cubic meter (gm3) at seven sensor locations in Los Angeles County every 46 hours at intervals of approximately 10 days in the future. However, the study was limited to Los Angeles in the United States.

Support vector machine (SVM) and multiple linear regressions were used by Jyothi et al. (2020) to create an efficient rainfall prediction agent model. For this, the decision tree and linear regression algorithms were used with Support Vector Regression (SVR) and implemented in MATLAB. Two sets of experiments were run; the first using SVR to create a time series forecasting agent model and the second utilising the multivariate regression issue to create a visualising agent model. The accuracy score increased by 15.9% because of Support Vector Regression (SVR). Quantitative estimation can therefore be produced by increasing the complexity of time series data for diverse situations of weather patterns with more parameters.

Kashikar et al. (2019) designed a weather

prediction model for Agricultural purposes. The functional regression algorithm and linear regression were both used in the approach, which was carried out using Python, the Pandas, NumPy, and Scikit Learn libraries. The outcome of the experiment is as follows: Explained Variance: 0.94; Mean Absolute Error: 1.07°C; Median Absolute Error: 0.81°C. According to the test results, the system performed in line with the project's intended goals and objectives. The weather prediction model system was able to predict the weather accurately and efficiently.

Abrahamsen et al. **(**2018) used an Artificial Neural Network (ANN) to attempt to predict the temperature. ANN is employed in this process. The temperature is tested in four models, which are the prediction of the temperature 1, 3, 6, and 12 hours in advance. For each model, two experiments were conducted. Only temperature was used as an input to the networks in the first experiment using Auto-Regressive Neural Network (AR-NN). As the prediction period increased from 1 hour to 12 hours, the test error also increased, starting at 0.0101 for the 1-hour model, 0.0318 for the 3-hour model, 0.0608 for the 6-hour model and reaching 0.0894 for the 12-hour model with regression horizons 24, 48, 48 and 169, respectively. In the second experiment, an Autoregressive Neural Network (ARXNN) with exogenous input was created by adding precipitation data to the network. As the prediction period increased from 1 hour to 12 hours, the test error increased as well, starting at 0.0133 for the 1-hour model, 0.0653 for the 3-hour model, 0.0946 for the 6-hour model and reaching 0.0991 for the 12-hour model with regression horizons 24, 48, 48 and 24, respectively. Although there was a slight increase in test error with ARXNN compared to the ARNN, it has been demonstrated that adding precipitation as an input to the ARXNN model slightly enhances forecast accuracy, as the regression of the 12-hour model reduced drastically to 24. Consequently, it might be intriguing to add more input to the model. Studying if adding data from other geographical places can enhance prediction outcomes is of relevance.

Mohammad et al. (2014) aimed to predict weather using MkNN algorithm and compare results with the following 5 algorithms: 1. Linear Regression, a model based on regression, 2. The Support Vector Machine version (SMO reg), 3. A type of artificial neural network, the multilayer perception. 4. RepTree, an approach based on decision trees, 5. CP-KNN, a KNN-based climate prediction model. The results of the study are arranged respectively as (Linear Regression, SMOReg, Multilayer Perception, RepTree, Knn, MkNN) Mean Absolute Error: (2.703, 5.177, 2.766, 2.738, 3.620, 2.080), Root Mean Square Error: (3.226, 6.384, 3.206, 3.144, 3.646, 2.114), Mean Absolute Percentage Error (24.943, 49.202, 23.435, 27.661, 5.679, **3.279**), Mean Squared Error (10.409, 40.751, 10.282, 9.884, 13.294, 4.471). The findings demonstrate that, in comparison to existing data mining prediction strategies, the suggested model yielded remarkably good results. To make the forecast more comprehensive and for a wider area, the model can be expanded to include additional attributes (such as solar radiation, the water cycle, air pressure, and earth rotation, among others). Additionally, it can be used to predict the climate, doing so on a seasonal to inter-annual time frame.

Scientists have tried their best to forecast environmental characteristics using several methods, and some of these methods are more accurate than others. In weather data, a variety of machine learning techniques are used to forecast climatic variables like temperature, wind speed, rainfall, and meteorological pollution. Artificial Neural Networks (ANN), Naive Bayes Networks, Support Vector Machines (SVM), Fuzzy Logic, Rule-based Techniques, which include Memory-based reasoning Techniques and Genetic Algorithms, are some of the most frequently used machine learning techniques for weather prediction.

Some of the shortcomings with these algorithms include the complexity of the algorithm and human error (during calculation process) due to the mathematical nature of the algorithms and time taken in making prediction by the machine.

This research will perform a comparative analysis of the classifiers: Random Forest, Decision Tree and Extra Tree classifiers on the weather data provided to it so as to provide the best of them. The choice of these classifiers is due to the non-complexity (ease of implementation) and non-mathematical nature of the classifiers which does not involve calculation process that could lead to failure due to human error.

A summary of the reviewed literature is presented in Table 1.

Table 1: *Summary of Existing Studies*

AUTHOR	TITLE	METHODOLOGY	RESULTS	LIMITATIONS/ INFERENCE
Sujatha et al. (2024)	Weather Prediction Using Machine Learning Algorithms	Random Forest and K-nearest neighbor algorithm using Python	The Random Forest algorithm performed better with accuracy of 86.77, precision of 69.05, F1_score of 62.15, recall of 56.53, and misclassification error of 13.22 compared to k-nearest neighbor with 84.35 and 59.38, 68.67, 57.48 and 16.08, respectively	Random forest algorithm performed better but was unable to reach the goal of the project which is 100% accuracy score of the weather prediction.
Xhabafti et al. (2024)	A Comparative Study of Statistical and Deep Learning Model-Base weather Prediction in Albania	The model is made up of some statistical methods, such as Auto Regressive Integrated Moving Average (ARIMA), Error, Trend & Seasonal (ETS) and using some deep learning models such as Long Short-Term Memory Network (LSTM) and Deep Forward Neural Network (DFNN	Three parts of the experiments were conducted, which are the comparison of ARIMA and ETS, LSTM and DFNN, while the third part is the comparison of the best in the first and second parts. As for the result, the Root Mean Square Error (RMSE) was used as the performance metrics. In the first part of the analysis, ARIMA had an RMSE of 38.06956 while ETS with 33.89779. The ETS model performed better, having lower RMSE in the prediction. The second part of the analysis, LSTM had an RMSE of 55.234002, while DFNN with 53.723089. The DFNN outperformed the LSTM based on the RMSE metrics, which is lower. The last part of the analysis sees the ETS model compared with the DFNN model and with the RMSE as the main metric, the ETS model performed better with lower RMSE 33.89779 compared with DFNN, which is 53.723089	The experiment is limited to Albania with records from January 1901 to December 2022, the statistical method had a more optimised error compared to the deep learning model.
Ajina et al. (2023)	Prediction of weather forecasting using artificial neural networks	The Artificial Neural Network with back-propagation algorithm was used	It was discovered that due to the drastic reduction of airplane transportation services and aircraft-related monitoring from March to May 2020, caused by the nationwide lockdown during the COVID-19 period, the predicted accuracy during the COVID-19 period from the average accuracy of the pre-COVID-19 period	A global pandemic can affect the accuracy of weather forecasts, which can impact future weather predictions.

AbdulRaheem et al (2022)	Weather prediction performance evaluation on selected machine learning algorithms	The Decision tree (DT), k-nearest neighbor(k-NN) and logistic regression (LR) algorithm were used to develop a model with the aid of a web-based application developed using Flask App	At the end of the study, the decision tree algorithm performed best with a 100% accuracy score, outperforming the logistic regression and k-nearest neighbor, which have an accuracy score of 93% and 78%, respectively	In terms of rain prediction, the decision tree achieved an appropriate score of accuracy
Muthukumar et al (2021)	Predicting PM2.5 atmospheric air pollution using deep learning with meteorological data and ground-based observations, and remote-sensing satellite big data	A two-stage model capable of learning spatiotemporal trends based on remote-sensing satellite imagery of air pollution and data of ground-based sensors monitoring air pollutants and meteorological features.	The resulting model predicts spatiotemporal PM2.5 in terms of micrograms per cubic meter (μgm3) at seven sensor locations in Los Angeles County every 46h at roughly 10 days in the future intervals using meteorological and air pollution data of remote-sensing satellite imagery and ground-level sensors from roughly 10 days in the past.	The model was designed to only work in Los Angeles County, with a concentration on PM2.5 air pollution
Jyothi et al (2020)	Weather Prediction Through Machine Learning	Decision Tree and linear regression algorithms were used with SVM and were implemented in MATLAB.	On the data, two sets of experiments were run, the first using SVR to create a time series forecasting agent model and the second utilising the multivariate regression issue to create a visualising agent model. The Support Vector Regression (SVR) resulted in 15.9% improved accuracy rate	Increasing the Complexity of time series data for various cases of weather patterns with a greater number of parameters can result in quantitative estimation.
Kashikar et al (2019)	Weather Prediction using Scikit-Learn	Algorithm used for this is the linear regression and a variation of functional regression and implemented using Python, Pandas library, NumPy library as well and the Scikit Learn library.	The Explained Variance: 0.94 The Mean Absolute Error: 1.07°C The Median Absolute Error: 0.81°C	Based on the test results, the whole system performed according to the designed aim and objectives of the project. The weather prediction model system was able to forecast weather for next 7 days to 1 month with accuracy and efficiency.

Abrahamsen et al (2018)	Machine Learning in Python for Weather Forecast based on Freely Available Weather Data	The Artificial Neural Network (ANN) is used in this work. Four separate models were trained to predict the temperature 1, 3, 6, and 12 hours ahead. Two experiments were done for each model. In the first experiment, only temperature was used as input to the networks. This constitutes an auto-regressive neural network (AR-NN). In the second experiment, precipitation data was introduced into the network, forming an autoregressive neural network with exogenous input (ARXNN).	As the prediction period increased from 1 hour to 12 hours, the test error also increased, starting at 0.0101 for the 1-hour model, 0.0318 for the 3-hour model, 0.0608 for the 6-hour model and reaching 0.0894 for the 12-hour model with regression horizons 24, 48, 48 and 169 respectively. In the second experiment, an Autoregressive Neural Network (ARXNN) with exogenous input was created by adding precipitation data to the network. As the prediction period increased from 1 hour to 12 hours, the test error increased as well, starting at 0.0133 for the 1-hour model, 0.0653 for the 3-hour model, 0.0946 for the 6-hour model and reaching 0.0991 for the 12-hour model with regression horizons 24, 48, 48 and 24, respectively.	Although there was a slight increase in test error with ARXNN compared to the ARNN but it has been demonstrated that adding precipitation as an input to the ARXNN model slightly enhances forecast accuracy as the regression of 12-hour model reduced drastically to 24. Introducing precipitation as an input in the ARX model was shown to slightly improve the prediction performance. Hence, it may be interesting to extend the model with other inputs. Mainly, it is of interest to study whether the introduction of data from other geographical locations can improve the prediction results.
Mohammad et al (2014)	Weather prediction using classification	The kNN (k-Nearest Neighbour) and MkNN (Modified k-nearest Neighbour) algorithms was used for this with JAVA programming language	The results are arranged respectively as (Linear Regression, SMOReg, MultiLayer Perception, RepTree, Knn, MkNN) • Mean Absolute Error: (2.703, 5.177, 2.766, 2.738, 3.620, 2.080) • Root Mean Square Error: (3.226, 6.384, 3.206, 3.144, 3.646, 2.114) • Mean Absolute Percentage Error (24.943, 49.202, 23.435, 27.661, 5.679, 3.279) • Mean Squared Error (10.409, 40.751, 10.282, 9.884, 13.294, 4.471)	The results show that the proposed model produces very good results compared to other data mining prediction techniques. The model can be extended to incorporate other attributes (such as solar radiation, water cycle, air pressure and earth rotation, etc) to make the forecast more general and for larger areas. It can also be extended to climate prediction, in which it will predict the climate at the seasonal to inter-annual time scale

3. Material and Method

A weather-based dataset is supplied as input to the prediction system, which comprises the three classifiers. The dataset then goes through data preprocessing, which involves data cleaning by removing from the dataset the null values, blank spaces, features that have no impact on the prediction, as well as converting categorical data to numerical data. The preprocessed dataset goes through the process of feature engineering. Here, the "formatted date" feature is used to generate new features of both hour and day using the sine and cosine function as machine learning is used to encode cyclic and periodic patterns and then visualise the correlation of all features in the dataset to see if any can be dropped. The processed dataset is then split into features and labels. Two rounds of experiments were done using 80% of the data for training and 20% for testing. Firstly, the "precipitation type" with only 2 possible outcomes is set as the target variable, the three classifiers perform their operations and evaluations were done and recorded, after which another round of tests was done, setting "summary" with a possibility of 27 outcomes as the target variable.

Algorithms used in this Study

The following classification algorithms were utilised in this study: Random Forest, Decision Tree and Extra Tree Classifiers.

A. Random Forest Classifier (RFC)

Step 1: Select random samples from a given data or training set.

Step 2: This algorithm will construct a decision tree for every training data.

Step 3: Voting will take place by averaging the decision tree.

Step 4: Finally, select the most voted prediction result as the final prediction result.

B. Decision Tree Classifier Algorithm (DTC)

Step 1: Begin the tree with the root node, S, which contains the complete dataset.

Step 2: Find the best attribute in the dataset using Attribute Selection Measure.

Step 3: Divide the S into subsets that contain possible values for the best attributes.

Step 4: Generate the decision tree node, which contains the best attribute.

Step 5: Recursively make new decision trees using the subsets of the dataset created in **step 3.** Continue this process until a stage is reached where you cannot further classify the nodes and call the final node as a leaf node.

C. Extra Tree Classifier (ETC)

Extra tree (short for Extremely Randomised Trees) is an ensemble supervised machine learning method that uses decision. This method is similar to random forests but can be faster. Like Random Forest's technique, the extra trees algorithm generates a large number of decision trees, but each tree's sampling is random and without replacement. This generates a dataset with distinct samples for each tree. For each tree, a predetermined number of features is also randomly chosen from the entire set of features. The selection of a splitting value for a feature at random is the most significant and distinctive aspect of additional trees. The algorithm chooses a split value at random rather than figuring out a locally optimal split using Gini or entropy. As a result, the trees are diverse and uncorrelated. (ArcGIS Pro, nd).

The algorithm for implementing the three Models: RFC, DTC, ETC on weather data is presented in Figure 1, while an explanation of the algorithm parameters is given in Table 2:

Algorithm to perform prediction on weather data using selected classifiers

Start

Input*: dataset weather_data*

Output: *model_scores[ ], model_confusion[ ], model_classification[ ],*

Begin

label[1,2]=["precip_type", "summary"]; //setting precip_type and summary as the target variables for each instance of test.

df_temp = weather_data // duplicate a copy of the weather dataset.

df_temp= Preprocess (df_temp) //perform data cleaning on the duplicated dataset and convert categorical data to numerical data.

for i = 1 to 2{

//Begin loop for each test

y= label[i] //target variable i.e label

X= df_temp – y // removing the target variable from the processed data so we are left with the remaining features.

//Creating subsets of training and testing data from X and y using the 80:20 split ratio, 80% for training and 20% for testing.

X_train = Split (X,0.8)

X_test = Split(X,0.2)

y_train = Split(y, 0.8)

y_test = Split(y,0.2)

models ["name", "model"] = ["RFC: RandomForestClassifier( )", "DTC: DecisionTreeClassifier( )", "ETC: ExtraTreeClassifier( )"] //each instance of the models is stored in the respective label RFC, DTC and ETC

for each models {

Train & Test (model) //Train the models and predict the target variable

Print model_scores[name] //generates accuracy scores

Print model_confusion[name] //generates confusion matrix

Print model_classification[name] //generates classification report

}

}

End

Figure 1: Model Implementation

Table 2: *Parameters used in the algorithm to perform prediction on a weather dataset using selected classifiers*

Parameter	Definition
weather_data	Dataset.
model_scores	stores the accuracy scores of each classifier.
model_confusion	stores the confusion matrix data of each classifier.
model_classification	stores the classification reports of each classifier.
df_temp	Duplicated copy of dataset to work on.
Label	An array storing the target variable for each test
I	Counter for each round of test.
X	The list of features for prediction.
Y	The label (target variable) for prediction.
X_train	80% of the dataset of variable X used for training.
y_train	80% of the dataset of variable y used for training.
X_test	20% of the dataset of variable X used for testing.
y_test	20% of the dataset of variable y used for testing.
Models	Array storing the predefined programming language functions of each classifier.
Name	The Classifier label in the array
Model	Each classifier assigned to "name"

Dataset

The Dataset (weather data) for this research was obtained from Kaggle https://www.kaggle.com/datasets/muthuj7/weather-dataset. The dataset spans the years 2006 to 2016. The features of the dataset include: datetime, summary, precipitation type, temperature, apparent temperature, humidity, windspeed, wind-bearing, visibility, loud cover, pressure and daily summary. The dataset contains 19188 records with 12 features.

Data Preprocessing

Whenever data is gathered from several sources, analysis is not practicable because the data was collected in raw form. Data preprocessing is essential in machine learning projects if better results are to be obtained from the model that is being used. Data in such a format is necessary for a particular machine learning model. For instance, because the Random Forest technique does not accept null values, null values from the original raw dataset must be handled before the algorithm can be used.

Pre-processing is the most crucial step in the machine learning work cycle since data provides the foundation of a strong model and an accurate prediction over time. By using variable Python routines, all the blank spaces, illogical entries, and erroneous data were eliminated.

Pseudocode for Data Preprocessing (Data Cleaning)

Data pre-processing is the most crucial step in the machine learning work cycle since data provides the foundation of a strong model and an accurate prediction over time. It is essential in machine learning projects to obtain better results from the algorithm being used. This is because raw data are usually "noisy", containing missing values or inconsistent data in some instances. For instance, because the Random Forest technique does not accept null values, null values from the original raw dataset must be handled before the algorithm can be used. The steps utilised for data preprocessing in this study include:

1. Remove features which do not have any impact on the prediction.

(The value of ***"Loud Cover"*** *feature is the same for all rows, so, it was removed. Also,* ***"daily summary"*** *feature is a long description of the "****Summary****" feature and cannot be used within the algorithms, so it was removed as well. They were all removed using drop() function in Python.*

2. Remove Null Values. *dropna() function in Python was used*

3. Remove blank spaces. *dropna() function in Python was used*

4. Convert Categorical data into numerical.

(The ***"precipitation type"*** *and* ***"summary"*** *features were converted into numerical values). The LabelEncoder class was used from sklearn. preprocessing library in Python*

The assigned values for each label after converting

the "precipitation type (Precip Type)" and "summary" features is shown in Tables 3 and 4, respectively.

Table 3: *Numerical conversion of the* ***"precip type"*** *feature*

Label	Converted to:
Rain	0
Snow	1

Table 3 shows the assigned values for the categorical labels "rain" and "snow", which were converted to 0 and 1 numerical values, respectively.

Table 4: *Numerical conversion of the* ***"summary"*** *feature*

Label	Converted to:
Breezy	0
Breezy and Dry	1
Breezy and Foggy	2
Breezy and Mostly Cloudy	3
Breezy and Overcast	4
Breezy and Partly Cloudy	5
Clear	6
Dangerously Windy and Partly Cloudy	7
Drizzle	8
Dry	9
Dry and Mostly Cloudy	10
Dry and Partly Cloudy	11
Foggy	12
Humid and Mostly Cloudy	13
Humid and Overcast	14
Humid and Partly Cloudy	15
Light Rain	16
Mostly Cloudy	17
Overcast	18
Partly Cloudy	19
Rain	20
Windy	21
Windy and Dry	22
Windy and Foggy	23
Windy and Mostly Cloudy	24
Windy and Overcast	25
Windy and Partly Cloudy	26

Table 4 shows the assigned values for the summary label after conversion to numerical values. The values ranged between 0 and 26, representing values such as "breezy", "breezy and dry", "clear", "dry" and so on.

Feature Engineering

The act of choosing, modifying, and converting unprocessed data into features that can be applied in supervised learning is known as feature engineering. A machine learning technique called feature engineering uses data to generate new variables that are not present in the training set. To streamline and accelerate data transformations while also improving model accuracy, it can generate new features for both supervised and unsupervised learning. In order to remove unneeded features, new features were added, and correlation was examined.

New Features added to the dataset

The feature "Formatted Date" is used to generate four new features which are "hour_sin", "hour_cos", "day_sin", and "day_cos". The sine and cosine functions are used for both hour and day.

Sine and cosine functions are used in machine learning to encode cyclic or periodic patterns in datetime data. By transforming datetime values using sine and cosine functions, we can create continuous representations that capture the periodic nature of phenomena such as time of day, day of the week, and seasonality.

Data Splitting

The data was split into features and class label; X: feature, y: label. The ***"Precip Type"*** was initially used as the target variable for the prediction. At this time, it was difficult to select the best model based on the accuracy score since "***Precip Type"*** only has 2 kinds of data in it, which is *rain* and *snow*. Then, the "***Summary"*** feature was selected as the target variable to get a more precise accuracy score.

Evaluation Metrics

The evaluation metrics used in this study are Accuracy Score, confusion matrix and classification report (which includes precision, recall and F1-score). Table 4 depicts the formula for computing accuracy, precision, recall and F1-score.

Table 5: *Evaluation Metrics*

Measure	Formula
Accuracy	$\frac{TP + TN}{TP + TN + FP + FN}$
Precision	$\frac{TP}{TP + FP}$
Recall	$\frac{TP}{TP + FN}$
F1-Score	$\frac{2 \times Precision \times Recall}{Precision + Recall}$

Table 5 depicts the formulas for evaluating the accuracy, precision, recall and F1-score of the models implemented in this study, where:

• **TP (True Positives):** The number of instances correctly predicted as positive by the model.

• **FN (False Negatives):** The number of instances that were truly positive but incorrectly predicted as negative by the model.

• **FP (False Positives):** The number of instances incorrectly predicted as positive

4. Result and Discussion

This section presents the key findings of the research, highlighting the model's performance across the different evaluation metrics. It also provides an in-depth discussion of the results, giving insights into the implications of the findings.

In evaluating the models, two instances were considered: First, "***Precip Type"*** was used as the target variable and the other instance used "***Summary"*** as the target variable. The results and discussion after training and testing the models are presented in the following sections.

Model Evaluation based on Accuracy

The accuracy score represents the proportion of correct predictions made by the model and is expressed as a percentage. The higher the value, the better the performance of the model.

Accuracy Score when using "precip type" for prediction

The accuracy scores of the models generated using "***Precip type"*** as the target variable are presented in Table 5.

Table 6*: Accuracy scores using "Precip Type" as the target variable.*

Classifier	Accuracy
RFC	0.997134
DTC	0.997134
ETC	0.994424

Table 6 shows that Random Forest Classifier and Decision Tree Classifiers had accuracy scores of 99.7%, while Extra Tree Classifier had 99.4% accuracy score. This implies that all three models accurately predicted the Precip Type, which could have been due to having only two class labels: rain and snow.

Accuracy Score using "summary" for prediction

The accuracy scores of the models generated using "***summary"*** as the target variable are presented in Table 7.

Table 7: *Accuracy Score of the models using Summary as the target variable.*

Classifier	Accuracy
RFC	0.660465
DTC	0.538618
ETC	0.647801

Table 7 shows RFC with an accuracy score of 66% which indicates that the model correctly predicted the weather 66 out of 100 times. DTC has an accuracy score of 53.9% while ETC has a 64.8% accuracy score. From this, it clearly shows that Random Forest Classifier has the best accuracy score for the prediction using summary as target variable.

Comparison of Accuracy Scores

Comparison of the accuracy of the models based on "***Precip Type***" and "***summary***" as target variables is presented in Figure 2.

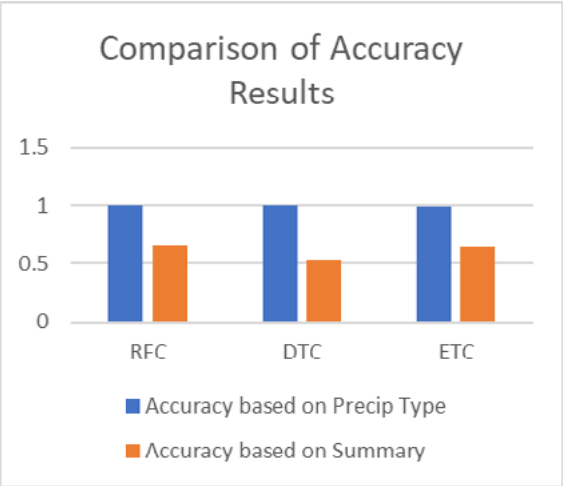


Figure 2: Comparison of Accuracy Scores

Figure 2 shows a comparison of the accuracy of the models when ***"precip type"*** and ***"summary"*** were used for prediction. It was revealed that the accuracy scores when "Precip Type" was used as target variable consistently performed better than when "summary" was used for all three models. This may have been because of the fewer labels for the "Precip Type" (rain and snow). Nonetheless, the accuracy scores based on "summary" performed above average in all three models, which indicates that for more than 50% of the time, the models will accurately predict the weather.

Model Evaluation based on Confusion Matrix

The confusion matrix is a matrix that evaluates the performance of a machine learning model by showing counts of correct and incorrect predictions for each class label. This study also plotted the confusion matrix on a chart for easy representation.

Confusion Matrix using "precip type" for prediction

The confusion matrix for RFC, DTC, and ETC using "Precip Type" as the target is depicted in Figures 3 (a), (b) and (c), respectively.

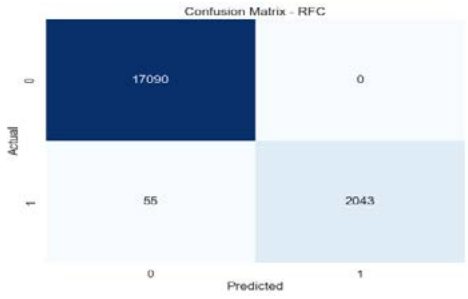


Figure 3(a): *Confusion Matrix for RFC using "Precip Type" as Target variable.*

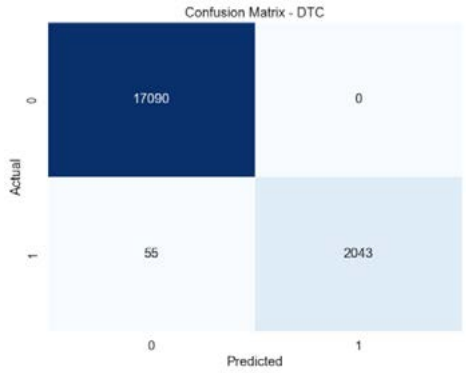


Figure 4: *Confusion Matrix for Decision Tree Classifier using "Precip Type" as the Target variable.*

Figure 3 (a) and (b) shows the confusion matrix for RFC and DTC which revealed that out of the total test record 19188, both models predicted 17090 instances correctly for when the actual value is 0 with no wrong predictions. Also, out of the total test record, both models predicted 2043 records correctly when the actual value is 1 and 55 records incorrectly.

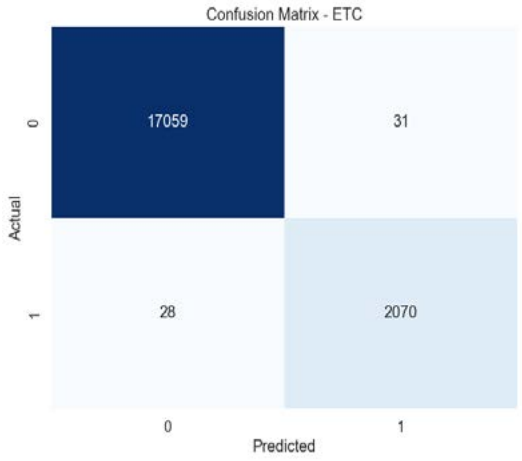


Figure 3(c): *Confusion Matrix for ETC using "Precip Type" as the Target variable.*

Figure 3(c) shows that out of the total test record of 19188, the model predicted 17059 records correctly when the actual value is 0 and predicted 31 records wrongly. Also, out of the total test records, it predicted 2070 records correctly when the actual value is 1 and 28 records incorrectly.

Confusion Matrix using "summary" for prediction

The confusion matrix for RFC, DTC and ETC using "summary" as the target are depicted in Figures 5 (a), 6 (a) and 7 (a), respectively while the percentage distributions of correct and incorrect predictions for each class label are shown in Figures 5 (b), 6(b) and 7 (c) for RFC, DTC and ETC, respectively using bar charts.

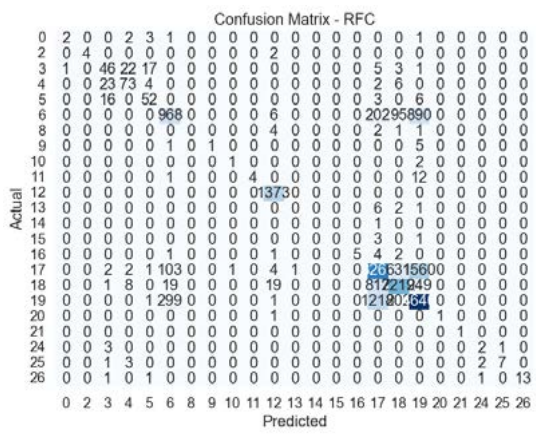


Figure 5 (a): *Confusion Matrix for RFC using "Summary" as the Target variable.*

Figure 5(a) shows the confusion matrix for RFC while the summary of correct and incorrect predictions is depicted on the bar chart in Figure 5(b)

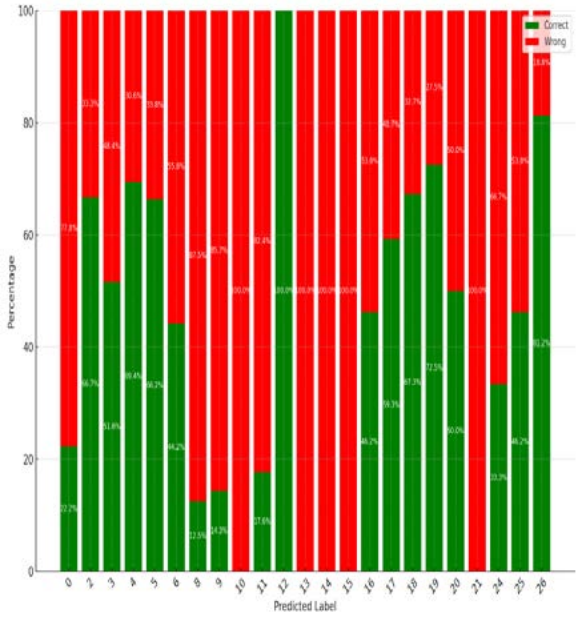


Figure 5 (b): Bar chart showing the percentage of Correct vs incorrect predictions per label based on the confusion matrix for RFC.

In Figure 5(b), the green bars represent the percentage of correct predictions for each label while the red bars show the percentage of incorrect predictions for each label. From the total number of predictions, RFC predicted correctly 12696 times and incorrectly 6492 times, with the model correctly predicting all instances of label 12.

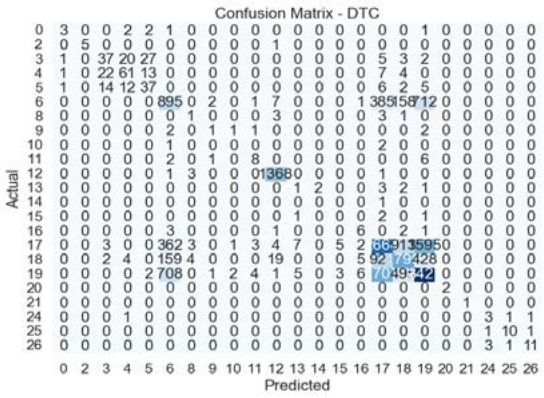


Figure 6 (a) *Confusion Matrix for DTC using "Summary" as the Target variable.*

Figure 6 (a) shows the confusion matrix for DTC, while the summary of correct and incorrect predictions is depicted on the bar chart in Figure 6(b).



Figure 6(b): Bar chart showing the percentage of Correct vs incorrect predictions per label based on the confusion matrix for DTC.

In Figure 6(b), the green bars represent the percentage of correct predictions for each label, while the red bars show the percentage of incorrect predictions for each label of a model. From the total number of predictions, 19188, DTC predicted correctly 10291 times and wrongly 8897 times, with the model correctly predicting label 21, which had just one record.

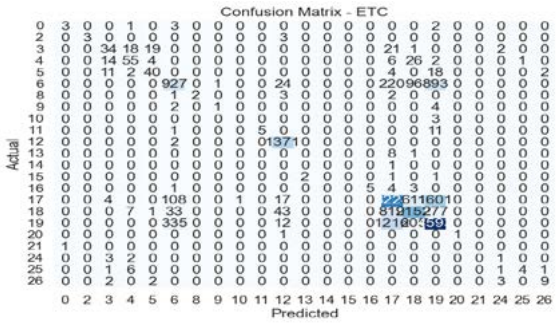


Figure 7 (a): *Confusion Matrix ETC using "Summary" as Target variable.*

Figure 7 (a) shows the confusion matrix for ETC while the summary of correct and incorrect predictions is depicted on the bar chart in Figure 7(b).

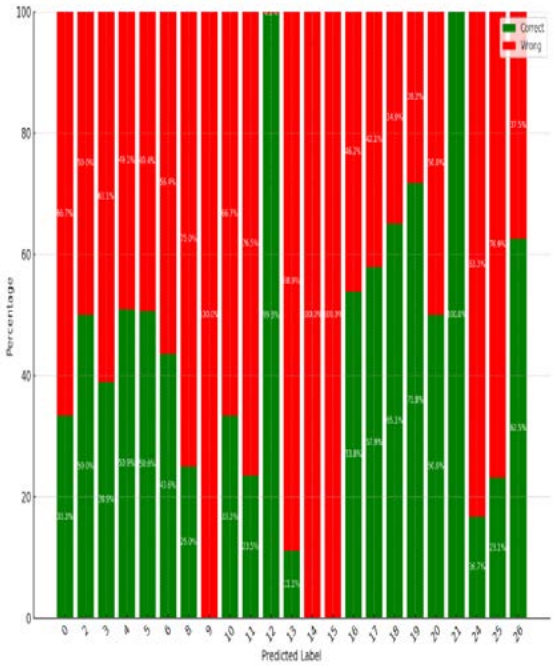


Figure 7(b): *Bar chart showing the percentage of Correct vs incorrect predictions per label based on the confusion matrix for DTC.*

In Figure 7(b), the green bars represent the percentage of correct predictions for each label, while the red bars show the percentage of incorrect predictions for each label of a model. From the total number of predictions, 19188, DTC predicted correctly 12436 times and wrongly 6752 times, with the model correctly predicting label 21, which had just one record.

Model Evaluation based on Classification Reports

In this study, the classification report gives a detailed description of a model's performance in terms of Precision, Recall and F1-Scores.

Classification Report using "precip type" for prediction

The Classification report of the three models: RFC, DTC and ETC, using "precip type" as target variable for the labels "rain" and "snow" is presented in Table 8.

Table 8: *Classification Report using "precip type" as the target variable*

Predicted Label	Metric	RFC	DTC	ETC
0	Precision	0.996792	0.996792	**0.998361**
	Recall	**1.000000**	**1.000000**	0.998186
	F1-Score	**0.998393**	**0.998393**	0.998274
1	Precision	**1.000000**	**1.000000**	0.985245
	Recall	0.973785	0.973785	**0.986654**
	F1-Score	**0.986718**	**0.986718**	0.985949

Table 8 shows the classification report of the three models using "Precip Type" as target variable based on the precision, recall and F1-score metrics. The predicted label 0 (rain) had the best precision of 99.836% when predicted using ETC, which indicates that 99.836% of the predicted values were correct, while RFC and DTC achieved the best precision of 100% respectively for the predicted label 1 (snow). Also, RFC achieved the best recall of 100% for the predicted label 0, which indicates that the model identified all instances correctly with no false negatives, while ETC achieved the best recall of 99.665% for the predicted label 1. The best F1-scores of 99.839% and 98.672% were achieved by RFC and DTC, respectively, for the predicted labels 0 and 1, which further emphasises the effectiveness of the model in predicting precipitation type. Consequently, RFC and DTC had similar performances while ETC came behind the two classifiers, except in the precision value for label 0.

Classification Report using "Summary" for prediction

The classification reports of the three models using summary as the target variable for all the predicted labels (0-26) is presented in Table 9.

Table 9: *Classification Report using "summary" as the target variable*

Predicted Label		RFC	DTC	ETC
0	Precision	0.666667	0.500000	**1.000000**
	Recall	0.222222	**0.333333**	**0.333333**
	F1-Score	0.333333	0.400000	**0.500000**
2	Precision	**1.000000**	**1.000000**	0.750000
	Recall	0.666667	**0.833333**	0.500000
	F1-Score	0.800000	**0.909091**	0.600000
3	Precision	0.521277	0.462500	**0.528571**
	Recall	**0.515789**	0.389474	0.389474
	F1-Score	**0.518519**	0.422857	0.448485
4	Precision	**0.681818**	0.645833	0.617978
	Recall	**0.694444**	0.574074	0.509259
	F1-Score	**0.688073**	0.607843	0.558376
5	Precision	**0.708333**	0.477273	0.619048
	Recall	**0.662338**	0.545455	0.506494
	F1-Score	**0.684564**	0.509091	0.557143
6	Precision	**0.690029**	0.403707	0.656446
	Recall	**0.441925**	0.413235	0.435909
	F1-Score	**0.538787**	0.408415	0.523915
8	Precision	**1.000000**	0.200000	**1.000000**
	Recall	0.125000	**0.250000**	**0.250000**
	F1-Score	0.222222	0.222222	**0.400000**
9	Precision	**1.000000**	0.142857	**1.000000**
	Recall	**0.142857**	**0.142857**	0.000000
	F1-Score	**0.250000**	0.142857	0.000000
10	Precision	0.000000	0.250000	**0.500000**
	Recall	0.000000	**0.333333**	**0.333333**
	F1-Score	**1.000000**	0.285714	0.400000
11	Precision	0.600000	0.470588	**0.800000**
	Recall	0.176471	**0.470588**	0.235294
	F1-Score	0.272727	**0.470588**	0.363636
12	Precision	0.972380	**0.973684**	0.925051
	Recall	**1.000000**	0.997087	0.997815
	F1-Score	**0.985996**	0.985246	0.960056
13	Precision	0.000000	0.000000	**0.250000**
	Recall	0.000000	0.000000	**0.111111**
	F1-Score	**1.000000**	**1.000000**	0.153846
14	Precision	**1.000000**	0.000000	**1.000000**
	Recall	0.000000	0.000000	0.000000
	F1-Score	0.000000	**1.000000**	0.000000
15	Precision	**1.000000**	0.000000	**1.000000**
	Recall	0.000000	0.000000	0.000000
	F1-Score	0.000000	**1.000000**	0.000000
16	Precision	**1.000000**	0.352941	**1.000000**
	Recall	0.461538	0.461538	**0.538462**
	F1-Score	0.631579	0.400000	**0.700000**
17	Precision	**0.590340**	0.470831	0.581769
	Recall	**0.592885**		0.579051
	F1-Score	**0.591610**	0.471254	0.580407
18	Precision	**0.702787**	0.518227	0.696882
	Recall	**0.673469**	0.533313	0.650660
	F1-Score	**0.687816**	0.525662	0.672978
19	Precision	**0.633155**	0.556419	0.621511
	Recall	**0.724729**	0.540324	0.717654
	F1-Score	**0.675854**	0.548253	0.666132
20	Precision	**1.000000**	0.250000	**1.000000**
	Recall	**0.500000**	**0.500000**	**0.500000**
	F1-Score	**0.666667**	0.333333	**0.666667**
21	Precision	**1.000000**	**1.000000**	**1.000000**
	Recall	0.000000	**1.000000**	**1.000000**
	F1-Score	0.000000	**1.000000**	**1.000000**
24	Precision	0.285714	**0.300000**	0.166667
	Recall	0.333333	**0.500000**	0.166667
	F1-Score	0.307692	**0.375000**	0.166667
25	Precision	**0.857143**	0.818182	0.600000
	Recall	0.461538	**0.692308**	0.230769
	F1-Score	0.600000	**0.750000**	0.333333
26	Precision	**0.928571**	0.846154	0.769231
	Recall	**0.812500**	0.687500	0.625000
	F1-Score	**0.866667**	0.758621	0.689655

The classification report depicted in Table 9 shows the precision, recall and F1-scores of the three models using summary as the target variable, where 0 means "Breezy", 1 means "Breezy & Dry" and so on. Using the predicted label 0 as an instance, the first row in Table 10 means the three algorithms are trying to predict the weather as "Breezy". During this prediction, Random Forest Algorithm achieved a precision of 66.7%, recall of 22.2% and F1-score of 33.3%. Decision Tree Classifier obtained a precision of 50%, recall of 33.3% and F1-score of 4%, while the Extra Tree classifier achieved a precision of 100%, recall of 33.3% and F1-score of 50%. During the prediction of the label "Breezy", the Extra Tree classifier performed better. The summary of the number of times each model achieved the best prediction scores for the metrics under consideration is presented in Table 12. The F1-score is used as a determinant of the best-performing model since it represents the harmonic mean of the precision and recall metrics, ensuring the effectiveness of the prediction.

For example, predicted label 0 means "Breezy", 1 means "Breezy & Dry", etc. Now, using predicted label 0 as an instance, the first row in Table 10 means the three algorithms are trying to predict the weather as "Breezy". During this prediction, Random Forest Algorithm has a precision of 66.7%, recall of 22.2% and F1-score of 33.3%. Decision Tree Classifier has a precision of 50%, recall of 33.3% and F1-score of 4% while the Extra Tree classifier has a precision of 100%, recall of 33.3% and F1-score of 50%. During the prediction of the label "Breezy", the Extra Tree classifier performed better.

Table 10 shows the number of times each algorithm predicted better to get the overall best of the three algorithms. Here, the F1-score will be considered as the decision factor since it comprises of both precision and recall.

Table 10: *Number of times each classifier predicts better.*

Predicted Label	RFC	DTC	ETC
0			✓
2		✓	
3	✓		
4	✓		
5	✓		
6	✓		
8			✓
9	✓		
10	✓		
11		✓	
12	✓		
13	✓	✓	
14		✓	
15		✓	
16			✓
17	✓		
18	✓		
19	✓		
20	✓		✓

21		✓	✓
24		✓	
25		✓	
26	✓		
Total	**11**	**6**	**3**

From Table 10, it is shown that RFC performed better at predicting 11 labels. DTC performed well with 6 labels, while ETC performed well at predicting 3 labels. However, the result is inconclusive when 3 labels were predicted.

Therefore, we can conclude that Random Forest Classifier has the best overall performance among the three models since it has the highest number of times it performed better.

Threats to Validity

At the end of the study, it was discovered that the results of the experiments performed are dependent on the number of possible outcomes of the target variables. As was shown when "Precip Type" was used for prediction compared to the use of "summary", much higher accuracy results were obtained.

5. Conclusion and Recommendation

In the realm of machine learning, weather prediction is a key research subject. There are still many mysteries to be solved and many fresh algorithms to be employed on weather data using precipitation type and weather summary. With the prediction of precipitation type, the accuracy scores for both random forest and decision tree were 99.71%, while extra tree classifiers achieved 99.44% accuracy. The confusion matrix shows better prediction of records by random forest and decision tree Classifiers with score of 99.71% each, while extra tree classifier performed the least, predicting 99.69% records correctly. Also, the Classification reports revealed that random forest had a precision of 99.84%, recall of 98.69% and F1-score of 99.26%. The decision tree classifier had a precision of 99.84%, recall of 98.69% and F1-score of 99.26%, while extra tree classifier had a precision of 99.18%, recall of 99.24% and F1-score of 99.21%. With the second set of predictions using weather summary, random forest had an accuracy score of 66.05%, decision tree had 53.9% and the extra tree had 64.8% accuracy scores. As for the confusion matrix, random forest performed best with 66.17% records correctly predicted, extra tree classifier with 64.8% correct records and decision tree with 53.6% records. The Classification report showed random forest had a precision of 69.6%, recall of 47.8% and F1-score of 52.2%, decision tree achieved a precision of 17.39%, recall of 39.13% and F1-score of 30.43%, while extra tree had a precision of 52.17%, recall of 30.43% and F1-score of 21.74%. In conclusion, Random Forest Classifier has proven to consistently outperform the other classifiers in this study. This research work can be reviewed in the future to make the algorithms predict future weather occurrences. Also, other machine learning algorithms and ensemble methods can be tested to verify the claims from the study.

References

AbdulRaheem, M., Awotunde, J. B., Abidemi, E. A., Idowu, D. O., & Adekola, S. O. (2022). Weather prediction performance evaluation on selected machine learning algorithms. *IAES International Journal of Artificial Intelligence (IJ-AI), 11(4),* 1535-1544.

Abhishek, K., Singha, M. P., Ghosh, S., & Anand, A. (2012). Weather forecasting model using artificial neural network. *Procedia Technology*, 4, 311-318

Abrahamsen, E. B., Brastein, O. M., and Lie, B. (2018). Machine Learning in Python for Weather Forecast based on Freely Available Weather Data. *In Proceedings of The 59th Conference on Simulation and Modelling (SIMS 59), 26-28 September 2018, Oslo Metropolitan University, Norway. Linköping Electronic Conference Proceedings 153:24, p. 169-176.* https://doi.org/10.3384/ecp18153169

Abrar, M., Sim, A. T. H., Shah, D., & Khusro, S.

(2014). Weather Prediction Using Classification. *Sci.Int. (Lahore),26(5),2217-2223.*

Ajina, A., Jaya, C. K. G, Bhat, D. N., Saxena, K. (2023). Prediction of weather forecasting using artificial neural networks. *Journal of Applied Research and Technology 21 (2) 205-211*.

ArcGIS PRO(Nd). https://pro.arcgis.com/en/pro-app/latest/tool-reference/geoai/how-extra-tree-classification-and-regression-works.htm

Iseh. A. J., Woma. T. Y. (2013). Weather Forecasting Models, Methods and Applications. *International Journal of Engineering Research & Technology (IJERT),* 2(12), 1945- 1956.

Jayasingh, S. K., & Mantri, J. K. (2020). Weather Predictions using Support Vector Machine and Rough Set. *International Journal of Engineering and Advanced Technology*, 9(2), 5513-5516

Jyothi, M. J. N. Manepalli (2020). Weather Prediction Through Machine Learning. *Complexity International Journal (CIJ),* 24(1).

Kashikar, S., Patil, S., Vedantwar, A., Katpatal, S., & Pillai, S. (2019). Weather Prediction using Scikit-Learn. *International Journal of Computer Science and Engineering,* 7(4), 26-40.

Krishna, G. V. (2015). An Integrated Approach for Weather Forecasting based on Data Mining and Forecasting Analysis. *International Journal of Computer Applications,* 120(11)26-29

Muthukumar, P., Cocom, E., Kabir N., Comer, B., Burga, I., Taub, J., Calvert, C. F., Holm, J., & Pourhomayoun, M. (2021). Predicting PM2.5 atmospheric air pollution using deep learning with meteorological data and ground-based observations and remote-sensing satellite big data. *Air Quality, Atmosphere and Health,* 1-14.

Omole, A. (2022). "Flood Killed 24, displaced 471000 persons, Kogi Govt". *Leadership Newspaper.* Available at https://leadership.ng/flood-killed-24-displaced-471000-persons-kogi-govt/

Sujatha, N., Lokesh, V. S., Valli, L. N., & Mech, M. (2024). Weather prediction using machine learning algorithms. *Journal of Emerging Technologies and Innovative Research (JETIR)* 11(1), 550-555

Wu, S. F., Zhu, J., & Wang, Y. (2012). Weather Forecasting Using Naïve Bayesian. *Advances in Future Computer and Control Systems:* 1, 337–341.

Xhabafti, M., Vika, B., & Sinaj, V. (2024). A Comparative Study of Statistical and Deep Learning Model-Base weather Prediction in Albania. *WSEAS Transactions on Computer Research, 12, 151-160*

SECTION B:
LIBRARY AND INFORMATION SCIENCE

New Media Technologies for Communication and Information Sharing in Nigeria: Nexus between Libraries and the Mass Media

Abdullahi A. BAKARE[1] Victor Olusegun BABATUNDE[2] Jemilat Biogera ABUBAKAR[3] Jamiu Oladele MUHAMMED[4] Shehu O. ISHOLA[5]

1,3 Department of Library and Information Science, Kwara State University, Malete

2 Department of Mass Communication, Kwara State University, Malete

4 Department of Library and Information Science, University of Ilorin, Ilorin

5 Department of Library and Information Science, Al- Hikmah University, Ilorin

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

The paper reviewed common trends in new media technologies for communication and information sharing practices in libraries and media institutions. The paper is premised on the argument that libraries and mass media, as cultural memory institutions, share a common objective and that instead of operating in isolation from each other, they ought to collaborate for mutual benefits. The study used a literature review approach to provide insights into the research phenomenon. The review provides evidence that libraries and mass media are employing new media technologies more frequently to communicate information, advertise services, connect with patrons, and share information among practitioners. The majority of the qualitative and quantitative studies reviewed identified libraries and media institutions as increasingly adopting new media technologies to promote information services and enhance user relationships. Social media platforms like WeChat and Facebook, among others, have been effective in promoting library collections and services worldwide. However, Nigerian libraries and media institutions are yet to fully utilise these technologies for sharing information and dissemination. Studies reviewed only showed that these technologies are mostly used for communication and interaction with colleagues, rather than for document delivery. The paper concluded that despite the global trends in practices, libraries and mass media in Nigeria are yet to fully utilise these opportunities to better engage with users and enhance their services of information dissemination. Looking ahead, libraries and mass media need to adapt and innovate to maintain their shared objectives and collaborate for mutual benefits. To achieve this, some recommendations were made that require practitioners to handle the tasks ahead in the increasingly digital environment, with a new set of business, technological, and creative skills.

Keywords: New Media Technologies, Communication and Information Sharing, Libraries, Mass Media, Social Media, Nigeria

1. Introduction

The library and mass media serve as platforms for sharing information, ideas, perspectives and entertainment. They provide a means for communities to connect and communicate with each other. Mass media (the press), like the library, strive to provide information for people to enrich their personal lives and enlighten them on good citizenship. Both agencies draw their strength from publications or information emanating from individuals, organisations, and local and international bodies. Information provided by both organisations and other corporate bodies helps to

reduce uncertainty in their operations and makes them more effective. For emphasis, the library, by its roles, is strongly related to mass media in society. They both play complementary roles (Nwalo, 2000).

The traditional mass media and libraries are distinct but are interrelated entities that serve common functions within a community. The primary purpose of traditional media is to provide a means for people to express themselves, share their culture, stories, and perspectives, and address issues relevant to their communities. The traditional media include newspapers, magazines, radio and television, managed and controlled by private or public organisations (Debono & Vancell, 2017). On the other hand, libraries are institutions that collect, organise, preserve, and give users access to a wealth of knowledge and learning materials, such as books, journals, digital media, and more. Traditional libraries preserve cultural heritage and provide information for use to support lifelong learning (Umeozor, & Ibegwam, 2022). The primary function of a library is to support education, research, and information dissemination for a broader audience. It is, therefore, apposite to suggest that both libraries and the mass media play important roles in education, cultural preservation, and the dissemination of information. To sum it up, libraries and mass media are driven by the same desire to democratise access to information (Chisita, Shoko, Rusero & Ngoaketse, 2020).

The advent of new media technologies in the twenty-first century has accelerated changes in how libraries and mass media disseminate information. The evolution broke down geographical barriers, necessitating new organisational and economic models for news and information. That development altered the connection between information and news producers/disseminators and consumers. Convergence started to take on several forms, such as cooperation between media outlets and the combined use of various media for information gathering and dissemination (Kolodzy, Grant, DeMars & Wilkinson, 2014). It has resulted in the emergence of neo-communities without borders.

In recent years, there has been an overwhelming increase in the availability of rapid news and information. This development intensified the idea that traditional media no longer played any worthwhile function. A report by Newman et al (2023) highlighted how younger audiences increasingly rely on social media and digital platforms over traditional news sources, raising concerns about the sustainability of legacy media. Hence, legacy news brands face declining engagement, particularly among the young generation who prefer news from social media, influencers, and digital-native outlets. These platforms increased pressure to deliver most recent information without any form of verification (Moss, 2016).

To the institutional libraries, the crowded information space filled with knowledge of different kinds that can be easily accessed in no particular order, without the strong delineation and sequencing making sifting through the information space difficult, in particular, has a challenging implication for their role as gate keepers and codifiers of knowledge (Moss, 2016). To the mass media, the phenomenal growth of misinformation in society arising from unedited information sourced from crowds raised concerns about how content from unprofessional contributors ends up shaping unhealthy public opinion (Qutab, Myers, and Gardner, 2019).

In order to reduce the tensions created for both institutions and ensure progress towards reclaiming the virtues of practice, libraries and mass media must consider sustainable adaptation or creative ways that both the industry and novel technology avenues can continue evolving from their domain as new media technologies continue to bring about more disruption and more possibilities (Kolodzy, Grant, DeMars & Wilkinson, 2014; Moss, 2016). As stated by Ufot, Akarika and Ukpe (2023), the introduction of new technology into the media and library landscape does not signal an end to the prevailing practice; rather, it fosters the evolution and adaptation of it, while contributing to the development of the successor.

This paper illustrates how the continuous development of technologies has created dilemmas, disrupting existing communication and information sharing patterns among libraries and the mass media. At the same time, it exemplifies how emerging common new media technologies, if adopted, can neutralise or normalise the effect of the disruptive impact. Similar to Chisita, Shoko, Rusero and Ngoaketse (2020), the paper is premised on the argument that libraries and mass media, as cultural memory institutions, share a common objective and that instead of operating as silos, retrogressively isolated from each other, ought to collaborate for mutual benefits. To this extent, practitioners in libraries and the media will increasingly need to cooperate and collaborate to meet challenges of digital collections creation, management, use and preservation.

The study used a literature review approach to provide insights into the research phenomenon. The study reviewed and interpreted literature on convergence between library and mass media to highlight trends and changes in current practices facilitated by emerging technologies for communication and information sharing in Nigeria.

2. Literature Review

The digital revolution has transformed the global distribution of information, news, and entertainment content. In the age of new media technologies, sources of information generation, as well as news collection and reporting, have experienced a significant paradigm shift. New media technology refers to all technologies that include television, newspapers, publishing and radio used for mass dissemination of communications (Chisita, Shoko, Rusero & Ngoaketse, 2020). To libraries and mass media, new media technology refers to the integration of digital, computational, and networked technologies into mass media and library systems, enabling advanced production, distribution, storage, retrieval, and interactive engagement with information. This encompasses digital platforms, artificial intelligence, cloud computing, social media, mobile applications, and immersive technologies that transform traditional media and information services (Croteau & Hoynes, 2018; Flew, 2021).

The beginning of the twenty-first century, as well as the online transmission of news, presented new challenges and opportunities for mass media and libraries. For instance, modern media technologies enabled interactive user feedback, creative participation, and on-demand access to material on any digital device, at anytime, anywhere. Another aspect of the new media technology is in the real-time generation of new and unregulated content (Nwanguma, 2015). Some anticipated that all media would provide online content, in addition to traditional content, in the future, while others saw media mergers where a single organisation would provide content on a variety of platforms, both new and old. Still others saw technologies that promised a revolution in the creation and dissemination of information (Kolodzy, Grant, DeMars & Wilkinson, 2014). Technology has now reduced entrance barriers and increased knowledge distribution to a global audience (Kaul 2012). As communities are no longer geographically constrained, practitioners must recognise and adapt to the various needs and interests of their audiences.

The digital age has altered the global distribution of news and entertainment information. Among other things, digital technology provides interaction, non-linear communication, and a new economy through the mediums it creates (Kaul, 2012). As more media becomes available in digital formats, and old media packaging and distribution strategies begin to unravel, "the customer is king" is quickly becoming the industry's new mantra. The challenge for mass media and libraries is to embrace multiple content and channels profitably. There will be opportunities for much more personalisation of all types of content, and end users will be empowered and have more control over how, where, and how much they pay for content (Kaul, 2012).

Professional convergence between libraries and mass media

An intriguing topic of professional convergence is how the two distinct professions of library and mass media rely on comparable skills and resources. Librarians and information professionals, for example, are taught to search, preserve, retrieve, and transmit information, just like journalists and broadcasters (Hannabuss, Barford, & Campbell, 1995). Ufot, Akarika, and Ukpe (2023) illustrate the types of convergence that the mass media and libraries can employ as a strategy to stay relevant in the business of communication and information sharing as follows:

Digital convergence: Here, media organisations are linked or intersected via integrated digital technologies to achieve a well-integrated conglomerate and, by extension, enhance multimedia information sharing and open access. As a result, digital technology makes it possible to deliver both contemporary and conventional communication services over many networks. Thus, it goes without saying that convergence is supported by digital technology. A good example is the internet, which integrates radio, television and film, and then distributes through push technology. This suggests that one can read, view, or listen to content on the Internet by simply pressing a button or clicking a mouse. By this role, the internet has evolved to become a reality medium of communication because of the convergence of different technologies.

Content convergence: Content convergence means an organisational effort guarantees content created in any part of the organisation to be found and reused by any other part of the organisation. Content is the foundation on which customer expenses are built, be it text, imaging, video or audio. Content production is at the heart of every business. Content convergence

in media brings the "three CS" – computing, communication, and content. It is a direct consequence of the digitalisation of media content and the popularisation of the Internet (Flew, 2013).

Multiplatform delivery: The maturity of the internet and mobile communications, as well as the data-enabled digital television systems, have broadened the range of options available for citizens to access the news. For example, Channels Television media practitioners use smartphones which combine numerous technologies that were previously available on separate devices: a computer, a watch, an alarm clock, a GPS, and a newspaper, among others, to cover and report new stories. These numerous technologies are now available in the palm of journalists. Digitalisation, again, has facilitated the development of multiplatform delivery strategies aimed at making information distribution as efficient as possible. There also seems to be a virtuous circle accelerating the development of multiplatform delivery technologies.

Multi-skilled professionals: Convergence can also be analysed from the standpoint of the redefinition of professional roles and skills of practitioners. Multi-skilling is a trend with increasing acceptance in new media, which demands that professionals be versatile, coping with a wide range of responsibilities to get jobs done. The advent of the digital age has presented the mainstream media with a number of significant communication issues, including new audience relations (interactivity), new languages (multimedia), and a new grammar (hypertext). But more significantly, this media revolution opens up the mass communication system and libraries to a variety of new participants, altering the communication environment for the traditional players (Kaul, 2012). A study by Williams (2020) revealed that practitioners had different roles of specialisation, and these provided a broad spectrum of where and how new media technologies could be used in academic libraries.

Active audience: The rise of user-generated content, interactive interfaces, and instantaneous global connectivity characterise the new media landscape. Audiences are no longer passive recipients but active contributors, shaping the discourse and influencing trends (Yin, 2023). However, Livingstone (1999) notes that the relationship between library and media practitioners and the citizens can be found in the changes in the audience habits and attitudes, namely, fragmentation, specialisation and active participation. Digital distribution technologies, therefore, allow for the customisation of content and make it easier the dissemination of information that is highly targeted for a specific audience. However, not only has user-generated content production rocketed in the last few years, it has also slowly become a culture of dialogue and collective deliberation. For instance, it has now become a trend for radio stations to engage in dialogue and collective deliberation through call-in programmes for various discourses on issues of great importance. Library and mass media practitioners also have to deal with convergence, as institutions are moving away from exclusivity to inclusivity. Other critical areas of convergence include but are not limited to seamless access, semantic web, resource sharing, cyber security, digital literacy, shared storage, artificial intelligence and decoloniality (Chisita, Shoko, Rusero & Ngoaketse, 2020).

A shifting communication and information sharing landscape

The rapid ascent of new media technology has orchestrated significant shifts in the landscape of traditional media and library practice, precipitating profound alterations in the dissemination of information (Yin, 2023). How mass communication media and libraries share and disseminate information has changed in terms of acquisition or use in different contexts and practice. The nature and role of libraries and media in our society have been drastically changed by new media technologies, which have reimagined long-standing public communication practices, occasionally eluding the two established organisations, and undermining their privileged position as information/news and entertainment gatekeepers (Kaul, 2012). Billions of people, whose access to daily changing information was limited a generation ago to few locally distributed printed newspapers, television channels, and radio stations, can now instantly access virtually all of the world's news and information from home, work, or anywhere else. This revolutionary shift in libraries and media will have considerably more significant historical, economic, and social repercussions than any previous media breakthrough, including the discovery of movable type by Gutenberg, broadcasting by Tesla and Marconi, or any other (Kaul, 2012).

Considering the various ways in which knowledge now circulates outside formal institutional structures, the transition from traditional to new media technology has democratised information dissemination, allowing for a more decentralised and participatory media environment. The internet makes it possi-

ble to find and retrieve an increasing depth and range of source material on a wide range of topics, using search engines such as Google. Hence, new media platforms, such as social media, online streaming, and digital publications, have emerged as powerful players, challenging the dominance of traditional outlets (Yin, 2023).

Likewise, authoritative articles on key issues in the social sciences can be consulted in Wikipedia and will be regularly updated by the community of scholars. It is now, therefore, possible to search for and find a relatively large amount of material on a given topic very fast (Moss, 2016). An array of new knowledge brokers now facilitates this activity of 'find and retrieve', acting as guides to what is worth following up.

Today, all the devices used for communication are continuously being blended into one massive media conglomerate; such that, with just a mobile phone, a computer system and the internet, one can comfortably access the media, irrespective of the form and location (Ufot, Akarika, & Ukpe, 2023). In a review of the industry's history, Kaul (2012) notes that although the leaders of each medium thought they would be destroyed by the newest technology, many of them managed to adapt and survive. Old media, as accustomed to, are traditional libraries, television, radio, and printed newspapers. However, new media are most typically connected with content that is accessible "online," which simply implies that the information is available via a virtual network, the Internet being the most prominent example (Kaul, 2012). The proliferation of new media technologies has necessitated a fundamental rethinking of the interface existing among media and library practitioners (Chisita, Shoko, Rusero & Ngoaketse, 2020).

New media technologies and emerging roles for communication and information sharing practices by libraries and mass media

The digital revolution has created a deluge of digital resources characterised by seamless and real-time access to content. This phenomenon has changed the myopic view of the library as a physical space and the librarian as a mere armchair guardian of the library and its books. The modern library and related institutions, such as mass media, reflect the progression of society in the digital trajectory as evidenced by the online presence and access to resources (Chisita, Shoko, Rusero & Ngoaketse, 2020). New media technologies are increasingly used to communicate information and for advertising services and connecting with patrons as well as well as for linking, liking and following other media or libraries' pages to keep abreast of developments in the field, and also to share and re-tweet information among practitioners (Witte, 2013; Williams, 2020). Libraries and mass media in the age of digital revolution encourage lifelong learning, make knowledge accessible and preserve local heritage through the following new media technologies:

Twitter: Twitter is a microblogging application and allows the transmission of short messages of up to 140 characters and keeps followers updated on daily activities, events, news, contributions and comments (Akinola, 2015; Ogunleye, 2015). While Twitter is a relatively new tool, it appears to have caught up with Facebook in terms of popularity in academic libraries (Chu and Du, 2012). Some academic libraries view Twitter as a medium of communication that presents ease of use, whereas others feel it is complicated. Yoo-Lee and Kim (2014) highlight that librarians have adopted a wide range of social media, such as Facebook, Twitter, Pinterest, and YouTube, to engage users and to market local resources and services. There is growing concern over the misuse of social media platforms to peddle fake news, resulting in information disorder. However, libraries, archives and the media can help to equip users and readers with knowledge and skills to overcome information disorder (Chisita, Shoko, Rusero & Ngoaketse, 2020).

Pinterest: One of the successful usage of new media technologies is the use of Pinterest as a library-marketing tool. This platform is used by academic libraries to display new titles by creating a library Pinterest account and "pinning" them to electronic boards that are publicly viewable without logging in to the system (Dudenhoffer, 2012).

Weblogs: A Weblogs or blog is a medium that takes on ideas, views, and suggestions from everyone. Aacharya (2021) mentions three types of blogs such as by media type, by device and by topic. Blogs can be used to share links and this is known as linklog. Blogs are also written for marketing or for enhancing communication and culture as well as for brand or PR objectives. The blog is not a new process for libraries as it is already an extension of what the librarians have been doing to identify, organise and share library information with everyone. The blog provides many opportunities for libraries and is used to: provide new library announcements; draw attention to new resources; give news on library services; list new

acquisitions; post book reviews, and help connect users' feedback, comments, and requests to the library, among others. Blogs examples in libraries are Librarian.net, David Lee King, LISNEWS, Library of Congress Blog and Library Connect (Aacharya, 2021).

Mobile technology: Mobile tools provide portable access to the world of information across boundaries of subject, discipline and organisation. Through the mobile Web, people can download audiobooks, upload camera phone photos to Flickr, receive turn-by-turn driving directions and have in-store coupons delivered directly to them. This evolution of handheld devices, combined with new high-speed wireless data networks, makes browsing the mobile Internet a more compelling experience. Many libraries are offering library instructional materials and resources via mobile platforms. For example, East Carolina University's "Research First Aid" is a series of podcasts for library researchers on the go (Negi, 2014). With mobile devices becoming more popular and acceptable than personal computers, it is now essential for libraries to devise means of delivering effective and efficient information services through mobile phones, tablets, smart devices, Mobile Apps and other mobile platforms and devices (Adamu, Omame, Ahmed & Gombe, 2019).

Features of new media technologies

Some of the outstanding features of new media technologies that stand it apart from traditional or analogue media are presented below as adapted from (StudyMassCom.com, 2024):

Interactivity: New media encourages active participation and engagement from users. Unlike traditional media, which is often one-way communication, new media allows users to interact with content, create their own, and engage in discussions with others.

Global access: Digital technologies have made new media widely accessible to people around the world. The internet and mobile devices have facilitated the ease of accessing and consuming information and entertainment. New media have a global reach, enabling content to be shared and accessed by people from different parts of the world. This interconnectedness has led to a more diverse and inclusive online community.

Multimedia integration: New media combines various forms of media, such as text, images, audio, and video, to create richer and more immersive experiences for users.

Real-time communication: Platforms like social media and instant messaging enable real-time communication, allowing people to connect and exchange information instantaneously.

User-generated content: Users can actively contribute to new media by creating and sharing their content, leading to a democratisation of information and creativity.

Personalisation: New media platforms often use algorithms to tailor content and recommendations based on users' interests and behaviour, providing more personalised experience.

Virality and shareability: On new media platforms, content can spread quickly and be widely shared, thereby expanding its reach and amplifying its impact.

Constant evolution: New media is continuously evolving, with emerging technologies and trends shaping the way content is produced, shared, and consumed.

New media technologies for communication and information sharing: trends in practices by libraries and mass media in Nigeria

Zhu (2016) investigated the use of the official WeChat account, China's most popular mobile social media site, to share Jinan University Library collections and services with students, faculty, and staff. The author found that academic libraries in China had created WeChat accounts and engaged numerous followers who are able to directly access library resources and services using their mobile devices. Thus, the social media tool proved to be an excellent tool for promoting library services and improving ties between the library and its users. A'dillah et al. (2016) also investigated the efficacy of Web 2.0 applications for boosting library services in Malaysian research university libraries. Facebook was found to have the most influence as a promotional medium for information dissemination, addressing user inquiries, and offering feedback on promotional programmes.

Williams (2020) explored the usage of new media technology in six academic university libraries in the Flanders region of Belgium and South Africa to gain insight into the benefits and technological challenges encountered. There were two types of presences depicted: an institutional library presence

(adoption), which is utilised to engage library users, and a non-presence (non-adoption). Each of the three Flemish academic libraries—UAL, FUBL, and CULL—adopted at least one social media platform. While the ULL was a non-adopter and did not actively participate in new media, the GUL and CPUTL, two South African university libraries, were adopters of at least two media. To make sure that consumers were contacted on a medium that worked for them, South African university libraries, similar to those in Flanders, were utilising one or more media platforms. The library's website provided access to the adopters' official media platforms.

The Flemish academic libraries surveyed by Williams (2020) shared their thoughts on Twitter's distinctive qualities while still offering students with a Facebook platform for relationship building. Gauteng University Libraries (GUL) and Cape Peninsula University of Technology Libraries (CPUTL), two of the participating South African university libraries, used at least two media (Facebook and Twitter) to engage with students and promote the library's resources for teaching, learning, and research.

Owusu-Ansah et al. (2015) examined the new media technology for supporting research in some academic institutions in four countries, namely South Africa, Ghana, Uganda and Nigeria. It was found that technologies were minimally used for communication purposes at Rhodes University Library in South Africa. On the other hand, the University of Education, Winneba Library in Ghana, Makerere University Library in Uganda and the University of Nigeria Library mostly used it to communicate and interact with colleagues. Tella et al. (2013), in an earlier similar study, investigated new media technologies use by 200 academic librarians in six states of Nigeria and found that they made use of media to share knowledge and other educational information and communicate with other libraries and librarians.

The study by Quadri and Adebayo (2016) on the use of new media by librarians for information dissemination in three federal university libraries in Southwest Nigeria found a variety of information services offered to library patrons to include reference services and Current Awareness Services (CAS), primarily via Facebook and Twitter. However, document delivery was the least disseminated to users through the two widely used media technologies. The value attached to sharing information through media sites was identified to include library instructions and tutorials provision, as well as a vast array of library-related media objects and contents shared with the larger academic community (Magoi, Aspura, & Abrizah, 2019). In this manner, those who are involved in the information dissemination process become more at ease while exchanging information, which also improves awareness, coordination, transparency, and efficiency in the services provided by academic libraries.

Umeozor and Ibegwam (2022) assessed the emerging roles of 43 Federal university libraries in Nigeria, using a quantitative method. Remote communication enabler, online information advocacy/virtual resource person, computerised indexing and abstracting, instant messaging, weblogs and streaming media were disagreed with by the majority of respondents as new media technologies for sharing and disseminating information. The study concluded that the libraries in Nigerian universities had yet to take full advantage of the opportunities presented by the new media technologies to boost information dissemination.

Thus far, libraries and media institutions are undergoing deep shifts driven by a myriad of trends, namely: the dramatic changes in how users access, share and engage in digital services and new media enabled by broadband and mobile networks (Mansfield, Winter, Griffith, Dockery & Brown, 2014). However, based on trends in practices reviewed, it seems the trends are not a common occurrence in Africa and Nigeria, in particular.

An agenda for reclaiming the virtue of practice going forward

Change in the media landscape is constant. We live amid the greatest change in the history of the media. Technology and its current applications have evolved at a pace, transforming the media landscape (Kaul, 2012). This scenario created new forms of competition for cultural memory institutions as their traditional positions of authority and expertise and ability to drive change are challenged (Mansfield, Winter, Griffith, Dockery & Brown, 2014). Library and mass media are moving from the era of single media to multi-media communication and information reporting (Ufot, Akarika, & Ukpe, 2023). This development affects the organisation of information dissemination and the working practices of practitioners in profound ways.

Libraries and mass media are faced with the task of developing a new set of practices that will be relevant to successfully merging the various media forms

and products which are delivered for interactive usage by consumers (Ufot, Akarika, & Ukpe, 2023). A tidal wave of creativity has flooded cyberspace, and surfing is no longer a passive absorbing of information. Tools like iMovie, Final Cut Pro, Garage Band, Cubase and PhotoShop have democratised creativity. New social networks and content aggregators have sprung up to host this generation's creative output (sort of virtual cinemas, art galleries and libraries) like Myspace and YouTube. Thus, technology has opened doors that have created a new mindset among young people.

The rise of blogging, sharing music, downloading information, taking part in chat rooms, bulletin boards and online communities has occasioned a new set of values (Kaul, 2012). The World Wide Web alone presents a breadth of information that is far greater than even the most robust cable television services can provide. For practitioners in libraries, advances in media technologies have brought on board competitors to the book in the form of electronic resources, social media, and 3D printers, among other technology-related utilities (Chisita, Shoko, Rusero & Ngoaketse, 2020). Thus, libraries and mass media as institutions seem to be at the crossroads in the increasingly digital world because of the dilemma of values and responsibilities and navigating these waters will require a new blend of business, technical and creative skills (Kaul, 2012). Chisita, Shoko, Rusero and Ngoaketse (2020) emphasise that the new developments in the library and media technology landscape have seen information professionals assuming newer responsibilities, some of which are identified as follows and as amplified by other authors:

Research data management: Library and media professionals have to unlearn the old and traditional practices to relearn and adapt to the contemporary trends in Information theory and practice. New competencies in modern approaches to information processing, seeking, storage, use, sharing and communication instructions on the use of new and diverse media in the library have become appropriate features of the modern-day librarian (Chisita, Shoko, Rusero & Ngoaketse, 2020).

Marketing and communicating using/leveraging social media applications: Since its inception one and a half decades ago, new media has created several opportunities for marketing and promoting academic library services by reaching out to and interacting with the general public. To this end, academic libraries have developed new ways to market their services and products (Magoi, Aspura & Abrizah, 2019). As an example, Web 2.0 to Web 4.0 applications involve the application of interactive, collaborative, and multimedia web-based technologies to information services and collections. These technologies allow users to engage libraries and archives through social networking sites, for example, blogs, wikis, and other mechanisms (Given & McTavish, 2010). Moreover, the use of new media in libraries is one form of relationship marketing that has the potential to pay dividends in the form of user loyalty and building social capital by connecting users to the library and the bigger world (Fernandez, 2009).

Electronic reference management systems: Reference management systems assist authors in gathering, preserving, organising, using, citing, annotating, and disseminating the sources they utilise in their work. Over time, reference management became simpler, quicker, and more social. Reference management system was originally created to lessen the work involved in properly editing citations, but they have since developed to include other features like online management of sources and bibliographic social bookmarking (Proske, Wenzel & Queitsch, 2023).

Research support services: Research is the basis for the development of the world and society. Financial, educational, industrial, and other welfare policies of governments around the globe are the outcome of the research. The accuracy in research leads to proper policy formation and implementation by the leadership of the government and private entities (Padhan & Naidu, 2022). University libraries provide access to online and printed information resources to support research activities of library users, substantially well placed in Institutional repositories, e-database of theses and dissertations, and faculty research profiles, along with a conducive learning environment. That is why libraries, knowledge centres, and data centres are essential for the progress of a society (Ali & Naveed, 2020; Padhan & Naidu, 2022).

New information infrastructure: Absence of support from parent bodies borders on the deployment of technical infrastructures for social media in developing nations (Magoi, Aspura, & Abrizah, 2019). Issues around information infrastructure include maintenance culture, reliable internet access on campuses, power supply and adequate budget in many African academic libraries.

Format of information accessed: Each of the Library's e-resource platforms and databases is differ-

ent, and sometimes the user experience can vary even within the same platform or database. However, you are always able to access full-text content via the library in one of four ways: HTML, Online PDF, Downloadable PDF, and EPUB. Some of these formats are more accessible than others, and you may already have your preferred format (University of Exeter Library, 2024).

Digital literacy skills training: New media technologies offer libraries and media institutions an opportunity to engage new techno-centric users in digital environments. As both institutions share similar notions of literacy with respect to information literacy, digital, media or multimodal literacies, they can collaborate to equip users with skills to analyse or evaluate or retrieve content, using their growing dynamic and complex needs (Chisita, Shoko, Rusero & Ngoaketse, 2020).

Social interaction: According to Wheeler and Nezlek (1977), social interaction is an exchange or discussion in which two people pay attention to one another and adjust their behavior in reaction to one another. The conceptual definition of a social interaction usually depends on the conceptual understanding of a relationship, wherein both partners' mutual recognition, conversation, and focused attention on that exchange are essential to the relationship's construction (Hall, 2018). Both parties are required to share information in order for social engagement to be conversational, and broadcasts readily recognised with a direct comment or a like/favorite.

The study of Nakitare, Nyambala and Kwanya (2020) establishes that most library users are digitally independent and access library resources remotely. The literature has also pointed out that new media technologies disseminate information on a variety of library-related topics, promote library resources and services, and extend services beyond the physical library's walls, which always entails delivering library services directly to the patrons' doorsteps (Magoi, Aspura & Abrizah, 2019). Information practitioners should continue to develop their knowledge, and skills due to technological changes (Chisita, Shoko, Rusero & Ngoaketse, 2020). To this end, library and media practitioners, to a great extent, now play the role of intermediaries, that is, going beyond information giving to empowering their users (Nakitare, Nyambala & Kwanya, 2020).

This paper reviewed common trends in new media technologies for communication and information sharing practices in libraries and media institutions. The paper is premised on the argument that libraries and mass media, as cultural memory institutions, share a common objective and that instead of operating in isolation from each other, ought to collaborate for mutual benefits. The comprehensive review on the global perspective showed that the advent of new technologies has significantly transformed the way mass media and libraries disseminate content. This shift has led to on-demand access to content, interactive user feedback, and real-time generation of new and unregulated content. The review demonstrated clearly how generally industries have adapted to the changing audience needs and interests of their users and how crucial it is for mass media and libraries to embrace multiple content channels and personalise content for greater user control.

Reviews on media convergence showed a trend where practitioners from various professions, including librarians, journalists, and broadcasters, collaborate to enhance information sharing and communication. This convergence involves digital technologies, content convergence, multiplatform delivery, multiskilled professionalism, and active audiences. It was clear how the internet, mobile communications, and data-enabled digital television systems have broadened the range of options for citizens to access news. Likewise, multiskilling was revealed as a trend that demands versatile professionals to cope with a wide range of responsibilities. It is important to note that the rise of user-generated content and global connectivity has transformed the media landscape, making audiences active contributors and shaping discourse. As such, practitioners must navigate convergence in areas such as seamless access, semantic web, resource sharing, cybersecurity, digital literacy, shared storage, artificial intelligence, and decoloniality.

It was clear from the reviewed literature that libraries and mass media often use new media technologies to communicate information, advertise services, connect with patrons, and share information among practitioners. Social media platforms like Twitter, Pinterest, and weblogs are used to engage users and market local resources. Mobile technology, such as smartphones and tablets, offers portable access to information across various subjects and disciplines. Libraries and mass media are adapting to these changes to ensure effective and efficient information services for their users. Reasons for this shift, as pointed out from the literature reviewed, might not be unconnected to the benefits that new media technologies offer in terms of outstanding features compared to analogue

media, such as interactivity, global access, multimedia integration, real-time communication, user-generated content, personalised experiences, virality, and constant evolution.

The majority of the qualitative and quantitative studies reviewed identified libraries and media institutions that are increasingly adopting new media technologies to promote information services and enhance user relationships. Social media platforms like WeChat and Facebook have been effective in promoting library collections and services worldwide. However, Nigerian libraries and media institutions are yet to fully utilise these technologies for sharing and disseminating information. Studies reviewed have only shown that these technologies are mostly used for communication and interaction with colleagues, rather than for document delivery. In Nigeria, findings from the reviewed literature revealed that academic librarians only use these platforms to connect with other libraries and librarians for sharing knowledge and educational information.

3. Conclusion and Recommendation

This review has provided evidence that new media technology is changing the media landscape and bringing in new competitors for institutions that preserve cultural memory. The organisation of information dissemination and the working practices of practitioners are being impacted by the shift in mass media and libraries from single to multi-media communication and information reporting. Technological developments in the media and libraries have introduced competitors such as electronic resources, social media, and 3D printers, forcing new organisational and economic models and necessitating a new combination of technical, creative, and business skills.

Looking ahead, libraries and mass media need to adapt and innovate to maintain their shared objectives and collaborate for mutual benefits. Research data management, social media marketing and communication, electronic reference management systems, research support services, new information infrastructure, artificial intelligence, information access formats, training in digital literacy, and social interaction are among the new responsibilities for information professionals. To handle these tasks in the increasingly digital environment, a new set of business, technological, and creative abilities is needed.

References

Aacharya, H. (2021). Blogs: Types and Use of Blogs in Libraries. *EPRA International Journal of Research and Development (IJRD)*, *6*(4).

Adamu, A. L. G., Omame, I. M., Ahmed, A., & Gombe, A. B. (2019). Adoption of new media technologies in university libraries: pathway to improving standard of education for national development in Nigeria. *International Journal of Arts, Languages and Business Studies*, *2*(1), 1-8.

A'dillah Mustafa, I. N. Z., Idris, S. R. A., & Abd, M. F. (2016). Social media promotional tools in academic library. *International Journal of Computer Theory and Engineering*, *8*(3), 260-264.

Akinola, O. T. (2015). Social media as weapon of mass instruction in training library and information science students. In: Tella A (ed.) Social Media Strategies for Dynamic Library Service Development. Hershey, PA: IGI Global, pp.175– 202.

Ali, N., & Naveed, M. A. (2020). Research support resources and services in university libraries of Pakistan: A situational analysis. *Pakistan Library Information Science Journal*, *51*, 57-63.

Chisita, C. T., Shoko, M., Rusero, A. M., & Ngoaketse, J. (2020). Media, libraries, and archives: Unearthing the missing link in Zimbabwe. In *Cooperation and collaboration initiatives for libraries and related institutions* (pp. ٢٧٢-٢٤٣). IGI Global.

Croteau, D., & Hoynes, W. (2018). *Media/Society: Technology, Industries, Content, and Users* (٦th ed.). SAGE Publications.

Debono, M., & Vancell, J. (2017). The role of the mass media and social media. INCOMPLETE INFORMATION

Dudenhoffer, C. (2012). Pin it! Pinterest as a library marketing and information literacy tool. *College*

& Research Libraries News, 73(6), 328–333. doi:10.5860/ crln.73.6.8775.

Fernandez, J. (2009). A SWOT analysis for social media in libraries. *Online*, *33*(5), 35.

Flew, T. (2021). *New Media* (٥th ed.). Oxford University Press. CONFORM YEAR, YOU HAVE ٢٠١٣ AND ٢٠٢١ IN THE TEXT

Given, L. M., & McTavish, L. (2010). What's old is new again: The reconvergence of libraries, archives, and museums in the digital age. *The Library Quarterly*, *80*(1), 7-32.

Hall, J. A. (2018). When is social media use social interaction? Defining mediated social interaction. *New media & society*, *20*(1), 162-179.

Hannabuss, S., Barford, J., & Campbell, F. (1995). Intellectual convergence in a mass communication course for librarians and publishers. *Journal of librarianship and information science*, *27*(2), 67-76.

Kaul, V. (2012). Changing paradigms of media landscape in the digital age. *Journal of Mass Communication and Journalism*, *2*(2), 1-9. doi:10.4172/2165- 7912.1000110

Kolodzy, J., Grant, A. E., DeMars, T. R., & Wilkinson, J. S. (2014). The convergence years. *Journalism & Mass Communication Educator*, *69*(2), 197-205.

Livingstone, S. (1999) New Media, New Audiences? *New Media and Society*. 1(1), 59-66.

Magoi, J. S., Aspura, M. Y. I., & Abrizah, A. (2019). Social media engagement in developing countries: boon or bane for academic libraries?. *Information development*, *35*(3),374-387.

Mansfield, T., Winter, C., Griffith, C., Dockery, M., & Brown, T. (2014). Innovation study: challenges and opportunities for Australia's galleries, libraries, archives and museums. https://apo.org.au/ sites/ default/files/resource-files/2014/09/aponid42371-1177676.pdf

Moss, G. (2016). Knowledge, education and research: Making common cause across communities of practice. *British Educational Research Journal*, *42*(6), 927-944.

Nakitare, J., Sawe, E., Nyambala, J., & Kwanya, T. (2020). The emerging roles of academic librarians in Kenya: apomediaries or infomediaries?. *Library Management*, *41*(6/7), 339-353.

Negi, D. S. (2014). *Using mobile technologies in libraries and information centers. Library Hi Tech News, 31(5), 14–16.* doi:١٠,١١٠٨/lhtn-٢٠١٤-٠٥-٠٠٣٤

Newman, N., Fletcher, R., Eddy, K., Robertson, C. T., & Nielsen, R. K. (2023). Reuters Institute Digital News Report 2023. Reuters Institute for the Study of Journalism.

Nwalo, K.I.N. (2000), LSE 101: Society, Development and Libraries, University of Ibadan.

Nwanguma, U. Q. (2015). New Media and the Overlapping Roles of Content Providers and Content Consumers. *New Media and Mass Communication*, *41*, 30-36.

Ogunleye, D. A. (2015). Social media and academic performance of library and information science undergraduates: A case study of selected tertiary institutions in Kwara State, Ilorin. In: Tella A (ed.) Social Media Strategies for Dynamic Library Service Development. Hershey, PA: IGI Global, pp. 203–229.

Owusu-Ansah CM, Gontshi V, Mutibwa L, et al. (2015) Applications of social media and Web 2.0 for research support in selected African academic institutions. *Journal of Balkan Libraries Union* 3(1): 30–39.

Padhan, D. K., & Naidu, G. H. (2022). Research Support Services in Academic Libraries. INCOMPLETE INFORMATION

Proske, A., Wenzel, C., & Queitsch, M. B. (2023). Reference Management Systems. In *Digital Writing Technologies in Higher Education: Theory, Research, and Practice* (pp. ٢٣٠-٢١٥). Cham: Springer International Publishing.

Quadri, G. O., & Adebayo Idowu, O. (2016). Social media use by librarians for information dissemination in three federal university libraries in Southwest Nigeria. *Journal of Library & Information Services in Distance Learning*, *10*(1-2), 30-40.

Qutab, S., Myers, M. D., & Gardner, L. A. (2019). Information disorder in the glam sector: the challenges of crowd sourced contributions. INCOMPLETE INFORMATION

StudyMassCom.com (2024). Traditional Media vs. New Media. Available at https://studymasscom.com/media/traditional-media-vs-new-media/

Tella A, Olarongbe, S. A., Akanbi-, H. B., et al. (2013) Use of social networking sites by academ-

ic librarians in six selected states of Nigeria. *New Review of Academic Librarianship*, 19(3): 274–290.

Ufot, J. O., Akarika, D. C., & Ukpe, A. P. (2023) Media Convergence and Journalism Practice in Nigeria: Issues and Challenges. *AKSU Journal of Administration and Corporate Governance*, (2), 91-100.

Umeozor, S. N., & Ibegwam, A. (2022). Assessment of the traditional and emerging roles of university libraries in Nigeria. *Journal of ICT Development Applications and Research*, *4*(1/2), 85-95.

University of Exeter Library (2024). Enhance your e-resource reading experience: What electronic formats are available? Available at: https://libguides.exeter.ac.uk/AlternativeFormats/eresources

Wheeler, L., & Nezlek, J. (1977). Sex differences in social participation. *Journal of Personality and Social Psychology*, *35*(10), 742-754.

Williams, M. L. (2020). The adoption of Web 2.0 technologies in academic libraries: A comparative exploration. *Journal of Librarianship and Information Science*, *52*(1), 137-149.

Witte, G. (2013). How to find and create social media content for your library. Library Connect, 1(2). Available at http://libraryconnect.elsevier.com/sites/default/files/LCN_11.2_Witte.pdf

Yin, L. (2023). The Changing Landscape of Media Communication: An Analysis of the Impact of New Media Marketing on News Consumption and Consumer Behavior. *International Journal of Education and Humanities* 11(2), 9-12.

Yoo-Lee, E. Y. & Kim, K. S. (2014). Libraries as media: Redefining a library in the digital age. *IFLA* WLIC, Singapore.

Zhu, Q. (2016). The application of social media in outreach of academic libraries' resources and services: A case study on WeChat. *Library Hi Tech*, *34*(4), 615-624.

Strategies For Leveraging Artificial Intelligence and Big Data in Libraries for Sustainable Community Development

Atanda Saliu SAMBO[1] Tunde Shamsudeen AJIBOLA[2] Ismaila Aliyu YAHAYA[3]

1,2 Department of Library and Information Science, Kwara State University, Malete, Nigeria.

3 Muhammadu Buhari Library, Kwara State University, Malete, Nigeria.

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

Artificial Intelligence (AI) and Big Data (BD) have attracted global attention and inspired innovations in every field, including the library, as access to information has been affected by technological evolution. Compared to the developed world, libraries in developing countries need to maximise the amazing potential of AI and BD in their services. These powerful tools hold immense potential to revolutionise how libraries function and serve their patrons in various capacities, including leveraging user experience, smarter information retrieval, and streamlining operations. This paper explores the strategies for leveraging AI and BD in libraries for sustainable community development. It discusses the potential of AI and BD in libraries, their importance for sustainable development, the connection between AI and BD, and leveraging AI for enhanced library services. It also highlights the prospects of AI and BD in libraries, strategies for integrating AI and big data in library services, and the challenges in leveraging AI and BD in libraries for sustainable community development. The study recommends, among others, that libraries should organise training for staff to stay relevant in the technology-driven era. It advocates the implementation of policies that would guide the application and use of AI and BD, as well as data protection. It recommends adequate funds to the library for AI and BD for competency and productivity.

Keywords: Strategies, Artificial Intelligence, Big Data, Library, Sustainable Development

1. Introduction

With the advent of the information age, libraries have transcended their traditional role as mere repositories of books and printed materials. As information hubs, libraries are well-positioned to utilise emerging technologies such as Artificial Intelligence (AI) and Big Data (BD) to foster sustainable community development. By harnessing these technologies, libraries can increase community development strategies, focusing on the relevance of the institutions, and addressing the information needs of their clientele. Libraries are undergoing a fascinating transformation with the incorporation of AI and BD. These powerful tools hold immense potential to revolutionise how libraries function and serve their patrons in various capacities, enhancing user experience, smarter information retrieval, and streamlining operations. Artificial intelligence can process vast amount of data collected by libraries to give impressive insights and personalised experiences. This could lead to the development of smart libraries that anticipate user needs and proactively deliver information and resources. AI and BD are being leveraged to facilitate access to information resources through open-access policies for digital materials.

AI and BD are having significant impact on how we think, act, and make decisions in our world. Google, IBM, Amazon, Netflix, and Expedia, among others, have embraced aspects of AI to improve their products and services. These technologies are also being used by many major sectors such as health, education, weather, business, stock, agriculture, government and non-government agencies of different nations to simplify and neutralise the workload, increase

and speed up productivity, reduce human efforts, and most importantly, lead the digital world in a clever and sophisticated way (Vysakh & Babu, 2020).

AI and BD systems continue to expand their reach across society at a rapid pace, bringing about transformations within modern spheres of existence (Leshkevich & Motozhanets, 2022). Yet, even with crucial progress in AI and BD adoption and usage, there is still a need for their systematic implementation in achieving developmental goals. This paper, therefore, undertakes a literature-based review of strategies for leveraging AI and BD in libraries for sustainable development.

Conceptualising Big Data

Big data refers to extremely large, complex datasets that are too vast and dynamic for traditional data processing tools to manage, capture, store, analyse, or visualise efficiently. It is characterised by large volume, high velocity, variety, veracity, and value. (Zimmerman, 2017). As explained by Zhan and Widen (2019), big data refers to huge datasets with rapid boundless in multiple file formats, which could trigger methods of data handling and accelerate the development of technical solutions. The variety and quality of datasets can make it difficult to use and manage data. Commercial businesses, data scientists, and data analysts can organise data that has been uniformly collected. Some data can exist in an unstructured and unprocessed form. This can be obtained from different sources such as e-mails and the internet (Wang, Xu, Chen & Chen, 2016).

As stressed by Cox (2018), libraries contend with other units within the parent institution for recognition, technology, staff attention, partnership, and other areas of importance. These are necessary for the librarians to position themselves for effective, efficient and improved service delivery. It should be stated that BD has become a tool to improve business decision making, anticipate future healthcare trends, and analyse customer service satisfaction (Kościelniak & Puto, 2015; Chang, 2016). This has made BD a promising area for future improvements in socio-economic and societal value, as well as a potential source of competitive advantage for institutions/organisations. Hence, librarians must be fully aware of BD and its benefits, and the need to expand data-related activities in libraries as one of the key technical breakthroughs.

With the emergence of big data, library and information professionals must know how to use large datasets, ensure its visibility and accessibility by developing metadata systems and systematising retrieval techniques. Librarians must also begin to acquire basic skills involved in big data, its impact on the nature of their profession, and how big data can be used efficiently to achieve the set goals. Sengupta (2016) states that big data goes beyond increasing the amount of data, but involves the improvement of the tools for storing, combining, aggregating, and analysing the data.

2. Literature Review

Artificial intelligence (AI) and big data (BD) present a vast opportunity for sustainable community development (Bhutani & Paliwal, 2015; Seele & Lock, 2017; AI4SDG, 2021) and offer vast analytical possibilities to track sustainable development (Letouzé, 2015; Wu et al., 2020). AI and BD can assist sustainable development policymakers (Xu et al., 2020; Milano et al., 2014) with real-time structural information (MacFeely, 2019), regulatory oversight (Yaeger et al., 2019), and governance (Sharma et al., 2019). However, there exist concerns over AI and BD, and their utilisation for sustainable development as AI and BD-based decision-making can reinforce and magnify pre-existing inequalities and bias, distorting or amplifying real world exclusion and discrimination against marginalised groups (Karimi et al., 2018), unless diversity and inclusion are factored in their use (Mitchell et al., 2020).

More so, there are notable predictions that AI and BD may have negative economic and social impacts on developing nations in the near future, by reducing employment opportunities (Carmody, 2020) and through the reshoring of information and communication technology (ICT) activities back to advanced economies (Baldwin, 2019). Kaplan and Haenlein (2019) assert that AI and BD can read and correct external input, learn from it, and utilise it to do certain tasks and duties through flexible adaptation. The rapid advancement of AI in recent years suggests that it will likely rank among the most valuable technologies in the years to come (Belharet et al., 2020; Yeager, 2021).

According to Kiradoo (2021), AI is a branch of technological know-how concerned with constructing intelligent machines and components that perform multiple tasks, imitating human intelligence. This is a technique in the direction of replicating human activities through gadgets, studying and recording analytics to enhance work and operational performance

(Belharet et al., 2020). Artificial intelligence and system mastering have an extensive variety of business packages. Rao and Kusuma (2019) opine that big data involves the use of relevant algorithms to process, analyse, and store massive data, discover value from massive data, and serve life and production. BD is the product of this high-tech era. The field of BD itself concerns the modern problem of (and solutions to) ever-increasing data volume, velocity, variety, and veracity, as well as increasingly personal, individual instrumentation and surveillance of our daily behaviours (Yaqoob et al., 2016). BD is a logical consequence of the importance that digital has taken in our lives, where data is multiplying at an unprecedented rate (Faroukhi et al., 2020). BD can be generally described as a large amount of unstructured and semi-structured data created by an organisation that takes a lot of time and money to download into a relatable database for analysis. BD analysis is mainly associated with cloud computing.

The role of the Library in Promoting Sustainable Development

Libraries play a vital role in achieving sustainable development goals (SDGs). Sustainable development is significant for libraries for several reasons (United Nations 2015; AI4SDGs, 2021). These reasons are listed as follows:

• Knowledge for All: Libraries are champions of equitable access to information, a cornerstone of sustainable development. They ensure that everyone has the resources to learn about environmental issues, social justice, and economic opportunities.

• Empowering Citizens**:** Libraries provide educational programmes and resources that equip people with the skills they need to contribute to sustainable development. This can include digital literacy, job training related to green technologies, or workshops on environmental awareness.

• Preserving Culture and Heritage: Libraries safeguard cultural heritage and indigenous knowledge, which are important for sustainable development. This knowledge can provide solutions to environmental challenges and promote social equity.

• Sustainable Practices: Libraries themselves can be models of sustainability. They can implement green building practices, use energy-efficient technologies, and promote eco-conscious behaviours, inspiring their communities.

• Community Hubs: Libraries serve as a platform for community engagement on sustainability issues. They can host discussions, workshops, seminars, and conferences that allow people to brainstorm solutions and advocate for change. By integrating sustainable development principles into their operations and services, libraries can become powerful drivers of positive change in society.

Sustainability is a complex yet integral concept embedded in the ethos of library administration (Hauke, Charney & Sahav, 2017). Libraries, acting as community pillars, have a crucial role to play in advocating and implementing sustainable practices. By integrating sustainability consciousness, libraries can reinforce their relevance and demonstrate leadership in pressing global concerns. Libraries, traditionally perceived as reservoirs of knowledge, play a key role in social sustainability by upholding the democratic ideals of access to information and social inclusion (Aabo, 2009). Their multifarious functions encompass boosting local literacy standards, enhancing citizens' lifelong learning, and fostering community bonds.

Research reveals how Norwegian libraries play an instrumental role in uniting communities, besides acting as venues for activities, thereby fostering social integration. Library administrators can exploit their potential fully, supporting an array of local agendas outside the sphere of reading and literacy to encompass social sustainability objectives. Economic sustainability in libraries is often elucidated in terms of cost efficiency. However, it also extends to the value libraries contribute to local economies. For example, library administrators can encourage programmes that support job seekers or budding entrepreneurs, further establishing the library's role as a societal resource (Imhof & Koenig, 2011). Moreover, libraries are economic stabilisers, providing resources during downturns and balancing societal information needs.

Leveraging Artificial Intelligence for Enhanced Library Services

Artificial intelligence (AI) is transforming libraries, making them more user-friendly, efficient, and personalised. Kiradoo (2021) highlights the following as a way in which libraries can leverage AI for enhanced services:

• Improved User Experience, such as AI-powered chatbots and virtual assistants**:** These can provide 24/7 support, answer user queries, recommend resources, and even help with research. Imagine a user asking a chatbot, "I'm interested in learning about sustainable

gardening. Can you recommend some books and online resources?

• Personalised recommendations**:** AI can analyse user borrowing history and preferences to suggest similar books, articles, or even movies they might enjoy. This can help users discover new favourites and expand their horizons.

• Smarter search functionalities: AI can understand natural language searches, enabling users to find information more easily. Imagine a user typing "Great African novels" instead of specific titles or authors, and the search results bringing up relevant options (Kaplan & Haenlein, 2019; Kiradoo, 2021).

Increased Efficiency and Streamlined Operations

• Automated tasks: AI can handle repetitive tasks like cataloguing, classification, and book shelving, freeing up librarians' time for more valuable tasks like user engagement, programme development, and research assistance.

• Predictive maintenance: AI can analyse data to predict equipment failures, allowing for proactive maintenance and preventing downtime. This ensures the library runs smoothly and that resources are always available (Kiradoo, 2021).

• Accessibility tools: AI can be used to create features like text-to-speech conversion or image description, making library resources more accessible for users with visual or reading impairments (Kiradoo, 2021).

Data-Driven Decision Making

• Collection development: AI can analyse user data to understand what materials are in high demand and which ones are underutilised. This helps libraries optimise their collections and make informed decisions about future acquisitions.

• Understanding user behaviour: Analysing borrowing patterns and website interactions can provide valuable insights into user needs and preferences. This allows libraries to tailor their services and programmes to better serve their communities.

• Programme evaluation**:** AI can be used to track the effectiveness of library programmes and identify areas for improvement. This ensures that libraries are offering programmes that are truly beneficial to their patrons.

Relationship between Artificial Intelligence and Big Data

Artificial Intelligence and Big Data have a synergistic connection. AI requires a massive scale of data to learn and improve decision-making processes, and big data analytics leverages AI for better data analysis. With this convergence, a user can easily leverage advanced analytics competencies like increased or creative analytics and more efficiently surface actionable insights from their vast stores of data. With BD, AI-powered analytics, users can be enabled with the spontaneous tools and robust technologies they need to extract high-value insights from data, thereby fostering data literacy. BD is the fuel on which AI runs. Large amounts of varied data are what make it possible for machine learning applications to do what they were designed to do: acquire and perfect a skill (Carmody, 2020). The more data available to the AI, the more it can learn and progress its pattern recognition competencies.

AI refers to a set of technologies which enable computers to simulate human intelligence. Examples of AI include speech recognition, such as directing virtual assistants like Alexa to perform tasks, image recognition for identification, and autonomous driving (Belharet et al., 2020). Furthermore, Kiradoo (2021) asserts that BD has a significant influence on AI by providing various opportunities for advancements in the field. The combination of BD and AI allows for the effective identification of trends and hidden patterns, enabling predictions. The large volume and complexity of data in BD sets, along with their diverse formats, require new approaches to data processing and management that traditional methods cannot handle.

The Future of Artificial Intelligence and Big Data in Libraries

The prospect of AI and BD in libraries is promising, offering opportunities for enhanced operations and services, improved user engagement, and data-driven decision-making. As AI and BD technology continue to evolve, libraries can expect even more exciting possibilities. Imagine smart libraries that anticipate user needs and proactively suggest resources. Additionally, AI can be used to create personalised learning experiences, recommending educational materials based on a user's individual goals and interests. AI is transforming libraries, making them more user-friendly and efficient (Dudek & Kujawski, 2022). The transformation in the roles of librarians, alongside the integration of AI and Big Data, will shape the future environment of libraries, making

them more relevant and responsive to the needs of their communities. By leveraging these technologies effectively and ethically, libraries can fulfil their mission of providing information access and fostering lifelong learning in an increasingly digital world.

Strategies for Integrating Artificial Intelligence and Big Data in Library Services

The utilisation of AI and BD in libraries is not an end in itself but a means to achieve greater community engagement and sustainable development goals. The following strategies illustrate how libraries can leverage these technologies to serve their communities better (Vysakh & Babu, 2020):

Data-Driven Community Programme Development: Libraries can analyse community data to identify trends, needs, and challenges faced by their members. For example, by examining local demographic data, libraries can develop targeted educational programmes and workshops that address the specific interests and requirements of different community groups. Data-driven insights can also help tailor library collections and resources to ensure they are relevant and accessible to all.

Personalisation of Library Services: AI-driven recommendations and customisation can enhance users' experience dramatically. Machine learning algorithms can suggest books and resources based on a user's past borrowing history and interests, akin to how streaming services recommend movies and music. As reported by Anand and Mobasher (2005), personalisation technologies have the potential to transform user interaction with library services, making them more intuitive and engaging.

Enabling Access to Global Information: The Bibliotheca Alexandrina's initiative in digitising and providing access to global information exemplifies how libraries can leverage Big Data. By digitising its collection and integrating international databases, the Bibliotheca Alexandrina provides users with access to a wealth of information, thereby promoting knowledge exchange and cultural understanding, which are fundamental to sustainable development.

Community Skill Development through AI Literacy Programmes: AI literacy is becoming an essential skill in the workforce. Libraries can offer AI workshops and coding classes to equip community members with the skills necessary to thrive in a technology-driven economy. This strategy not only enhances individual competencies but also contributes to the overall competitiveness and innovation of the community as a whole.

Collaboration with Local Organisations and Businesses: Partnerships with local businesses, schools, and non-profit organisations can extend the reach and impact of library services enabled by AI and Big Data. Libraries can play a central role in building consortia that share data and resources, fostering a collaborative environment conducive to addressing community challenges and advancing sustainable development goals.

Case Studies of Successful Implementations

Across the globe, there are numerous instances where libraries have successfully implemented AI and BD to improve services and community engagement. For instance, several libraries in academic institutions have begun using AI to provide 24/7 virtual reference services, enabling efficient and timely support for researchers and students. Additionally, the application of BD in public libraries has enhanced the understanding of user needs, allowing for a more user-centric approach in library service delivery.

Planning and Evaluation

• Conduct needs assessment: Identify areas where AI and BD can address current challenges or improve existing services.

• Develop a strategic plan: Set clear goals for AI and BD integration, outlining how it will improve user experience and library operations.

• Establish ethical guidelines: Develop policies for data collection, use, and security to ensure user privacy and responsible AI implementation (Kiradoo, 2021).

Building Infrastructure and Expertise

• Invest in AI tools and resources: Choose AI tools that align with your strategic goals, considering factors like cost, scalability, and ease of use.

• Develop staff expertise: Provide training for librarians on using AI tools and interpreting big data to leverage its full potential.

• Partner with technology experts: Collaborate with external partners to ensure smooth implementation and ongoing support for AI and big data systems (Vysakh & Babu, 2020).

User-Centered Integration

• Start small and iterate: Begin with a pilot project focusing on a specific service area, like AI-powered chatbots or personalised recommendations.

• Gather user feedback: Actively seek user input throughout the integration process to understand their needs and concerns and refine your approach accordingly.

• Focus on transparency and user control**:** Ensure users understand how AI and big data are being used in the library and provide options for them to control their data privacy (Vysakh & Babu, 2020).

Data Management and Security

• Develop a data governance framework**:** Establish clear protocols for data collection, storage, access, and disposal to maintain data integrity and security.

• Invest in data security measures**:** Implement robust cybersecurity measures to protect users' data from unauthorised access or breaches.

• Promote data literacy: Educate users about how their data is used in the library and empower them to make informed choices about data sharing (Vysakh & Babu, 2020).

Collaboration and Innovation

• Share best practices: Collaborate with other libraries to share experiences and knowledge about successful AI and BD implementations.

• Explore emerging technologies**:** Stay updated on advancements in AI and big data to explore new possibilities for library services.

• Develop partnerships with external organisations: Collaborate with researchers, data scientists, and other stakeholders to develop innovative solutions for library challenges (Vysakh & Babu, 2020). Through following these strategies, libraries can effectively integrate AI and BD to create a more user-friendly, efficient, and future-proof library experience. The key is to prioritise users' needs, ensure data privacy, and continuously evaluate and adapt approaches along the way.

Challenges and Solutions

It is crucial to acknowledge potential challenges facing the implementation of AI technologies in libraries. These technologies require investment and ethical considerations for their use in libraries. Additionally, the roles of the librarians might evolve, requiring new skillsets to work effectively together with AI and BD. Furthermore, implementing AI and BD requires careful planning and consideration. Some challenges, as identified by Kiradoo (2021) and Kaplan and Haenlein (2019), include cost. AI technology can be expensive, and libraries need to find sustainable ways to integrate it into their operations. Ethical data collection and use are crucial; hence, libraries need to ensure users' data is protected and used responsibly. Librarians might need to develop new skills to work efficiently. Despite these challenges, AI and BD offer a bright future for libraries. By embracing this technology, libraries can transform themselves into even more dynamic and user-centred institutions, empowering people to access information and knowledge more effectively (Kaplan & Haenlein, 2019; Kiradoo, 2021).

3. Conclusion and Recommendation

The deployment of AI and BD in libraries offers chances to drive sustainable development and to engage communities more meaningfully. As libraries continue to adapt to technological advances, they must adopt strategic planning, invest in skill development, and motivate organisations to exploit the advantages of the technologies for their users. The prospect of libraries is not only in their collections, but also in their ability to harness data and technology to create innovative services that respond to the evolving needs of their users and communities**.** More so, leveraging AI and BD offers libraries a remarkable opportunity to evolve and better serve their users, communities, and drive sustainable development. Through promoting digital literacy and inclusion, offering personalised services, enhancing accessibility, employing data-driven decision-making, and maintaining ethical standards, libraries can harness these technologies to foster a more inclusive, informed, and sustainable society. The incorporation of AI and BD into community development strategies is not without its challenges, yet the potential rewards for local and global communities alike are undeniably rich. Libraries, as enduring pillars of community and knowledge, are perfectly positioned to lead the charge in embracing these innovative technologies for the greater good.

By leveraging AI and BD technologies, libraries can become more effective in providing access to information, bridging the digital divide, and promoting lifelong learning. Also, they can contribute to sustainable resource management and foster novelty within

their communities. As we look to the future, the synergy between AI, BD and libraries holds enormous possibilities for addressing the global challenges outlined in the Sustainable Development Goals. Big data has a significant influence on AI by providing various opportunities for advancements in the field. Libraries are an important part of communities around the world because they continually provide personalised and specialised services. To further enhance the role of libraries in leveraging AI and Bd for sustainable community development, the following recommendations are proposed: Library management should organise training for library staff to stay relevant in this technology-driven era; the implementation of policies that would guide the application and use of AI and BD as well as data protection should be flexible; adequate funds should be allocated to the library for AI and BD for competence and productivity; and library management should recruit data analysts or managers who would handle data as a valuable resource in the library.

References

Aabo, S. (2009). *The role and value of public libraries in the age of digital technologies*. Available at https://journals.sagepub.com/doi/abs/10.1177/0961000609345091

AI4SDGs (2021). *AI for Sustainable Development Goals - SDG Projects*. Available at https://ai-for sdgs.academy/topics

Anand, S. S., & Mobasher, B. (2005). Intelligent techniques for web personalization. IJCAI. Available at https://link.springer.com/chapter/10.1007/11768012_22

Baldwin, R. (2019). *The Globotics Upheaval: Globalisation, Robotics and the Future of Work.* Oxford University Press.

Bhutani, S. & Paliwal, Y. (2015) Digitalization: A step towards sustainable development. *International Journal of Sustainable Development, 8*(12), 23-42.

Belharet, A., Bharathan, U., Dzingina, B., Madhavan, N., Mathur, C., Toti, Y. B., & Markowski, K. (2020). *Report on the impact of artificial intelligence on project management*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3660689

Carmody, P. (2020). Meta-trends in global value chains and development: Interacting impacts with COVID-19 in Africa. *Transnational Corporations Journal*, *27*(2), 45-58.

Chang, A. C. (2016). Big data in medicine: The upcoming artificial intelligence. *Progress in Pediatric Cardiology*. *100*(43), 91–94. https://www.infona.pl/resource/bwmeta1.element.elsevier-88d9ca39-ebb9-3567-80b3-387f45aa131d

Dudek, T., & Kujawski, A. (2022). The concept of big data management with various transportation systems sources as a key role in smart cities development. *Energies*. Available at https://doi.org/10.3390/en15249506

Hauke, P., Grunwald, M., & Wilde, A. (2017). Green libraries coming Up! National and international initiatives fostering environmentally sustainable libraries and library services. In BOBCATSSS 1– https://proceedings.bobcatsss2014.hb.se/article/view/316/414

Imhof, R., & Koenig, M. (2011). Public libraries and their national policies: International case studies. *Elsevier*, https://www.elsevier.com/books/public-libraries-and-their-national-policies/imhof/978-1-84334-689-9

Kaplan, A., Haenlein, M., (2019). Siri, Siri, in my hand: Who's the fairest in the l and? On the interpretations, illustrations, and implications of artificial intelligence. *Horiz*, *62*(1), 15–25

Karimi, F., Génois, M., Wagner, C., Singer, P., & Strohmaier, M. (2018). Homophily influences ranking of minorities in social networks. *Scientific Reports*, 8.

Kiradoo, G. (2021). Role of application of artificial intelligence (AI) and Its importance in the healthcare industry. Available at https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3824630

Kościelniak, H., & Puto, A. (2015). Big data in decision making processes of enterprises. Part of Special Issue: *International Conference on Communications, Management, and Information Technology*, *65*, 1052–1058. https://doi.org/10.1016/j.procs.2015.09.053

Letouzé, E. (2015). *Reflections on big data & the*

sustainable development goals: Measuring & achieving development progress in the big data era. Data-Pop Alliance, Hard Humanitarian Initiative.

Leshkevich, T. Motozhanets, B. (2022). A social perception of artificial intelligence and digitisation of cultural heritage: *Russian Context*, 12, 2712. https://doi.org/10.3390/ app12052712.

Mitchell, M. (2020). *Diversity and inclusion metrics in subset selection*. Proceedings of the AAAI/ ACM Conference on AI, Ethics, and Society, 117–123.

Moulding, J. (2016). Cisco visual networking index: Global mobile data traffic forecast update. Available at https://www.v-net.tv/cisco-visual-networking-index-global-mobile-data-traffic-forecast-update-2015–2020.

Rao, S. P., & Kusuma M. (2019). Application of big data DE duplication in cloud environment. IEEE, *7*(4), 921–934.

Seele, P. and Lock, I. (2017). The game-changing potential of digitalisation for sustainability: Possibilities, perils, and pathways. *Sustainability Science*, *12*, 183-185.

Sengupta, S. (2016). *Big data: The next big opportunity for librarians*. New Delhi http:// eprints.rclis.org/34349/1/final-proceeding-iic-clist16-2s-view-50-51.pdf

Sharma, M. (2019). Augmented intelligence: A way for helping universities to make smarter decisions. In Rathore, V.S., Worring, M., Mishra, D.K., Joshi, A. and Maheshwari, S. (Eds), Emerging Trends in Expert Applications and Security. Springer.

United Nations (2015). *Transforming our world: The 2030 agenda for sustainable development.* Available at https://sustainabledevelopment.un.org/post2015/transformingourworld/publication.

Vysakh, C. & Babu, H. R. (2020). Application of artificially intelligent robot in libraries. *Reshaping of Librarianship, Innovations and Transformation,* 59-63 https://www.researchgate.net/publication/338712408.

Wang, C., Xu, S., Chen, L., & Chen, X. (2016). Exposing library data with big data technology: A review. IEEE/ACIS 15th International Conference on Computer and Information Science. ICIS Proceedings, 1–6. https://doi.org/10.1109/ICIS.2016.7550937.

Wu, B., Tian, F., Zhang, M., Zeng, H., & Zeng, Y. (2020). Cloud services with big data provide a solution for monitoring and tracking sustainable development goals. *Geography and Sustainability*, 1, 25-32.

Xu, Z. (2020). Assessing progress towards sustainable development over space and time. *Nature*, *57*(7), 74-78.

Yaqoob, I., Hashem, I. A. T., Gani, A., Mokhtar, S., Ahmed, E., Anuar, N. B., & Vasilakos, A. V. (2016). Big data: From beginning to future. *International Journal of Information Management, 36*(6), 1231-1247. DOI: 10.1016/j.ijinfomgt.2016.07.009

Yeager, J. (2021). Using technology and analytics to enhance stakeholder engagement in environmental decision making. *IBM Center for the Business of Government,* Washington DC, US.

Zimmerman, E. (2017). Big data and democracy. *Education and Information Technologies*, *22*(4), 1665-1675. https://journals.sagepub.com/doi/full/10.1177/0340035216666357

SECTION C:
MASS COMMUNICATION

Usage of Electronic Media for Alternative Crisis Mitigation and Human Rights Activism: A Study of *Kokoro Alate* Radio Programme

Bashirat Damilola SUBAIR[1]

1 Department of Mass Communication, Kwara State University, Malete

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

The Nigerian legal system is currently burdened with a high volume of civil cases and complaints, leading to the rise of alternative dispute resolution methods. The electronic media has significantly contributed to the popularity of these alternative informal court proceedings, playing a key role in addressing issues of justice in society. This study explored the role of *Kokoro Alate*, an alternative dispute resolution court on the Agidigbo FM, in addressing civil cases through dispute resolution and human rights activism in Nigeria. The study employed a quantitative survey approach. *Kokoro Alate's* page on Facebook was explored, and listeners of the programme were generated through the platform, and they form the study population. From a listener population of 264,000, a purposive sampling method was employed to select the participants for the study, and a total of 188 respondents were generated. Data were collected through online questionnaires and analysed, using descriptive and inferential statistics, including frequencies and percentages, mean and standard deviation and correlation analysis. The findings reveal that electronic media significantly enhances the reach of *Kokoro Alate*'s proceedings, contributing to the effective management and documentation of disputes and human rights cases. Additionally, the programme has encouraged both disputants and complainants to feature on the platform. The programme demonstrates effectiveness in preventing an escalation of crises and helps facilitate settlement between disputants. The study recommended raising awareness about alternative dispute resolution options through both the legal system and media channels. Additionally, it suggested that *Kokoro Alate* should employ a translator for its vernacular to be translated into Pidgin English or English language to take care of different tribes in the country and generate the interest of other tribes in featuring on the programme or advocate for its replication in their local environment.

Keywords: Alternate dispute court, crisis mitigation, electronic media, human rights activism, *Kokoro Alate.*

1. Introduction

Litigation is enshrined in Nigeria's constitution to maintain peace, order, and protect citizens' rights. However, the legal system often faces challenges such as an overwhelming number of cases, which hinder the timely resolution of many complaints. The introduction of technology has helped shift the focus towards addressing these issues, allowing for a more effective approach to managing complaints and influencing public opinion and policy. The role of the electronic media in society cannot be overstated, as it amplifies the voices of marginalised individuals. Many human rights cases go unnoticed or underreported, often due to the identities of the parties involved. In response, human rights-focused radio and television stations have emerged, offering platforms for Nigerians to report injustices, seek help, and change the narrative. These stations broadcast on radio, cable television, and online through social media, providing broad accessibility and reach (MacArthur Foundation, n.d.). The rise of human rights activists and peace builders is crucial in fostering national unity and ensuring accountability in the enforcement of human rights.

African societies possess a strong tradition of eloquence, oratory, and skilled cross-examination, which enriches the conflict resolution process. These cultural strengths are often highlighted in electronic media-based alternative dispute resolution programmes. Previous studies have recognised the potential benefits of adapting traditional tribunal models to electron-

ic media formats, which has proved to be an effective method for addressing legal disputes (Olaoba, 2001, cited in Oyebode, 2015).

Nigeria's alternative court transmission started in the 1980s, with the NTA Ibadan leading the innovation. Other state television and radio stations followed in quick succession. Some of the adjudicatory programmes on radio and television in the South-West of Nigeria are: *Agborodun* on NTA Ibadan; *So daa be* on BCOS TV; *Ijoko Agba* on OSRC Akure; *Olowogbogboro* on OGTV, Abeokuta; *Jeka parie* on OSRC Akure; *Gboro mi wo* and *Mogbe ejo mi de* on LTV (Oyebode, 2015). With the rapid utilisation of digital media, online electronic platforms submerge with alternative courts to corroborate the mainstream electronic media in facilitating reception and participation in the de-escalation of crisis. However, a new development ensues after the success of crisis mitigation in online platforms, as human rights activism was incorporated to combat the abuse against the vulnerable by championing justice. This brought in programmes such as proceedings from the *Berekete family*, Paternity court show, Judging matters and *Kokoro Alate,* among others. It is in the light of this that this study inquired into the nature of alternative courts through an examination of *Kokoro Alate* to determine its effectiveness in the dispensation of dispute resolution and engagement in human rights activism.

The country has recorded several cases of criminality, breach of contract, marriage dissolution, disputes and intolerance, among others, over the years. The court has been overwhelmed with complaints and requests for justice on many civil matters. However, the aftermath of the court judgment could turn sour and create disaffection among the parties involved. The system, at times, fails the weak minority, subjecting them to being forced to accept undeserving defeat. In another case, complaints of the underprivileged are swept under the carpet if the case concerns a stronger antagonist or when the complainant does not possess enough funds to finance the case. The emergence of human rights foundations, alternative courts and charity organisations, coupled with the incorporation of technology, now drives a change to these narratives. It is in this vein that this study decided to inquire into the influence of electronic media in the flourishing of alternative courts and the function of social responsibility demonstrated by the electronic media in its mediation, conflict resolution and spearheading redress of injustice.

The primary aim of this study was to assess the effectiveness of alternative courts in crisis management and human rights advocacy, specifically focusing on the *Kokoro Alate* programme on Agidigbo FM. The study sought to provide insights into the efficiency of alternative courts and highlight the role of *Kokoro Alate* on Agidigbo FM in contributing to social order and providing a platform for the vulnerable to express their grievances and seek redress. Consequently, the objectives of the study were to: (i) examine perceptions of *Kokoro Alate's* listeners on the effectiveness of the programme in crisis mitigation and promoting human rights activism; (ii) determine the influence of electronic media on *Kokoro Alate* proceedings; and (iii) investigate the challenges encountered by the host of the programme on alternate dispute courts.

2. Literature Review

Rationale for the emergence of the alternate dispute court

Alternative Dispute Resolution is the approach to settling disagreements without relying on litigation, out of court, and with the assistance of an unbiased third party. This process includes conciliation, mediation, or arbitration (Ashwini *et al*. 2021). Nigeria's constitution spelt out the expected behaviour of all patriotic citizens and identified actions or behaviours that are frowned upon. It also made provision for civilian complaints and how to address civil complaints. The judicial system exists to right the wrongs done to individuals or institutions. However, the system is perceived as not favouring all the citizens equally, most especially the weak and the vulnerable. In most instances, law terminology exchanged between lawyers and judges in courts is incomprehensible to most disputants, leaving them to wander in the dark. Additionally, there is a possibility that the case could be revised to implicate the complainant, as decisions within the judicial system can be unpredictable. Furthermore, people without financial means may struggle to meet legal representation, putting them at a disadvantage. Filing a complaint with the law enforcement agencies also poses financial challenges for the poor. With the potential for law enforcement officers to demand high fees due to expenses such as fueling vehicles and mobilising personnel, individuals with limited resources may face significant obstacles to getting justice (Mishra, Sharfi & Ranaware, 2021). More so, the adjournment of cases by the courts tends to delay judgment and flame disaffection between the disputants the more. Delay in justice dispensation

could also have other adverse consequences, as the disputants might be plotting against themselves while justice gets slowed down (Adebayo, 2015).

The recourse to traditional courts is inspired by the appreciation of the traditional dispute resolution method that exists to impartially navigate conflict with no financial requirement and assurance of quick dispensation of judgment/justice. Alternate Dispute courts were endorsed as a result of over-bloated cases in the legal system, and due to the inability of complainants to meet the levies imposed on their cases. More so, there are cases that require family and informal intervention. In a Nigerian traditional setting, dispute courts were organised by the councils of elders, the monarchs, and the heads of lineages and families. But with urbanisation and the emergence of civil society, mediators and foundations have taken up the task of mitigating crises by utilising intelligence, investigation and excerpts from the legal system (Ajayi & Oluwafemi, 2014; Ajayi & Abdulraheem, 2022). On another note, external dispute mediators assume the role of mitigating conflict among kinsmen, couples, employers and employees, neighbours and people bound by circumstances, among others (Albert *et al.* 1995). Strong (2018) emphasises that alternative courts provide various mechanisms and procedures to resolve disputes outside the traditional judicial system. These mechanisms, as outlined by Gurjar and Singh (2022), Jones (2021), Wilson et al. (2021), Namagga (2018), and Strong (2018), include mediation, premediation, opening statements, issue exploration, option generation, negotiation, agreement, and follow-up.

Electronic media has, over time, impacted alternative crisis mitigation, ranging from facilitating remote hearing and mediation, reducing cost, increasing efficiency, and enabling wider participation. It enables rapid communication and exchange of information between parties, mediators, and arbitrators, streamlining the alternative court process. Online negotiation has reduction in time as well as enhancing economic savings. Moreover, where a dispute arises, parties do not have to wait for weeks or months before they have their issues resolved, as in the case of litigation. (Ikubanni & Abiola, 2022). The media has made alternative courts more accessible to a broader audience, including those in remote or underserved areas. Electronic media facilitates the quicker resolution of disputes by allowing proceedings to be carried out more efficiently (Paluck, 2009). It has proven to be a valuable tool in maintaining support for ceasefire, peace treaties, and other diplomatic efforts aimed at ending conflict and violence, by highlighting and promoting peace negotiations (Bratic & Schirch, 2007). Most importantly, the media can be vital in building trust in peace processes. Through its influence, the media has the potential to contribute to fostering a culture of peace. One of the key goals of media-driven initiatives is to eliminate racial, ethnic, and national divisions among groups, thus promoting reconciliation and understanding (Bratic & Schirch, 2007).

Propagation of Human Rights in the Media

Human rights highlight each person's innate worth regardless of their culture, country, or level of political office. The human rights philosophy heightens people's sense of fraternity and affection. It promotes integrity and unanimity throughout the entire world. Human rights are universal as they are applicable globally (Weston, 2024). According to the United Nations (1948), all individuals are entitled to freedom and are equal in terms of their rights and dignity. They are expected to live in a fraternity as they are gifted with rationality and conscience. Human rights, as defined by the UDHR, are divided into two cartograms: those whose protection is required for people to live in dignity and those whose protection is required for people to develop their personalities to the fullest extent possible (More & Patil, 2012). The promotion of human rights can be defined as education, training and information aimed at building a universal culture of human rights through the sharing of knowledge, imparting of skills and moulding of attitudes (Amnesty International, 2011).

The media's efforts in disseminating information on human rights and associated topics through radio, television, newspaper and other mass media through drama, sports, and artistic and cultural events have shown to be an effective approach for engaging those who are frequently shut off from the conversation about human rights. The state's attempts to advance ideals, attitudes, and beliefs that motivate people to defend their own and others' rights are aided by the media's actions. The advancement of human rights is crucial to preventing injustices and conflicts as well as to building a society where everyone is recognised and cherished for their humanity (Sekaggya, 2013). The media act as society's watchdog, play a vital role in advancing and safeguarding human rights in Nigeria. They serve as a powerful platform for educating the public about their rights and highlighting violations, thereby holding perpetrators accountable. Asemah *et al*. (2013) posit that the media can be instrumental in

combating child and women trafficking both within Nigeria and globally. This suggests that the media are key in raising awareness about gender-related issues. In regions where human rights abuses are widespread, the media can help draw both national and international attention to these violations. The media play a vital role in ensuring that governing bodies maintain, oversee, and promote the protection of human rights (Talbi, 2012). The promotion of a human rights culture is greatly impacted by the exercise of the right to knowledge. It also helps with the strategy of utilising the media's influence to target individuals with messages that will stop infractions. Thus, when it comes to organising and pursuing human rights concerns to accomplish the goal of social justice in the community, the role of the media is crucial (Aldamen, 2017).

***Kokoro Alate:* a flagship on Agidigbo FM**

Kokoro Alate was introduced to Agidigbo FM, a private radio station in Ibadan, in 2020. The programme often tackles difficult and controversial issues. The programme fast became prominent for its commitment to addressing social injustices, giving voice to the voiceless and holding those in power accountable. The platform is used to advocate justice, transparency and accountability. It also brought attention to numerous social issues, including corruption and human rights abuses in Nigeria. The programme offers amusing and jovial moments, especially with the popular saying *'E gbe nu si mic, omo Nigeria fe gbo yin*', meaning 'speak to the microphone, Nigerians are eager to hear from you'.

Kokoro Alate offers a tent spot to alleviate conflict among the disputants. However, in the case of disproportionate issues that override amicability under the shade provided, an entry will be made to the studio to press further on the cause of differences and after which there will be navigation of a mechanism for de-exacerbation. The studio setting is characterised by the mediator, witnesses, studio personnel, the complainant and the defendant. On some occasions, the first appearance would be the complainant. Having expressed his or her grievance, the mediator will announce the invitation of the alleged and have a letter or verbal summons delivered to the alleged. The complainant and the defendant would be allowed to sit side by side to give an account of their respective stories, with witnesses and concrete evidence for submission. While treating a delicate issue, the face of the affected would be concealed on camera or covered with a mask.

After some time, *Kokoro Alate's* prominence transcended mainstream radio. It is now streaming on digital platforms in distinct forms. Moreover, the organisers of the programme have social media pages to complement their mainstream platform and gain wider access to the programme. There has been copious analysis of the programme on blogs and influencers' pages, which has galvanised the popularity and viral reach of the programme. This supports Han *et al*.'s (2020) submission that social media influencers have become key players in amplifying the reach of socially relevant media programmes by increasing the number of posts. This promotes empathy and support in terms of finance and activism to those featured on the programme.

The programmes, however, on a few occasions, had their fair share of challenges. In 2022, the chief host of *Kokoro Alate* was detained by the police for championing a protest on the arrest of Chief Rahman Adedoyin over the death of Timothy Adegoke in Chief Rahman's hotel in Osun State. The police claimed Mr. Hamzat was arrested for cyberbullying, while his station head argued that he was arrested for his defiant call for justice for Timothy Adegoke and extensive support for the deceased's family (Punch Newspaper, May 2022). The host of *Kokoro Alate* later appeared on a live stream to express his dismay after his intensive effort on an issue concerning a street roamer, Muideen, and a popular prophet, Agbala Gabriel. He was berated for taking sides with the prophet and chiding Muideen because he is poor. Hamzat expressed his frustration with the case and claimed he is a human from whom mistakes and errors are bound to occur. The host of *Kokoro Alate* also expressed his disbelief over complaints from people on how he kept hosting the father of a popular singer, Mohbad, after his mysterious death. In his attempt to inquire into the cause of Mohbad's death and expose his killer(s), there was an outcry that he was taking sides. The host angrily alerted the social media audiences that he had handed off Mohbad's case. Despite these encounters, the show keeps waxing stronger and receiving complainants daily.

Theoretical Perspective

Social responsibility and the media

The social responsibility theory, which stems from libertarian thought, argues that the media has a duty to serve the public interest by promoting not only freedom but also accountability. This includes advancing public opinion, consumer rights, private

interests, and broader societal concerns. The central idea is that freedom comes with responsibility. As Ravi (2012) notes, if the media fails in this duty, a public authority may need to intervene. In its role as a public institution, the media must balance its freedom with the obligation to inform and educate society, reflecting its critical function in a democratic system (McQuail, 2010). Melisande (2009) outlines four core responsibilities of the press within the framework of social responsibility: ensuring accurate reporting, analysis, and editorial content to the public; offering constructive criticism, serving as a channel for public opinion and providing necessary feedback to the government; and to themselves, finding satisfaction and fulfillment in their work, and contributing to a complete narrative of success, while ensuring the media organisation remains financially viable while serving as a legitimate source of education, enlightenment, and entertainment to the owner.

Journalists act as watchdogs for the public, overseeing other power structures in society. In other words, they are often expected to take an adversarial stance. Adeyanju (2005) supports this notion, stating that the press should serve as a preliminary warning mechanism for developing issues that could pose risks to a country or community. However, Kadiri (2009) notes that differing interpretations of media responsibility in journalism often lead to conflicts in practice. In the discourse of social responsibility, the idea of the media as society's watchdog extends beyond its conventional functions of reporting on events and monitoring society; it also involves mediating interactions between different societal elements and embracing rich cultural practices that prioritise fairness and fair play (Oyebode, 2015).

Thus, the social responsibility theory, concerning this study, underscores the electronic media's essential role in advancing societal interests, mediating conflicts, and promoting human rights. This connotes the role of media in enhancing the visibility and vigour of alternative courts by engaging conflicting parties to state their wants and needs and revolting against human oppressors. However, it remains clear that the media's role in conflict resolution and human rights activism is crucial but must be exercised with care to avoid bias and distortion of public discourse.

Empirical Review

Rhoda, Udeh, Inobemhe, and Santas's (2022) study focused on assessing the impact of the *Berekete Family Programme*, a widely recognised human rights radio show in Nigeria. The study explored the role of the radio programme in raising awareness about human rights violations, corruption, and insecurity in the Federal Capital Territory (FCT) and Nasarawa State. The study's target population consisted of residents in the FCT and Nasarawa, particularly those who regularly tuned in to the *Berekete Family Programme*. A random sampling technique was used to select 300 participants who were frequent listeners of the programme. Data were gathered using a combination of interviews and focus group discussions (FGDs). Interviews were conducted with listeners to understand their perceptions of the programme's influence on their awareness of human rights and societal issues. The data were analysed using both qualitative and quantitative methods. Quantitative data from the surveys were analysed using descriptive statistics (percentages and frequencies), while the qualitative data from interviews and FGDs were analysed using thematic analysis to identify recurring themes and patterns related to the programme's impact on human rights awareness. The findings revealed that the programme was effective in addressing key societal issues, particularly human rights abuse, and helped in mobilising public support for justice and accountability.

Liu *et al*. (2020) conducted a study titled **"**How Does Courtroom Broadcasting Influence Public Confidence in Justice? The Mediation Effect of Vicarious Interpersonal Treatment". The study involved 170 college students from China, aged 18–31, with an average age of 22.8 years. The sample included 44.1% males, 17% undergraduates, 56.5% master's students, and 26.5% Ph.D. students. Only 2.4% were majoring in law. Participants were randomly assigned to two groups: A real-life civil case from 2008, widely publicised in China, was chosen for the study and an edited version of a legal programme reporting the case, including trial preparation, statements, evidence presentation, closing arguments, and judgment announcement. A Pilot Study was conducted on 25 students to ensure comprehension of the case and relationships among the parties involved. The study found that the experimental group (video viewing) reported higher perceived interpersonal treatment (M = 22.87) compared to the control group (M = 21.90). The experimental group also reported higher perceived procedural justice (M = 4.41) than the control group (M = 4.21), and no significant difference was found between the groups (experimental: M = 3.77; control: M = 3.69).Video watching was positively correlated with

interpersonal treatment ($r = 0.20$, $p < 0.01$) and procedural justice ($r = 0.17$, $p < 0.05$). The chain mediation model revealed that the effect of video watching on confidence in justice was mediated by perceived interpersonal treatment and procedural justice.

In the study by Rossner and McCurdy (2020) titled "Video Hearings as an Alternative to Physical Court Hearings", the researchers observed both video hearings and traditional in-person hearings across civil, family, and tax jurisdictions and conducted interviews with various stakeholders, including appellants, their representatives, HM Revenue and Customs (HMRC) representatives, and judges overseeing the hearings. The study focused on evaluating participants' experiences with video hearings, considering factors such as convenience, clarity, and ease of use. According to the findings of the study, participants generally found video hearings to be convenient, robust, and user-friendly. Despite some technical issues, users appreciated the reduced need for travel and the flexibility offered by video hearing. Judges and other stakeholders adapted effectively to the video format, maintaining appropriate levels of formality and authority.

Meyer (2020) conducted a study on "Promoted Media Coverage of Court Decisions: Media Gatekeeping of Court Press Releases and the Role of News Values". The study analysed 584 press releases issued by the FCC between 2010 and 2018. These press releases are official communications promoting the Court's decisions. The press releases were cross-referenced with articles from German newspapers to determine instances of media coverage, while an automated content analysis method was utilised to assess the relationship between press releases and newspaper articles. This approach involved measuring the textual alignment between the content of press releases and related news articles. The study examined how specific news values, such as conflict, political power, and familiarity, affect the likelihood of press releases being covered by the media. Additional factors like the presence of oral hearings, press releases accompanying decisions, and dissenting opinions were analysed for their impact on media coverage.The study found that approximately 18% of the analysed press releases received media coverage. Contrary to expectations, news values like conflict and political power did not significantly influence media coverage. Press releases promoting decisions associated with oral hearings are more likely to be reported, suggesting that issues familiar to the public have higher newsworthiness.

Orijakor *et al*. (2020) conducted a study to assess the effectiveness of a radio programme on Darling 107.3 FM in increasing awareness of child maltreatment in Imo State, Nigeria. The study focused on parents, caregivers, and community members in Imo State who listened to the radio programme. A total of 250 respondents were selected using a simple random sampling technique. Data were collected through surveys and structured interviews. Interviews were also conducted with parents and social workers who had been involved in child abuse cases. The data were analysed, using descriptive statistics, focusing on the frequency and percentage of responses to survey questions. Qualitative data from interviews was analysed thematically to understand the deeper impact of the programme on community awareness and reporting behaviour. The study found that the radio programme had significantly improved the understanding of child abuse among parents and had contributed to a greater willingness to report abuse cases to relevant authorities.

Nammaga's (2018) study examined 'the effectiveness of alternative dispute resolution as a method of dispute resolution in the commercial division of the Uganda High Court'. The study explored the use of alternative dispute resolution (ADR) as a tool for settling conflicts within the Commercial Division of Uganda's High Court. A qualitative research approach was employed, drawing from both primary and secondary sources. Primary data included legal frameworks and documents such as the Constitution of Uganda, judicial decisions from the High Court on conflict matters, various statutes governing dispute resolution, and international agreements ratified by Uganda. Secondary data were obtained from academic literature, including books, peer-reviewed journal articles, and digital research databases. The findings of the study highlighted successful ADR strategies used in countries outside Uganda, providing a comparative analysis. Findings also emphasised the extent to which the Ugandan High Court has integrated and complied with various ADR mechanisms in resolving disputes nationwide and revealed that resolving disputes outside of court avoids delays and reduces costs.

Aldamen's (2017) study examined the role of both print and electronic media in advocating for human rights in Jordan. The study focused on the effectiveness of media in bringing attention to abuses of human rights and promoting justice for marginalised groups. The study's population included Jordanian citizens from over 150 different locations, with a quan-

titative approach used for data gathering. Data were gathered through structured questionnaires distributed to the participants. The data were analysed, using statistical methods, including descriptive statistics (frequencies and percentages), and inferential analysis through Chi-square tests to explore the relationship between media consumption patterns and the public's approval of how media addresses human rights issues. The findings revealed a moderate level of approval, suggesting that while the media contributed to human rights advocacy, its effectiveness was limited by challenges such as political interference and a lack of public engagement.

Oyebode (2015), in his study, evaluated the role of the *So Daa Bee* programme on BCOS, Ibadan in promoting alternative dispute resolution (ADR) through electronic media. The study sought to determine how effectively the programme incorporated traditional dispute settlement techniques alongside modern mediation practices in resolving conflicts in the Nigerian context. The study focused on people who were directly engaged in the programme or had regularly followed it. In-depth interviews were conducted with a few participants, mediators, and stakeholders associated with the show to gather qualitative insights into the programme's effectiveness**.** Thematic analysis was used for the qualitative interview data and analysis of *So Dee Bee* selected editions. The study revealed that the *So Daa Bee* programme had a positive impact on conflict resolution, especially by incorporating traditional settlement practices.

3. Material and Method

The study adopted a quantitative approach in eliciting responses from listeners of the *Kokoro Alate* programme on Agidigbo FM. An online questionnaire was used in achieving this. The trend of *Kokoro Alate* listenership is peculiar in some cities of Nigeria, especially in the South-West and North Central zones. However, as common as the listeners may be, there could be challenges in identifying them. The strategy for selecting the respondents of this study was, therefore, through *Kokoro Alate's* posts on Facebook. The researcher carefully studied the comment section and followers of *Kokoro Alate's* page on Facebook for two weeks before discerning the active audiences of the programme. It was observed between December 2024 and January 2025 that the Facebook followers of the programme numbered 264,000. The data were gathered between the 10th of January 2025 and the 3rd of February 2025. A purposive sampling technique was adopted to select the *Kokoro Alate* audiences, and a total of 400 respondents were purposely selected for the study. The questionnaire was designed with Google-form and 400 questionnaires were distributed across the selected audiences of *Kokoro Alate* on Facebook via direct message (DM). A total of 188 responded, indicating a 47% response rate. This shows the difficulty in achieving the cooperation of people for online research purposes. The 188 questionnaires retrieved were correctly filled, and this connotes that there were no questionnaires submitted with errors. The results were analysed, using the Statistical Package for the Social Sciences (SPSS). The study employed descriptive and inferential statistics in analysing and interpreting the data. The descriptive data were analysed and presented in simple percentage tables. In analysing data from the Likert-scale questions, the study utilised mean scores and standard deviations.

4. Results and Discussion

Table 1: Demographic distribution of respondents

Variable		Frequency	Percentage
Gender	Male	76	40%
	Female	112	60%
Total		**188**	**100%**
Age	18-27	38	20%
	28-37	66	35%
	38-47	48	26%
	48 and above	36	19%
Total		**188**	**100%**
Educational Qualification	SSCE	34	18%
	Diploma	42	22%
	B.Sc./HND	83	44%
	M.Sc.	24	13%
	PhD	5	3%
Total		**188**	100%
Marital Status	Single	34	18%
	Married	103	55%
	Divorced	13	7%
	Widowed	92	49%
Total		**188**	**100%**
Employment Status	Employed	75	40%
	Self-Employed	21	11%
	Unemployed		
Total			

The table above depicts the demographics of the respondents. The female respondents appeared to be more than the male respondents. This implies that the

proportion of females who listened to *Kokoro Alate* was more than the males. The age grade of respondents from 28-37 was the highest among other age grades. The respondents with B.Sc./HND academic qualification appeared to be more, with the lowest qualification in the distribution being SSSCE, which signifies that all respondents were literate. The majority of the respondents were married, while a few were widowed. A significant number of the respondents were either employed by an organisation or self-employed, indicating that the majority of them had a source of livelihood.

Table 2: Effectiveness of Crisis Mitigation on *Kokoro Alate*

Variables	Level of Agreement				Total			
Kokoro Alate guarantees that all parties involved in a crisis has access to the platform and is included in the resolution process	SA	A	N	D	SD		Mean	STD
	57	105	8	7	11	188	4.01	1.10
	30%	56%	3%	3%	3%	100%		
Kokoro Alate employs strategies to prevent conflicts from escalating and facilitating resolutions between disputing parties	59	102	9	12	6	188	4.04	1.08
	31%	54%	5%	7%	3%	100%		
Kokoro Alate offers fast dispensation of conflict mitigation, and it is cost-effective	47	117	8	11	5	188	4.01	1.03
	25%	62%	4%	6%	3%	100%		

Average

(Mean=4.02, SD=1.01)

The majority of the respondents (86%) agreed that *Kokoro Alate* ensures that every participant in a crisis has access to the platform and is included in the resolution process (M = 4.01, SD = 1.10). In the same vein, 85% of the respondents (M = 4.04, SD = 1.08) believed *Kokoro Alate* possesses effective methods to prevent crisis escalation and helps facilitate settlement between disputants while 87% of the respondents (M = 4.01, SD = 1.03) believed that *Kokoro Alate* is quick and cost-effective in conflict mitigation, suggesting general satisfaction with the platform's speed and affordability. These simply imply that *Kokoro Alate* is generally perceived as an effective tool for crisis mitigation, with particular strengths in accessibility, inclusivity, prevention of escalation, and efficiency in resolving conflicts quickly and affordably.

Table 3: Effectiveness of Human Rights Activism on *Kokoro Alate*

Variables	Level of Agreement				Total			
Kokoro Alate provides a platform for marginalised and vulnerable individuals to voice their grievances in the fight for human rights	SA	A	N	D	SD		Mean	St. Dev.
	60	98	9	9	12	188	3.99	
	32%	52%	5%	5%	6%	100%		1.15
Kokoro Alate has the potential to rally round warring factions by attracting relevant authorities and non-governmental activists	55	92	13	11	15	188	3.82	1.24
	30%	49%	7%	6%	8%	100%		

Kokoro Alate frequently highlights various success stories in the fight against human rights abuses	63	98	6	9	12	188	4.02	1.12
	34%	52%	3%	5%	6%	100%		

Average

(Mean=3.94, SD=1.02)

Analysis of the responses indicates that 84% of respondents (M = 3.99, SD = 1.15) agreed that *Kokoro Alate* provides a platform for marginalised and vulnerable individuals to voice their grievances in the fight for human rights. This suggests that *Kokoro Alate* is seen as an effective channel for raising awareness and enabling these communities to express their struggles. In the same vein, 79% of the respondents (M = 3.82, SD = 1.24) agreed that *Kokoro Alate* can bring together warring factions, attract relevant authorities, and mobilise non-governmental organisations for conflict resolution. This indicates a positive perception of *Kokoro Alate's* potential to unite different actors in human rights activism, making it an effective tool in addressing conflicts and human rights abuses. Again, 86% of the respondents (M = 4.02, SD = 1.12) agreed that *Kokoro Alate Kokoro Alate* frequently highlights various success stories and efforts to combat human rights violations. This indicates that *Kokoro Alate* is perceived as not only effective in activism but also in showcasing positive outcomes and victories in the struggle for human rights.

Table 4: Influence of electronic media on *Kokoro Alate's* proceedings

Variables	**Level of Agreement**					**Total**		
Electronic media enhances *Kokoro Alate's* reach and accessibility	SA	A	N	D	SD		Mean	St. Dev.
	58	105	8	6	11	188	4.03	1.11
	31%	56%	4%	3%	6%	100%		
Electronic media prompts disputants and complainants to feature on *Kokoro Alate*	49	113	5	9	12	188	3.95	1.16
	26%	60%	3%	5%	6%	100%		
Kokoro Alate's reach via electronic media could make relevant authorities take necessary action against human rights violators	45	109	10	11	13	188	3.86	1.21
	24%	58%	5%	6%	7%	100%		

Average (Mean=3.95, SD=1.03)

A significant majority (87%) of the respondents (M = 4.03, SD = 1.11) believed that electronic media enhances the reach and accessibility of *Kokoro Alate,* indicating strong support for the idea that electronic media broadens the platform's audience and accessibility. A majority (86%) of the respondents (M = 3.95, SD = 1.16) agreed that electronic media encourages disputants and complainants to participate in *Kokoro Alate*, indicating that electronic media motivates disputants and complainants to feature on the programme, while 82% of the respondents (M = 3.86, SD = 1.21) agreed that electronic media can impact authorities on taking action against human rights violators.

Table 5: Challenges encountered by *Kokoro Alate*

Variables								
Lack of legal backing is a challenge for *Kokoro Alate's* resolution on conflicts and human rights activism	SA	A	N	D	SD		Mean	Std
	46	98	13	15	16	188	3.76	
	24%	52%	7%	8%	9%	100%		1.27
Kokoro Alate cannot try and punish offenders in accordance with legal procedure	56	102	11	7	12	188	3.97	1.13
	30%	54%	6%	4%	6%	100%		

Average (Mean=3.87, SD=1.10)

The majority (76%) of the respondents (M = 3.76, SD = 1.27) believed that the lack of legal backing is a significant challenge for *Kokoro Alate* in resolving conflicts and promoting human rights activism, indicating that most people perceived the absence of formal legal support as a limitation to *Kokoro Alate's* effectiveness in conflict resolution. A significant majority of 84% (M = 3.97, SD = 1.13) agreed that *Kokoro Alate* lacks the legal authority to try and punish offenders according to legal procedures, reflecting a consensus that *Kokoro Alate* is limited in its capacity to enforce legal consequences, which may hinder its role in addressing human rights violations effectively.

Table 7 Analysis of Research Hypothesis 1

H_0 Lack of legal backing does not have a significant effect on disputants and complainants' intent on featuring in *Kokoro Alate*

Variable	Lack of Legal Backing	Media Prompting Disputants
Lack of Legal Backing	1.00	0.60*
Media Prompting Disputants to Feature	0.60*	1.00

$p < .05$. The correlation coefficient (r) between the perceived lack of legal backing and media prompting disputants to feature on *Kokoro Alate* is statistically significant and moderate (r = 0.60). This suggests that respondents who see legal backing as a challenge are also more likely to say that the media prompt their participation in *Kokoro Alate*. There is a moderate to strong positive correlation **(**$r \approx 0.60$**)** between perceiving lack of legal backing as a challenge and being prompted by electronic media to feature on *Kokoro Alate***.** This indicates that H_0 can be rejected, and there is evidence of a relationship between the two variables.

Table 8: Analysis of Research Hypothesis 2

H_2 Electronic media enhancement of *Kokoro Alate's* reach and accessibility influence policy makers and activists to intervene in human injustice

Variable	Electronic Media Enhancement of Reach	Electronic Media Influence on Policymakers
Electronic Media Enhancement of Reach	1.00	0.75*
Electronic Media Influence on Policymakers	0.75*	1.00

$p < .01$. The correlation coefficient (r = 0.75) suggests a strong positive relationship between the enhancement of *Kokoro Alate*'*s* reach via electronic media and the influence of electronic media on policymakers and activists to intervene in human rights violations. r = 0.75 indicates a strong positive correlation between Electronic Media Enhancement of Reach and Electronic Media Influence on Policymakers. This means that as electronic media improves *Kokoro Alate's* reach and accessibility, it also increases the likelihood of policymakers and activists being influenced to intervene in human rights cases.

Regarding the first research objective, *Kokoro Alate* has proven to be effective in dispute resolution and human rights advocacy by ensuring accessibility and inclusivity for all parties involved in a conflict. The programme employs strategies to prevent conflicts from escalating and facilitates settlements between disputants. Additionally, *Kokoro Alate* offers swift conflict resolution, is cost-effective for complainants, and provides flexibility in dispute management. The findings in Research Objective 1 align with Namagga's (2018) submission, which highlights

that the method for resolving disputes outside of court avoids delays and reduces costs. Jones (2021) further argues that alternative courts ensure impartial treatment and fair chances for all involved to assert their rights and interests. Similarly, Strong (2018) emphasises that alternative courts provide various mechanisms and procedures to resolve disputes outside the traditional judicial system. These mechanisms, as outlined by Gurjar and Singh (2022), Jones (2021), Wilson et al. (2021), Namagga (2018), and Strong (2018), include mediation, premediation, opening statements, issue exploration, option generation, negotiation, agreement, and follow-up.

Moreover, Bratic and Schirch (2007) assert that using the media to support ceasefires, treaties, and other diplomatic measures has been instrumental in ending conflicts and violence. The media can enhance trust in peace initiatives and contribute to fostering a culture of peace by bridging racial, ethnic, and national divides between groups. The media's role in building these connections is essential for peaceful coexistence (Bratic & Schirch, 2007). *Kokoro Alate* also addresses human rights abuse by providing marginalised and vulnerable groups with a platform to voice their grievances. It has the potential to rally both relevant authorities and non-governmental organisations, often highlighting successful efforts in combating human rights violations. This aligns with Talbi's (2012) assertion that the media serves an essential function in ensuring that political structures uphold and promote human rights. The media not only provides access to information but also empowers citizens to hold governments and institutions accountable, ensuring they remain on track or improve. The media serves as the public's eyes, ears, and voice, bringing attention to human rights violations and encouraging governments and civil society organisations to implement policies that improve citizens' quality of life (Asemeh *et al*., 2013).

Concerning the second research objective, the study found that electronic media could enhance *Kokoro Alate's* accessibility and reach, fostering empathy and encouraging relevant authorities to take necessary actions against human rights violators. The electronic media play a vital role in documenting and maintaining records of disputes and human rights cases handled by *Kokoro Alate*. Additionally, they broaden the programme's reach, prompting both disputants and complainants to participate and engage with the programme. These findings are in tune with the position of Ikubanni and Abiola (2022), who note that electronic media have had an impact on alternative crisis mitigation. Some of these effects include facilitating remote hearings and mediations, cutting expenses, boosting productivity, and allowing for greater involvement. The alternative court procedure is streamlined by the quick information sharing and communication that electronic media allows between parties, mediators, and arbitrators. Alternative courts are increasingly accessible to the general public, especially to those residing in rural or suburban areas, with the aid of electronic media. Electronic media enables faster resolution of disputes, as proceedings can be conducted more quickly and efficiently.

However, from the findings, *Kokoro Alate* is prone to challenges due to a lack of legal backing in the moderation of crises and the inability to put offenders on trial. This finding is in line with the argument of Agnihotri, Kumar & Dwivedy, (2024) that when there is a dispute involving complex legal issues in an alternative court, it is unlikely that a mediator or arbitrator would be equally knowledgeable as a judge. A professional mediator is necessary for numerous situations involving disputes, including social conflicts, viable conflicts, and many more. In the majority of cases, the mediator fails to get a judge's viewpoint. Ikubanni and Abiola (2022) also note that the Alternative Conflict Resolution Act does not specify particular provisions or guidelines regarding the operation of alternative dispute courts in Nigeria. The widespread acceptance of alternative conflict courts is hindered by the absence of regulatory frameworks to govern their functioning. The legal challenge confronting *Kokoro Alate,* however, does not affect the complainants' intent in featuring on the show, which connotes that legal backing is not regarded as a prerequisite by those who participate in the show. Also, there is a significant relationship between the reach and accessibility of *Kokoro Alate* and the exertion of support towards those facing injustice by policymakers and activists. This suggests that the extended reach of *Kokoro Alate* offers benefits to disputing parties.

5. Conclusion and Recommendation

Alternative dispute courts are relevant in society; they are approachable by the helpless and vulnerable complainants. The findings of this study demonstrate

that electronic media is a potent tool in expanding the reach of alternative courts and ensuring the settlement of disputes without humongous pay. Electronic media has helped arouse the interest of people in featuring in *Kokoro Alate* to express their grievances with the hope of securing relief. *Kokoro Alate* is timely and cost-effective in the moderation of conflict and activism. However, *Kokoro Alate* lacks legal backing. It cannot also try offenders. This is a major weakness of *Kokoro Alate*. More so, there are chances of prejudice or bias due to the non-application of the legal procedures, and either of the parties could feel the moderator had taken sides in the conflict or dispute. However, given the numerous advantages offered by alternative dispute resolution, awareness and promotion of it is recommended by the judicial system and the media to decongest the courts and prisons. Legal practitioners should offer litigation terms/advice to alternative courts to streamline their work. Moderators of alternative courts should also seek guidance or study the legal system as a guide in the handling of conflict, settlement and activism. *Kokoro Alate*, currently moderated in the Yoruba language, should employ a translator for its vernacular to be translated into Pidgin English or English language to allow attraction to different tribes in the country and enhance the interest of other tribes in featuring on the programme or advocate for its replication in their local environment. Finally, based on the submissions of Rhoda, Udeh, Inobemhe and Santas (2022) and Orijakor et al. (2020), among other studies, that human rights abuse is becoming alarming in the country and that the vulnerable are disadvantaged in most cases, government should recognise and support alternative dispute programmes to help redress this situation.

References

Adebayo, A.A. (2015). The challenges of accessing justice in contemporary African society: lessons from Yoruba juristic practices. *Al-Hikmat,* 35, 65-82.

Adeyanju, M.A. (2005) 'Development–related theories and their relevance to development communication and the operation of mass media in Nigeria.' Unpublished Seminar Paper delivered at the University of Ibadan.

Agnihotri, U., Kumar, R., & Dwivedy, D. (2024). *Social-legal perspective on law and changing dimensions in the modern era: An analysis of India criminal justice system from the perspective of human rights.* India: BFC Publication.

Ajayi, A.T. & Oluwafemi, B.L. (2014). Methods of conflict resolution in Africa. *African research review: An international multidiscipline journal, Ethiopia,* 8(2),135-157.

Ajayi, O.E. & Abdulraheem, I. (2022). Traditional methods of conflict management and resolutions: the case of the old Oyo empire. *European journal of management and marketing studies,* 7(4),126-139.

Albert, I.S., Awe. T., Hérault, G. & Omitoogun, W. (1995). *Informal Channels for Conflict Resolution in Ibadan, Nigeria*. Ibadan: IFRA.

Aldamen, Y. (2017). The role of print and electronic media in the defense of human rights: a Jordanian perspective. *Jordan journal of social sciences, 10(1),*119-131.

Amnesty International (2011). *Universal Jurisdiction: a preliminary survey of legislation around the world*. Amnesty International Publications.

Asemah, E.S., Edegoh, L.O. & Ogwo, C. (2013). Employing the mass media for the promotion of human rights in Nigeria. *African research review,* 7(1),47-60.

Ashwini, M., Charvi, S., Girish, I., Vibhuti, V.K., Arindam, S., Ravi, T.C., Ishita, G., Abhishek, C., & Nayan, B. (2021). Alternate Dispute Resolution: The rise of alternate dispute resolution: stepping towards efficient justice system. Alliance Center for alternate dispute resolution (ACADR), Alliance School of Law, Alliance University.

Bratic, V., & Schirch, L. (2007). *Why and when to use the media for conflict prevention and peacebuilding.* European centre for conflict prevention, Amsterdam.

Gurja, M.S., & Sigh, C. (2024). The significance of alternative dispute resolution in facilitating justice administration. *International journal of legal studies. 1(1)*. Available at https://iaeme.com/Home/issue/IJLS?Volume=1&Issue=1.

Han. Y, & Lappas, T. & Sabnis, G. (2020). The Impor-

tance of Interactions Between Content Characteristics and Creator Characteristics for Studying Virality in Social Media, Information Systems Research. *INFORMS*, 31(2),576-588.

Ikubanni, O. & Abiola, S. (2022). Impact of technology on alternative dispute resolution in Nigeria and the birth and challenges of online dispute resolution. *Global Journal of politics and law research, 10(4)*,1-13.

Jones, A**.** (2021). Alternate dispute resolution and human rights activism in the 21st century. *International Journal of Conflict Management, 32*(4), 238–254.

Kadiri, K. (2009). Constraints and Challenges of Reporting Development News in the Nigerian Press. *Journal of Communication and Media Research,* 2 (1), 125-146.

Liu, J., Liu, S., & Luo, Z. (2020). How Does Courtroom Broadcasting Influence Public Confidence in Justice? The Mediation Effect of Vicarious Interpersonal Treatment. *Frontiers in Psychology*, 11, 1766

MacArthur Foundation**.** (n.d.). *Supporting human rights and conflict resolution through alternative dispute mechanisms*. MacArthur Foundation.

McQuail, D. (2010). *MacQuail's mass communication theory (6th Ed.).* London: Sage Publications.

Melisanda, M. (2009). *Social Responsibility in the Media*. Oxford: Centre for International Media Ethnics CIME.

Meyer, P. (2020). Promoted Media Coverage of Court Decisions: Media Gatekeeping of Court Press Releases and the Role of News Values. *Journalism Studies*, 22(6),723–740

Mishra, R., Sharfi, A. & Ranaware, V. (2021). *Rise of Alternative Dispute Resolution: Stepping Towards Efficient Justice System*. Alliance Centre for Alternate Dispute Resolution (ACADR), Alliance University, Karnataka.

More, V. M. & Patil, G.R. (2012) The promotion and protection of human rights in global scenario: nuts and facts. *Asia Pacific journal of management and entrepreneurship research*, 1(1), 1-10.

Namagga, A. (2018). *An examination of the effectiveness of alternative dispute resolution as a method of dispute resolution in the commercial division of the Uganda high court*. Kampala International University.

Olaoba, O. B. (2001). *The significance of cross examination in Yoruba traditional jurisprudence*. Ibadan: John Archers Publishers Limited.

Onadeko, T. (2008). Yoruba traditional adjudicatory system. *African Study Monographs*, 29(1), 15-28.

Orijakor, F., Smith, P., & Ejike, K**.** (2020). Alternative dispute resolution mechanisms and human rights advocacy in Nigeria: A critical review. *African Journal of Law and Politics, 12*(2), 134–150

Oyebode, M. O. (2015). Promoting of alternative dispute resolution on electronic media: the example of Soo da bee programme on BCOS, Ibadan, Nigeria. *Media, society & culture political communication health & behavioural change,* 7(1), 233-246.

Paluck, E. L. (2009). Reducing intergroup prejudice and conflict using the media: a field experiment in Rwanda. *Journal of personality and social psychology,* 96(3), 574.

Punch Newspaper (2022). Why Agidigbo FM owner Oriyomi Hamzat was arrested - Police. Available at http://punchng.com/just-in-why-agidigbbo-fm-owner-oriyomi-hamzat-was-arrested-police/.

Ravi, B. K. (2012). Media and social responsibility: a critical perspective with special reference to television. *Academic Research International, 2*(1). *ISSN-L: 2223-9553, ISSN: 2223-9944*

Rhoda, A. O., Udeh, S.N., Inobemhe, K., & Santas, T. (2022). Perception of Berekete family programme on human rights radio among FCT and Nasarawa residents. *Media and communication currents,* 6(2),17-45.

Rossner, M., & McCurdy, M. (2020). Video Hearings as an Alternative to Physical Court Hearings. *London School of Economics and Political Science*

Sekaggya, L. (2013). A*frica and international human rights, Accessing human rights institutions. Hand book of Africa's international relations*. Routledge.

Strong, S. I. (2018). "Applying the Lessons of International Commercial Arbitration to International Commercial Mediation: A Dispute System Design Analysis." *In Meditation in International Commercial and Investment Disputes* (Titi, C. & Gomez, K. F (eds). Oxford: Oxford University Press.

Talbi, S. (2012). The right to information and guaran-

tees of the implementation of human rights conventions. JIL scientific research center.

United Nations. (1948). *Universal Declaration of human rights*. Available at https//:www.un.org/en/universal-declaration-human-rights/index.html.

Weston, B.H. (2024). Human rights-Natural law, Transformation, Rights. Available at Britannica/topic.

Wilson-Evered, E., Zeleznikow, J., Wilson-Evered, E., & Zeleznikow, J. (2021). Case study: The development and evaluation of Relationship Australia Queensland's online family dispute resolution system. In *Online Family Dispute Resolution: Evidence for creating the ideal people and technology interface* (pp. 63-88).

Influence of Social Media Brand Influencers on Believability and Usage of Brands Among Selected Undergraduates in Kwara State

Abdujelil SANUSI[1] Kamaldeen Arikewuyo AHMED[2] Idowu Kamal DAUDA[3] Bashirat Damilola SUBAIR[4]

1 Department of Public Relations and Advertising, University of Abuja, Abuja

2,3,4 Department of Mass Communication, Kwara State University, Malete

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

This study assessed the influence of social media brand influencers on the believability and usage of brands among undergraduates at selected universities in Kwara State. The consumer socialisation theory was used as the anchor for the study. Using the stratified random sampling, probability proportionate to size (PPS) was adopted to select primarily the study's sample size among 381 respondents at the University of Ilorin, Kwara State University, Malete and Landmark University, Omu-Aran. The Statistical Package for the Social Sciences IBM SPSS 21.0 was utilised for the analysis. The findings showed that university students perceived social media brand influencers as giving instantaneous updates on products; they also gave moderate attention to social media platforms and always used Twitter as their preferred social media platform. Moreover, the result of the effectiveness of social media brand influencers on brand believability and usage showed that the majority of respondents agreed that social media brand influencers impact brand believability and usage with (M=3.6, SD=1.3). Other findings showed that testimonials from trusted social media brand influencers influence social media users' believability and usage with (M=3.5, SD=1.2). This suggests that the undergraduates in Kwara State have a high reliance on the content shared by social media brand influencers. The study concluded that today's companies have to work with digital influencers to improve their brand image and build a sense of loyalty among consumers.

Keywords: Social Media, Brand Influencers, Believability, Brand Usage, University Undergraduates

1. Introduction

The rise of social media has significantly influenced the way young people, especially college and university students, interact with brands (Rebelo, 2017). Indeed, Liu, Jiang, Lin, Ding, Duan, and Xu (2015) indicate that undergraduate students are more likely to be influenced by information provided by individuals characterised by a high level of exposure, which may include celebrities. For this reason, Liu, Jin, Briones and Kuch (2012) argue that most companies have considered influencer identification as an important approach, because social media can facilitate the spread of advertising messages through the 'recommendations' of influencers to their large follower networks. Therefore, marketers have to understand that their marketing efforts can increase sales and profit if they can manage the use of social media and the power of social media influencers. However, much of the influencer research has been done from the perspective of the "brand enthusiasts" (Abidin & Ots, 2016). Despite the body of literature on them, the credibility and authenticity of the influencers in creating brand awareness and messaging have come into question (Kozinets, de Valck, Wojnicki & Wilner, 2010). Their impactful influence on consumers' buying behaviour and their product perception has compelled many studies to consider the trends in popularity and influence of the influencers. In a study by Kwak, Lee, Park, and Moon (2010), three measures were employed to assess the effectiveness of influencers on Twitter, namely: the number of followers, page ranking, and the number of retweets, with ranking being the most prominent. In this regard, Sertoglu, Catli,

and Korkmaz (2014) express that through an influencer, purchase intentions for viewers are determined, and subsequently, the problem is formed, followed by the acceptance of the information that is provided to the audience.

Considering that social media inherently engenders skepticism toward corporate advertising (Akar & Topcu, 2011), this research aimed to determine the perceptions of credibility that social media users, especially undergraduate students, attach to influencers and the resultant impact on trustworthiness and engagement. This research is expected to help managers and marketers overcome this problem, as the actual experiences of consumers are already available. With more sophistication, they may attempt to reassure managers and marketers that the influencer, in tandem with platforms like Instagram and Twitter, is indeed a very important 'bridge' for completing the sale and extending the engagement. Although, numerous similar studies have been conducted, which include but not limited to the works of Abidin and Ots (2016), Dolbec and Fischer (2015), Abidin and Thomson (2012), De Veirman, Cauberghe and Hudders (2017), and Solomon (2017), that show how social media influencers influenced the perceptions of users toward brands, the influence of social media brand influencers on believability and usage of brands, particularly among undergraduates, have not been adequately examined. This, therefore, underscores the need to investigate the believability of social media influencers by undergraduates before the usage of a particular brand and to understand the relationship between social media influencers and the social media users among undergraduates in Kwara State universities. Specifically, this study aimed to investigate (i) students' social media usage pattern and perceptions about social media influencers on engagement with any particular brand (ii) the effectiveness of social media brand influencers on brand believability and usage among selected university students in Kwara State, and (iii) the influence of social media influencers on the believability and usage of brands among undergraduates in Kwara state.

2. Literature Review

Content, Expertise, and Social Identity as Power of Social Media Influencers

According to Forbes (2016), a social media influencer (SMI) possesses the capacity to shape the attitudes, beliefs, behaviours, and purchasing decisions of their audience. It was elucidated that this is attributable to their capacity to exert influence, along with their engagement and communication with their audience. Li, Lee, and Lien (2014) assert that social media influencers (SMIs) are distinguished by their ability to create and disseminate high-quality content across their social media platforms. This is accomplished through the provision of recommendations, images, and other forms of content that persuade a consumer to acquire a particular product (Forbes, 2016). Li et al. (2014) contend that SMIs can enhance their content by personalising it, thereby allowing followers to gain insight into their personal experiences (Forbes, 2016).

Consumers are posited to be influenced to accept the information conveyed through personalised content, as they perceive their interests, attitudes, and viewpoints to be aligned with those of the SMIs (Kapitan & Silvera, 2015). However, Nejad, Sherrell, and Babakus (2014) observe that an individual's current motivations, interests, and attitudes can significantly influence their focus and comprehension of the information presented within the content. To foster a sense of direct communication from the source, SMIs must construct their narratives in a more personalised manner, contrasting with those of corporations (Park, Lee, & Han, 2007; Uzunoğlu & Kip, 2014).

When evaluating the acceptance of information from SMIs, consumers consider expertise to be an exceedingly desirable attribute (Valck, Hoffman, Hennig-Thurau, & Spann, 2013). The consumer's perception of the SMI's capacity to generate accurate and reliable content is frequently utilised to delineate competence within this domain, given the consumer's established relationship with the SMI (Nejad, Sherrell, & Babakus, 2014). If an SMI is perceived as an authority in their respective field, the consumer will probably embrace the information presented by the SMI (Valck et al., 2013). According to Kapitan and Silvera (2015), SMIs are celebrated for their specialised knowledge and expertise across various product categories, such as fashion or beauty, rather than being confined to a singular area. When SMIs endorse a product, their expertise and knowledge contribute to their perceived credibility, as they demonstrate familiarity with the subject matter (Kapitan & Silvera, 2015). Nejad et al. (2014) indicate that while expertise influences a consumer's attachment to the information provided by the SMI, credibility exerts a more substantial effect on how the consumer interprets the content presented. The appeal of the SMI fosters a more favourable disposition towards the product being mar-

keted, and in a broader context, knowledge can enhance brand consideration (Kapitan & Silvera, 2015).

As a result, a consumer's connections and perceptions of a social media influencer (SMI) may be the most significant factor influencing their attitude towards the SMI (Li, Lee, & Lien, 2014). A positive correlation between a consumer's SMI and the recommended product may pique the consumer's interest and raise their awareness of the product, perhaps leading to a purchase (Li, Lee & Lien, 2014). For example, a consumer may be surfing their social media profiles when they notice an advertisement for a clothing brand created by a prominent and likeable SMI. Because of the attractiveness of the SMI in the advertisement, the buyer may believe that they can have the same thing and look just as good. This influence can occur even if the buyer was not looking for a specific piece of clothing. As a result, the brand that sells the product that SMI promotes attracts the consumer's attention and may lead to a purchase. Additionally, a client will consider the brand that was introduced by the SMI when selecting from a set of clothing goods at a store (Kapitan & Silvera, 2015). This image indicates that when consumers see people they look up to wearing, using, or presenting a brand's products, they are more inclined to adopt and purchase those items over those from other businesses (Forbes, 2016).

According to Liu et al. (2015), trust can influence the level of influence between a consumer and an SMI, while Nejad, Sherrell, and Babakus (2014) stress that the level of belief a consumer has in the material determines how trustworthy they perceive it to be. Going a step further, Al-Oufi, Kim, and Saddik (2012) define trust as the positive outcome of an activity based on another person's beliefs, facts, or actions. A trustworthy SMI can encourage customers to accept product recommendations more easily, according to Liu et al. (2015). To preserve clients' trust, the SMI must continue to be proficient in their area of specialisation, such as fitness or fashion (Liu et al., 2015). SMIs are perceived as more trustworthy and credible than people who offer their knowledge on a specific product category, so their credibility suffers when they provide information on topics outside of their area of expertise (Forbes, 2016). Trust is also required when determining the value of an SMI's opinions and recommendations (Liu et al., 2015). Meanwhile, Li et al. (2014) argue that companies need to select the right SMI to have the greatest impact on consumers. According to Liu et al. (2015), firms should give special focus to targeting SMIs who have a high degree of trust (as well as competence). Customers are more likely to trust an SMI when they interact with someone who understands their interests and tastes in goods and brands (Liu et al., 2015). As a result, a consumer may be more inclined to purchase if they receive recommendations from a reliable source (Hsu, Lin, & Chiang, 2013).

Influencers' Impact on Consumers' Decisions on Social Media

In the realm of social networks, a previously passive individual may abruptly transition into an active and knowledgeable participant (Belagati, 2017). Social networks facilitate the dissemination of customer sentiments and experiences regarding products and services among users. Potential consumers, driven by the desire to acquire insights from individuals who have utilised and purchased the products they are contemplating buying, frequently engage with product evaluations shared by virtual influencers, as noted by Jalilvand and Samiei (2012) and Barzdaitė and Abromavičius (2016). A substantial number of consumers actively seek online evaluations of products and services and rely on opinion leaders to ascertain the influence of product information on their purchasing decisions (Jalilvand & Samiei, 2012; Barzdaitė & Abromavičius, 2016).

The primary objective of influencer marketing is to enhance brand recognition and sales figures. The endorsements and recommendations provided by influencers on social media platforms directly contribute to the realisation of these objectives (Edson, Escalas, & Bettman, 2015). The endorsements and suggestions made by influencers are frequently regarded with seriousness, which can significantly aid the organisation in attracting new clientele. The recommendations from influencers are often perceived as more trustworthy than conventional advertising. According to Černikovaitė (2018), individuals who place confidence in the opinion leaders are likely to purchase the product or service and, upon satisfaction, are predisposed to repeat the purchase.

Consequently, influencers possess a unique persona, a distinct set of values, and a specific domain of expertise, alongside a robust personal brand identity. They inherently attract a considerable number of followers on social media, and their audience tends to exhibit consistency in relationships, interests, and even socioeconomic status. They engage in dialogue with

their followers and encourage their behaviours; their voice is authentic, and they adhere to a set of principles (Černikovaitė, 2018). When followers of a brand share, comment on, or "like" a reference to that brand, it enhances the brand's visibility online. Furthermore, the followers of the contributor will have the opportunity to disseminate the trademark entry and peruse comments. In this manner, the brand's information is disseminated more broadly, and the outreach expands organically.

The influencer can engage numerous, even highly specific, demographic segments (Bush, Martin, & Bush, 2004). This attribute proves to be particularly advantageous when the brand's target audience is narrowly defined. In such instances, it is prudent to collaborate with an influencer who caters specifically to that brand rather than opting for a widely recognised personality. Based on the preceding observations, the organisation assesses the influence of social media influencers on consumer purchasing decisions before soliciting them for favourable reviews of their products or services. Influencers have cultivated trust and fostered intimate connections with their followers. In this context, users perceive influencers as credible sources of information concerning specific products or services. Individuals are often regarded as possessing a particular status due to their substantial follower base, frequently exceeding 10,000.

Branding with Social Media

On social media platforms, influencers interact with brand consumers authentically and sincerely. According to a study by Ashley and Tuten (2014), branded activities on social media can be strategically employed to enhance brand traffic, foster customer engagement and loyalty, facilitate word-of-mouth marketing, and elevate brand awareness and recognition. The content disseminated on social media is frequently shared and contributed by actively participating customers. Fosdick (2012) posits that participation can manifest either as passive engagement, such as merely consuming media content, or as active involvement, exemplified by the submission of user-generated narratives. Commonly utilised metrics for assessing consumer engagement encompass comments, clicks, follower counts, referrals to others, inquiries, friend requests, or the completion of a purchase (Falls, 2010).

These consumer behaviours that culminate in a brand reference within an individual's network are designated as influence impressions (Li & Bernoff, 2008). Such influence impressions represent a form of earned marketing on social media platforms, analogous to word-of-mouth advertising. Individuals utilise social media to cultivate and sustain relationships with both brands and other individuals, owing to their intrinsic sociability. By actively engaging with their followers on social media, influencers possess the capacity to alter their audience's opinions, attitudes, and beliefs regarding brands. Influencer marketing constitutes a pivotal strategy that organisations deploy to engage and forge connections with their targeted audience, as evidenced by empirical studies. Theoretical frameworks concerning the efficacy of influence and individuals' perceptions of inclusivity within a brand community are intrinsically linked to the ability of social media influencers to cultivate authentic relationships with brand consumers. The marketing landscape is continually evolving, with social media platforms such as Instagram playing a vital role in broadening customer outreach. In the pre-social media era, content may have been subject to more stringent control; however, the present landscape is characterised by ordinary individuals exerting influence over their followers and articulating their opinions, values, and perspectives on products. Comprehending the methodologies employed by these influencers in managing their brands, whether it be through user engagement, the promotion of specific brand identities, or the nature of content produced, is of paramount importance.

Empirical Review

The brand acceptance and the influence of social media relationships are well-researched. Atika, Ujang and Tinaprilla (2019) did a study of social media influencers' effects on brand image, self-concept and buying intention. Data were gathered from the online survey on websites and social media sites. Samples were collected through convenience sampling, and the samples of the study consisted of 219 respondents in total. In this research, exogenous variables involved the social media influencers; the intervening variables included the brand image and self-concept, while the purchase intention was treated as the endogenous variable. This study used the SmartPLS software in analysing the data through the analytical method of Structural Equation Modelling. The study found that though brand image has a positive significant effect on the intention to purchase, self-concept and social media influencers significantly had negative impacts on the intention to buy. It is ascertained that social media influencers highly boost the consumers' views both on the local cosmetics brand and themselves. Besides, brand image is shown to have a positive impact

on the intention to make purchases.

Gorgulu (2019) examined how trust in Instagram influencers affected customers' tendency to buy a brand. The research tested for relationships that may exist between the trust of Instagram users in digital influencers and associations made with attributes of advertised products. Data was collected by conducting an online survey targeted at users of Instagram. Higher influencer trust resulted in a higher level of brand involvement, loyalty, and image, as found by the results of this study. In addition, the correlation of brand loyalty with the consumer's trust in digital influencers was found to be strongly positive, while the brand image and consumer trust in digital influencers showed a similar correlation.

The purpose of the study by Baker (2018) was to investigate social media influencers as a source of advertising for the Irish cosmetics industry from the perspective of female millennial consumers. Seven in-depth interviews were conducted in total, where female Millennial consumers shared an interest in beauty and social media influencers. This research applied an interpretivist inductive methodology to derive a true representation of the opinions of women Millennial consumers. The thematic coding was applied to interpret such opinions. It emerged from the findings that marketers must ensure reliability by portraying the lives of social media influencers to be similar to those of Millennial consumers. The study also found that even though female Millennials were aware of the practice, they did not approve of influencers manipulating publicly shared images.

In their study, Kostic Ivanovic and Okanovic (2018) explored the emergence of social networks in research into social media influencer marketing practice centred around brand and business engagement with consumers. The study aimed to explain influencer marketing in a social media context by tracing the marketing roots of the concept and placing it in the digital era and a world where social media connects individuals. The study classified influencers into different categories that will help campaign creators monitor, assess, and choose the best influencers for a certain campaign and brand. However, according to Forbes magazine, the findings were that influencer marketing is the most favourite current marketing trend. Along the same line of argument, the findings from the literature review indicate that the increased popularity of social networks has transformed the way companies and brands communicate with their clients.

Theoretical Approach

Consumer Socialisation Theory (CST)

The Consumer Socialisation Theory readily serves as this study's foundation. According to the theory of consumer socialisation, through the three steps of modelling, reinforcement and social engagement, consumers acquire concepts and behaviours from the socialisation agent. The process of copying the behaviour of the socialisation agent is what is referred to as modelling. The socialisation agent may use both positive and negative reinforcement strategies. Last but not least, social interaction promotes learning through strategies, including deliberate consumer training. Consumer learning happens when the client and the socialisation agent interact (Moschis & Moore, 1979). According to Moschis (1987), peer group influence, which includes the authority of the influencing agent, has a major impact on a consumer's behaviour and opinions.

The theory of consumer socialisation maintains that consumers learn concepts and behaviours from the socialisation agent through three processes: contact, modelling and reinforcement. Consumer modelling refers to reproducing the behaviours of the socialisation agent. The agents can use methods of positive and negative strategies for reinforcement. Lastly, social connection enables learners to acquire knowledge in ways such as intentional consumer training. Moschis and Moore (1979) would contend that consumer learning emanates from the interaction between the client and the socialisation agent. In this case, according to Moschis (1987), the social media influencer would be a "socialisation agent", in that they are an influencing source of the imposition of norms, attitudes, motives, and behaviours in the customer.

This, therefore, situates the social media influencers as agents of computer-mediated socialisation. The undergraduates are, thereafter, likely to imitate the norms, attitudes, motivations, and behaviours of the social media influencers they follow. Consumers are influenced to act in a manner that is consistent with the attitudes and behaviours of the social media influencer they follow, and they learn about the product and/or its usage from the influencer.

3. Material and Method

This study applied a quantitative approach of the survey method to study how social media brand influencers affect beliefs and the use of certain brands

among Kwara State undergraduates. Three universities in Kwara State were selected from the three senatorial zones in the state, with a combined population of 67,661. These include Landmark University, Omu-Aran (Kwara South), with a student population of 4,264 (Student Affair Unit, 2020); University of Ilorin (Ilorin) with 44,897 students (Academic Support Services, 2020) from Kwara Central; and Kwara State University, Malete (Kwara North) with 18,500 students (Student Affair Unit, 2020). The sample size for the study was determined using the Krejcie and Morgan sample size table, which gave 381. The stratified sampling technique was adopted to achieve systematic selection to ensure an approximately equal representation. Thus, stratified sampling with probability proportionate to size was used in arriving at the sample size for the study. This is because PPS recognises many groups (or the composite characteristics) in the target population and then takes the appropriate actions to incorporate them in the sample (Umar & Usman, 2015). It is particularly useful when the sampling units range greatly in size since it ensures that individuals in larger sites have the same chance of being included in the sample as those in smaller settings, and vice versa. PPS and weighting average were used in determining the sample size of respondents at each university, since the selected institutions are not of the same size, as shown in the table below:

Table 1: Universities and Sample Size

S/N	Universities	Population Figure	Proportion	Sample Size
1	University of Ilorin	44,897	381 x 44,897 / 63, 661	253
2	Kwara State University	18,500	381 x 18,500 / 63, 661	104
3	Landmark University	4,264	381 x 264 / 63, 661	24
4	Total	67, 661		381

This was done by dividing the total sample size of 381 by the sum of undergraduate students from the University of Ilorin, Kwara State University, and Landmark University, respectively, times the undergraduate students in each university, to ensure that the respondents are proportionally represented. The sample size of respondents in each university is also shown in the table. The University of Ilorin had a sample size of 253, while Kwara State University and Landmark University had 104 and 24 respondents, respectively. Meanwhile, the study used a simple random sampling technique in the process of administering questionnaires to the respondents, considering the different faculties and departments in each of the selected universities. And thus, with a random sampling method, every undergraduate in the study area had the chance of being selected (Wimmer & Dominick, 2011). The Statistical Package for the Social Sciences, IBM SPSS 21.0, was used for data analysis. Inferential statistics, frequency tables, numbers, percentages, mean, and standard deviation were employed to comprehensively present and analyse the findings. This was done in congruence with the research objectives of the study.

4. Result and Discussion

Data were gathered and quantitatively evaluated based on the findings of a cross-sectional survey study about the influence of social media brand influencers on undergraduates' beliefs and brand usage in three universities in Kwara State.

Table 2: Social Media Usage and Perception of Social Media Influencers

Social media usage	Frequency	Percentage
How often do you use social media?		
Often	131	35.4
Seldom	30	8.1
Always	173	46.8
When I get a notification on give always	28	7.6
I don't	8	2.2
Total	**370**	**100**
Which of the following social media platforms do you use most?		
Instagram	184	49.7
Twitter	186	50.3
Total	**370**	**100**
How much attention do you pay to the use of social media platforms?		
No attention	75	20.3
Much attention	14	38.6
Moderate attention	152	41.1
Total	**370**	**100**
What is your perception of social media influencers?		
Very Credible	83	22.4
Easy Accessibility	121	32.7
Instantaneous Product update	166	44
Total	**370**	**100**

The data in Table 2, which is on social media usage, indicate that the majority of the respondents always made use of social media, with 46.8%, while 2.2% of the respondents noted that they did not use social media, making them the least of the respondents. On the type of social media platforms used by respondents, the majority, that is 50.3% of the respondents, used Twitter as their social media platform, while 49.7% of the respondents were users of Instagram. In respect of the attention given to these social media platforms by respondents, majority i.e., 41.1% of the respondents gave moderate attention to their preferred social media platforms, followed by 38.6% of the respondents that gave much attention to social media use, while 20.3% of the respondents gave no attention to social media. On respondents' perception of social media influencers, 44.9% of the respondents perceived social media influencers as giving instantaneous brand updates about a brand, while 32.7% of the respondents perceived them as having easy accessibility, and 22.4% of the respondents perceived them to be very credible.

Table 3: Effectiveness of Social Media Brand Influencers on Brand Believability and Usage

Effectiveness of Social Media Brand Influencers	Level of Agreement*0%							
	1	2	3	4	5	M	SD	%
Social media brand influencers generate leads for new brands through trends or hashtags, giving the product more popularity	15.7	11.6	12.4	29.7	30.5	3.5	1.4	70
Social media brand influencers' approach is consumer-oriented, as there are possibilities of giveaways for product effectiveness	14.6	14.9	16.2	27.6	26.8	3.4	1.4	68
Social media brand influencers' involvement in product affirmation allows for niche marketing	11.4	10.3	18.9	30.5	28.9	3.6	1.3	72
Social media influencers can reach a wider and more diverse audience	15.7	17.3	19.7	25.1	22.2	3.2	1.4	64
Social media brand influencers bring more exposure to your brand and can attract new customers	9.2	12.4	18.4	33.2	26.8	3.6	1.3	72
Social media brand influencers can add value to a brand and reinforce its positioning.	11.1	13.2	22.4	27.6	25.9	3.4	1.3	68
Total						**4.14**	**1.62**	**63.2**

***Scale: 1=Strongly disagree 2= Disagree 3=Neutral 4=Agree 5=Strongly Agree**

The data in Table 3, which is on the effectiveness of social media brand influencers, indicates that 30.5% of the respondents strongly agreed that social media brand influencers generate leads for new brands through trends or hashtags, giving the product more popularity with (M=3.5, SD=1.4). The Table also revealed that 27.6% of the respondents agreed that the social media brand influencers' approach is consumer-oriented, as there are possibilities of giveaways for product effectiveness with (M=3.4, SD=1.4). Moreover, 30.5% of the respondents agreed that social media brand influencers' involvement in product affirmation allows for niche marketing with (M=3.6, SD=1.3), while 25.1% of the respondents agreed that social media influencers can reach a wider and more diverse audience with (M=3.2, SD=1.4), 33.2% of the respondents agreed that social media brand influencers bring more brand exposure and can attract new types of customers with (M=3.6, SD=1.3). Lastly, 27.6% of the respondents agreed that social media brand influencers can add value to a brand, help reinforce its positioning and market segmentation with (M=3.4, SD=1.3). From the table, it can be seen that items 3 and 5 have the joint highest mean (3.6). It can also be seen that all the items have a mean that is above the decision point (3.00). It could, therefore, be concluded that all items on the effectiveness of social media brand influencers were agreed upon by the respondents.

Table 4: Influence of Social Media Influencers on Believability and Usage of Brands

Influence on believability and usage of brands	Level of agreement*							
	1	2	3	4	5	M	SD	%
Social media users' loyalty to social media brand influencers influences brands' believability and usage	24.1	10.8	16.2	20.0	28.9	3.2	1.5	64
Testimonials from trusted social media influencers influence brands' believability and usage	10.5	12.4	14.1	45.4	17.6	3.5	1.2	70
Product hype by social media brand influencers positively stimulates the believability and usage of brands	29.2	11.9	15.4	31.4	12.2	2.9	1.4	56
Expatiating the efficacy of brands influences brands' believability and usage	18.6	11.1	8.9	49.7	1.6	3.2	1.3	64
A social media brand influencer's personality helps build the believability and usage of brands	23.5	11.9	16.8	29.7	18.1	3.1	1.4	62
The credibility of social media brand influencers influences brands' believability and usage.	23.5	12.4	19.7	26.8	17.6	3.0	1.4	60

***Scale: 1=Strongly disagree 2= Disagree 3=Neutral 4=Agree 5=Strongly Agree**

The data in Table 4 which is on the influence of social media influencers on the believability and usage of brands among undergraduates in Kwara State indicates that 28.9% of the respondents strongly agreed that social media users' loyalty to social media brand influencers influences brands' believability and usage with (M=3.2, SD=1.5), while 45.4% of the respondents agreed that testimonials from social media brand influencers translate to social media users believability and usage with (M=3.5, SD=1.2). In the same vein, 31.4% of the respondents agreed that product hype by social media brand influencers positively stimulates the believability and usage of brands by social media influencers with (M=2.9, SD=1.4). Moreover, 49.7% of the respondents agreed that social media brand influencers carry their social media followers along in brand showcase by expatiating the efficacy of such brand product with (M=3.2, SD=1.3), while 29.7% of the respondents agreed that social media brand influencer's personality helps build the believability and usage of brands with (M=3.1, SD=1.4), and 26.8% of the respondents agreed that the credibility of social media brand influencers influence believability and usage of brands with (M=3.0, SD=1.4). Based on the results shown in the Table, it can be seen that one item (three) was below the decision point of 3.00. Also, item 2 has the highest mean. This implies that the respondents strongly agreed that testimonials from trusted social media influencers influence social media users' believability and usage. It can be concluded that undergraduates in Kwara universities highly believe content taken from social media brand influencers.

Based on the efficacy of social media brand influencers, the findings of the study revealed that these influencers increase the popularity of products by referring consumers to new businesses through hashtags or trends. The results on the efficacy of social media brand influencers, therefore, support Lim et al.'s (2017) findings that followers of specific social media influencers are more likely to believe their messages due to experience and credibility; hence, social media influencers are considered more potent and effective in driving their followers' behaviour. The study established that product believability and usage are influenced by the loyalty of social media users to social media brand influencers, the belief and usage of social media users are affected by testimonials from social media brand influencers, and that product hype from social media brand influencers positively influence social media users in their belief and usage of brands.

These findings were based on how certain Kwara State undergraduates' beliefs in social media influencers affect their brand usage. Also, social media brand influencers engage their fans in brand displays by providing details about the efficacy of a brand product. This result confirms Wang, Kao, and Ngamsiriudom's (2017) arguments that when the source, such as "an Instagram influencer," was trustworthy, then the posted information can lead to the creation of belief and attitude change; it also shapes the behaviours of the recipients. To that end, Černikovaitė (2018) also expresses that influencers create an aura of "reliable relationship" and, thereby, "got the trust" of their audience. In this respect, it is considered that the influencers are a reliable source of information about certain goods or services. The findings also support the study of Gorgulu (2019), who identifies that the

relationship between brand loyalty and trust of consumers in digital influencers is preceded by the relationship between brand image and consumer trust in digital influencers, which, in turn, affects brand use.

5. Conclusion and Recommendation

Over the years, social media brand influencers have indeed proved able to influence the decisions of social media users by trending a new or current brand across many social media handles. Business entities have gained financially from the utilisation of social media brand influencers because, through hashtags or trends, they have created leads to new businesses that often increase a company's exposure or popularity. As these have already established relationships with individuals whom they believe have similar interests in life and other factors, it would seem these individuals ensure others' ideas, beliefs, and behaviours change or alter, due to that pre-existing allegiance. The power and influence a consumer has with media outlets affect businesses and their credibility regarding usage because the information that such influencers can offer shapes a customer's attitudes, beliefs, and behaviours towards a brand. Social media influencers affect decisions of their followers on brand selection and usability since they are highly respected by their followers. It is, therefore, recommended that social media brand influencers establish a consistent relationship between their clients, the brand owners, and followers by quickly and aptly attending to the needs or concerns of their followers. This will increase the number of followers and potential usage of the brand displayed via social media handles. Working with digital influencers is also essential for modern organisations to increase consumer loyalty and brand recognition.

References

Abidin, C., & Ots, M. (2016). Influencers tell all? Unravelling authenticity and credibility in a brand scandal. In M. Edström., A. T Kenyon., & E. Svensson. (Eds) *Blurring the Lines: Market-driven and Democracy-driven Freedom of Expression* (pp. 153-161). Nordic Information Centre for Media and Communication Research.

Abidin, C., & Thompson, E.C. (2012). Buymylife.com: Cyber-femininities and commercial intimacy in blogshops. *Women's Studies International Forum*, *35*(6), 467-477.

Akar, E & Topcu, B. (2011). An examination of the factors influencing consumer's attitude toward social media marketing. *Journal of Internet Commerce, 10* (1), 35-67.

Al-Oufi, S. Kim. H. N & Saddik, A. E. (2012). A group trust metric for identifying people of trust in online social networks. *Expert Systems with Applications, 39*(8), 13173-13181.

Ashley, C., & Tuten, T. (2014). Creative strategies in social media marketing: An exploratory study of branded social content and consumer engagement. *Psychology and Marketing*, *32*(1), 15–

Atika, H., Ujang. J., & Tinaprilla, D.N., (2019). The effect of social media influencer on brand image, self-concept, and purchase intention. *Journal of Consumer Sciences*, *4*(2), 76-89.

Baker, D. S. (2018). *The Impact of Social Media Influencers as an Advertising Source in the Beauty Industry from an Irish Female Millennials' Perspective* (Doctoral dissertation, Dublin, National College of Ireland).

Barzdaitė, A., & Abromavičius, E. (2016). *E-WOM komunikacijos vartojimo poveikis*

prekės ženklo įvaizdžiui ir pirkimo intencijai. Available at https://alytauskolegija.lt/wpcontent/uploads/straipsniai/Barzdaite.pdf

Belagatti, P. (2017). *The Importance and Impact of Influencer Marketing in 2017. Available at* https://www.influencive.com/theimportance-and-impact-ofInfluencer-marketing/

Bush, A. J., Martin, C. A., & Bush, V. D. (2004). Sports celebrity influence on the behavioral intentions of generation Y. *Journal of advertising research*, *44*(1), 108-118.

Černikovaitė, M. (2018). *Nuomoniųlyderiai – augantinišasocialiniųtinklųrinkoje.* Available at https://www.lzinios.lt/

Ekonomika/nuomoniu-lyderiai-augantnisa socialiniu-tinklurinkodaroje/.

De Veirman, M., Cauberghe V., & Hudders, L. (2017). Marketing through Instagram influencers: the impact of number of followers and product divergence on brand attitude. *International Journal of Advertising*, *36*(5), 798-828.

Dolbec, P.Y., & Fischer, E. (2015). Refashioning a field? connected consumers and institutional dynamics in markets. *Journal of Consumer Research*, *41*(6), 1447-1468.

Edson, E.J., & Bettman, J. R. (2015). Managing brand meaning through celebrity endorsement. *Review of Marketing Research*, *12,* 29-52.

Falls, J. (2010). What is engagement and how do we measure it? *Social Media Explorer*. Available at http://www.socialmediaexplorer.2010/01/04/ what is engagement-and-how-do-we-measure it.

Forbes, K. (2016). Examining the beauty industry's use of social influencers. *Elon Journal of Undergraduate Research in Communications, 7*(2), 78-87.

Fosdick, M. (2012). The globalization of social media: consumer relationships with brands evolve in the digital space. *Strategic Direction*, *28* (6). doi:10.1108/sd.2012.05628faa.006

Gorgulu, V. (2019) Investigating consumer trust in Instagram influencers and its impact on brand related characteristics and purchase intention. Available at https://api.semanticscholar.org/CorpusID:207983283

Hsu, C.L., Lin, J. C. & Chiang, H. S. (2013). The effects of blogger recommendations on customers' online shopping intentions. *Internet Research*, *23* (1) 69-88.

Jalilvand, M.R., & Samiei, N. (2012). The effect of electronic word of mouth on brand image and purchase intention. *Marketing Intelligence and Planning, 30*(4), 460-476.

Kapitan, S., & Silvera, D. H. (2015). From digital media influencers to celebrity endorsers: attributions drive endorser effectiveness. *Marketing Letters: Journal of Marketing Research, 27*(3), 553-567.

Kostic, S.C., Ivanovic, A. & Okanovic, M. (2018). Influencer marketing in a social media context. Available at Influencer marketing in a social media context (researchgate.net)

Kozinets, R.V., deValck, K., Wojnicki, A., & Wilner, S. J. S. (2010). Networked narratives: Understanding word-of-mouth marketing in online communities. *Journal of Marketing*, *74*(2), 71-89.

Kwak, H., Lee, C., Park, H., & Moon, S. (2010). What is Twitter, a social network or a news media? In *Proceedings of the 19th international conference on Worldwide web,* (pp. 591-600). ACM.

Li, C., & Bernoff, J. (2008). *Groundswell*. Boston: Harvard Business Review Press.

Li, Y. M., Lee Y., & Lien, N. J. (2014). Online social advertising via influential endorsers. *International Journal of Electronic Commerce, 16* (3), 119-153.

Lim, X. J., Radzol, A.R.M., Cheah, J. & Wong, M.W. (2017). The impact of social media influencers on purchase intention and the mediation effect of customer attitude. *Asian Journal of Business Research*, *7*(2), 19-36.

Liu, B.F., Jin, Y., Briones, R., & Kuch, B., (2012). Managing turbulence in the blogosphere: Evaluating the blog-mediated crisis communication model with the American red-cross. *Journal of Public Relations Research,* 24, (4), 353–370.

Liu, S., Jiang, C., Lin, Z. Ding, Y., Duan R., & Xu, Z. (2015). Effective influencers based on Trust for electronic word-of-mouth marketing. A domain aware approach. *Information Sciences*, 306, 34-52.

Moschis, G.P. (1987). *Consumer Socialisation*. Lexington, Massachusetts: Lexington Books.

Moschis, G.P. & Moore R. L. (1979). Decision making among the young: A socialization perspective. *Journal of Consumer Research Inc., 6*(2), 101-112.

Nejad, M.G., Sherrell, D.L., & Babakus, E. (2014). Influentials and Influence Mechanisms in New Product Diffusion: An Integrative Review. *Journal of Marketing Theory and Practice, 22*(2),

185-207.

Park, D.H., Lee, J., & Han, I. (2007). The effect of on-line consumer reviews on consumer purchasing intention: The moderating role of involvement. *International Journal of Electronic Commerce, 11*(4), 125-148.

Rebelo, M. (2017). How influencers' credibility on Instagram is perceived by consumers and its impact on purchase intentions. *Master Thesis,* the Universidade Catolica Portuguesa.

Sertoglu, A. E., Catli, O. & Korkmaz, S. (2014). Examining the effect of endorser credibility on the consumers' buying intentions. An empirical study in Turkey. *International Review of Management and Marketing, 4*(1), 66-77.

Solomon, M. R. (2017). *Consumer behaviour: Buying, having and being*. (12th ed.). United States: Person Education.

Umar, H.S. & Usman, M. (2015). The imperative of population sampling in social science research. *Global Journal of Political and Science and Administration 3*(3), 49-57.

Uzunoğlu, E., & Kip, S.M. (2014). Brand communication through digital influencers: Leveraging blogger engagement. *International Journal of Information Management, 34*, 592-602.

Yadav, M. S., De Valck, K., Hennig-Thurau, T., Hoffman, D. L., & Spann, M. (2013). Social commerce: a contingency framework for assessing marketing potential. *Journal of Interactive Marketing*, *27*(4), 311-323.

Wang, S. W., Kao, G. H. Y., & Ngamsiriudom, W. (2017). Consumers' attitude of endorser credibility, brand and intention with respect to celebrity endorsement of the airline sector. *Journal of Air Transport Management*, *60*, 10-17.

Wimmer, R. D. & Dominick, J. R. (2011). *Mass media research: An introduction* (9th ed.). Canada: Wadsworth, Cengage Learning

Adapting to Change: Examining Nigerian Newspapers' Pursuit of Sustainable Business Models in the Digital Landscape

Isiaka Zubair ALIAGAN[1] Kamaldin Abdulsalam BABATUNDE[2] Yusuf Bolakale SULEIMAN[3]

1 Department of Mass Communication, Kwara State University

2 Department of Advertising and Public Relations, University of Abuja

3 Department of Information, Journalism and Media Studies, University of Abuja

KWASU Journal of Information, Communication and Technology (KJICT.) 2023, 2(1)
© 2023 Faculty of Information and Communication Technology, Kwara State University, Malete, Nigeria.
URL: http://kjict.ng/

Abstract

Newspaper industries globally and locally have been struggling to carve a niche for themselves in the face of the internet revolution that has caused a serious decline in printed newspaper readership and a drastic reduction in newspapers' major source of income, advertising revenue. In the quest for survival, research on finding new business models to rescue the industries from the readership and revenue crisis has inevitably taken different dimensions in various industrial climates. To understand how the newspaper industry in Nigeria - compared with its global counterparts - has been faring with the challenges, this study examined the new business models adopted by Nigerian newspapers to navigate the crisis, using an adapted 14 –item business model template for in-depth interviews with 12 print and online newspaper editors and managers to generate data for the study. The interviews undertaken between 2019 and 2020 covered nine national newspapers. An inductive data-driven thematic analysis was used for data analysis. Findings revealed full dependence on printed advertising, reluctance to introduce content charging for fear of undercutting from competitors, poor response to e-commerce, cross-media synergy, and investment in multiple platforms, though cross-subsidy and commercialised news seem to be an exploitable attraction. The study concluded that Nigerian newspapers are still conservative in their approach to creating a sustainable business model, although three observable revenue streams are recorded by the newspapers in line with the literature. It recommended, among others, that newspapers should initiate an aggressive move to create new revenue streams; find creative ways and means to lower cost and enter into productive synergy across newspaper organisations to collectively survive the current challenge facing them.

Keywords: Nigeria; Newspaper; Sustainable, Business Models; Digital landscape

1. Introduction

The internet revolution was expected to benefit the newspaper and other media with improved content and advertising revenue. However, since the emergence of the new disruptive technology, readership of the printed publication has nose-dived and advertising revenue plummeted (Abenen aarthy & Foster, 2014; Aliagan, 2020; Hassan, Abubakar, Yahaya, Latiff, & Shehu, 2021), forcing the newspaper to engage in a perpetual search for new business models. Experiments in new survival strategies to save the newspaper from the biggest crisis faced in its three centuries of existence have continued to direct research in a new business model (Brecht, Hendriks, Stroebele, Hahn, & Wolff, 2021; Karimi & Walter, 2021; Pourashraf & Mobasher, 2022). In Nigeria, as experienced in other parts of the world, a permanent solution to the newspaper crisis is yet to be found (Aliagan, 2015, 2020).

As the newspaper found itself operating in cyberspace and following challenges in readership and revenue (Wang & Huang, 2011), the first measure taken

to save the situation was the adoption of online publishing (Jones & Salter, 2012). Aside from the migration of news readers online, advertising also shifted to cyberspace (Jones & Salter, 2012), and the newspaper lost its traditional link between advertisers and newsreaders (Starr, 2009). With the emergence of free advertisement sites online, newspapers' share of online advertising became insignificant, and it cannot compensate for print advertising loss or the newspaper's investment online (Waterman & Wook Ji, 2012). Faced with the parlous situation and the phenomenon of decreasing readership and revenue loss, newspaper managers in Nigeria engaged in a series of efforts on new business models to generate revenues from the adoption of digitised technologies, but a perfect solution is yet to be found (Aliagan, 2016a). Although a few studies have been conducted on Nigerian newspapers in the digital era, the focus of only a few of them was on new business models or survival strategies adopted by the newspaper to overcome the threats of declining readership and revenue loss. This study, therefore, examined the business model innovations introduced by Nigerian newspapers in response to digital challenges and threats of extinction. It also builds on earlier studies on survival strategies newspapers in Nigeria have initiated (Aliagan, 2015, 2020; Oyokunyi, Ekeanyanwu, & Aniebo, 2017) through experiments in new business models.

This study is important as it adds to the understanding of the trend of studies on the evolution of new business models by newspapers in Nigeria. In addition, the threats from declining readership and revenue as well as new technologies to newspapers' survival, had previously been seen as relating to only a part of the world, with statistics stating that African and Asian newspaper industries were not affected (Lunden, 2009). This has been disproved by subsequent studies which revealed that Asian countries such as Japan and China known for strong printed newspaper culture were also experiencing difficulties due to the disruptive technology (Sparks, Wang, Huang, et al., 2016; Villi & Hayashi, 2017). Based on this background, this study investigated the pursuit of sustainable business models by Nigerian newspapers in the digital era. Specifically, the objectives of the study were to (a) determine which of the revenue streams established in business model literature are adopted by Nigerian newspapers, and (b) identify the current business model chart emerging from the innovations by Nigerian newspapers.

2. Literature Review

The Business Model Evolution

The newspaper industry had to face a serious business model challenge (Casero-Ripollés & Izquierdo-Castillo, 2013) due to the inability of the news media to generate income from their free online content. Fremium became increasingly popular and one of the dominant business models in the digital economy (Holm & Günzel-Jensen, 2017). The freemium business model, which combines paid and free content behind a paywall, remains one of the popular choices of newspapers, but freemium has yet to meet industry standards or expectations or generate the kind of profits industry actors had hoped for (Holm, 2016). Thus, a culture of freemium has taken root online, making news material available for free and increasing consumer resistance to paying (Franklin, 2011). With freemium, advertising became the newspapers' only source of income (Casero-(Ripollés & Izquierdo-Castillo, 2013). Although the consumption of online news (based on the freemium business model) increased significantly, there was no commensurate revenue from access to it. Thus, newspaper content continued to be free, supported by meagre revenue from online advertising, with the expectation that a large customer base would generate sufficient traffic that would boost advertising revenue (Hognaland & Saebi, 2015).

The introduction of the paywall business model was, therefore, the next approach after the freemium business model by newspaper organisations. The emergence of paywalls led to a shift from the advertising model to reader revenue (Chyi, 2020 in Vara-Miguel et. al., 2023), with almost 70% of the 200 most important newspapers in Europe and America introducing some form of paywall. Despite this, the introduction of paywalls in other regions of the world suffered from the aftermath of freemium. Following the challenge faced with the introduction of paywalls and the reluctance of news readers to pay for hitherto free content, newspapers began to search for diverse income sources and revenue earnings. Scholars of media economics argued that the best way to reduce losses and increase revenue was through diversification (Picard, 2011).

With the failure of the traditional business model of news organisations, Goyanes and Vara-Miguel (2017) proposed that news organisations worldwide should initiate business model innovations through trial-and-error (Goyanes & Vara-Miguel, 2017 in Vara-Miguel et. al., 2023) strategies. The diversifica-

tion of revenue sources and income streams identified in literature include branded content, online commerce, supply of additional products and services, institutional grants and subsidies, donations by individuals, paying for digital news content, readers' payment in the form of subscriptions and memberships (McChesney & Nichols, as cited in Casero-Ripollés & Izquierdo-Castillo, 2013; Vara-Miguel et. al, 2023). Other types of funding diversification identified in literature comprise e-commerce, business-to-business, events, merchandising, crowdfunding (Vara-Miguel et. al., 2023) and real estate (Kruger, Swatman & Van der Beek, 2003). While subscription models have been widely researched, membership and donations are still open to exploration by researchers (Gordiienko, 2021; Regner, 2021). Tejedor et al. (2020) reported that the most sustainable digital-native media use three or more revenue streams.

In their study on revenue diversification, Ragnhild, Bente, and Jens (2021) found that newspaper firms were compelled to find other revenue streams, such as digital subscriptions combined with paywalls, due to the declining income from commercial advertising. Experiments by newspapers across the world confirm that advertising revenues are not enough to sustain most media companies (Vara-Miguel et al.,2023). However, a study by Vara-Miguel, Sánchez-Blanco, Sádaba-Chalezquer, and Negredo (2021) on digital natives and non-natives in Spain discovered that most websites (74.5%) only rely on one or two revenue streams, and that advertising is still the most common source of income for digital news operations (85.8%). Digitally native websites hardly ever use other possible financing sources such as donations (3.4%), e-commerce (9.4%), sponsored content (15.6%), public or private grants (13.2%), or user payments (7.7%).

Aliagan (2016b) aggregates the various suggestions from studies on new business models for newspapers in the digital era. He proposes a 14-item business model template for newspapers in the digital era. These are: (i) Advertising (ii) Digital Pay-plans (iii) Niche publication (iv) E-Commerce/Transactional Services (v) Promotional Services (vi) Cross Subsidy (vii) Cross media Synergy (viii) Investment in Multiple Platforms (ix) Crowdfunding (x) Partnership with news aggregators (xi) Foundations support (xii) Government subsidy (xiii) Platform shift (xiv) Disinvesting in and discontinuing the printed newspaper (See Figure 1).

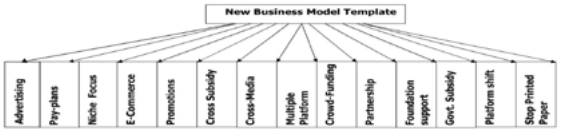


Figure 1: New Business Model Template

Source: Aliagan (2016b).

3. Material and Method

Qualitative in-depth interviews were conducted with the newspaper informants to generate data for the study. The study area comprised of Lagos, Ibadan and Abuja, Nigeria where the head offices of the selected newspapers were located. The subject selection criteria were based on the newspapers' circulation strength and national visibility. The selected newspapers (except *Blueprint*) were the 10 highest-selling newspapers as revealed in ADVAN circulation check of 2009 (Zus Bureau Limited, 2009). These newspapers were *The Guardian, Vanguard, This Day, The Punch, The Sun, The Nation, Daily Trust, Leadership,* and *Nigerian Tribune*. *Blueprint* came into being much after the 2009 exercise. The study adopted purposive sampling for the selection of informants in line with the suggestion by Guest, Bunce and Johnson (2006). Aside from meeting the predetermined criteria of being editor/manager of a printed or online edition of the newspaper, the informants also met the requirement of possessing some degree of expertise in the domain of enquiry. The informants comprised persons who held editorship and managerial positions in the newspapers, thus possessing ample knowledge of the business operations of the newspapers in the period of examination. In-depth face-to-face interviews that covered the period between 2019 and 2020 were conducted. All the informants from the 10 sampled newspapers were represented, except for *Daily Trust,* which could not honour interview requests. In all, 12 interviews were successfully conducted from the 20 targeted, giving a 60% response rate. The 12 informants were identified by codes indicating their designations in the newspapers they represented, while newspapers were identified with their known names where necessary. A 14-point business model template, which excluded niche publication given its not being monetised in the Nigerian newspaper setting, aggregated by Aliagan (2016b) from a study of the evolution of business model, was adapted for the interview protocol. The study adopted inductive data-driven thematic analysis for its data analysis and presentation

as suggested in Bowen (2006), as well as the guide proposed by DeCuir-Gunby, Marshall and McCulloch (2011). The interview data were transcribed manually and processed with the aid of NVivo software, and the data output was further analysed manually to suit the objectives of the study.

Newspaper	Interviewees	Identification Code
1. The Guardian	• Editor, The Guardian • Head Digital	EDG HDG
2. Nigerian Tribune	• Editor • Online Editor	EDT ONT
3. The Nation	• Managing Editor, North • Chairman Editorial Board	MEN CEN
4. The Punch	• Editor	EDP
5. This Day	• Editor	EDTD
6. The Sun	• Editor	EDS
7. Vanguard	• Editor	EDV
8. Leadership	• Chief Operating Officer	COOL
9. Blueprint	• Editor	EDB

The interviewed informants

4. Result and Discussion

Advertising

Advertising has been the main source of revenue for the newspaper from time. Print advertising accounts for an average of 90% of revenue in most newspapers in Nigeria. As found in this study, all the Nigerian newspapers investigated had online presence through their corporate websites and on social media platforms. The newspaper websites are the main sources of advertising online. *Nigerian Tribune*, for instance, just like other newspapers, has a good online presence through its newspaper website, its Facebook page and Twitter account, among others, from which it generates traffic that boosts its advertisement drive online. Revenue from online advertising is, however, not substantial compared to income from print advertisements. Online advertising return, according to the *Leadership* newspaper, is not appreciating. According to informant COOL, "for now, not many people really want to subscribe to online advert, maybe because of the peculiar nature of the region where we are strong, but that is not to say we are not making it anyway." Online advertising in *The Punch* has been a wonderful experience, said informant EDP. "I was once the online editor of the newspaper from 2013-2015, and under my watch, we moved from 35 million pageview per month to 77 million." What is clear from the submission of most of the editors and newspaper managers, however, is that online advertising, as a standalone income source, cannot sustain a newspaper. Some newspapers in this study raked in an average of $2,000 to $5,000 a month from online advertising. This income assists in their foreign exchange needs for newsprint and other consumables used in newspaper production. Online advertising in Nigeria is still growing, but newspapers rely more on print advertising. It could, therefore, be inferred, from the views of the informants, that even though returns from advertising, whether print or online, have shrunk, newspapers cannot survive without advertising.

Content Charging

It has been argued that paywalls may be effective at reserving online information for paying customers without causing a significant loss of traffic (Olsen, Kammer, & Solvoll, 2020), but studies have found that many readers are hesitant to pay for news online (Tóth, Goyanes, Demeter, & Campos-Freire, 2022), which supports the culture of 'freemium' (Aliagan, 2016a). Informant OET argued that freemium can be operated on a printed newspaper, too, to enhance readership and advertising. He stressed, "Maybe we need to change the game as to how it is played. People like free things. It is because it is free online, that is why people go there. Circulate the printed newspaper for free, too." Based on this development, content charging is not popular in Nigeria. Only one newspaper (*The Punch)* attempted to build a paywall, but it was not successful. Informant EDP, however, hinted that this was not due to a lack of response from subscribers, but rather because content charging was just evolving then, and things were not yet right. There was not just the problem of access, but also difficulty in the payment platform, the informant reasoned. As informant BDE further affirmed, "When I was the Editor of Punch, we tried it, but failed, even The Guardian tried it, it failed. We tried for almost a year at The Punch. There were subscribers, but they were not substantial enough," he said. One newspaper (*The Nation*) is exploring a paywall, while one (*The Guardian*) said it should be encouraged. According to the informant HDG of *The Guardian*, "we currently do not have a paywall on our website," though she felt that content charging should be encouraged because "Good journalism costs money; it's a good way to encourage independent journalism for an investing public."

The informants were divided over the desirability of free online content. Some believed blocking a news-

paper's online content and charging fees for access would drive away readers. Others agreed that once a newspaper took the lead and was successful, other newspapers would follow suit. Informant EDT noted that content charging might not necessarily drive away readers, because "if a medium is strong, it means that more people will go online to read its stories and then the advertiser will also look at the charts." Informant EDS reasoned that charging for online content is a tall dream. The idea of using 'fremium' to generate traffic to woo advertisers may, however, be a farce in the Nigerian context. Informant EDS reported that bloggers were making money from pilfering stories from traditional newspapers and other lesser-known media. Four of the nine newspapers studied (*The Nation*, *This Day*, *The Sun*, and *The Guardian*) were monetising their archive editions. Earning money from the e-mail alert service received minimal success, as four of the newspapers in the study (*The Nation*, *Nigerian Tribune*, *The Guardian* and *Leadership*) were charging a fee for it. However, monetising puzzles and games was not a success story, as only two newspapers (*Nigerian Tribune* and *Leadership*) offered them for free. Although the fee from the sale of the digital edition of the newspaper is small, six of the newspapers (*This Day*, *Nigerian Tribune*, *Leadership*, *The Sun*, *Blueprint* and *The Guardian*) were making money from it. Newspapers were not exploring monetising by charging an access fee to their websites, as only one newspaper (*This Day*) was doing that presently.

E-commerce/Transactional Services

Doyle (2013) suggests that newspapers should engage in e-commerce or transactional services like sales of goods and services, travel, and fashion as a means of generating more income. E-commerce was identified as a potential revenue stream (Vara-Miguel et. al., 2023). In line with this, newspapers established some non-editorial revenue-generating businesses on their online platforms to generate additional revenue. These online platforms were turned into a business arena for the marketing of goods and services. As revealed in this study, it is a rare enterprise among newspapers in Nigeria. Most newspapers in this study did not report engaging in e-commerce or transactional services, largely because they considered it not conforming to the original purpose of journalism or did not consider it a possible online revenue source. Only two newspapers, the *Nigerian Tribune* and *The Guardian*, recorded a semblance of e-commerce/transactional services. *Nigerian Tribune,* at one time, reportedly had a partnership with Jumia, an online marketing platform from which it was generating some income. In addition, the newspaper has what is called Tribune Online Services, through which it posts human-interest stories for people to read. It has a YouTube account that is monetised. As explained by Informant OET, "For us to upload your video, you must pay at least N100,000 for five minutes content" The newspaper also enters into partnerships with different agencies to which it sells online. As explained by informant OET, "We have people that buy content from us, and they pay royalties. We have different news agencies that also source materials for mostly people who are outside the country who want to read African stories. They subscribe to us, and we give them content." As for *The Guardian*, the only type of transactional service that it offers online has to do with advertising. According to informant HDG, the newspaper promotes its classified advertising service on its online platform. With this, the "prospects fill out a form on our website, upload necessary documents, pay, and the ad is published in print", but the return from that is "marginal," she remarked.

Promotions

Lunden (2009) proposes several promotional materials such as a pass for a fitness gym, free health check-up, DVDS, energy-saving light bulbs, free cinema tickets, free lunch vouchers, free deliveries, films, and a slash in the cover price of the newspaper, etc., to boost readership and circulation. Promotions are in the same league as events, as identified in Vara-Miguel et. al. (2023). To woo readers for the online and offline publications, some newspapers in the study undertake a series of promotional activities. Five newspapers (*The Nation*, *This Day*, *Nigeria Tribune*, *Vanguard*, *Blueprint*) reported having done promotional services to boost sales and readership, while no report was recorded for four. *The Nation* burnt its past editions into CDs and distributed them free to attract loyal readers. *This Day* also promotes its brand name through several promotional events such as its musical show, raffle draw and beauty pageant. *Nigerian Tribune* does many promotions, but these are mostly informal things done to appreciate readers and advertisers, especially during the festive period and individual celebrations. *Vanguard* also engages in promotional activities as a socially responsible medium. It had a spotlight promotion on the Nigerian Police, and it organises several activities for vendors who sell the newspaper. It gives them customised gifts such as an umbrella, among others. *Blueprint* undertakes promotional campaigns in other media in collabora-

tion with government agencies. It also produces promotional souvenirs in collaboration with them on social issues and causes. These activities are done with newspaper funds to generate goodwill and patronage, and sometimes as social responsibility causes for the good of society. These activities are not ordinarily targeted at revenue generation.

Cross Subsidy

To fund the newspaper, Lunden (2009) suggests establishing a cross subsidy, in which a larger, more successful organisation feeds a smaller, less successful one. This is in semblance to the business-to-business revenue model identified in Vara-Miguel et. al. (2023). All but two of the newspapers (*Blueprint, The Guardian*) engaged in cross-subsidy ventures that complemented revenue from the newspaper. *The Nation*, for instance, was printing daily editions for other newspapers such as *Leadership*, *National Pilot*, and *This Day*. However, *The Nation* does not own any company that it looks up to for sustenance but has commercial printing that generates as much as 25% of the revenue of the newspaper. The newspaper, according to informant NBE, also organises seminars, conferences and workshops on issues of interest to the public. "We make up to N5 million or N10 million from this sometimes," said informant NBE. *The Punch* engages in commercial printing, especially for newspapers such as *This Day*, and *Alaroye*, among others. According to informant EDP, the revenue from commercial printing was not substantial. For instance, *Alaroye* prints once a week, and *This Day*'s print run is small, he explained. In addition, a newspaper like *This Day* undertakes some non-editorial-related businesses to generate income. For instance, it has the *This Day* Dome in Abuja, a high-tech event centre through which it generates regular income. It also organises musical shows and beauty pageants periodically. According to informant EDT, the newspaper undertakes event promotion, which he described as "financially rewarding and helps to finance operations." *Nigerian Tribune* does not have any other businesses aside from commercialising its printing plant. As explained by informant EDT, the newspaper also has a three-storey building in Abuja that houses its printing plant. A part of the building is given out for rental to generate funds. The owner of *Leadership* newspaper owned Banana Restaurant in the highbrow district of Maitama in Abuja, but informant COOL believed it had no relationship with the newspaper. *Leadership,* however, has a printing press with which it handles commercial printing. However, when the press was down, it had to print in another newspaper's press. Like other newspapers, the *Sun* also engages in commercial printing from its three printing plants in the country. In addition, *Vanguard* has some businesses through which it generates income to augment the newspaper's revenue. According to the informant EDV, the newspaper organises quarterly seminars and workshops, conferences, and an annual economic summit. Generally, cross subsidy works for the newspapers that engage in it and considering that only two newspapers did not record participating in it shows that it is a viable income alternative for the distressed newspaper sector.

Cross Media Synergy

Wang and Huang (2011) suggest that newspapers should enter into cooperative arrangements to lower cost of production and to minimise risk. The outlook on cross-media synergy as revealed in the study is poor, as only two newspapers (*The Nation, Blueprint*) reported on undertaking cross-media cooperation, while seven did not report undertaking such a cooperative venture. This indicates that the newspapers failed to see cooperation in times of challenge as an easy way for the troubled newspaper industry. *The Nation* had such a cooperative arrangement with *The Punch* on newspaper circulation and content, but it did not work out. Informant NBE of *The Nation* gave the following illustration of the cooperative arrangement:

> … We mooted the idea of joint distribution of newspapers instead of engaging commercial transport. Since Punch will be taking its paper to Ado Ekiti, and we are also going there, why don't we use just one vehicle? Instead of paying N50,000 per day by each newspaper organisation, the amount would be shared equally between us. However, arrangements on press time, which differ in the two newspapers, did not make this to work *Inf. NBE*

Thus, different production timing did not make the cooperative arrangement to work. *Blueprint* also had cooperation arrangement with other newspapers in the area of circulation of newspaper copies. To informant MEN of *The Nation*, it is in the interest of the newspapers to cooperate and unite. All newspapers could come together to establish a plant in some states in the country, he suggested. "We will just print and roll out from the common press, and it will save a lot of cost." According to the informant EDT of *Nigerian Tribune,* cooperative synergy among the newspapers could include training, printing, advertising and circulation. However, it has been difficult for newspapers

in Nigeria to work out a cooperative arrangement. The reason for this, as explained by informant EDT, is that "…newspaper managers are very proud and very suspicious people, who would like to go solo in many things." Informant COOL of the *Leadership* newspaper believed that cross media synergy would create a situation whereby some newspapers would just bother themselves only with the newsgathering and processing arm of the business while some other organisations take care of the printing and the circulation.

Multiple Platforms

Picard (2004) suggests delving into multiple media platforms such as running radio and television stations. *This Day* was the first newspaper to invest in multiple media platforms through its Arise Television. *The Guardian* has a television studio and is broadcasting online only. However, as informant HDG of *The Guardian* said, the newspaper's radio and television were still in the early stages. She believed investment in multiple platforms was "not a way out; it simply makes business sense; promoting horizontal convergence." Two newspapers (*Nigerian Tribune* and *The Nation*) were recorded as having applied for radio or television licenses, but five have not made any move in that regard. Informant TED, however, thinks that investment in multiple platforms would be good for the newspaper as "It helps; it gives your medium a profile like Arise Television by *This Day*. It gives them a profile that they are becoming a big medium, and it also boosts revenue." *Vanguard* has not applied for or taken radio or television licenses, a development that informant EDV described as unfortunate. *Blueprint* also does not have either radio or television licenses, but informant EDB believed that investment in multiple platforms was good for the newspaper.

Crowdfunding

Newspapers could also seek sponsorship of investigative news to reduce the cost of news sourcing as proposed by Berger, Dinah, David, and Siegel (2009) and identified in Vara-Miguel et. al. (2023). While none of the newspapers had implemented crowdfunding, as revealed in the study, four newspapers (*The Nation, This Day, The Guardian* & *Vanguard*) believed in crowdfunding, one (*Nigerian Tribune*) was already exploring it, and two newspapers (*Leadership & Blueprint*) had not attempted it. *Nigerian Tribune* was exploring crowdfunding, working with a prominent online medium, *Premium Times*, that would fund investigative reports conducted with it. According to Informant TED, "We had a session with the Premium Times that came here for three days, and we are trying to do one or two things together, to get grants from one or two places, so we may soon do that for investigative journalism, specifically." *The Punch*, according to informant EDP, cherished its independence, hence it does not seek funds from any source. Informant HEN of the *Nation* saw nothing wrong in seeking sponsorship to fund investigative journalism, as it was a way of asserting that "the news organisation has a value in the modern world; we need to investigate the society where there is increasing tyranny by very powerful leaders and groups." Informant TDE believed that crowdfunding would be a good option for investigative journalism. *Vanguard* is willing to explore crowdfunding as pacesetters in this direction, such as the online *Premium Times*, *Sahara Reporters* and *The Cable* are making headway in it. For now, the *Blueprint* is not engaged in crowdfunding. However, informant EDB believed that crowdfunding, "aside from reducing the cost of operation and enhancing professionalism, gives the newspaper some level of visibility and independence."

Partnership with News Aggregators

Although all the newspapers in this study have accounts with Google and Yahoo news aggregators for advertising revenue sharing, increased exposure, as well as competitive positioning (Mcllroy, 2022), the revenue is deemed small. However, the return serves the forex needs of the newspapers in purchasing newsprint and other consumables for printing. Two newspapers (*Blueprint* and *The Guardian*) reported on this. *Blueprint* hosts its online platform on Google Cloud, and it runs Google advertisements on it. *The Guardian*, according to informant HDG, had an opt-in arrangement with Google and other news aggregators, and some of them "redirect traffic to our website and some others pay for content license", but the majority of them "operate unlicensed." She noted that the income from the news aggregators had not been "exactly remarkable", though the association with Google, especially, had been beneficial. Informant HDG would want the news aggregators to "use proper channels for content utilisation rather than the common theft."

Commercialised News

In line with the suggestion of Patel (2010) on news syndication as a revenue source among other revenue strands, the study found that two newspapers

had initiated charging for news content in printed newspapers. *The Nation* and *Nigerian Tribune* have tried to evolve a measure by which revenue is accrued from commercialised news. Through this, news sources are made to pay for some type of stories. For the *Nigerian Tribune*, payment is made by some news sources every quarter or half a year to run their stories. According to Informant TED, the news sources are then treated as advertisers and pampered because of the revenue they are bringing in. The informant reasoned that some of these sources paid as much as N10 million to television channels during electioneering campaigns, for instance, while the newspaper is approached to publish news and photographs for free. "The thing is, if you can afford N10 million to Channels Television, you must pay for your news in our newspaper. That's what started it," argued Informant TED. During the 2019 elections, the newspaper had a partnership for news coverage with three states in Nigeria, for which it was paid. For the non-election period, the degree of paid news varies.

Foundations Support

To raise funds to maintain their operations, Entman (2010) advises operating newspapers like foundations or charities and treating them as such. Although comparatively uncommon, donations and grants from individuals and organisations are identified in Casero-Ripollés and Izquierdo-Castillo (2013), Gordiienko (2021), Regner (2021) and Vara-Miguel et. al. (2023). However, funding through foundation support does not seem to enjoy much support among newspapers in Nigeria. None of the newspapers has benefited from or explored donations or grants from individuals or foundations. One informant said his newspaper might seek foundation support, two believed it was desirable, one reasoned that it was improper, one never believed in it, and there were no records from eight informants. However, informant EDT of the *Nigerian Tribune* believed that the newspaper was in a dire state, and foundation support was an option to bail it out. According to him,

> … if we are not careful, the newspaper will die. There is a foreign medium that, after each story, they seek help from readers; for you to continue to enjoy this medium, anything that you have, send it to this particular account. That is the new way. Therefore, if Nigeria or Nigerians or foundations like that can help the media out, the newspaper can seek such support. People outside may not know there is a serious problem with the newspaper. Many newspapers are unable to pay salaries; newspapers are living on debt because, for instance, advertisers are owing newspapers a lot, they cannot pay because the economy is bad, and in the newspaper, almost everything that we use is imported, including the ink and the newsprint. We pay for diesel, we pay for electricity, we pay transporters, we pay workers, and we pay state taxes and rental for all our offices in the country. *Inf. EDT*

To informant COOL of *Leadership* newspaper, the reality favoured seeking support from foundations, although this might be against journalism ethics. Informant EDV of *Vanguard* also hinted that *Vanguard* might explore seeking foundation support, as some Nigerian online media are already making headway in that direction. Informant EDB of *Blueprint* believed that seeking foundation support was desirable, but this would depend on the kind of organisation donating. *The Punch's* informant EDP said his newspaper did not seek support from any foundation.

Government Subsidy

Estok (2010) recommends government subsidies for the newspaper or a bailout to cushion the effect of the drought of revenue. Institutional grants and subsidies are also mentioned as revenue sources in Vara-Miguel et. al. (2023). In Nigeria, although a newspaper may have a covert linkage with the government, government financial support for a newspaper is not often pronounced. In this study, only one informant supported seeking a bailout from the government, six were opposed to it, while there is no record from six. Informant EDTD of *This Day* believed it would be ethically wrong for a newspaper to seek a subsidy from the government. Informant EDT of *Nigerian Tribune* believed it would be suicidal for the newspaper to seek a bailout from the government. Informant EDV of *Vanguard* argued that newspapers could apply for a bailout from the government. According to him, "…if corrupt and incompetent governors are getting a bailout, why shouldn't the media also get a bailout because we are also victims of the very bad economy…, which caused the extinction of the nation's paper mills." An ailing newspaper should never seek a bailout from the government, argued informant EDB of *Blueprint*. *The Punch* does not seek or accept any kind of support from the government because, according to Informant EPD, "That is the difference between Punch and some other newspapers," he said. However, *Blueprint,* along with some newspapers, was approached in the past by the government to seek a bailout, but this was turned down on second thought, according to Informant EDB.

Platform Shift

Estok (2010) proposes a platform shift to electronic journalism via mobile and tablet journalism for the ailing newspaper industry. Nigerian newspapers have a digitised format of their publications from which they derive small revenue. It is not certain if any newspaper is looking at a complete shift to digital editions. Findings in the study revealed that two informants were unsure if their newspapers would adopt platform shift, four said it was not practicable now, while there were no reports on this by seven informants. According to informant EDTD of *This Day,* both the "print and digital platforms would co-exist." Informant COOL of *Leadership* described his newspaper's experience with the e-edition as positive. E-edition, he reasoned, was able to extend a newspaper's reach, as its circulation could be limited with the hard copy. However, he did not think the e-edition should be a replacement for the printed newspaper as both were complementary. Informant HEN of *The Nation* believed that platform shift, though it is the practice in the developed media, was not practicable in Nigeria now because many people were still attached to the printed copy. However, as to whether platform shift would be the option in the near future, he said only time could tell, as technology had always determined the course of history. Informant EDB of *Blueprint* agreed that the future of the newspaper was in the digitised format as projected, describing the experience of *Blueprint* in publishing a digitised edition online as worthwhile. Publishing an e-edition, he remarked, "increases visibility and functionality" of the newspaper.

Disinvesting in and Discontinuing the Printed Newspaper

Clark (2013) suggests that printed newspapers should be discontinued to reduce expenses and increase revenue from online investments. Most informants in the study did not share this view. Virtually all of them, except one, agreed that the printed newspaper would not die; at least it would be around for some 10 to 15 years. Informant EDTD, for instance, did not think his newspaper was considering abandoning the printed format. *Informant* EDT saw a danger in discontinuing the printed edition of the newspaper. He remarked,

I hope we do not get to the stage where newspapers will be closed down. We have about 300 staff, and to run an online medium, we do not need up to 20. We have a brand-new machine. It costs about N250 million; what will happen to it? Some newspapers have three; what will happen to those investments? What will happen to the people who are working there? *Inf. EDT*

To informant EDP, "The digital platform will continue to exist and print platforms will continue to be diversified." Informant COOL was also not in support of discontinuing the printed newspaper. Informant EDN believed that if the printed newspaper was discontinued, many allied industries such as newsprint, ink and other consumables in newspaper production would close. Informant EDV said that no matter the attractions online, the printed newspaper could not be discontinued in Nigeria. He pointed out that some Nigerian publications actually tried to shift online but came back after some time. *Blueprint,* opined informant EDB, is not considering stopping the publishing of the printed newspaper. He did not think this was the way out for the newspaper either. However, he feared that "the days of print edition of newspapers are numbered as the current trend tilts towards online increases daily."

Generally, the approach to new revenue streams and business models adopted by Nigerian newspapers appears similar to experiences in other climes (Lunden, 2009; Picard, 2011; Vara-Miguel et. al., 2023). Nigerian newspapers are slow in diversifying their revenue streams and may have adopted a trial-and-error strategy (Vara-Miguel et. al., 2023) in evolving a business model that would take them out of the woods. Tejedor et al. (2020) reported that the most sustainable digital-native media use three or more revenue streams. This is largely true of the situation of newspapers in Nigeria, in which three revenue streams are operational among the newspapers in this study. The revenue streams currently operational among the newspapers in this study are print advertising, cross subsidy/business-to-business, and commercialised news.

However, while newspapers in the developed media market are looking away from dependence on print advertising, Nigerian newspapers still see print advertising as the bulwark for the traumatised industry. As argued by Pickard, Stearns, and Aaron (2007), newspapers depend on advertising, which rakes in 90% of their revenue, as also recorded in the Nigerian situation. The poor return from online advertising in the country only typified the experience recorded in the other media world (National Assembly for Wales, 2009). Online advertising alone cannot sustain the newspaper industry. Compared to Spanish newspapers in which 85% of revenue streams come from advertising (Vara-Miguel et. al (2021), online advertising is still poor in Nigeria, as the returns from it are not substantial. However, the

poor returns from online advertising were responsible for the exploration of new revenue portfolios by the newspapers.

Content charging is not working in Nigeria compared to the developed media market. The fear that content charging will chase readers to free news sites or that it generates less revenue reflects the global experience (Clark, 2013; Franklin, 2014). Content charging, though attempted by only one newspaper in this study, failed due to poor handling and fear of undercutting by rival newspapers, and has never been revisited by the newspapers after the hiccup from the initial attempt. The inability to charge for content, despite its obvious success in the advanced media market of Europe and America (Vara-Miguel et. al., 2023), typifies the experience in some climes where the fear of readers drifting away from news content hidden behind paywalls informed reluctance to adopt premium fees on news. Freemium, as undertaken in Nigeria or elsewhere, has not yet met industry standards or expectations or generated the kind of profits expected from it (Holm, 2016) as stressed earlier. Instructively, one of the editors in this study suggested adopting the freemium business model for printed newspapers, considering how freemium has galvanised readership traffic online. Informant OET thinks making printed newspaper free can work magic.

The poor response to e-commerce as suggested by National Assembly for Wales (2009) and Doyle (2013) indicates that Nigerian newspaper executives may still be operating in the old business model era. Compared to the experience in Spain where it attained minimal success (9.4%), as recorded by Vara-Miguel et. al. (2021), it appears e-commerce revenue model has not been fully explored in Nigeria possibly due to its novelty or the lack of proper understanding of the business models that fit the new online sphere. Promotional services, as discovered in this study, are targeted at social responsibility services for the government and society and are not conceptualised to yield revenue. Conversely, cross subsidies or business-to-business (Tejedor et al., 2020) are largely successful, as about 80% of the newspapers in this study are engaging in it. This means that newspapers in Nigeria considered non-editorial revenue portfolio as a significant revenue stream.

Cross media synergy (Picard, 2011) is, however, not working well because many of the newspapers would like to go solo, and they operate a rule of secrecy in their relationship with others. This hurts the newspaper's survival. Operating multiple platforms works well for *This Day*. Other newspapers are gradually warming up to embrace multiple platforms in which television works to boost the image and revenue of the newspaper. It is, however, not clear what financial impact the Arise Television has had on the *This Day* newspaper, though the Arise Television, of recent, has made a significant impact among the television audience in Nigeria. Crowdfunding (Berger et al., 2007; Vara-Miguel et. al., 2023) is not yet popular among Nigerian newspapers. Reasons for the independence stance and possibly lack of trust may influence not exploring the crowdfunding revenue option. Partnerships with news aggregators like Google and Yahoo seem to be working, and even though the return is not substantial, it meets the foreign exchange needs of the newspaper, especially with the challenge in the forex sector and scarce forex reserves. Partnership with news aggregators may be an accidental revenue source in that when it was first introduced, news media complained of the appropriation of their news content without financial returns. Many Nigerian newspapers now reap revenue from stories lifted from their websites by the news aggregators.

Commercialising news reports (Patel, 2010) for government and big corporations might be a good business model innovation for Nigerian newspapers and a novel addition to business model literature as indicated in the study. Commercialised news is introduced only in the printed newspaper. Reasons of journalism ethics may be responsible for newspapers not exploring the commercialised news option, which had long been introduced on radio and television. Exploring this novel option for both online and offline publications may be a good alternative revenue source for Nigerian newspaper managers. Compared to other climes, donations and grants from individuals and organisations are relatively uncommon in Nigeria, partly due to issues of professional pride and ethics or fear of compromise. Most newspapers are unlikely to receive donations and grants that may compromise them professionally. Earlier studies only record minimal results (3.4%) from donations (Vara-Miguel et. al., 2023) and insufficient research (Gordiienko, 2021; Regner, 2021) on donations as a revenue source.

Rejection of a subsidy or bailout from the government as suggested in Estok (2010) and Casero-Ripollés and Izquierdo-Castillo (2013) by the newspaper executive is in line with the argument that this could compromise the independent posture of the newspaper. None of the newspapers in this study has sought or taken a subsidy from the government, partly due

to reasons of professional pride and the suspicion that pervades the government and media relationship. Government subsidies to the media are common in some countries. For instance, in France, the government made a bold decision in 2009 to bail out the crumbling French newspapers and magazines to the tune of 600 million Euros for a period spanning three years, free year subscription for French citizens to a newspaper of their choice and waiving employers' cost of 90 million Euros for employees delivering newspapers (Lunden, 2009).

While some legacy newspapers in developed media market had embarked on platform shift, the situation in Nigeria is uncertain (Aliagan, 2020). Newspaper executives in Nigeria are evidently accustomed with the print heritage and are still adjusting to the online journalism alternative. The future of printed newspapers in Nigeria still seems secure, at least for a few more years (Aliagan, 2020), especially with the meagre return from online advertising sources and the reluctance to charge for online content.

5. Conclusion and Recommendation

Newspapers in Nigeria are still conservative in their approach to creating a sustainable business model for their operations, although three observable revenue streams are recorded by the newspapers in line with the findings of previous studies. Although advertising currently sustains the industry, there may be a backlash from advertisers who are already finding a cheap attraction online. Thus, dependence on print advertising may be threatened. The problem of rivalry among newspaper executives has frustrated attempts at cross media synergy in lowering costs. No significant move had been made in exploring areas of cooperation to lower costs. Content charging, which is the ultimate way out of the challenge for the newspapers, is also not an attractive option for the Nigerian newspapers due to the fear of undercutting by uncooperative rival news media. Conclusively, therefore, Nigerian newspapers are in a labyrinth. Based on the findings in the study, the following are recommended for the newspapers to come out of the woods. Newspapers should initiate an aggressive move to create new revenue streams; find creative ways and means to lower cost and shelve ego trip among newspaper executive; enter into productive synergy across newspaper organisations to collectively survive the current challenge facing them; and expend more efforts on nurturing online advertising for sustainability and growth of the industry's foreign exchange in the face of the exchange rate surge. This should be managed without any relent in print advertising for local consumption. Newspapers should also initiate a new strategy for individual readers' subscription at a lower cost, and for subscribed copies to be dropped at the subscriber's doorstep. Furthermore, it is recommended that newspapers should engage in promotional activities at educational institutions across the nation where the newspaper industry has branches or circulates to. Finally, findings in this study are limited by the non-attempt to gauge the effectiveness of the revenue streams and business models identified. Other studies may look at this limitation and broaden the scope of the study by having more informants, thereby enriching the findings.

Acknowledgments

The authors acknowledge the Tertiary Education Trust Fund (TETFund) for providing the financial support for undertaking this research study through the Institutional Based Research (IBR) Grant Award KWASUNGR/CSP/171117/VOL4/TETF/0049. We appreciate the funding agency's contribution to the success of this study, and the various newspaper organisations that granted interviews to generate materials for the study.

References

Abenarthy P. M. & Foster, R. (2014). The News Landscape in 2014: Transformed or Diminished? (Formulating a Game Plan for Survival in the Digital Era). Retrieved from https://go.gale.com/ps/i.do?id=GALE%7CA267134574&sid=-googleScholar&v=2.1&it=r&linkaccess=abs&issn=19489145&p=AONE&sw=w&userGroupName=anon%7Ec3584db8

Aliagan, I. Z. (2016b). Newspaper business model in digital era: The case of Nigeria. *Media and Communication Review,* 2, 75–99.

Aliagan, I. Z. (2015). Examining survival strategies employed by Nigerian Newspapers against loss

of readership and revenues. *Journal of New Media and Mass Communication,* 35, 9–16.

Aliagan, I. Z. (2016a). Free versus fee: the 'freemium' factor in Nigeria's newspapers' contents on the web. *Journal of Communication and Media Research,* 8, 1–14.

Aliagan, I. Z., Babatunde, A. K. & Briandana, R. (2020). Nigeria's newspapers' experiment in digital publishing: small gains, uncertain future. *Social and Digital Media Discourse,* 1, 13–26.

Berger, P., Dinah, E., David, L. & Siegel, D. J. (2009). *'The fee v. paid online content debate' Newspaper Association of America*. Retrieved from www.davidlafontaine.com/case-studies/final-pdf-paid-content.pdf

Bowen, G. A. (2006). Grounded theory and sensitizing concepts. *International journal of qualitative methods, 5*, 12-23. doi/full/10.1177/160940690600500304.

Brecht, P., Hendriks, D., Stroebele, A., Hahn, C.H. & Wolff, I. (2021). Discovery and validation of business models: How B2B startups can use business experiments. *Technology Innovation Management Review, 11*, 17–31.

Casero-Ripollés, A. & Izquierdo-Castillo, J. (2013). Between decline and a new online business model: The case of the Spanish newspaper industry. *Journal of Media Business Studies, 10*, 63–78.

Clark, T., (2013). Can local newspapers survive in the digital age? In Mair, J., Keeble, R. L. & Fowler, N. (eds). *What do we mean by local? The rise, fall and possible rise again of local jourmnalism*. Suffolk: Abramis Publishing.

DeCuir-Gunby, J. T, Marshall, P. L. & McCulloch, A. W. (2011). Developing and using a codebook for the analysis of interview data: An example from a professional development research project. *Field Methods, 23*, 136-155. doi/pdf/10.1177/1525822x10388468.

Doyle, G. (2014). Re-invention and survival: Newspapers in the era of digital multiplatform delivery. *Journal of Media Business Studies, 10,* 1–20.

Entman, R. M. (2010). Improving newspapers' economic prospects by augmenting their contributions to democracy. *The International Journal of Press/Politics*. doi: 10.1177/1940161209352371.

Estok, D. (2010). *Reports of newspapers' death greatly exaggerated.* Retrieved from http://j-source.ca/article/reports-newspapers-death-greatly-exaggerated

Franklin, B. (2014). The future of journalism. *Journalism Studies, 15*, 481–499. doi: 10.1080/1461670X.2014.93025.

Gordiienko, T. O. (2021). "The rise of membership model in the Ukranian media". In: World trends in modern journalism. International scientific conference. Riga, Latvia. Publishing House 'Baltija Publishing', 53-56. Retrieved from https://doi.org/10.30525/978-9934-26-118-3-13

Goyanes, M. & Vara-Miguel, A. (2017). "Probabilidad de pagar por noticias digitales en España". El profesional de la información, *26* (*3)*, 448-498. Retrieved from https://doi.org/10.3145/epi.2017.may.15

Guest, G., Bunce, A. & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods, 18,* 59-82. doi/pdf/10.1177/1525822X05279903.

Hassan, I., Abubakar, U. I., Yahaya Nasidi, Q., Latiff Azmi, M. N. & Shehu, A. (2021). Challenges and opportunities for newspapers in the age of digital communication. *International Journal of Academic Research in Business and Social Sciences*.

Hognaland, I. & Saebi, T. (2015). Business model selection and innovation: An empirical investigation of the Norwegian newspaper industry. *Beta Scandinavian Journal of Business Research, 29*, 49–73.

Holm, A. B., & Günzel-Jensen, F. (2017). Succeeding with freemium: strategies for implementation. *Journal of Business Strategy*, *38*(2), 16-24.

Holm, A. B. (2016). Could freemium models work for legacy newspapers?. *Nordicom information*, *38*(1), 83-87.

Jones, J. & Salter, L. (2012). *Digital journalism.* Los Angeles: Sage Publications Ltd.

Kammer. A., Boeck, M., Hansen, J. V. & Hauschildt, L.J. H. (2015). The free-to-fee transition: Audiences' attitudes toward paying for online news. *Journal of Media Business Studies, 12*, 107–120. doi: 10.1080/16522354.2015.1053345.

Karimi, J. & Walter, Z. (2021). The role of entrepre-

neurial agility in digital entrepreneurship and creating value in response to digital disruption in the newspaper industry. *Sustainability, 13*, 27–41.

Kruger, C. C., Swatman, P. M. C. & Van der Beek, K. (2003). Business model formation within the online news market: The Core+ complement business model framework. Proceedings of the 16th Bled eCommerce Conference eTransformation, Bled, Slovenia.

Lunden, K. (2009). The death of print? The challenges and opportunities facing the print media on the web. Reuters Institute Fellowship Paper, Reuters Institute for the Study of Journalism, University of Oxford.

Mcllroy, T. (2022). *The future of newspapers*. Retrieved from http://thefutureofpublishing.com/industries/the-future-of-newspapers/

National Assembly for Wales (2009, June). Communities and culture committee. The Welch Newspaper Industry. Retrieved from https://senedd.wales/Laid%20Documents/CR-LD7563%20-%20The%20Welsh%20Newspaper%20Industry-17062009-133009/cr-ld7563-e-English.pdf

Olsen, R. K., Kammer, A. & Solvoll, M. K. (2020). Paywalls' impact on local news websites' traffic and their civic and business implications. *Journalism Studies, 21,* 197–216.

Oyokunyi, J. I., Ekeanyanwu, N. T. & Aniebo, S. (2017). Economics of decline and survival strategies of Nigerian print media industry: a study of *The Guardian*, *The Sun* and *Leadership* Newspapers. *UNIUYO Journal of Humanities (UUJH), 21*, 305–327.

Patel, A. (2010). *The survival of the newspaper in the digital age of communication*. BSc Thesis, New York University.

Picard, R. G. (2011). *Mapping digital media: Digitization and media business models*. Open Society Foundations.

Picard, R. G. (2004). The economics of the daily newspaper industry. In Alexander, A. et al. (eds). *Media economics: Theory and practice* (3rd ed). London: Lawrence Erlbaum.

Pourashraf, P. & Mobasher, B. (2022, July). Using user's local context to support local news. In *Adjunct Proceedings of the 30th ACM Conference on User Modeling, Adaptation and Personalization,* ٣٥٩–365.

Regner, T. (2021). "Crowdfunding a monthly income: an analysis of the membership platform Patreon". *Journal of cultural economics*, *45* (1), 133-142. https://doi.org/10.1007/s10824-020-09381-5

Smith, A. (1980). *Goodbye gutenberg: The newspaper revolution of the 1980s*. New York, Oxford: Oxford University Press.

Sparks, C., Wang H, Huang, Y., Zhao, Y., Lü N, & Wan, D. (2016). The impact of digital media on newspapers: Comparing responses in China and the United States. *Global Media and China,* 1, 186–207. doi: 10.1177/2059436416666385 gch.sagepub.com.

Starr, P. (2009). Goodbye to the age of newspapers (Hello to a new era of corruption). Retrieved from https://newrepublic.com/article/64252/goodbye-the-age-newspapers-hello-new-era-corruption

Tejedor, S., Ventín, A., Cervi, L., Pulido, C. & Tusa, F. (2020). "Native media and business models: comparative study of 14 successful experiences in Latin America". Media and communication, *8*(2), 146-158. https://doi.org/10.17645/mac.v8i2.2712

Tóth, T, Goyanes, M., Demeter, M. & Campos-Freire, F. (2022). Social implications of paywalls in a polarized society: representations, inequalities, and effects of citizens' political knowledge. In *Total Journalism,* ١٦٩–179. Springer, Cham.

Vara-Miguel, A., Sánchez-Blanco, C., Sádaba-Chalezquer, C. & Negredo, S. (2021). "Funding sustainable online news: sources of revenue in digital-native and traditional media in Spain". *Sustainability*, *13* (20). https://doi.org/10.3390/su132011328

Vara-Miguel, A.; Sádaba, C.; Negredo, S.; Sánchez-Blanco, C. (2023). "Revenue diversification strategies of online news organisations: subscriptions and memberships". Profesional de la información, v. 32, n. 2, e320205. https://doi.org/10.3145/epi.2023.mar.05

Villi, M., & Hayashi, K. (2017). "The Mission is to Keep this Industry Intact" Digital transition in the Japanese newspaper industry. *Journalism Studies*, *18*, 960–977.

Wang, W. & Huang, J. S. (2011). The Taiwanese press in the internet age: Business strategies, revenue models, Long-Tail Economy and their impacts on Journalism *JRE Journal,* 1, 28–54.

Waterman, D., & Wook Ji, S. (2012). Online versus offline in the United States: Are the media shrinking? *The Information Society*, *28*, 285–303.

Zus Bureau Limited (2009). *Newspaper Circulation Check.*