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10th HYBRID CONFERENCE INTERNATIONAL CONFERENCE OF SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION (SSTE)



FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION (SSTE)
P.M.B 65, MINNA, NIGER STATE, NIGERIA

10th SSTE HYBRID INTERNATIONAL CONFERENCE



THEME:

EMERGING TECHNOLOGY AND INNOVATIVE PEDAGOGY FOR ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT

DATE: Monday 7th to Friday 11th October, 2024.
VENUE: CPES Complex, FUT Bosso Campus, Minna, Niger State

PROCEEDINGS

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FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

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SCIENCE AND TECHNOLOGY EDUCATION (SSTE)**

HYBRID CONFERENCE

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**10th INTERNATIONAL CONFERENCE OF SCHOOL OF
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ACKNOWLEDGEMENTS

Local Organizing Committee of the 10th International Conference of School of Science and Technology Education (SSTE), Federal University of Technology, Minna, appreciates the Management of the University for the Unflinching Support given to the team which led to the success of this Conference. We also wish to express our profound gratitude for the assistance rendered by the University Management especially in disseminating information relating to this Conference using the University website, Campus News, and FUT Search FM.

We thank the Dean, School of Science and Technology Education (SSTE) for hosting this Conference despite the economic situation in the country. His encouragement, advice, and moral support gave the Local Organizing Committee the strength to complete this task and make sure the Conference is successful.

We also, sincerely thank the academic staff of the School and University Community for their essential roles played towards the success of the Conference. We thank the non-teaching staff for their roles which contributed to the success of this Conference.

The efforts of the Editorial Board are commendable for making sure that the Book of Proceedings was ready. We appreciate the efforts of the Keynote presenter, Lead Paper presenters, and others for attending this Conference despite their tight schedule.

We also commend the undergraduate and postgraduate students of the School for sparing their time to participate in all the events. Above all, we thank God Almighty for the strength given to the LOC members to discharge their enormous tasks.

PREFACE

Emerging Technology and Innovative Pedagogy for Entrepreneurship and Economy Development is about giving students the skills they need to succeed in this new world and helping them develop the confidence to practice those skills.

Hence, the theme of this conference is apt and provides opportunities where experts brainstorm so that international communities can benefit from one another and also respond to Emerging Technology and Innovative Pedagogy for Entrepreneurship and Economy Development. It is worth noting that, proper implementation of the Emerging Technology and Innovative Pedagogy for Entrepreneurship and Economy Development would have a greater influence on the quality of manpower injected into the labour market which may determine the economic growth of any nation.

The theme and sub-themes of this conference, "Emerging Technology and Innovative Pedagogy for Entrepreneurship and Economy Development" are based on the prevailing circumstances in education sectors in developing nations. I am sure this conference has provided an avenue for researchers and educators to share their ideas on the theme and sub-themes of the conference that can enhance quality education, self-reliance for entrepreneurship in underdeveloped and developing nations across the world. I hope the theme and sub-themes meet the needs of the stakeholders in education.

The sub-themes are:

- Innovative Pedagogy for STEM and TVET
- Artificial Intelligence (AI) and new Technology for Enhancing STEM and TVET
- Artificial Intelligence (AI) for Embedded Learning Pedagogy
- Artificial Intelligence (AI) and Inclusive Learning for People Leaving with Disabilities
- Emerging Technologies for Language, Cultural, and Economic Development
- Language, Culture and Entrepreneurship for Economic Development
- Emerging Technologies for STEM and TVET Instruction
- Emerging Technologies for Entrepreneurship in STEM and TVET
- Emerging Technologies in STEM and TVET for Economic Development
- AI for Creativity and Innovation in Library and Information Science
- Digital Transformation and Internet Crime
- Emerging Technologies and Climate Change for Economic Development

The Local Organizing Committee is thankful to the participants of 2024 conference for their contributions.

God bless you all

Prof. Abubakar Mohammed Idris
Chairman LOC

WELCOME ADDRESS BY THE VICE CHANCELLOR, PROFESSOR FARUK ADAMU KUTA AT THE OPENING CEREMONY OF THE 10TH INTERNATIONAL CONFERENCE OF THE SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION (SSTE), FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA, NIGER STATE, NIGERIA HELD AT THE CPES HALL, BOSSO CAMPUS, FUT MINNA. 7th-11th OCTOBER, 2024

On behalf of the Governing Council, Management, Staff, and Students of the Federal University of Technology, Minna, I am delighted to welcome you to the 10th International Conference of the School of Science and Technology Education. A warm welcome to all our distinguished speakers, especially our Keynote Speaker, Prof. Stephen Jobson Mitchual, Vice Chancellor of the University of Education, Winneba, Ghana, as well as our Lead Paper presenters, Prof. Benjamin A. Ogwo from the Department of Career and Technical Educator Preparation, State University of New York, USA, and Prof. Mudashiru Olalere Yusuf from the Department of Educational Technology, University of Ilorin, Kwara State, Nigeria. To all participants joining us from near and far, we are pleased to welcome you to this annual conference which has long served as a platform for scholars to come together and share their research on issues of critical importance for the advancement of human society.

This year's conference theme is "Emerging Technology and Innovative Pedagogy for Entrepreneurship and Economic Development." For economies aiming to compete globally, embracing technology and entrepreneurship is essential. This is why conferences like this can help policymakers, educators, and entrepreneurs exchange ideas on how to harness the latest technological advancements for long-term economic gains.

The focus on emerging technologies is timely, as cutting-edge innovations like artificial intelligence (AI), blockchain, robotics, the Internet of Things (IoT), and other digital developments are not only transforming industries, enhancing business efficiency, and creating new markets but also reshaping various aspects of our daily lives. Undoubtedly, the discussions here will center on how to integrate new technological advancements and creative teaching approaches to promote entrepreneurship and drive economic growth.

By combining emerging technologies with innovative teaching methods, learners will acquire the knowledge and skills essential for success in today's fast-changing economy. This approach not only prepares them to excel as entrepreneurs but also empowers them to contribute to broader economic development by fostering innovation, enhancing productivity, and driving growth in various sectors. This university is especially dedicated to nurturing entrepreneurial abilities in our students, enabling them to create job opportunities, launch businesses, and actively support Nigeria's overall economic growth.

The concept of this tenth Conference of the School of Science and Technology Education is truly commendable. It serves as a vital platform for discussing the integration of education, technology, and entrepreneurship, which will shape future economies and drive sustainable growth. This is why I would like to express my sincere appreciation to the Dean, the Conference Organizing Committee, and the entire staff of the school for their tireless efforts in ensuring the success of this event.

Finally, to our distinguished invited guests, resource persons and participants, I wish you all a successful and productive conference, as well as an enjoyable and pleasant stay with us here in Minna. Thank you for your attention.

**WELCOME ADDRESS BY
THE DEAN, PROFESSOR AMOSA ISAKA GAMBARI, SCHOOL OF SCIENCE
AND TECHNOLOGY EDUCATION, FEDERAL UNIVERSITY OF TECHNOLOGY,
MINNA, NIGER STATE, NIGERIA AT THE OPENING CEREMONY OF THE 10TH
INTERNATIONAL CONFERENCE OF THE SCHOOL ON 9TH OCTOBER, 2024**

Protocol

First and foremost, I thank the Almighty for bringing us safely to this occasion of the School of Science and Technology Education (SSTE) Tenth International Conference. I warmly welcome you all on behalf of the School to the Conference.

I sincerely welcome and appreciate the Chief Host, our hardworking Vice-Chancellor and his management team for providing a conducive environment that facilitates the hosting of this conference at its usual time of the year.

On behalf of the School, I welcome the Registrar/Chief Executive, National Examinations Council (NECO), Professor Ibrahim Dantani Wushishi for the honour and his immense contributions to the school.

Mr. Chairman, Distinguished Ladies and Gentlemen, the Keynote speaker is a friend of the school, an erudite scholar and stimulating speaker, in person of **Professor Stephen Jobson Mitchual** the Vice-chancellor, University of Education, Winneba, Ghana. We are very proud to have him as a conference partner. We want to further the partnership by collaborating with your institution. Sir, you are very welcome to Nigeria and to our great institution.

I also especially welcome the Lead Paper presenter I, a great academic and researcher, an international acclaimed speaker, **Prof. Benjamin A. Ogwu** of the Department of Career and Technical Education, State University of New York, Oswego, USA, you are highly welcome Sir.

It is my pleasure to introduce our second Lead Paper presenter **Prof. Mudasiru Olalere Yusuf** of Educational Technology Department, Faculty of Education, University of Ilorin, Kwara State, Nigeria who has graciously accepted our invitation to share his expertise with us today. As my PhD supervisor he has been a valuable mentor and guiding light in my academic journey. You are highly welcome Sir.

I particularly appreciate the presence of **Deans and Directors, Professors, Heads of Department and other colleagues** who have graciously honoured this invitation. I say thank you for being part of this great occasion.

Our School (SSTE) has a commitment to pursue excellence in teaching, learning, and research with widening globalization and rapid growth in knowledge, the School is committed to staying at the forefront of developments in education and to sharing knowledge and expertise in ways that will most effectively prepare our students for the future. The School's International Conference is growing in stature each year and is an excellent opportunity to share the latest expertise in transnational education and to take new ideas to our various institutions.

Distinguished guests, esteemed colleagues, and valued participants, both present here and joining us virtually, I am delighted to welcome you all to the 10th Faculty of Education

This year's theme, "Emerging Technology and Innovative Pedagogy

come together to delve into the intersection of education, technology, entrepreneurship, and economic growth.

The conference theme seeks to address the challenges of integrating cutting-edge technologies and innovative teaching methods into entrepreneurship education. It aims to explore how digital tools, AI, and other technologies can enhance the teaching and learning process, fostering creativity, critical thinking, and problem-solving skills among students. The conference also seeks to address the need for adaptive educational frameworks that equip learners with the necessary skills to drive economic growth, entrepreneurship, and sustainable development in a rapidly changing global economy.

The sub-themes of this conference were carefully extracted from the main theme. It covers, among other areas, artificial intelligence, embedded learning pedagogy, and also artificial intelligence for enhancing STEM and TVET. The theme is quite strategic and very relevant to the present time. It is hoped and believed that the international and national scholars gathered here for this conference will arrive at developmental breakthroughs in the course of their deliberations.

We are in an era where technologies like artificial intelligence, Internet of Things, virtual reality, and cloud computing are transforming society, especially education. These advancements provide new learning opportunities and essential skills for success in today's fast-paced world. Integrating these technologies into education is crucial in preparing future entrepreneurs who will drive economic growth and create jobs.

Ladies and gentlemen, emerging technologies such as artificial intelligence have come to stay; it is better we embrace modernity and shun archaism. "Where the heart is willing to change, it finds a thousand ways. Where it is unwilling, it finds a thousand excuses. Frankly speaking, there is no excuse for the non-integration of technology in our schools and workplaces. "Technology would not replace the teachers, but those teachers who use technology will probably replace those who do not".

In essence, the central theme of this conference prompts us to explore how we can leverage technology, creative teaching methods, and entrepreneurial spirit to nurture meaningful and enduring economic progress. I urge each and every one to actively engage in the discussions, share your perspectives, and collaborate on ideas that have the potential to transform our education systems and economy.

Chairman, Ladies and Gentlemen, I am convinced that these stimulating speakers of this conference will meet everyone's expectations. I believe this conference will be another great success.

I congratulate the staff and students of the School of Science and Technology Education and others who contributed to the success of the 2024 International Conference. I offer my warmest congratulations and best wishes to the organizing committee for a successful and meaningful gathering of great minds. It is my hope that the dialogues and exchanges here will ignite fresh collaborations and initiatives that will make a lasting impact on our collective future.

Once again, I express my heartfelt gratitude to the Vice-Chancellor of this great and dynam university and his management team for their contributions to our conference.

nally, to our distinguished invited guests, resource persons, and participants, you are all welcome to this great institution and to the city of Minna. Please do have a pleasant experience as you take time out of your busy schedule to visit places of interest in the university and Minna city. Please enjoy our serene environment.

We look forward to your being part of the 2025 International Conference. I wish you fruitful deliberations and a safe journey to your various destinations.

Thank you for your attention.

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THE IMPACT OF EMERGING TECHNOLOGIES ON LIBRARY ADMINISTRATION: OPPORTUNITIES, CHALLENGES AND FUTURE PROSPECTS

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Abstract

The contemporary landscape of library administration is being significantly influenced by technological advancements such as artificial intelligence (AI), Intelligent Library Search and Federated Search, Internet of Things, Cloud Computing, Academic Integrity and Plagiarism, big data analytics, blockchain technology (BT), virtual reality (VR) and augmented reality (AR). These technologies offer novel prospects for augmenting services, managing resources, and fostering user engagement. Nonetheless, they also pose challenges related to financial constraints, the need for specialized technical knowledge, resistance to change, and security considerations. This paper delves into examining the influence of technology on library administration, emphasizing the opportunities it offers, the challenges encountered during implementation, and the potential future for libraries that effectively embrace these technologies. The study concludes by providing strategic recommendations for libraries to adeptly navigate these technological advancements. The paper investigates the varied impact of technology on library administration. It not only underscores the wide-ranging opportunities that technology offers but also delves into the challenges often encountered during its implementation. Moreover, the paper discusses the potential future for libraries that successfully adopt these technologies, taking into consideration factors such as user engagement, resource management, and information accessibility. Finally, the study concludes by offering a set of strategic recommendations designed to help libraries effectively navigate the challenges and opportunities in the ever-evolving digital landscape.

Keywords: Library Administration, Emerging Technologies, Opportunities, Challenges and Future Prospects

Introduction

The rapid advancement of technology has dramatically changed how libraries operate. From managing physical collections to providing access to digital resources, libraries have continuously adapted to meet the needs of their users. The emergence of technologies such as artificial intelligence (AI), Intelligent Library Search, Internet of Things, Cloud

technologies (Ganesamoorthy & Selvakamal, 2024). The fifth law of library science (Ranganathan, 1931) states that 'the library is a growing organism.' Many libraries now adopt and use computers and other technologies in their operations and services to meet the needs of their users. The above factors led to the change of name of the department from library science to library and information science and more recently to library and information technology (Bharathi & Sudhier 2024)

Problem Statement

Incorporating emerging technologies into library management presents a set of complex challenges despite their significant advantages. The constraints included poor library leadership, inadequate technological infrastructure and a lack of financial prowess to sustain emerging technologies in an e-learning environment (Mitha & Omarsaib, 2024). Financial limitations, the demand for specialized technical competencies, employee reluctance towards change, and apprehensions concerning data security and privacy are among the foremost obstacles that libraries must address. Effectively navigating these challenges to leverage the potential of these technologies while mitigating associated complexities is imperative for the advancement of library administration.

Literature Review

Overview of Emerging Technologies in Library Administration

In 2024, a profound transformation is underway at many libraries, driven by a surge in technological integration and the need to stay relevant and redefine their role in their communities. This wave of innovation encompasses a comprehensive approach to improving user experiences and expanding the library's impact (Pressreader, 2024). Libraries are embracing the use of cutting-edge technologies such as artificial intelligence, virtual reality, and digital resources to enhance the overall quality and effectiveness of their services and operations. By leveraging these emerging technologies, libraries are aiming to provide more personalized experiences, streamline processes, and offer innovative resources to their patrons. These technologies include:

Artificial Intelligence (AI): Is transforming library administration by enhancing the efficiency, accuracy, and user experience across various library functions. AI is revolutionizing how libraries operate, offering new opportunities for efficiency, personalization, and innovation. As AI technologies continue to evolve, their role in enhancing library services and supporting academic research will only become more significant. These tools can help researchers identify relevant literature, analyze data, and generate insights, reducing the time and effort required for research and enabling more comprehensive and impactful studies. AI technologies are employed to generate and enrich metadata for digital and physical resources. By analyzing the text, images, and other content, AI can create detailed and accurate metadata, including abstracts, keywords, and descriptive tags. This improves the discoverability of sources and enhances search engine performance within library systems. Due to their ease of use, generative AI tools like ChatGPT have become extremely popular. With the growing popularity of these tools among students, faculty are increasingly turning to librarians to help cultivate AI...

academic focus, making it easier for users to find the most relevant materials quickly. While **aggregated search** allows users to search multiple databases and information sources simultaneously through a single search interface. Instead of searching each database separately, aggregated search aggregates results from various sources, providing a comprehensive view of available resources. This technology is particularly useful in academic libraries, where users need access to a wide range of scholarly databases and journals. Libraries used this technology for descriptive cataloguing, subject indexing, database searching, and collection development (Gautam, 2024).

Internet of Things (IoT): IoT devices in libraries enable real-time monitoring and management of assets such as books, computers, and environmental conditions. For instance, RFID tags on books allow for automatic check-ins and check-outs, reducing manual workload. The best-integrated library software started using the Internet of Things (IoT) to transfer data without human intervention. Libraries use IoT to control smart circulation and check-out, managing inventory, ecological monitoring, energy efficiency, space utilization, user experience growth, security and access control, analytics for data, collection creation, augmented and virtual reality and smart shelves, ecological sustainability, monitoring remotely and maintenance planning, learning and collaboration spaces, personalized services, innovative technology, digital advertising, and wearable devices are just a few of the key IoT opportunities (Sanjiv, et al. 2024).

Cloud Computing: Cloud-based solutions provide scalable storage and access to digital resources, allowing libraries to manage vast amounts of data efficiently. Cloud computing also facilitates collaboration across institutions by enabling shared access to resources and tools. Libraries across the world are adopting cloud computing to make library services more streamlined and cost-efficient. It also improved file security, streamlined access with reduced security risks, an efficient virtual workspace, and enhanced information storage and retrieval capabilities (Isiaka, 2024).

Academic Integrity and Plagiarism: Academic integrity tools are essential in libraries to ensure the originality of academic work. Plagiarism detection software like Turnitin or Grammarly uses algorithms to compare texts against a vast database of published works, detecting similarities and potential plagiarism. These tools are integrated into library systems to help students and researchers maintain academic honesty by checking their work before submission. Copying others' work damages the intellectual integrity of their academic experience. Therefore, avoiding plagiarism has become the need of the hour (Gautam, 2024).

Big Data Analytics: Libraries utilize big data analytics to gain insights into user behavior, resource usage, and operational efficiency. By analyzing large datasets, libraries can optimize their services, tailor collections to user needs, and improve decision-making processes. It allows libraries to make informed decisions and optimize their services. By deciphering patterns from vast information, libraries can better anticipate needs and provide personalized services.

provides a decentralized, tamper-proof ledger that ensures transparency and trust in transactions like interlibrary loans. This unchangeable record is a potent weapon against data falsification, guaranteeing that the historical and cultural value of digital archives endures and is accessible. With blockchain technology, library services could be transformed as it offers enhanced security, transparency, and effectiveness (Fasola, *et al.* 2024)

Virtual Reality (VR) and Augmented Reality (AR): VR and AR are used to create immersive learning experiences, such as virtual tours of the library or interactive exhibits. They also enhance the user experience by overlaying digital information onto physical spaces, aiding in navigation and resource discovery. It enhances user engagement and provides new ways to explore library resources. Through VR headsets, patrons can embark on virtual tours of historical sites, wander through ancient libraries, or explore distant galaxies. Furthermore, libraries are utilizing VR to digitize their collections and create virtual libraries and archives. By digitizing manuscripts, historical documents, and artifacts, libraries can preserve cultural heritage and make it accessible to a global audience. Users can navigate through these digital archives in a virtual environment, interacting with objects and documents in ways that were previously impossible (Weiss, 2024)

Opportunities Presented by Emerging Technologies

Automation and Efficiency: Artificial Intelligence (AI) is transforming library administration by automating routine tasks such as cataloging, classification, and information retrieval. AI-driven chatbots and virtual assistants can handle user queries, freeing librarians to focus on more complex tasks. This automation enhances operational efficiency and reduces the likelihood of human error.

Enhanced User Experience: The integration of AI and machine learning allows libraries to offer personalized services. Recommender systems, for instance, analyze user behavior to suggest relevant resources, improving user engagement and satisfaction. Additionally, augmented reality (AR) and virtual reality (VR) technologies can create immersive learning environments, providing users with interactive experiences that extend beyond traditional library services.

Improved Resource Management: The Internet of Things (IoT) facilitates better inventory management by enabling real-time tracking of library materials. IoT devices can monitor environmental conditions, ensuring the preservation of delicate materials. Furthermore, blockchain technology can enhance the security and transparency of library transactions, such as the lending and returning of materials, by creating tamper-proof records.

Scalable Storage Solutions: Cloud computing offers libraries scalable and cost-effective storage solutions, enabling them to manage vast amounts of digital resources. Cloud-based platforms also support collaborative work, allowing libraries to share resources and expertise across institutions. This accessibility ensures that users can access information anytime and anywhere, fostering a more inclusive knowledge environment.

adopting emerging
technologies in

of purchasing, maintaining, and upgrading these systems can be prohibitive, limiting their adoption.

Skill Gaps and Training Needs: The integration of emerging technologies requires specialized skills that many library staff may not possess. Continuous training and professional development are essential to equip librarians with the necessary technical expertise. However, the rapid pace of technological change can make it difficult for staff to keep up, leading to skill gaps that hinder effective implementation.

Data Privacy and Security Concerns: As libraries increasingly rely on digital platforms, concerns about data privacy and security become more pronounced. The use of AI, IoT, and blockchain involves the collection and processing of vast amounts of data, raising questions about how this data is stored, shared, and protected. Libraries must navigate these issues carefully to maintain user trust and comply with regulatory requirements.

Resistance to Change: The introduction of new technologies can be met with resistance from both staff and users who are accustomed to traditional methods of library administration. This resistance can stem from a fear of obsolescence, a lack of understanding of the new technologies, or a reluctance to change established practices. Overcoming this resistance requires effective change management strategies and clear communication about the benefits of the new technologies.

Prospects for Library Administration

Personalization and Customization: The future of library administration lies in the ability to offer personalized and customized services. AI and machine learning will play a crucial role in analyzing user data to provide tailored recommendations and services. This shift towards personalization will enhance user engagement and ensure that libraries remain relevant in a digital age where information is abundant but often overwhelming.

Collaborative and Open Platforms: As cloud computing and blockchain technologies continue to evolve, libraries will increasingly collaborate on a global scale. Open-access platforms and shared databases will allow libraries to pool resources and provide users with access to a wider range of materials. This collaborative approach will also facilitate the sharing of best practices and innovations, driving continuous improvement in library services.

Integration of Emerging Technologies: Libraries will continue to integrate emerging technologies, such as AI, IoT, and blockchain, into their operations. This integration will not only improve efficiency and security but also enable libraries to offer innovative services that meet the evolving needs of their users. For instance, AI-driven tools can analyze user behavior to recommend books and provide proactive

experiences, and data-driven decision-making. However, libraries face challenges related to financial constraints, technical expertise, resistance to change, and security concerns.

Recommendations for Effective Technology Integration

Strategic Planning for Technology Integration: Libraries should develop comprehensive strategic plans that outline the integration of emerging technologies into their operations. These plans should include clear objectives, timelines, and resource allocation strategies to ensure a smooth and effective implementation.

Investment in Staff Training, Development and adoption to new technologies: To overcome the technical challenges associated with emerging technologies, libraries should invest in continuous training and development programs for their staff. This will ensure that library personnel have the necessary skills and knowledge to manage, maintain and adopt new technologies effectively.

Securing Adequate Funding: Libraries should actively seek out funding opportunities, including grants and partnerships with technology providers, to support the financial investment required for technology adoption. Budgeting for ongoing maintenance and upgrades is also essential to keep technologies up-to-date and functional.

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