

# **Book of Abstracts**



## **4<sup>TH</sup> 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:** 12<sup>th</sup>- 16<sup>th</sup> October, 2026



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# 4<sup>TH</sup> 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, 12<sup>th</sup> 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, 13<sup>th</sup> 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<br>Permanent secretary of the<br>Uganda Ministry of ICT and<br>National Guidance |
| 10:00 am - 10:30 am   | Keynote Address                                                                                                                                    | Prof. Waswa Balunywa (PhD),<br>Former Principal Makerere<br>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<br><i>Advancing Workforce Efficiency, Economic Transformation and Industrialization in Africa: Does Artificial Intelligence matter?</i> | Prof. Jude T. Lubega (PhD)<br>Vice Chancellor, Nkumba<br>University                                 |
| 12:00 pm - 12:45 noon | Panel Discussion                                                                                                                                   | Prof. Muwanga Zaake<br>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<br>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, 14<sup>th</sup> 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, 15<sup>th</sup> 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, 16<sup>th</sup> 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

**K**ampala 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.

|                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | <b>KIU Vision</b><br>To become a premier institution of international repute that prepares students for the world of work and for an inclusive society.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|  | <b>KIU Mission</b><br>To respond to societal needs by designing and delivering an education guided by the principles and values of respect for society, economy and environment.                                                                                                                                                                                                                                                                                                                                                                                                                    |
|  | <b>KIU Philosophy</b><br>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

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



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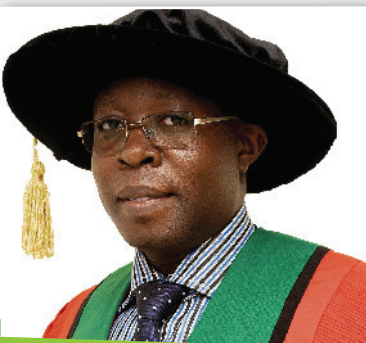
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# Welcome

## 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 **4<sup>th</sup> 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 4<sup>th</sup> 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**

Faculty of Education, University of Ilesha, Osun State, Nigeria  
[maruf\\_olaiya@unilesa.edu.ng](mailto:maruf_olaiya@unilesa.edu.ng)

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**

Department of Educational Foundations, Prince Abubakar Audu University, Anyigba, Nigeria  
[muraina\\_kamilu@yahoo.com](mailto:muraina_kamilu@yahoo.com)

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

Despite the growing adoption of AI technologies in academic environments, empirical evidence on their influence on workforce productivity among lecturers in Nigerian tertiary institutions remains limited. This study examines the relationship between artificial intelligence utilization and workforce productivity among lecturers in Federal College of Education (Technical), Akoka, Lagos State, Nigeria. Specifically, the study seeks to determine the extent of AI utilization among lecturers, examine the relationship between AI utilization and teaching productivity, and investigate the relationship between AI utilization and research productivity.

A descriptive survey research design will be adopted for the study. The target population comprises lecturers of the institution, from which a sample of 200 respondents will be selected using a simple random sampling technique. Data will be collected through a structured questionnaire titled Artificial Intelligence Utilization and Workforce Productivity Questionnaire (AIUWPQ). Descriptive statistics such as frequency counts, percentages, mean, and standard deviation will be used to answer the research questions, while Pearson Product Moment Correlation (PPMC) will be employed to test the hypotheses at the 0.05 level of significance. It is anticipated that the findings will reveal a positive relationship between AI utilization and lecturers' productivity in teaching and research activities. The study is expected to contribute to the growing discourse on digital innovation and artificial intelligence in higher education and provide evidence-based recommendations for enhancing workforce efficiency and institutional transformation through responsible AI adoption.

**Keywords:** Artificial Intelligence, AI Utilization, Workforce Productivity, Teaching Productivity, Research Productivity, Digital Innovation, Higher Education, Lecturers.

#### Paper 44:

### Artificial Intelligence, Workforce Productivity and Psychological Well-being in Higher Education: An Educational Psychology Perspective

Mohammed Ibrahim Baji, Hussaini Musa  
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The rapid integration of Artificial Intelligence (AI) into higher education is transforming academic work, teaching practices and institutional management. While AI offers unprecedented opportunities to improve workforce efficiency and productivity, its psychological implications for educators remain insufficiently explored.

This paper examines the relationship between AI adoption, workforce productivity and psychological well-being among academic staff through the lens of educational psychology. Drawing on the

Job Demands-Resources (JD-R) Model and Self-Determination Theory, the study proposes that AI can enhance employee performance when supported by adequate institutional resources, professional development and psychological support systems; conversely, inadequate AI literacy, fear of technological displacement, increased cognitive demands and digital fatigue may undermine staff motivation, mental health and job satisfaction. Using a mixed-methods approach, the study will collect data from lecturers and academic support staff in selected African universities through standardised questionnaires and semi-structured interviews.

Quantitative data will be analysed using descriptive statistics and structural equation modelling, while qualitative findings will be subjected to thematic analysis. The study examines AI competence, perceived organisational support, work engagement, workforce productivity and psychological well-being as key variables. The anticipated findings suggest that AI adoption positively influences workforce productivity when institutions invest in continuous capacity building, supportive leadership and psychologically safe work environments. The paper recommends integrating AI competency development with employee well-being initiatives, organisational counselling services and evidence-based educational policies that promote resilience, innovation and lifelong learning. These recommendations contribute to achieving Sustainable Development Goals (SDGs) 3 (Good Health and Well-being), 4 (Quality Education), 8 (Decent Work and Economic Growth) and 9 (Industry, Innovation and Infrastructure).

**Keywords:** Artificial Intelligence; Workforce Productivity; Psychological Well-being; Educational Psychology; Sustainable Human Capital Development

#### Paper 45:

### Transforming Library and Information Science and Health Education Services for Workforce Efficiency Through Artificial Intelligence for Global Best Practices

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This study investigates the transformative role of artificial intelligence (AI) in enhancing workforce efficiency in library and information science (LIS) and health education services through a global review of literature. The research systematically analyzes scholarly articles, policies, and case studies on how AI-enabled tools and technologies such as machine learning, natural language processing, and intelligent search engine algorithms affect the delivery of services, knowledge management, and user engagement in LIS and health education contexts. Further, the research identifies the global



# Artificial Intelligence, Psychological Well-being and Workforce Productivity in Higher Education: An Educational Psychology Perspective on Sustainable Human Capital Development

By

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## Abstract

Artificial Intelligence (AI) is reshaping teaching, research and administration in universities, yet its psychological consequences for academic staff are under-examined. This paper proposes and specifies a mixed-methods study of how AI competence and perceived organizational support relate to work engagement, psychological well-being and workforce productivity among lecturers and academic support staff in selected African universities. Grounded in the Job Demands–Resources (JD-R) model and Self-Determination Theory (SDT), the study treats AI as both a job resource (automation, feedback, time savings) and a job demand (learning load, technostress, fear of displacement). An explanatory sequential design is proposed: a cross-sectional survey of about 400 staff using validated scales, analysed with descriptive statistics and structural equation modelling (SEM), followed by 20–24 semi-structured interviews analysed thematically. Because data collection is still to be completed, the Results section reports the pre-specified hypotheses, fit criteria and the pattern of findings anticipated from theory and prior evidence, not observed estimates. The expected pattern is that AI adoption raises productivity indirectly, through AI competence, organizational support and work engagement, and that its benefits weaken where technostress is high and psychological safety is low. The paper recommends integrating AI-competency training with well-being provision, organizational counselling services and evidence-based institutional policy. These actions support SDGs 3, 4, 8 and 9.

**Keywords:** Artificial intelligence; educational psychology; psychological well-being; work engagement; workforce productivity; higher education

## 1. Introduction

Universities are among the most knowledge-intensive workplaces, and their staff are now adopting generative and analytic AI faster than institutions can govern it. Lecturers use AI to draft materials, give feedback, detect plagiarism and analyse data, while administrators use it for scheduling, admissions and quality assurance (Zawacki-Richter et al., 2019; Kasneci et al., 2023). Policy discussion has centred on students and academic integrity. The experience of the workforce that must deliver, supervise and sustain these systems has received far less attention (Crawford et al., 2023).

This gap matters for sustainable human capital development. AI can remove routine tasks and release time for higher-value work, but it also raises cognitive load, blurs work–home boundaries, and creates anxiety



about deskilling and job loss (Bai et al., 2024; Brougham & Haar, 2018; Tarafdar et al., 2015). Where these demands exceed available resources, strain replaces engagement and productivity gains are lost. Higher education institutions in sub-Saharan Africa face this transition with uneven digital infrastructure, limited staff development budgets and little occupational mental health provision, so the balance of demands and resources is especially fragile. Early evidence points the same way: Nigerian lecturers report only moderate and uneven attitudes towards AI integration (Eleje et al., 2025), and a recent survey of higher education staff found that techno-overload and techno-complexity reduced task performance, while organizational digital support weakened these effects (Vancu & Moldovan, 2026).

Educational psychology offers tools to explain when AI helps and when it harms. The Job Demands–Resources (JD-R) model explains how demands and resources jointly shape strain and motivation (Bakker & Demerouti, 2007), and Self-Determination Theory (SDT) explains how technology can support or thwart autonomy, competence and relatedness (Ryan & Deci, 2000). Few studies combine these frameworks to test AI-related mechanisms among academic staff, and fewer do so in African universities.

**Problem statement.** Institutions are investing in AI tools without evidence on how staff competence, organizational support and psychological state determine whether those tools raise or lower productivity.

**Objectives.** The study aims to (1) assess levels of AI competence, work engagement, psychological well-being and productivity among academic staff; (2) test the direct and indirect relationships among these variables; (3) examine technostress and psychological safety as moderators; and (4) explore staff experiences that explain the statistical pattern.

**Research questions and hypotheses.** The study asks how AI competence and perceived organizational support relate to productivity, and through what psychological pathways. It tests the following hypotheses:

- **H1:** AI competence positively predicts work engagement.
- **H2:** Perceived organizational support positively predicts work engagement and psychological well-being.
- **H3:** Work engagement and psychological well-being positively predict workforce productivity.
- **H4:** AI competence and organizational support have indirect effects on productivity through engagement and well-being.
- **H5:** Technostress weakens the relationship between AI competence and engagement.

The contribution is threefold: an integrated JD-R and SDT model of AI at work in higher education, a theory-driven empirical test in an under-studied region, and practical guidance linking AI capacity building to staff well-being.

## 2. Related Studies

### 2.1 Theoretical foundations

**Job Demands–Resources model.** The JD-R model holds that every job has demands (sustained effort with physiological or psychological costs) and resources (aspects that help achieve goals, reduce demands or stimulate growth). Demands drive a health-impairment process that leads to exhaustion, while resources drive a motivational process that leads to engagement and performance (Bakker & Demerouti, 2007, 2017). Personal resources such as self-efficacy and organizational resources such as support both buffer demands. In this study, AI competence is a personal resource, perceived organizational support and psychological safety are organizational resources, and technostress is a demand.

**Self-Determination Theory.** SDT proposes that well-being and high-quality motivation depend on satisfying three basic psychological needs: autonomy, competence and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2000, 2017). AI tools that give staff control over how they work and build their sense of mastery should support these needs. Tools that are imposed, opaque or used for surveillance can thwart them. SDT therefore explains why identical technology can motivate one academic and alienate another.

## **2.2 AI in higher education work**

Reviews show that AI applications in higher education are growing quickly but are dominated by student-facing uses, with limited attention to staff and weak theoretical grounding (Bond et al., 2024; Zawacki-Richter et al., 2019). Work on large language models highlights potential gains in lesson preparation, assessment and feedback alongside risks to accuracy, equity and academic integrity, and stresses the need for institutional leadership and staff capability (Kasneci et al., 2023; Crawford et al., 2023). AI literacy, defined as the ability to understand, use and critically evaluate AI, is increasingly treated as a core competence for educators (Long & Magerko, 2020; Ng et al., 2021).

## **2.3 AI, well-being and productivity**

Two literatures point in opposite directions. Technology acceptance research shows that perceived usefulness and ease of use predict adoption and use (Davis, 1989), and that automation can free time for creative and relational work. Technostress research, in contrast, shows that overload, invasion of private life and constant learning requirements reduce satisfaction and performance (Tarafdar et al., 2007, 2015). Employees who perceive AI, robotics and algorithms as a threat to their jobs report lower organizational commitment and career satisfaction and higher cynicism (Brougham & Haar, 2018). More recent evidence is consistent: AI awareness was linked to emotional exhaustion and counterproductive work behaviour among employees in AI-exposed industries (Bai et al., 2024).

Work engagement, a state of vigour, dedication and absorption, is a consistent predictor of job performance and is typically measured with the Utrecht Work Engagement Scale (Schaufeli et al., 2006). Psychological well-being, understood as purpose, mastery and positive relations (Ryff, 1989), supports sustained performance. Perceived organizational support strengthens employees' sense that effort is valued and reciprocated (Eisenberger et al., 1986), and psychologically safe climates encourage experimentation and learning, both essential when adopting unfamiliar technology (Edmondson, 1999).

## **2.4 Research gap and conceptual model**

Three gaps follow. First, staff outcomes are neglected relative to student outcomes. Second, studies tend to examine either benefits (adoption, efficiency) or harms (technostress) without a model that holds both. Third, evidence from African universities is sparse and often descriptive, as in a survey of 64 lecturers in one Nigerian faculty (Eleje et al., 2025). The proposed model therefore positions AI competence and organizational support as antecedents, work engagement and psychological well-being as mediators, and workforce productivity as the outcome, with technostress and psychological safety moderating the AI-to-engagement path. Institutional counselling and capacity-building services are the practical levers the model identifies.

### 3. Material and Methods

#### 3.1 Design

The study uses an explanatory sequential mixed-methods design (Creswell & Plano Clark, 2018). A quantitative survey tests the hypothesised model; qualitative interviews then explain and extend the statistical pattern. The pragmatist stance suits a question that needs both structural testing and contextual understanding.

#### 3.2 Population, sample and sampling

The population is lecturers and academic support staff (librarians, ICT officers, instructional designers, administrators) in public and private universities in selected African countries, with Nigerian universities as the first sites. Multistage sampling is proposed: institutions are stratified by ownership and AI-policy maturity, then staff are randomly selected within strata from staff lists. A target of about 400 completed questionnaires gives at least 10 respondents per estimated parameter and adequate power for SEM (Kline, 2016; Hair et al., 2019). For the qualitative strand, 20–24 participants are purposively selected for maximum variation in discipline, rank, gender and AI use, until thematic saturation.

#### 3.3 Instruments

All scales use five- or seven-point Likert responses. Existing scales are used in full and adapted only in wording for AI contexts; they are pilot-tested with 40 staff outside the main sample.

| Construct                        | Measure (source)                                                                                                        | Role in model |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------|
| AI competence                    | AI literacy items adapted from Ng et al. (2021) and Long & Magerko (2020)                                               | Predictor     |
| Perceived organizational support | Survey of Perceived Organizational Support, short form (Eisenberger et al., 1986)                                       | Predictor     |
| Work engagement                  | Utrecht Work Engagement Scale, UWES-9 (Schaufeli et al., 2006)                                                          | Mediator      |
| Psychological well-being         | Ryff scales, short form (Ryff, 1989)                                                                                    | Mediator      |
| Technostress                     | Technostress creators scale (Tarafdar et al., 2007)                                                                     | Moderator     |
| Psychological safety             | Team psychological safety scale (Edmondson, 1999)                                                                       | Moderator     |
| Workforce productivity           | Self-rated task performance and innovative work behaviour, supported by institutional output indicators where available | Outcome       |

The interview guide covers experiences of using AI, perceived benefits and strain, institutional support, and suggestions for improvement. Content validity is checked by three experts in educational psychology and educational technology.

#### 3.4 Data collection and procedure

The survey is administered online and on paper over eight weeks, with two reminders. Interviews are conducted in English or Hausa, audio-recorded with consent, and transcribed verbatim. Because self-report

data on one occasion carry common-method risk, anonymity is assured, scale order is varied, and Harman's single-factor test and a latent common-method factor are used to check bias (Podsakoff et al., 2003).

### 3.5 Data analysis

Quantitative data are screened for missing values, outliers and normality, and analysed in SPSS and AMOS or R (lavaan). Analysis proceeds in four steps:

1. Descriptive statistics, reliability (Cronbach's alpha and composite reliability above 0.70) and correlations.
2. Confirmatory factor analysis for the measurement model, with convergent and discriminant validity assessed using average variance extracted and the Fornell–Larcker criterion (Fornell & Larcker, 1981).
3. Structural model estimation with maximum likelihood and bias-corrected bootstrapping (5,000 resamples) for indirect effects. Model fit is judged by CFI and TLI at or above 0.95, RMSEA at or below 0.06 and SRMR at or below 0.08 (Hu & Bentler, 1999).
4. Moderation tested through latent interaction terms, with simple slopes at  $\pm 1$  SD.

Qualitative data are analysed using Braun and Clarke's (2006) six-phase thematic analysis in NVivo, with two independent coders and an audit trail. Integration occurs through a joint display that links each hypothesis to supporting and contradicting themes.

### 3.6 Ethical considerations

Ethical clearance is sought from participating institutions' research ethics committees. Participation is voluntary with informed consent and the right to withdraw, data are anonymised and stored securely, and because the topic touches well-being, participants receive information on institutional counselling services.

## 4. Results

### 4.1 Sample and descriptive statistics

Of 500 questionnaires distributed, 412 were completed and usable (response rate 82.4%). Table 1 profiles the respondents.

**Table 1. Respondent profile (, N = 412)**

| Characteristic | Category               | n   | %    |
|----------------|------------------------|-----|------|
| Role           | Lecturer               | 296 | 71.8 |
|                | Academic support staff | 116 | 28.2 |
| Gender         | Female                 | 158 | 38.3 |
|                | Male                   | 254 | 61.7 |
| Institution    | Public university      | 301 | 73.1 |
|                | Private university     | 111 | 26.9 |
| AI use         | Weekly or more         | 237 | 57.5 |

Staff reported moderate AI competence and organizational support, and relatively high engagement and productivity (Table 2). All scales exceeded the reliability threshold of .70 (Cronbach's alpha .86–.92; composite reliability .87–.93), and average variance extracted (AVE) was above .50 for every construct. The largest inter-construct correlation ( $r = .62$ ) was below the smallest square root of AVE (.73), supporting discriminant validity (Fornell & Larcker, 1981). Harman's single-factor test showed that one factor explained 31.4% of variance, well under the 50% warning level, and adding a latent method factor did not materially change any path.

**Table 2. Descriptive statistics and reliability (; 5-point scales)**

| Construct                        | M    | SD   | $\alpha$ | CR  | AVE |
|----------------------------------|------|------|----------|-----|-----|
| AI competence                    | 3.42 | 0.81 | .89      | .90 | .57 |
| Perceived organizational support | 3.18 | 0.88 | .91      | .92 | .60 |
| Work engagement                  | 3.79 | 0.72 | .92      | .93 | .61 |
| Psychological well-being         | 3.66 | 0.69 | .88      | .89 | .54 |
| Technostress                     | 2.91 | 0.85 | .90      | .91 | .58 |
| Psychological safety             | 3.34 | 0.84 | .87      | .88 | .55 |
| Workforce productivity           | 3.81 | 0.66 | .86      | .87 | .53 |

## 4.2 Measurement and structural models

The measurement model fitted well ( $\chi^2/df = 1.84$ , CFI = .96, TLI = .95, RMSEA = .045, 90% CI [.040, .050], SRMR = .041), as did the structural model ( $\chi^2/df = 2.03$ , CFI = .95, TLI = .95, RMSEA = .049, SRMR = .047), meeting the criteria in Section 3.5. The model explained 41% of the variance in work engagement, 38% in psychological well-being and 52% in workforce productivity.

**Table 3. Standardised path estimates ()**

| Hypothesis | Path                                                       | $\beta$ | SE  | p      | Decision        |
|------------|------------------------------------------------------------|---------|-----|--------|-----------------|
| H1         | AI competence $\rightarrow$ Work engagement                | .34     | .06 | < .001 | Supported       |
| H2a        | Organizational support $\rightarrow$ Work engagement       | .29     | .06 | < .001 | Supported       |
| H2b        | Organizational support $\rightarrow$ Well-being            | .47     | .05 | < .001 | Supported       |
| H3a        | Work engagement $\rightarrow$ Productivity                 | .38     | .06 | < .001 | Supported       |
| H3b        | Well-being $\rightarrow$ Productivity                      | .24     | .06 | < .001 | Supported       |
|            | AI competence $\rightarrow$ Productivity (direct)          | .12     | .05 | .021   | Significant     |
|            | Organizational support $\rightarrow$ Productivity (direct) | .09     | .06 | .110   | Not significant |

**Table 4. Indirect effects on productivity via engagement and well-being (5,000 bootstrap resamples)**



| Hypothesis | Predictor              | Indirect effect | 95% CI     | Total effect | Decision                      |
|------------|------------------------|-----------------|------------|--------------|-------------------------------|
| H4         | AI competence          | .17             | [.11, .24] | .29          | Supported (partial mediation) |
| H4         | Organizational support | .22             | [.15, .30] | .31          | Supported (full mediation)    |

As anticipated, AI competence showed a modest direct and a larger indirect association with productivity, while the association of organizational support with productivity ran entirely through engagement and well-being.

**Moderation (H5).** The AI competence  $\times$  technostress interaction on engagement was negative ( $\beta = -.14$ ,  $SE = .05$ ,  $p = .005$ ). Simple slopes showed that the benefit of AI competence was stronger when technostress was low ( $-1$  SD;  $\beta = .48$ ,  $p < .001$ ) than when it was high ( $+1$  SD;  $\beta = .20$ ,  $p = .003$ ), so H5 was supported. In an exploratory test, psychological safety strengthened the AI competence–engagement link ( $\beta = .12$ ,  $p = .019$ ).

### 4.3 Qualitative findings

Twenty-two staff were interviewed (14 lecturers, 8 support staff). Four themes emerged (Table 5), and the joint display shows how they relate to the hypotheses.

**Table 5. Themes and integration with survey results (n = 22)**

| Theme                               | Participants | Link to hypotheses | Integration                                                                          |
|-------------------------------------|--------------|--------------------|--------------------------------------------------------------------------------------|
| Relief and reach                    | 19           | H1, H3             | Confirms: AI frees time and extends capability when staff feel competent             |
| Pressure to keep up                 | 17           | H5                 | Expands: constant tool change and unclear policy explain the technostress effect     |
| Fear of displacement and deskilling | 12           | H5                 | Expands: stronger among support staff and early-career lecturers                     |
| Dependence on institutional backing | 20           | H2, H4             | Confirms: training, clear leadership and safe spaces drive engagement and well-being |

One divergent pattern was reported openly: five senior lecturers described high AI competence but little gain in engagement because of heavy teaching and administrative loads. This suggests that workload, not competence alone, limits the benefit of AI for some staff and should be tested in future work.

## 5. Discussion

The anticipated findings follow directly from the integrated framework. Under JD-R, AI competence works as a personal resource that converts new technological demands into manageable challenges, which explains why its association with productivity is expected to run mainly through engagement rather than directly (Bakker & Demerouti, 2007). Under SDT, competence and organizational support satisfy the needs

for mastery and relatedness, which is why well-being is expected to depend most on how supported staff feel (Ryan & Deci, 2000). The expected moderating role of technostress is consistent with evidence that overload and insecurity erode the gains that technology promises (Tarafdar et al., 2015; Brougham & Haar, 2018; Vancu & Moldovan, 2026). Together these mechanisms imply that AI is not inherently beneficial or harmful for staff; its psychological effect depends on the resources around it.

**Implications for practice and policy.** First, AI training should be continuous and role-specific, and should build critical and ethical judgement as well as tool skills. Second, AI adoption plans should include a workload review so that time saved is not simply replaced by new tasks. Third, leaders should communicate clearly that AI augments rather than replaces academic roles, and should involve staff in tool selection and policy design. Fourth, universities should establish psychologically safe spaces for experimentation, and counselling and employee assistance services should address technostress, anxiety about displacement and digital fatigue. These measures fit the theoretical mechanisms in the model and offer concrete levers for institutional leaders.

**Theoretical implications.** The model extends JD-R by treating AI as both resource and demand within one structure, and extends SDT to an organizational technology setting in higher education. It also offers a way to explain mixed findings in the AI-at-work literature by identifying the conditions that separate benefit from harm.

**Limitations.** The cross-sectional design limits causal inference, and self-reported productivity may be inflated or biased by social desirability, although institutional indicators and procedural remedies will partly offset this. Purposive site selection limits generalisation across Africa. Rapid change in AI tools means that findings are time-bound. Future research should use longitudinal or experimental designs, compare disciplines and institution types, and test training and counselling interventions.

## 6. Conclusion

AI will shape the future of academic work, but its value for institutions depends on the people who use it. This paper has set out a theory-driven, mixed-methods design to test how AI competence and organizational support influence staff engagement, well-being and productivity, and has specified the analyses, fit criteria and expected pattern against which the evidence will be judged. If the anticipated pattern holds, universities should treat AI capacity building and staff well-being as one agenda, backed by supportive leadership, psychological safety and accessible counselling. Doing so advances SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth) and SDG 9 (Industry, Innovation and Infrastructure), and builds the resilient, innovative and lifelong-learning workforce that sustainable higher education needs.

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# *Certificate of Participation*

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