

Book of Abstracts



4TH INTERNATIONAL RESEARCH AND DEVELOPMENT CONFERENCE (IRDEC-2026)

Theme:

The Role of Digital Innovation in Advancing Workforce Efficiency, Economic Transformation and Industrialisation

VENUE: Kampala International University
DATES: 12th- 16th October, 2026

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4TH INTERNATIONAL RESEARCH AND DEVELOPMENT CONFERENCE (IRDEC-2026)

THEME: *The Role of Digital Innovation in Advancing Workforce Efficiency, Economic Transformation and Industrialization*

Programme of Activities:

Day 1

Monday, 12th October, 2026, Arrival of Participants, Registration and Physical Fitness

TIME	ACTIVITY	ANCHOR PERSON
09:00 am - 01:00 pm	Arrival of Participants and Registration	Dr. Muneer Ahmad & Secretariat
02:00 pm – 5:00 pm	Physical Fitness	Sport Unit

Day 2

Tuesday, 13th October, 2026

Opening Ceremony

TIME	ACTIVITY	ANCHOR PERSON
08:00 am - 8:30 am	Arrival of Participants / Invited Guests	Secretariat
08:30 am - 08:40am	Anthems and Prayer	Mr. Kimuli Shawn & Guild President
08:40 am - 09:00 am	Welcome Address by Vice Chancellor	Professor Muhammed Ngoma
09:00 am - 09:30 am	Goodwill Message by Chairman, Board of Trustees	Al- Hajj Dr. (Hon) Hassan Bassajjabalaba
09:30 am - 10:00 am	Speech by the Guest of Honor	Dr. Aminah Zawedde Permanent secretary of the Uganda Ministry of ICT and National Guidance
10:00 am - 10:30 am	Keynote Address	Prof. Waswa Balunywa (PhD), Former Principal Makerere University Business School
10:30 am – 10:40 am	Interactive Session	Secretariat
10:40 am - 10:50 am	Cultural Performance	Secretariat
10:50 am - 11:15 am	Breakfast	Secretariat
11:15 am - 12:00 Noon	Lead Paper <i>Advancing Workforce Efficiency, Economic Transformation and Industrialization in Africa: Does Artificial Intelligence matter?</i>	Prof. Jude T. Lubega (PhD) Vice Chancellor, Nkumba University
12:00 pm - 12:45 noon	Panel Discussion	Prof. Muwanga Zaake Kampala International University
12:45pm - 12:55pm	Cultural Performance	Secretariat
12:55pm - 01:00 pm	Vote of Thanks by DVC-F&A/ ADVC- RICE	Dr. Mundu Mustafa Deputy VC F&A KIU

TIME	ACTIVITY	ANCHOR PERSON
01:00 pm – 02:00 pm	Lunch Break	Secretariat
02:00 pm - 05:00 pm	PhD - Symposium	Prof. Tarig Elsheikh Mahmoud
05:00 pm - 05:15 pm	Tea Break	Secretariat

Day 3

Wednesday, 14th October, 2026

Technical Sessions

TIME	ACTIVITY	ANCHOR PERSON
08:00 am - 10:00 am	Technical Sessions I	Dr. Willy Turyahikayo/Prof. Isah Bala Yabo / Assoc. Prof. Peter Betiang
10:00 am - 11:00 pm	Breakfast	Secretariat
11:00 pm - 01:00 pm	Technical Sessions II	Prof. Charles Waiswa /Ass. Prof. Abubakar Abdulkarim / Dr Rehema Namono
01:00 pm - 02:00 pm	Lunch Break	Secretariat
02:00 pm – 05:00 pm	Technical Session III	Dr. Willy Turyahikayo / Dr. Michael Adewusi / Mrs. Christine Ainebyoona
05:00 pm - 05:10 pm	Tea Break	Secretariat

Day 4

Thursday, 15th October, 2026

Technical Sessions

Morning Session		
TIME	ACTIVITY	ANCHOR PERSON
08:00 am – 10:00 am	Technical Sessions I	Dr. Willy Turyahikayo / Prof. Aja Pat-rick
10:00 am – 11:00 pm	Breakfast	Secretariat
11:00 pm – 01:00 pm	Technical Sessions II	Prof. Charles Waiswa/Dr. Willy Turyahikayo
01:00 pm – 02:00 pm	Lunch Break	Secretariat
Afternoon Session (Closure and Dinner)		
04:00 pm - 04:15 pm	Closing Remarks by DVC-RICE	Prof. Regina Ejemot-Nwadiaro
04:15 pm - 04:30 pm	Closing Remarks by DVC-AA	Dr. J. E. Ashibi
04:30 pm - 04:45 pm	Closing remarks by VC	Professor Muhammed Ngoma
04:45 pm - 05:00 pm	Closing Remarks by CBoT Representative	Mr. Kibuuka Ambrose
05:00 pm – 05:15 pm	Music and Cultural Dance	Mr. Kimuli Shawn / Secretariat
05:15 pm – 06:15 pm	Dinner	Secretariat

Day 5

Friday, 16th October, 2025

Tour and Departure

TIME	ACTIVITY	ANCHOR PERSON
09:00 am - 03:00 pm	Tour	Dr. Willy Turyahikayo / Dr. M. Mundu / Ms. C. Ainebyoona / Shawn. Kimuli



About KIU

Kampala International University (KIU) is a chartered private university in Uganda. Established in 2001, KIU has built a name in Africa's higher education sector currently ranked not only the best private university in Uganda but also the second best overall university in the country (Webometrics Ranking (July, 2025): <https://www.webometrics.org/uganda>). KIU is a member of the Association of Commonwealth Universities (ACU), Association of African Universities (AAU), the Inter-University Council of East Africa (IUCEA), International Association of Universities (IAU), United Nations Academic Impact (UNAI), Africa Research & Innovation Partnership (ARIP) and Sustainable Development Solutions Network (SDSN). It has two campuses; the main campus is located in Kansanga along Ggaba road in Kampala (Central region) and the Western Campus in Ishaka, Bushenyi (Western Uganda), along Kasese Road. The University has a branch in Dar-es-Salaam called Kampala International University in Tanzania (KIUT).

The University's student population is drawn from over 30+ countries including Uganda, Kenya, Tanzania, Rwanda, Burundi, DRC, Chad, Somalia, Southern Sudan, Northern Sudan, Ethiopia, Eritrea, Comoros, Zambia, Malawi, South Africa, Nigeria, Liberia, Cameroon, Ghana, Gambia, Sierra Leone, Korea, Spain, Pakistan, India, Mexico and Turkey among others. The University has been, and continues to be a centre for intellectual life, a locus of research, innovation and entrepreneurship extending the

boundaries of knowledge, a resource for professional development, and a key player in the growing global network of scholars. The University offers a number of quality programs/disciplines at both undergraduate and postgraduate levels that ensures passion and opportunity for life-long success, creativity, innovation and leadership. These disciplines include; Medicine and Health Sciences, Engineering and Applied Sciences, Natural and Mathematical Sciences, Law, Business and Agribusiness Studies, Humanities, Education and Social Sciences, Computing and Informatics, Vocational and Technical Education and is in the process of starting, Veterinary Medicine, Food and Nutrition Sciences. The programmes are offered through colleges, schools, faculties, teaching departments and Directorate of Higher Degrees and Research.

KIU has steadily embraced and deployed different technologies in teaching and learning, management of student and staff records, enhancement of examination and assessment management and institutional collaborations and Partnerships. The University offers a wide range of extra-curricular activities enabling students to compete at national, regional and International levels, and have exhibited great success over the years. At KIU we produce graduates who are competent, confident, competitive, of good character, employable and job creators who are ready to contribute positively to society. This is made possible by the quality staff, drawn from different regions, who bring diverse knowledge and expertise to enrich the training process.

	KIU Vision To become a premier institution of international repute that prepares students for the world of work and for an inclusive society.
	KIU Mission To respond to societal needs by designing and delivering an education guided by the principles and values of respect for society, economy and environment.
	KIU Philosophy KIU regards each student as a unique individual. It's our role to assist students to actualize their strengths. We ensure that the educational experience of students culminates into productive graduates who can contribute positively to the overall well-being of society. Holistic development and a strong, positive intellectual development is what KIU strives to teach in each student. At KIU we produce graduates who are competent, confident, competitive, of good character, employable and job creators who are ready to contribute positively to society.

About the Conference

The IRDeC - 2026 serves as a premier global platform for scholars, scientists, industry leaders, innovators, and policymakers to engage in high-impact discussions on the role of Digital Innovation and Artificial Intelligence in Advancing Workforce Efficiency, Economic Transformation and Industrialization in Africa.

Theme:

The Role of Digital Innovation in Advancing Workforce Efficiency, Economic Transformation and Industrialization

Conference Tracks	
Track 1 <ul style="list-style-type: none"> Digital infrastructure Innovation Ecosystems Smart connectivity 	
Track 2 <ul style="list-style-type: none"> Workforce efficiency Productivity Health and well-being 	
Track 3 <ul style="list-style-type: none"> Digital Economy Economic Transformation for sustainable Development 	
Track 4 Industry 4.0 and 5.0 <ul style="list-style-type: none"> Smart manufacturing 	<ul style="list-style-type: none"> Automation Intelligent systems
	Track 5 <ul style="list-style-type: none"> Governance Policy and Ethical Intelligence
	Technical Sessions: <ol style="list-style-type: none"> Agriculture, Biology and Health Sciences Education Law and Governance Finance, Economics, Procurement and Business Management Humanities and Social Sciences Science, Technology, Engineering and Mathematics (STEM) Virtual.

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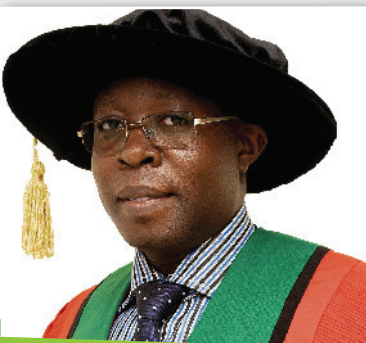
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Welcome

ADDRESS BY THE DIRECTOR, DIRECTORATE OF HIGHER DEGREES & RESEARCH



The Guest of Honor, Special Guests, Chairman and Members Board of Trustees, Members of the University Council, Vice Chancellor and Management plus the entire staff of KIU, Ladies and Gentlemen. Good morning. I take this privilege and honor to welcome you all to this **4th International Research and Development Conference (IRDeC 2026)** that is taking place at **Kampala International University**, focusing on the: **“Role of Digital Innovation and Artificial Intelligence in Advancing Workforce Efficiency, Economic Transformation and Industrialization.”**

Globally, we are currently being guided through the era of unprecedented technological evolution and Digital innovation and Artificial Intelligence (AI) are now amidst many activities and actions as the active engines reshaping our routine engagements. From supporting research designs to generating ideas and supporting advanced data analysis to deploying intelligent systems that drive smarter decision-making, these technologies are fundamentally redefining workplace structures, job roles, and industrial capability.

The IRDeC 2026 was explicitly designed to serve as a vital platform to share ideas, learn from each other as a basis of increasing logical use of these tool as they get incorporated in the daily routines and decision making. During this conference, we should also affirmatively aim to bridge the gap between theory

and execution since we have the opportunity of sitting talking to each other as **researchers, industry leaders, policymakers, and other diverse categories of society**. The 4th IRDeC conference engagements have been designed to facilitate rigorous dialogue, cross-sector knowledge sharing, and the deep collaboration required to navigate the transformative impact of Digital Innovation and AI across various sectors.

Dear Participants, this Conference will value your insights and examination of avenues to enhance immediate workforce productivity and streamline operations for sustainable economic transformation and robust industrialization. Therefore, we should engage deeply, challenge ourselves in all aspects as we forge collaborations that will outlast our time together here. Thank you to the entire organizing committee, the speakers, and all of you for prioritizing IRDeC 2026.

I once again welcome you to the conference

Prof. Charles Waiswa
Director, Directorate Of Higher Degrees & Research
Kampala International University

PARTNERS

Welcome

ADDRESS BY THE VICE CHANCELLOR



Our Chief Guest, Dr. Aminah Zawedde, Permanent Secretary, Ministry of ICT and National Guidance, Republic of Uganda, Distinguished Guests, Esteemed Researchers and Scholars, Industry Leaders, Policymakers; Development Partners, Members of the KIU Community, Ladies and Gentlemen.

On behalf of Kampala International University, I am pleased to welcome you to the **4th International Research and Development Conference, IRDeC 2026**.

We gather at an important moment for higher education, research, industry and society. The pace at which technology is transforming the way we work, learn, produce, communicate and solve problems demands that universities do more than generate knowledge. We must ensure that **knowledge becomes innovation, innovation becomes application, and application creates measurable impact**.

This year, we have deliberately embraced a theme that is both timely and challenging:



“The Role of Digital Innovation and Artificial Intelligence in Advancing Workforce Efficiency, Economic Transformation and Industrialisation.”

The theme comes at a defining moment for our societies. It challenges us to look beyond what artificial intelligence and digital technologies can do and ask a more fundamental question: **What should these technologies enable our societies, institutions, businesses and people to achieve?**

At KIU, we believe that the future of higher education must be anchored in relevance. Universities must prepare graduates who can think critically, work confidently with technology, solve complex problems, create opportunities and continuously adapt to changing environments.

This conviction places greater emphasis on demonstrable competencies, practical application, problem-solving, internships, community engagement and stronger connections between education and the world of work.

Our commitment to digital transformation is equally deliberate.

Artificial intelligence is no longer a distant possibility. It is already reshaping healthcare, agriculture, manufacturing, finance, education, communication, research and public administration. Universities therefore have a responsibility to ensure that Africa is not merely a consumer of these technologies, but an active participant in their development, adaptation, and responsible application.

We need to advance plans for a major expansion of our health sciences and healthcare infrastructure, bringing together specialised healthcare infrastructure and advanced computing through major Health and AI partnerships and collaborations.

This convergence of **health sciences, artificial intelligence, data science and research** represents an important dimension of KIU's future.

We see enormous potential for AI and advanced data systems to support early disease detection, precision medicine, biomedical research, clinical decision-making and the development of innovative healthcare solutions. More broadly, AI presents opportunities to improve productivity, strengthen institutions, support entrepreneurship and create new pathways for employment.

Our ambition is therefore not technology for technology's sake. **Our ambition is technology in the service of humanity and development.**

IRDeC 2026 provides precisely the platform required to advance this conversation. The conference brings together researchers, academics, industry actors, policymakers and other stakeholders from Uganda, across Africa and from the global academic community to interrogate the opportunities and challenges presented by digital transformation and artificial intelligence.

I am confident that the outcome of this conference will extend well beyond the presentation of research papers. I expect new collaborations, new research directions, new partnerships and practical ideas that can contribute to transformation at institutional, national, regional and global levels.

The conference addresses critical areas including digital infrastructure, innovation ecosystems, workforce productivity, the digital economy, Industry 4.0 and 5.0, governance, cybersecurity and responsible artificial intelligence.

I am particularly pleased that IRDeC creates space for **interdisciplinary thinking**.

The challenges facing our continent cannot be solved by one discipline alone. The future requires engineers to speak to economists, health scientists to work with data scientists, policymakers to engage researchers, and industry to collaborate with universities.

It is through such collaboration that research can move beyond publications and become a driver of transformation.

As researchers, I encourage you to ask questions that

matter. Let our research respond to the realities of our communities, our economies and our industries. Let us develop solutions that are scientifically credible, ethically grounded, economically viable and capable of being implemented at scale.

KIU will continue to strengthen its research ecosystem, support innovation, promote international collaboration and create opportunities for scholars and students to translate knowledge into impact.

I invite every participant to use this conference not only as a platform to present research, but also as an opportunity to **build partnerships, challenge assumptions, exchange knowledge and identify possibilities for collaboration**.

May IRDeC 2026 generate ideas that travel beyond this conference. May the research presented here influence classrooms, laboratories, hospitals, businesses, industries and policy spaces.

Most importantly, may it contribute to a future in which digital innovation and artificial intelligence expand opportunity, strengthen human capability and accelerate economic transformation and industrialisation.

On behalf of Kampala International University, I welcome you once again to IRDeC 2026.

I wish you fruitful deliberations, meaningful partnerships and a conference rich in knowledge, innovation and practical outcomes.

Thank you, and welcome to Kampala International University.

***Prof. Muhammed Ngoma, PhD
Vice Chancellor
Kampala International University***

Welcome

WELCOME AND GOODWILL MESSAGE FROM THE CHAIRMAN, BOARD OF TRUSTEES



Our Chief Guest, Dr. Aminah Zawedde, Permanent Secretary, Ministry of ICT and National Guidance; Distinguished Guests; Esteemed Academics and Researchers; Industry and Government Representatives; Development Partners; Members of the Kampala International University Community; Ladies and Gentlemen,

It is my honour and pleasure, on behalf of the Board of Trustees of Kampala International University, to welcome you to the **4th International Research and Development Conference, IRDeC 2026**.

I extend a special welcome to the researchers, academics, innovators, industry leaders and policymakers who have travelled from Uganda, across Africa and beyond to participate in this important intellectual gathering.

I have reflected deeply on the theme of this year's conference:



“The Role of Digital Innovation and Artificial Intelligence in Advancing Workforce Efficiency, Economic Transformation and Industrialisation.”

I can confirm that this theme speaks directly to the world we are building and to the future we must prepare for.

The future will belong to institutions and nations that are prepared to invest in **knowledge, human capital, innovation and technology**. For Africa, this is not simply an opportunity. **It is an imperative.**

I have always believed that Kampala International University must be more than a place where qualifications are awarded. It must be a place where **people are empowered, ideas are developed, skills are strengthened and solutions are created**.

That philosophy continues to guide KIU's growth.

The University's journey has been shaped by a commitment to expanding access to higher education while progressively strengthening teaching, research, healthcare, infrastructure, innovation and international partnerships.

Today, our focus is increasingly on how these investments can translate into greater impact for **Uganda, Africa and the wider world**.

The transformation of the global economy makes this responsibility even more urgent.

Artificial intelligence, automation, data science and digital platforms are changing the nature of employment and production. They are creating new industries while transforming existing ones. They are also challenging universities to rethink how they prepare graduates for a labour market that will require not only academic knowledge, but **adaptability, creativity, digital competence, entrepreneurship and lifelong learning**.

This is why KIU is embracing **Competency-Based Education and Training, CBET**, as a strategic direction.

We want graduates who can demonstrate what they know by **what they can do**.

Our commitment to CBET is therefore about more than changing curricula. It is about strengthening the connection between the university, the workplace and society. It means giving students opportunities to apply knowledge, develop practical skills, engage with industry and communities, solve problems and become productive contributors to the economy.

At the same time, KIU is positioning itself for the emerging **AI and data-driven economy**.

Our planned **Centre for Artificial Intelligence and Data Science** reflects our determination to participate actively in the technological transformation taking place across Africa.

We want KIU to be a place where young people acquire advanced digital skills, where researchers explore new applications of AI and data science, and where partnerships produce solutions to real challenges.

Our investment in the health sector demonstrates this same philosophy.

The University's **\$60 million Health and AI Expansion at the Western Campus in Ishaka** brings together specialised healthcare infrastructure and technological innovation through the planned **Cancer Institute, Heart Institute, Neurosurgery Hospital and Centre for Artificial Intelligence and Data Science**.

This represents a significant investment in healthcare, research, advanced skills and technology. This is the kind of investment that we believe can **change lives**.

It is also a demonstration of what becomes possible when education, research, healthcare, technology and investment are brought together around a common purpose.

I therefore challenge our researchers and academic community to **think boldly**.

Let us not only ask how technology can improve existing systems. Let us ask what new systems, industries and possibilities we can create.

Let us develop **African solutions to African challenges**.

Let us ensure that artificial intelligence advances productivity without losing sight of human dignity. Let innovation create employment rather than simply replace it. Let digital transformation widen access to opportunity. Let research inform policy. Let universities and industry work together to build the capabilities required by the economies of tomorrow.

Research achieves its greatest value when knowledge is **shared, questioned, strengthened and translated into action**.

IRDeC provides an important meeting point between scholarship and society, creating opportunities for researchers, policymakers, industry and development partners to exchange ideas, challenge established thinking and form collaborations that can deliver meaningful results.

I am particularly encouraged by the breadth of participation in this year's conference. The diversity of researchers and perspectives represented here demonstrates that the challenges of digital transformation and artificial intelligence require us to work across borders, disciplines and institutions.

I commend the Vice Chancellor, University Management, the Directorate responsible for research and innovation, the conference committees, academic staff and all those whose dedication has made IRDeC 2026 possible.

I also thank our partners and participants for believing in the importance of research, innovation and knowledge exchange.

As we look ahead, the Board of Trustees remains committed to supporting investments that strengthen KIU's academic mission, expand research capacity, advance technology, improve healthcare and prepare our graduates for meaningful participation in a rapidly changing global economy.

The task before us is ambitious, but our belief is equally strong.

A university that invests in knowledge invests in the future. A university that connects knowledge with innovation helps shape that future.

May IRDeC 2026 inspire **new ideas, stronger partnerships and solutions that extend far beyond this conference**.

May the knowledge generated here contribute to stronger institutions, more productive workforces, innovative industries and a more prosperous and sustainable Africa.

I warmly welcome you to Kampala International University and wish you a productive, inspiring and memorable conference.

Thank you.

Al-Hajj Dr. Hassan Basajjabalaba
Chairman, Board of Trustees and Founder
Kampala International University

Prof. Waswa Balunywa, PhD



Professor Waswa Balunywa is currently a Consultant and trainer who has been serving in the education sector for over 35 years. He currently consults in the areas of Leadership, Change Management, Economics and Entrepreneurship. He served as the Principal of Makerere University Business School (MUBS) for over 20 years.

He led the team that initiated private programmes in Makerere University changing the landscape of higher education not only in the country but in the region.

Professor Balunywa holds a PhD in Entrepreneurship from the University of Stirling in the United Kingdom and has an MBA and a Bachelor Degree of Commerce both from the University of Delhi in India.

He has served as a Director on different Boards including the Bank of Uganda, Uganda Airlines, Coca-Cola among others. He currently serves as a member of the NRM Central Executive Committee, MTN Mobile Money board, Madhvani Group (Kakira Sugar work Limited Board) among others. He is a patron of

different associations including the largest students' organization in the world AIESEC (Uganda Chapter) and YPMA.

Professor Balunywa is also a social entrepreneur and supports vulnerable persons in his community. The Balunywa Foundation, of which he is a Director is training women in business startup and trying to put girls who cannot access education in schools. Recently he started the Balunywa Leadership Academy that is empowering fresh graduates. He has also been running a free online leadership training for over 4 years. He runs online programs for Youth and mentors numerous young people preparing them for the world of work.

Professor Balunywa is a blogger and writes extensively on the Economy, Leadership Management and Social Issues. He has an interest in Nature, Yoga, Wrestling and Swimming (but he doesn't know how to swim).

Prof Jude T. Lubega, PhD



The renowned Award winning Academician, examiner, researcher and practitioner in the field of Information Technology, is the Vice Chancellor of Nkumba University.

Assistant Governor Elect Jude Lubega is also at the heart of Rotary Service.

As Assistant Governor for Lake Victoria Zone 2 in the Year 2026/27 Prof. Jude brings with him a wealth of experience and commitment in impacting Communities.

Prof Jude's Rotary journey started in 2010 as charter member for RC Kampala City Makerere (now Rainbow) and in 2017 as a Charter Member of RC Namasuba a Club that has so far produced Two Award winning Assistant Governors.

His leadership capabilities led him to being the Club's 2nd President (2019/20). His subsequent roles as D 9214 Chair for Website in 2022/23 positively increased the District's ability to Adapt.

His dedication to Rotary Service is further reflected in his roles as Chair of Rotary Wash Institute (RoWashi) housed at Nkumba University. This is Africa's Premier Institute that is increasing Impact in the Rotary Focus Area of Water and Sanitation. He is a giver to RI and

currently at PHF Level 8.

Beyond Rotary, Professor Jude has served as a Lecturer of ICT at Reading University in The UK and Senior Lecturer at Makerere University.

Prof Jude is one of the Founders and CEO of 8Tech Consults Ltd in 2007 and he sits on several Boards including ;

1. Uganda Communication Commissioner AI Task Force
2. Uganda National Examinations Board
3. Uganda Vice Chancellor's Board
4. RENU Board
5. IUCEA Board Etc.

Prof Jude is an Author and has supervised over 12 Masters graduates and 16 PhD graduates so far. He has consulted for UNESCO, UNCDF, ESKOM, NITA (u)

A devoted Christian, married to Rita with Children.

IRDEC 2026

4th International Research and Development Conference

*The Role of Digital Innovation in Advancing Workforce Efficiency, Economic Transformation,
and Industrialization*

BOOK OF ABSTRACTS

*Complete Collection – 532 Abstracts (Papers 1–532)
Kampala International University
Uganda · October 12–16, 2026*



Editorial Note

This book presents abstracts for IRDeC 2026 in a uniform format: title; author name(s); affiliation; email; abstract body; and keywords. Academic titles are omitted from author lines. Author, affiliation and email lines follow the title without field labels. Papers are numbered continuously 1–532 by thematic area. Colour key: paper numbers red; titles blue; author/affiliation/email green.

Total abstracts: 532

THEME 1

Education, Teaching, Learning & Digital Pedagogy

Papers 1–93 (93 papers)

Paper 1:

Impact of Artificial Intelligence-Enhanced Learning on Secondary School Students' Mathematics Achievement: Evidence from Nigeria

Olaiya Segun Maruf, Ajala Iyabo Romoke, Makinde Folorunso Babatunde

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The research was designed to find out the effect of AI-enhanced learning on academic performance of senior secondary school students in Mathematics concepts in Osun State, Nigeria. The study adopted a quasi-experimental research design with 80 students. Mathematics Achievement Test (MAT) with reliability coefficients of 0.85 was used. Results revealed that AI-enhanced learning had a significant effect on students' performance in Mathematics.

Keywords: AI-enhanced learning, Mathematics achievement, Educational technology

Paper 2:

Integrating Artificial Intelligence in the Teaching of Language within Higher Education as a Catalyst for National Development

Obera Joy Aladi

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Integrating AI into language education has moved from a theoretical possibility to a pedagogical necessity. This study explores how AI-driven tools—including Natural Language Processing (NLP), intelligent tutoring systems, and generative AI—are reshaping language instruction at the university level. The integration of these technologies facilitates personalized learning pathways, provides real-time feedback, and increases accessibility to high-quality instruction across geographic and socioeconomic barriers. Beyond individual learning gains, this research argues that AI-enhanced language proficiency is a strategic lever for national development. By

improving the communicative competence and global competitiveness of the workforce, higher education institutions directly contribute to human capital development, cross-cultural collaboration, and national policy goals, such as the promotion of multilingualism. However, full-scale implementation is often hindered by digital infrastructure deficits, insufficient AI literacy among educators, and ethical concerns regarding data privacy and algorithmic bias. The study concludes that for AI to truly drive national progress, governments and institutions must prioritize inclusive policy frameworks and professional development that align technological innovation with local educational realities.

Keywords: Artificial Intelligence, Language Education, Higher Education, National Development, Personalized Learning, AI Literacy

Paper 3:

Artificial Intelligence Adoption for Sustainable Development in Higher Education: Challenges, Prospects and Strategies in Nigeria

Muraina Kamilu Olanrewaju, Obera Aladi Joy

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This study examines the adoption of Artificial Intelligence (AI) for sustainable development in higher education in Nigeria, with particular emphasis on its challenges, prospects, and strategic pathways for effective integration. As AI continues to reshape global educational systems, its potential to enhance teaching, learning, research, and administrative efficiency has become increasingly evident. However, in developing contexts such as Nigeria, the adoption of AI remains uneven and constrained by multiple systemic factors. This study adopts a qualitative research approach based on secondary data, drawing from peer-reviewed journal articles, policy documents, institutional reports, and other scholarly sources to provide a comprehensive analysis of AI adoption in Nigerian higher education. The findings reveal that AI holds significant prospects for advancing sustainable development, particularly in improving access to quality education, promoting personalized learning, enhancing research productivity, and increasing

ten districts, exploring the COVID-19-induced possibilities and challenges faced. The study reveals a mixed bag of findings, ranging from unpleasant encounters to eye-opening discoveries, made more interesting by the need for student teachers to meet university requirements as assessed by lecturers who paid periodic supervisory visits. The study concludes that despite the possibilities arising from their experiences, student teachers faced formidable challenges in undertaking teaching practice during the pandemic, recommending a collective approach from all stakeholders when dealing with the supervision and assessment of student teachers during teaching practice amid epidemics such as COVID-19.

Keywords: Student Teachers, Teaching Practice, COVID-19, Challenges, Possibilities

Paper 35:

Artificial Intelligence and Digital Learning for Workforce Productivity and Efficiency: Transforming Continuing Education and e-Learning in African Universities

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The Fourth Industrial Revolution has reshaped continuing education, compelling higher education institutions to adopt digital solutions that strengthen workforce productivity and efficiency, lifelong learning, and institutional competitiveness. Artificial Intelligence (AI) has emerged as a transformative technology capable of personalising learning experiences, automating administrative processes, supporting data-driven decision-making, and enhancing learner engagement. Despite this potential, many continuing education and e-learning centres in Africa continue to grapple with inadequate digital infrastructure, limited staff AI competencies, policy gaps, and resistance to technological change. This paper examines how AI and digital learning technologies can improve workforce efficiency and productivity within continuing education programmes in African universities, guided by the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), adopting a mixed-methods design involving administrators, lecturers, instructional designers, and adult learners from selected universities. The study anticipates that effective AI integration will significantly enhance administrative efficiency, teaching quality, learner retention, staff productivity, and institutional responsiveness to labour-market demands, arguing that sustainable implementation depends on strategic leadership, investment in digital infrastructure, continuous staff capacity

development, robust governance frameworks, and clear ethical guidelines for AI deployment. The paper concludes that continuing education centres must reposition themselves as innovation hubs that leverage AI to advance flexible, inclusive, and high-quality lifelong learning, contributing directly to Sustainable Development Goals 4, 8, 9, and 17.

Keywords: Artificial Intelligence, Continuing Education, e-Learning, Workforce Productivity, Digital Transformation, Africa

Paper 36:

Parental Involvement in Early Childhood Education and Child Development

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Parental involvement is widely recognized as a critical factor in the success of early childhood education and the holistic development of children. In communities such as Eha Amufu, where socio-economic conditions and cultural practices shape educational experiences, the role of parents in supporting early learning is particularly significant. This study examines the impact of parental involvement on child development outcomes, focusing on literacy, numeracy, emotional well-being, and social skills, using a mixed-methods approach with data collected through surveys, interviews, and classroom observations involving parents, teachers, and caregivers in Eha Amufu. The research seeks to identify the extent of parental participation, challenges hindering active involvement, and strategies to enhance collaboration between parents and educators, with findings expected to demonstrate how parental support contributes to improved academic readiness, emotional resilience, and social integration among children.

Keywords: Parental Involvement, Early Childhood Education, Child Development, Eha Amufu, Family-School Partnership

Paper 37:

Impact of Curriculum Innovation on Student Achievement in Eha Amufu

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Curriculum innovation is widely recognized as a key driver of educational improvement, particularly in enhancing student achievement and preparing learners for contemporary challenges. In rural communities such as Eha Amufu, curriculum reforms are essential for bridging gaps in access, quality, and relevance of education. This study investigates the impact of curriculum innovation on student achievement in Eha Amufu, focusing

**Artificial Intelligence and Digital Learning for Workforce Productivity and Efficiency:
Transforming Continuing Education and e-Learning in African Universities**

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Abstract

The Fourth Industrial Revolution has reshaped continuing education, compelling higher education institutions to adopt digital solutions that strengthen workforce productivity and efficiency, lifelong learning and institutional competitiveness. Artificial Intelligence (AI) has emerged as a transformative technology capable of personalising learning experiences, automating administrative processes, supporting data-driven decision-making and enhancing learner engagement. Despite this potential, many continuing education and e-learning centres in Africa continue to grapple with inadequate digital infrastructure, limited staff AI competencies, policy gaps and resistance to technological change. This paper examines how AI and digital learning technologies can improve workforce efficiency and productivity within continuing education programmes in African universities. Guided by the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), the study adopts a mixed-methods design involving administrators, lecturers, instructional designers and adult learners from selected universities. Data will be collected through structured questionnaires, interviews and institutional document analysis to assess AI readiness, digital competence, employee productivity, learner satisfaction and organisational performance. The study anticipates that effective AI integration will significantly enhance administrative efficiency, teaching quality, learner retention, staff productivity and institutional responsiveness to labour-market demands. It further argues that sustainable implementation depends on strategic leadership, investment in digital infrastructure, continuous staff capacity development, robust governance frameworks and clear ethical guidelines for AI deployment. The paper concludes that continuing education centres must reposition themselves as innovation hubs that leverage AI to advance flexible, inclusive and high-quality lifelong learning, offering practical recommendations for university administrators, policymakers and educational leaders seeking to strengthen workforce productivity and efficiency and accelerate digital transformation across African higher education. The study contributes directly to Sustainable Development Goals (SDGs) 4 (Quality Education), 8 (Decent Work and Economic Growth), 9 (Industry, Innovation and Infrastructure) and 17 (Partnerships for the Goals).

Keywords: Artificial Intelligence; Continuing Education; e-Learning; Workforce Productivity; Digital Transformation; Africa.

1.0 Introduction

1.1 Background to the Study

The Fourth Industrial Revolution (4IR) has redefined how knowledge is produced, shared and applied in the workplace, placing continuing education and lifelong learning at the centre of national development agendas (Zakari, 2020). Artificial Intelligence (AI) is increasingly recognised as a driver of institutional transformation, capable of personalising instruction, automating routine administrative work and generating insight from institutional data that would otherwise remain untapped (George & Wooden, 2023). Continuing education units, corporate training departments and university-based lifelong learning centres are simultaneously under pressure to demonstrate measurable contributions to workforce productivity, as employers increasingly expect graduates and re-skilled professionals to keep pace with fast-changing labour-market demands (Zakari, 2020).

Digital learning technologies, ranging from learning management systems to AI-driven tutoring and analytics tools, offer a pathway to scale continuing education delivery, personalise support for adult learners and free instructional staff from repetitive administrative tasks so that they can focus on higher-value teaching and mentoring functions (George & Wooden, 2023; Maiga et al., 2020). Yet the promise of AI in African continuing education contexts remains constrained by structural realities. Studies of AI adoption across African higher education institutions consistently identify inadequate digital infrastructure, unreliable electricity and internet connectivity, low device ownership among staff and learners, and limited institutional AI competence as recurring barriers (Hlongwane et al., 2024; Krönke, 2020). These constraints are compounded by governance gaps, as many institutions have yet to develop clear policies on data protection, algorithmic transparency or the ethical use of AI in teaching and administration (Afolabi, 2024; Kizito & Banothile, 2021).

1.2 Statement of the Problem

Despite growing global evidence of AI's potential to improve workforce productivity, continuing education and e-learning centres in African universities have been slow and uneven adopters of these technologies. Existing literature on AI in African higher education has concentrated heavily on ethical concerns, general adoption barriers, or student-facing e-learning, largely in isolation from the workforce productivity outcomes of the administrators, lecturers and instructional designers who deliver continuing education programmes themselves (Afolabi, 2024; Maiga et al., 2020). Comparatively little empirical work has applied established technology-acceptance theory to continuing education contexts in Nigerian or other African universities specifically. This creates a gap in the evidence available to institutional leaders seeking to understand how, and under what conditions, AI adoption translates into measurable improvements in administrative efficiency, teaching quality and staff productivity within continuing education programmes. This paper responds directly to that gap.

1.3 Objectives of the Study

The broad objective of this study is to examine the role of AI and digital learning technologies in improving workforce efficiency and productivity within continuing education programmes in African universities. The specific objectives are to:

- i. assess the level of AI readiness and digital competence among administrators, lecturers, instructional designers and adult learners in selected continuing education and e-learning centres;
- ii. examine the relationship between AI adoption and administrative efficiency in continuing education programmes;

- iii. evaluate the influence of digital learning technologies on staff productivity, teaching quality and learner satisfaction;
- iv. identify the infrastructural, policy and competency challenges limiting AI integration in continuing education centres; and
- v. propose strategies for the sustainable integration of AI to strengthen workforce productivity and institutional responsiveness to labour-market demands.

1.4 Research Questions

- i. What is the level of AI readiness and digital competence among staff and learners in selected continuing education centres?
- ii. What relationship exists between AI adoption and administrative efficiency in continuing education programmes?
- iii. How do digital learning technologies influence staff productivity, teaching quality and learner satisfaction?
- iv. What infrastructural, policy and competency challenges limit AI integration in continuing education centres?
- v. What strategies can support the sustainable integration of AI in continuing education programmes?

1.5 Significance of the Study

The study is expected to benefit university administrators and continuing education managers by providing an evidence base for planning AI-related investments; policymakers, by informing governance frameworks and ethical guidelines for AI deployment in higher education; lecturers and instructional designers, by clarifying the conditions under which AI adoption supports rather than burdens their work; and adult learners, whose learning experience and outcomes stand to benefit from better-targeted digital learning tools. The study also contributes to the growing scholarly literature on technology acceptance in African higher education and speaks directly to Sustainable Development Goals 4, 8, 9 and 17.

1.6 Scope of the Study

The study is delimited to continuing education and e-learning centres in selected Nigerian universities and focuses specifically on workforce productivity outcomes for administrators, lecturers, instructional designers and adult learners engaged in continuing education programmes. It does not extend to undergraduate degree programmes or to AI applications outside the continuing education and lifelong learning context.

2.0 Literature Review

2.1 Conceptual Review

Artificial Intelligence in education refers to the use of computational systems that can personalise content, automate assessment and administrative tasks, and support data-driven decision-making

within teaching and learning environments (George & Wooden, 2023). Digital learning encompasses the broader set of technologies, including learning management systems, mobile learning platforms and adaptive learning tools, through which instruction is delivered, tracked and assessed electronically. Continuing education, meanwhile, refers to structured post-graduation or in-service learning opportunities designed to update the knowledge and skills of the existing workforce, and is closely tied to the wider concept of lifelong learning (Zakari, 2020).

2.2 AI Applications in African Higher Education

African universities have begun to explore a range of AI applications, including adaptive learning platforms, AI-enhanced research support tools and automated administrative systems, although adoption remains uneven and generally at an early stage compared with more digitally mature regions (Hlongwane et al., 2024). Where AI has been adopted, institutions report gains in administrative efficiency, expanded access to learning resources and improved capacity for data-informed institutional planning (George & Wooden, 2023; Maiga et al., 2020). These early applications suggest considerable unrealised potential for continuing education centres, which typically serve working adult learners who need flexible, self-paced and personalised learning pathways.

2.3 Challenges to AI and Digital Learning Adoption in Africa

The literature converges on a consistent set of barriers to AI and digital learning adoption in African higher education. Infrastructural constraints, including unreliable electricity, limited broadband access and low personal device ownership among staff and students, remain among the most frequently cited obstacles (Krönke, 2020). Institutional constraints compound these problems: many universities lack the trained personnel, structured professional development programmes and technical support needed to sustain AI-enabled systems (Hlongwane et al., 2024). Governance and ethical concerns add a further layer of difficulty, as African higher education institutions frequently lack clear policies on data privacy, algorithmic transparency and responsible AI use, leaving staff and learners exposed to unaddressed risks (Afolabi, 2024; Kizito & Banothile, 2021).

2.4 Workforce Productivity and Continuing Education

Workforce productivity in the higher education context is generally understood in terms of administrative efficiency, teaching quality, staff output and institutional responsiveness to changing labour-market needs. Continuing education has long been identified as a critical mechanism for sustaining workforce productivity, since it allows workers to update their skills without a full return to formal schooling (Zakari, 2020). As labour markets change more rapidly under the influence of automation and AI, the capacity of continuing education centres to deliver flexible, technology-enabled learning becomes an increasingly important determinant of both individual employability and institutional competitiveness.

2.5 Summary and Gap in Literature

While the reviewed literature establishes both the potential benefits and the persistent barriers associated with AI adoption in African higher education, few studies examine these dynamics specifically within continuing education and e-learning centres, or connect them explicitly to workforce productivity outcomes using an established technology-acceptance framework. This study addresses that gap by applying the Technology Acceptance Model and the Unified Theory

of Acceptance and Use of Technology to the continuing education context in selected Nigerian universities.

3.0 Theoretical Framework

3.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Davis (1989), proposes that an individual's intention to use a technology is shaped primarily by two beliefs: perceived usefulness, the degree to which a person believes a technology will enhance their performance, and perceived ease of use, the degree to which a person believes using the technology will be free of effort. TAM provides a parsimonious lens through which to examine how administrators, lecturers and instructional designers form judgements about whether AI tools are worth adopting in their day-to-day continuing education work.

3.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology, developed by Venkatesh et al. (2003), extends TAM by integrating constructs from eight prior technology-acceptance models into four core determinants of behavioural intention and use: performance expectancy, effort expectancy, social influence and facilitating conditions. UTAUT has been widely and successfully applied to e-learning adoption studies in developing-country university settings, where it has been shown to significantly predict both behavioural intention to use e-learning systems and actual usage behaviour (Abbad, 2021). A recent systematic review confirms that performance expectancy is consistently the strongest predictor of behavioural intention across higher education technology-acceptance studies (Xue et al., 2024).

3.3 Application to the Present Study

This study adopts a combined TAM-UTAUT framework, using perceived usefulness, perceived ease of use, performance expectancy, effort expectancy, social influence and facilitating conditions as the principal constructs guiding the design of data-collection instruments. This combined approach allows the study to capture both the individual cognitive judgements emphasised by TAM and the broader social and institutional facilitating conditions emphasised by UTAUT, which are particularly relevant given the infrastructural and policy constraints documented in the African higher education literature.

4.0 Methodology

4.1 Research Design

The study adopts a concurrent mixed-methods design, combining a quantitative cross-sectional survey with qualitative interviews and institutional document analysis. This design allows numerical patterns of AI readiness, digital competence and productivity to be triangulated against the lived experiences and interpretations of administrators, lecturers, instructional designers and adult learners.

4.2 Population and Sample

The target population comprises administrators, lecturers, instructional designers and adult learners attached to continuing education and e-learning centres in selected Nigerian universities,

including Ibrahim Badamasi Babangida University, Lapai, and the Federal University of Technology, Minna. A multi-stage sampling procedure will be used: purposive selection of participating universities and continuing education centres, followed by stratified random sampling of staff and learners within each centre, to ensure adequate representation across administrative, teaching and learner categories.

4.3 Instrumentation

Data will be collected using three instruments. A structured questionnaire, built around TAM and UTAUT constructs and measured on a five-point Likert scale, will capture AI readiness, digital competence, perceived usefulness and ease of use, performance and effort expectancy, facilitating conditions, and self-reported productivity outcomes. A semi-structured interview guide will be used with a purposively selected subset of administrators and instructional designers to explore contextual factors not easily captured through closed-ended items. An institutional document analysis checklist will guide the review of policy documents, ICT strategy papers and continuing education programme records.

4.4 Validity and Reliability

The questionnaire will be subjected to face and content validity checks by experts in educational technology and measurement, and a pilot test will be conducted with a small sample outside the main study to establish internal consistency reliability using Cronbach's alpha, with a minimum threshold of 0.70 considered acceptable. Qualitative trustworthiness will be supported through triangulation across data sources and member-checking of interview transcripts.

4.5 Data Collection Procedure

Following institutional ethical clearance and informed consent, questionnaires will be administered to sampled staff and learners, interviews will be conducted with purposively selected participants, and relevant institutional documents will be collected and reviewed alongside the primary data.

4.6 Method of Data Analysis

Quantitative data will be analysed using descriptive statistics to summarise readiness and productivity indicators, and inferential statistics, including correlation and multiple regression analysis, to test the relationships between TAM/UTAUT constructs and workforce productivity outcomes. Qualitative data from interviews and document analysis will be analysed thematically to identify recurring patterns, contextual explanations and institutional constraints that complement the quantitative findings.

5.0 Expected Contribution of the Study

The study anticipates that effective AI integration, where supported by adequate infrastructure and staff competence, will be associated with measurable improvements in administrative efficiency, teaching quality, learner retention and institutional responsiveness to labour-market demands. It further expects to confirm that facilitating conditions, encompassing infrastructure, technical support and institutional policy, moderate the strength of the relationship between staff attitudes toward AI and actual productivity outcomes, consistent with prior UTAUT-based research in developing-country higher education settings (Abbad, 2021; Xue et al., 2024). Where AI readiness

or facilitating conditions are found to be weak, the study expects to identify specific, actionable gaps in infrastructure, training or policy that institutional leaders can address.

6.0 Recommendations

- i. University leadership should develop explicit AI adoption strategies for continuing education centres, backed by dedicated budget lines for digital infrastructure and technical support.
- ii. Institutions should invest in continuous, role-specific AI and digital competence training for administrators, lecturers and instructional designers rather than one-off workshops.
- iii. Universities should establish clear governance frameworks covering data protection, algorithmic transparency and ethical AI use before scaling AI-enabled tools across continuing education programmes.
- iv. Continuing education centres should prioritise facilitating conditions, such as reliable connectivity and accessible devices, since these have consistently been shown to shape actual technology use more strongly than attitudes alone.
- v. Policymakers should support inter-institutional partnerships and donor collaboration to close the infrastructural and financing gaps that individual universities cannot close alone.
- vi. Future research should track productivity outcomes longitudinally as AI tools mature, to test whether the relationships proposed in this study strengthen over time.

7.0 Conclusion

Artificial Intelligence and digital learning technologies hold considerable promise for strengthening workforce productivity within continuing education and e-learning centres in African universities. Realising this promise, however, depends on far more than the availability of AI tools: it requires adequate digital infrastructure, sustained staff capacity development, sound governance and an institutional culture that treats continuing education centres as innovation hubs rather than peripheral units. By applying the Technology Acceptance Model and the Unified Theory of Acceptance and Use of Technology to the Nigerian continuing education context, this study aims to provide university administrators, policymakers and educational leaders with an evidence-based understanding of how to translate AI adoption into genuine gains in workforce productivity, learner satisfaction and institutional competitiveness.

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DR MUSA HUSSAINI

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