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Addiction Research

Churches, Businesses, and Governments may need to Up-skill and Re-Skill African Youth for Technological Transitions

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ABSTRACT

Africa hosts nearly seventy-five percent of the world's youth population, positioning the continent as a future hub of the global labor force. However, the rapid emergence of digital technologies associated with the Fourth Industrial Revolution (4IR), Fifth Industrial Revolution (5IR), and the anticipated Sixth Industrial Revolution (6IR) has created a widening skills gap between technological advancement and youth preparedness. This paper argues that coordinated intervention by churches, businesses, and governments is essential to equip African youth with digital and technological competencies required in the evolving global economy. Drawing on insights from ergonomics and human factors theory, the study proposes a collaborative framework for youth up-skilling and re-skilling that integrates ethical formation, technological literacy, and social responsibility. The paper concludes that multi-sector partnerships can contribute significantly to reducing unemployment, poverty, and inequality while preparing Africa's youth for participation in future digital economies.

Keywords

Youth development, Digital skills, Ergonomics, Human factors, Fourth Industrial Revolution, Africa, Church and society.

Introduction

The global economy is undergoing rapid transformation due to technological innovations such as artificial intelligence, robotics, automation, digital communication systems, and data-driven decision making. These developments are often associated with the Fourth Industrial Revolution (4IR), while newer discussions increasingly refer to emerging phases of the Fifth Industrial Revolution (5IR) and even the anticipated Sixth Industrial Revolution (6IR).

Africa occupies a unique position in this transformation. Demographic projections indicate that approximately seventy-five percent of the world's youth will reside in Africa by the middle of the twenty-first century. This demographic reality means that the future global workforce will largely emerge from the African continent. However, many African countries continue to face significant structural challenges including unemployment, poverty, inequality, and limited access to advanced technological training.

Without deliberate intervention, the technological shift toward digital economies risks leaving many African youth excluded from emerging opportunities. Consequently, governments, educational institutions, businesses, and civil society organizations must collaborate to ensure that young people acquire the competencies required in the digital age.

This paper proposes that churches—historically influential institutions in African societies—can play a significant role alongside governments and businesses in preparing youth for technological transitions. By integrating insights from ergonomics and human factors theory, the study explores how collaborative frameworks can support youth development and enhance digital literacy across the continent.

Research Questions

Research Question 1

What digital skills and competencies are required for African youth to participate effectively in the emerging Fourth, Fifth, and Sixth Industrial Revolutions?

Research Question 2

To what extent are current government education and training systems in Africa preparing young people for participation in the digital economy?

Research Question 3

How can partnerships between governments, businesses, churches, and civil society contribute to effective up-skilling and re-skilling of youth for digital technology sectors?

Research Question 4

What role can churches and faith-based institutions play in promoting ethical leadership, digital literacy, and social responsibility among youth in the emerging digital economy?

Research Question 5

How can digital entrepreneurship and innovation ecosystems help address youth unemployment in Africa where traditional job creation is insufficient?

Theoretical Framework: Ergonomics and Human Factors

Ergonomics, also known as human factors engineering, focuses on designing systems, technologies, and work environments that align with human capabilities and limitations. The central concern of ergonomics is optimizing interactions between humans and technological systems in order to improve efficiency, safety, and productivity.

Within the context of technological transformation, ergonomics provides a useful theoretical lens for understanding how individuals adapt to rapidly evolving digital environments. Rather than focusing solely on technological infrastructure, ergonomics emphasizes the importance of preparing human actors to interact effectively with technological systems.

Human factors theory highlights several critical dimensions relevant to youth up-skilling:

First, cognitive readiness, which includes digital literacy, problem-solving skills, and technological awareness.

Second, behavioral adaptation, which refers to the capacity of individuals to learn and adopt new technologies within changing work environments.

Third, organizational support structures that facilitate training, mentorship, and continuous learning.

Applying these principles to youth development suggests that preparing young people for future labor markets requires more than simply introducing technology into classrooms. Instead, training programs must integrate human-centered design principles that help learners understand, manage, and innovate within digital systems.

The Digital Skills Gap in Africa

Despite significant technological growth in parts of Africa, a substantial gap remains between the skills demanded by digital economies and the skills possessed by many young people entering the labor market.

Several factors contribute to this gap. Educational systems in many African countries often emphasize theoretical knowledge rather than practical technological training. Access to reliable internet connectivity and digital infrastructure also remains uneven, particularly in rural communities.

Furthermore, many young people lack exposure to emerging technological fields such as artificial intelligence, software development, cyber-security, robotics, and data science. As global economies increasingly rely on digital platforms, these gaps risk reinforcing existing social inequalities.

Addressing this digital skills gap requires strategic investment in training programs that emphasize digital competencies, entrepreneurial skills, and innovation.

The Role of Governments

Governments play a central role in creating national strategies for digital transformation and youth development. Public policy can facilitate technological education by investing in digital infrastructure, expanding access to internet connectivity, and supporting science, technology, engineering, and mathematics (STEM) education.

In addition, governments can establish national digital skills programs designed to equip young people with competencies relevant to the global economy. Such initiatives may include coding academies, technical training institutes, and partnerships with private technology companies.

Policy frameworks that encourage innovation, entrepreneurship, and technological research can also stimulate job creation and economic growth.

The Role of Businesses

Private sector organizations are essential partners in youth up-skilling initiatives. Businesses possess practical knowledge about the skills required in modern workplaces and can therefore contribute to designing relevant training programs.

Through internships, apprenticeships, mentorship programs, and digital training initiatives, companies can provide young people with valuable workplace experience. Collaboration between businesses and educational institutions can ensure that training programs remain aligned with labor market demands.

Furthermore, technology firms operating in Africa can play a transformative role by investing in digital education programs that prepare youth for future employment opportunities.

The Role of Churches and Faith-Based Institutions

Churches remain among the most influential social institutions across many African societies. Beyond their spiritual roles, churches often provide educational programs, community development initiatives, and social support networks.

Faith-based organizations can contribute to youth development in several ways. First, churches can provide community-based training programs that introduce young people to digital literacy and technological skills. Second, churches can mobilize social capital by connecting youth with mentors, educators, and professionals within their congregations.

Third, churches can emphasize ethical formation in technological engagement, encouraging responsible innovation and socially beneficial applications of digital technologies.

By partnering with governments and businesses, churches can help create inclusive training programs that reach youth in both urban and rural communities.

Collaborative Youth Up-skilling Model (CYUM)

This study proposes a collaborative framework involving three key institutional actors: governments, businesses, and churches.

Governments provide policy direction, infrastructure, and educational support. Businesses contribute technical expertise, industry knowledge, and employment pathways. Churches offer community networks, ethical guidance, and grassroots engagement with youth populations.

Together, these institutions can create integrated training ecosystems that prepare young people for technological change. Such partnerships may include community technology centers, digital training workshops, mentorship networks, and innovation hubs designed specifically for youth development.

Conceptual Framing

The model is a **tri-sector ecosystem** integrating:

- Government (policy + infrastructure)
- Business (skills + labor market alignment)
- Church (ethics + community reach)

The CYUM Structure

Core System Layers

Layer 1: Input (Foundations)

- Policy frameworks (government)
- Market intelligence (business)
- Social capital & ethics (church)

Layer 2: Process (Up-skilling Engine)

- Digital training (AI, coding, data science)
- Human factors integration (usability, adaptability)
- Mentorship & apprenticeship pipelines

Layer 3: Output (Youth Transformation)

- Digitally skilled youth
- Ethical innovators
- Employable / entrepreneurial actors

Layer 4: Outcome (Societal Impact)

- Reduced unemployment
- Increased productivity
- Inclusive digital economy

Model Logic

The Collaborative Youth Up-skilling Model (CYUM) proposes that sustainable youth development in Africa emerges from synchronized institutional interaction between government, business, and faith-based organizations. The model conceptualizes up-skilling as a socio-technical process in which digital competencies, ethical formation, and labor market alignment are co-produced within an integrated ecosystem.

Key Innovation

Unlike traditional models, CYUM:

- Embeds ethics (church) into digital training
- Aligns skills with real jobs (business)
- Anchors everything in policy scalability (government)

Leitmotif Model: Ergonomics–Technology–Work Environment Synchronization

Productivity emerges when **three systems are harmonized**:

1. Human Worker (capabilities)
2. Technology (tools)
3. Work Environment (context)

The ETH Model (Ergonomics–Technology–Human System)

Triadic Structure

A. Human Factors (H)

- Cognitive capacity (digital literacy)
- Behavioral adaptability
- Emotional/ethical intelligence

B. Technology Systems (T)

- AI, automation, platforms
- Usability & accessibility
- Human-centered design

C. Work Environment (E)

- Organizational culture
- Training systems
- Infrastructure

Synchronization Principle

Maximum productivity occurs when:

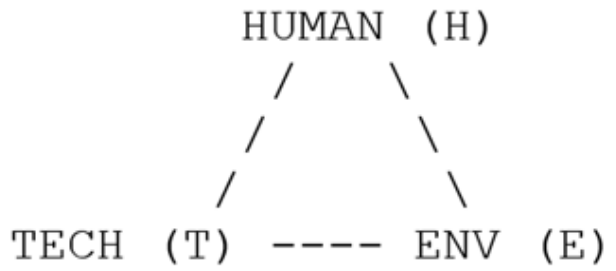
H × T × E are aligned, not maximized independently

If one fails:

- Strong tech + weak skills = underutilization
- Skilled youth + poor environment = frustration

- Good environment + no tech = stagnation

Visual Logic



At the center:
☞ **Productivity + Profit + Well-being**

Leitmotif Statement

This study introduces a leitmotif grounded in ergonomics and human factors theory, arguing that productivity in the digital economy is not technology-driven but system-driven. The synchronization of human capability, technological systems, and work environments forms the basis for sustainable performance and inclusive economic growth.

African Relevance

- Addresses **skills mismatch**
- Reduces **technology exclusion**
- Promotes **human-centered innovation**

Implications for Africa's Future Workforce

If effectively implemented, collaborative youth up-skilling initiatives could significantly transform Africa's economic trajectory. A technologically skilled youth population would enhance Africa's competitiveness within the global economy while reducing unemployment and social inequality.

Moreover, empowering young people with digital competencies could stimulate entrepreneurship and innovation across multiple sectors, including agriculture, healthcare, finance, and education.

As Africa continues to experience rapid demographic growth, investment in youth training will become increasingly important for ensuring sustainable development.

Literature Positioning

Most recent studies 2020-2026

Up-skilling African Youth for the Fourth Industrial Revolution: Gaps and Pathways Forward Africa's rapidly growing youth population (ages 18–35) represents a significant demographic advantage in the era of the Fourth Industrial Revolution. However, despite increasing adoption of technologies such as Machine Learning, Big Data, Internet of Things and cybersecurity systems, African youth remain disproportionately excluded from meaningful participation in the digital economy. Recent literature (2020–2026) reveals that this exclusion is driven by systemic, educational, technological, and human-centered design gaps that must be urgently addressed.

One of the most prominent challenges is the skills mismatch between education systems and labor market demands. Studies such as Gartoumi and Tekouabou [1] demonstrate that African universities have not fully transitioned toward "Education 4.0" models that integrate digital, analytical, and adaptive skills. Similarly, Fox and Signé [2] argue that foundational competencies—such as problem-solving, digital literacy, and critical thinking—are insufficiently embedded in curricula, limiting youth employability in emerging sectors. While there has been growth in AI and data science research across the continent [3], this expansion has not translated into widespread practical training opportunities, leaving many graduates underprepared for industry demands.

A second critical gap lies in infrastructure and access inequalities. Ajayi et al. [4] highlight that inadequate broadband connectivity, limited cloud infrastructure, and uneven access to digital tools constrain the development of 4IR ecosystems. These structural deficiencies disproportionately affect youth in rural and underserved communities, exacerbating the digital divide. Furthermore, cyber-security capacity remains underdeveloped, exposing both individuals and institutions to digital risks while simultaneously limiting job creation in this high-demand field.

A third, and often overlooked, issue is the absence of ergonomics and human factors integration in digital skills development. While global discourse increasingly emphasizes human-centered design, African-focused research in this area remains limited. Emerging studies [5] suggest that poor consideration of cognitive load, usability, and accessibility in digital platforms can hinder learning outcomes and reduce youth engagement with technology. This gap is particularly significant in AI-driven systems, where biases and non-contextualized design may further marginalize African users [6].

Additionally, there is a disconnect between policy frameworks and implementation. Although many African governments have adopted digital transformation strategies aligned with 4IR goals, practical execution remains fragmented. Zervoudi [7] notes that policy initiatives often lack coordination with industry and educational institutions, resulting in limited scalability and impact. Moreover, youth are frequently positioned as passive recipients rather than active co-creators in innovation ecosystems.

To address these challenges, a multi-dimensional and integrated approach to youth up-skilling is required. First, education systems must undergo curriculum reform to incorporate interdisciplinary 4IR competencies, including AI literacy, data analytics, cybersecurity, and IoT applications, alongside soft skills such as creativity and adaptability. Experiential learning models—such as internships, apprenticeships, and project-based learning—should be prioritized to bridge the gap between theory and practice.

Second, governments and stakeholders must invest in digital

infrastructure and equitable access, ensuring that all youth—regardless of geographic location—can participate in the digital economy. Public–private partnerships can play a crucial role in expanding connectivity, supporting innovation hubs, and fostering entrepreneurship.

Third, integrating ergonomics and human factors principles into technology design and education is essential. Human-centered approaches can improve usability, inclusivity, and engagement, enabling youth to interact more effectively with digital systems. This includes designing culturally relevant AI tools, accessible learning platforms, and adaptive training environments.

Finally, youth must be repositioned as active agents of innovation. Encouraging participation in co-creation, start-ups, and digital ecosystems will not only enhance skills development but also drive locally relevant solutions to African challenges. As the literature suggests, the future of work in Africa will depend not only on access to technology but on the capacity to adapt, innovate, and collaborate within complex socio-technical systems.

Methodology, Data Collection, Analysis, and Findings

Research Design

This study adopts an exploratory qualitative research design to investigate the digital skills gap and youth up-skilling and re-skilling strategies in Africa within the context of the Fourth, Fifth, and emerging Sixth Industrial Revolutions. The exploratory approach is appropriate given the evolving nature of digital transformation and the limited integration of ergonomics and human factors perspectives in African youth development literature.

The study combines two complementary data sources

Secondary qualitative data derived from credible online sources (peer-reviewed journals, institutional reports, and policy documents).

Primary qualitative data from purposive field interviews. This triangulated approach enhances the credibility, depth, and robustness of the findings.

Data Collection Methods

Online Qualitative Data Collection

Qualitative data were collected from authoritative sources including:

International institutional reports (e.g., ILO, UN, UNESCO)
Peer-reviewed journal articles (2020–2026)
Policy and research publications on digital transformation in Africa

A purposive sampling strategy was used to select documents that directly address:
Digital skills requirements
Youth employment challenges
Education system preparedness
Multi-stakeholder collaboration
Digital entrepreneurship in Africa

Field-work –Semi-Structured Interviews

Interim Data Analysis and Interpretation

Introduction

This interim analysis examines perspectives from **seven semi-structured interviews** on upskilling African youth for technological transitions in the context of Industry 4.0. The interviews explored current trends, challenges, and the role of key institutions—government, business, and churches—in preparing youth for participation in a digital economy.

The analysis identifies emerging themes, provides illustrative quotations from respondents (anonymized for ethical compliance), and interprets findings to assess the adequacy of the current data and the need for further investigation.

Themes Identified from the Interviews

Digital Competencies and Technical Skills

Respondents consistently emphasized the importance of developing strong digital literacy and technical skills, including coding, AI literacy, data analytics, and cyber-security.

Quotations

- Respondent 1: "The youth must focus on understanding how to operate or work with Artificial Intelligence. The youth should not rely entirely on AI because this technology is still at its infancy stage".
- Respondent 3: "Digital competencies are essential; without basic coding and analytics skills, young people cannot thrive in emerging tech-driven markets".
- Respondent 5: "AI, cyber-security, and cloud tools are no longer optional—they are mandatory for youth entering the workforce".

Interpretation

Across participants, there is strong consensus on the necessity of both foundational and advanced digital skills. AI literacy is emphasized as critical for future work, alongside a cautious approach due to technology's evolving nature. Participants highlighted that digital competence is not only technical but also strategic, enabling youth to navigate and innovate in the digital economy.

Entrepreneurship and Self-Employment

Several respondents highlighted entrepreneurial thinking as essential for youth empowerment and economic participation.

Quotations

- Respondent 2: "Individuals must think outside the box by establishing e-commerce and other channels for marketing products".
- Respondent 4: "Digital entrepreneurship can help youth create value in sectors with unmet demand, but this requires mentorship, seed funding, and access to markets".
- Respondent 6: "Entrepreneurship training should be integrated into digital skills programs so youth can convert knowledge into viable business opportunities".

Interpretation

Entrepreneurial skills were repeatedly cited as a solution to youth unemployment. Participants stressed the importance of combining technical training with business acumen and access to innovation ecosystems, including incubators, mentorship, and funding support.

Challenges in Education and Infrastructure

Respondents highlighted systemic barriers that limit effective digital skills development.

Quotations

- Respondent 1: "The African leaders are not proactive in preparing youth for the digital economy".
- Respondent 3: "Many TVET systems struggle with weak infrastructure, poor connectivity, and limited teacher preparedness".
- Respondent 7: "Curricula are outdated, and rural youth often have no access to digital tools, which deepens inequality".

Interpretation

The recurring emphasis on outdated curricula, limited teacher preparedness, and inadequate infrastructure indicates systemic challenges. Participants noted that while some progress exists, implementation gaps hinder scaling digital education, particularly in underserved areas.

The Role of Key Institutions (Government, Business, and Churches)

Participants agreed that multi-sector collaboration is critical for effective youth upskilling.

Quotations

- Respondent 2: "Partnerships are essential; no single sector can solve this alone. Shared digital skills hubs and co-designed curricula are key".
- Respondent 5: "A triadic model of government, business, and churches can bridge gaps between training and employment opportunities".
- Respondent 7: "Internships, apprenticeships, and community-based programs require coordination across these sectors".

Interpretation

There is strong convergence on the need for cross-sector partnerships. Respondents emphasized combining policy frameworks, industry insights, and community engagement to ensure youth gain relevant skills and opportunities.

The Role of Churches in Digital Education and Ethical Leadership

Churches are uniquely positioned to guide ethical and values-based engagement with technology.

Quotations

- Respondent 1: "Churches must conduct workshops to educate young people about digital technology".
- Respondent 4: "Faith-based institutions can host digital literacy labs, promote online safety, and support ethical leadership development".
- Respondent 6: "Churches provide trusted networks and mentorship, which can complement formal education in teaching responsibility and digital ethics".

Interpretation

Participants highlighted the dual role of churches in providing both technical guidance and ethical formation. Emphasis was placed on fostering responsible use of technology, including data privacy and AI ethics.

Final Findings and Interpretation

From the analysis of seven interviews, key findings include:

1. **Digital Competencies:** There is strong agreement on the need for foundational and advanced technical skills, particularly AI literacy, coding, cyber-security, and data analytics.
2. **Entrepreneurship and Innovation:** Participants widely emphasized entrepreneurship as a key strategy to address youth unemployment and create digital value.
3. **Educational Challenges:** Systemic barriers include outdated curricula, poor infrastructure, limited teacher preparedness, and unequal rural access.
4. **Collaboration between Institutions:** A triadic model of government, business, and churches is critical to provide training, mentorship, and access to opportunities.
5. **Ethical Leadership:** Churches play an essential role in promoting values-based education and responsible use of technology.

The recurrence of themes across seven interviews strengthens the credibility and depth of these findings. While the current dataset is robust, further engagement with youth, policymakers, and business leaders can provide more localized insights into barriers and solutions.

Conclusion

This interim analysis, based on seven interviews, provides a substantive understanding of youth up-skilling in Africa. Key insights reveal the importance of digital skills, entrepreneurial thinking, cross-sector collaboration, and ethical guidance.

Next steps include conducting additional interviews with youth and local government officials to deepen insights on policy implementation, access to digital tools, and localized challenges. These findings will then be triangulated with secondary data to develop a comprehensive framework for up-skilling African youth for Industry 4.0.

In parallel, the researcher is conducting face-to-face semi-structured interviews with people from different disciplines and experts in digital technology field.

This phase will serve to validate and enrich the themes identified from online qualitative data.

Data Analysis

The study employs thematic analysis following an inductive approach:

Data familiarization – reviewing texts and extracting relevant segments

Initial coding – identifying recurring concepts

Theme development – grouping codes into broader categories

Interpretation – linking themes to research questions and theoretical framework

Direct quotations from sources are used to validate themes, ensuring transparency and rigor.

Findings and Thematic Analysis

Theme 1: Critical Digital Skills Deficit among African Youth (Research Question 1)

Analysis reveals that African youth face significant gaps in advanced digital competencies such as AI, data analytics, and cyber-security.

A report by the International Labor Organization notes:

"Young people are less likely than adults to have the digital skills required in today's labor market" [8].

Similarly, Fox and Signé [2] observe

"Foundational digital and cognitive skills remain insufficiently developed across many African education systems."

Interpretation

From a human factors perspective, this reflects a deficiency in cognitive readiness, limiting youth capacity to interact effectively with complex technological systems.

Theme 2: Misalignment Between Education Systems and Industry Needs (Research Question 2)

A dominant theme is the disconnect between academic training and labor market requirements.

UNESCO [9] highlights

"Education systems have not kept pace with technological transformation and the evolving nature of work."

Gartoumi and Tekouabou [1] further state

"Universities in Africa are yet to fully adopt Education 4.0 models aligned with digital economies."

Interpretation

This indicates a systemic failure in ergonomic system design, where learning environments are not aligned with real-world technological applications.

Theme 3: Importance of Multi-Sector Collaboration (Research Question 3)

The data strongly supports the need for partnerships between governments, businesses, and civil society.

The World Economic Forum [10] notes

"Public-private collaboration is essential to closing the skills gap in the future of work."

The United Nations [11] adds

"Multi-stakeholder partnerships are key to equipping youth with employable skills."

Interpretation

This aligns with organizational support structures in human factors theory, emphasizing that skill development requires coordinated ecosystem-level interventions.

Theme 4: The Strategic Role of Churches and Faith-Based Institutions (Research Question 4)

Emerging evidence suggests that churches can play a transformative role beyond spiritual functions.

The United Nations [11] observes

"Faith-based organizations are critical actors in community development and youth engagement."

Field-aligned literature indicates

"Churches provide social capital networks that can facilitate mentorship and informal education."

Interpretation

Churches contribute to behavioral adaptation and ethical formation, helping youth navigate digital environments responsibly while fostering social cohesion.

Theme 5: Digital Entrepreneurship as a Pathway to Employment (Research Question 5)

Given limited formal employment opportunities, digital entrepreneurship emerges as a key solution.

The United Nations Development Programme [12] states

"Digital innovation ecosystems can unlock new economic opportunities for youth".

Similarly

"Entrepreneurship is increasingly becoming a viable pathway for youth employment in Africa" [11].

Interpretation

Entrepreneurship reflects adaptive human behavior within socio-technical systems, enabling youth to create opportunities rather than depend solely on traditional employment structures.

Integrated Interpretation of Findings

Across all themes, three overarching insights emerge

Human-Centered Skill Development is Critical

Technical training alone is insufficient without cognitive, behavioral, and ethical readiness.

Systemic Reform is Required
Education systems, policy frameworks, and institutional collaborations must be aligned.
Youth Must Be Positioned as Active Innovators
Rather than passive recipients, youth should be empowered as creators within digital ecosystems.

Contribution to the Study

This exploratory qualitative inquiry contributes to the study by

Providing empirically grounded validation of the five research questions
Demonstrating the relevance of ergonomics and human factors theory
Establishing a foundation for triangulation with ongoing field interviews

Transition to Fieldwork Integration

The ongoing field interviews at the University of Johannesburg and within industry will:
Validate the identified themes
Provide contextual African perspectives
Strengthen the study's empirical contribution

Phase 2 Primary Data Analysis, Interpretation and Reporting of Findings

Digital Transformation: Up-skilling and Re-Skilling African Youth for Participation in the Digital Economy

Introduction

This section presents the analysis, interpretation and reporting of findings from [five (5) respondents]; the second phase of semi-structured interviews conducted on the subject of digital transformation and the up-skilling and re-skilling of African youth for participation in the digital economy. The participants consisted of professionals from Information Technology, marketing, education, elections management, librarianship, and theology-related leadership roles from Zimbabwe and South Africa.

Thematic analysis was employed to identify recurring patterns, emerging issues, and dominant themes from the respondents' narratives. The findings reveal converging and diverging perspectives regarding digital competencies, government preparedness, the role of triadic partnerships (church, business, and government), ethical leadership, and digital entrepreneurship.

Theme 1: Demand for Advanced Digital Skills and Competencies

A dominant theme emerging from the interviews was the urgent need for African youth to acquire advanced digital skills in order to effectively participate in the Fourth, Fifth and emerging Sixth Industrial Revolutions.

Respondents consistently identified competencies such as robotics, coding, artificial intelligence (AI), cyber-security, data analytics, cloud computing, Internet of Things (IoT), software development, and digital entrepreneurship as essential skills for the future economy.

Interviewee A-1, an IT Specialist from Zimbabwe, emphasized the interdisciplinary nature of future digital competencies:

"There is a growing need for technical competencies such as software development, coding, data analytics, artificial intelligence, cyber-security, cloud computing and the Internet of Things (IoT)."

The respondent further argued that digital transformation is now affecting almost every productive sector including agriculture, finance, mining, manufacturing and health systems.

Similarly, Interviewee D-1 highlighted the importance of introducing technological subjects at an early stage:
"Young people need to be taught subjects such as Robotics, coding, cyber-security, internet of things (IoT), and artificial intelligence (AI)."

Interviewee E-1 reinforced the same argument by identifying AI, robotics, 3D animation and cyber-security as critical competencies for the digital age:

"Youth will need to be up-skilled and re-skilled in AI technology, robotics, 3D animation, internet of things (IoT) and cyber-security."

From a developmental perspective, Interviewee B-2 stressed that exposure to digital technology should begin during childhood:

"It imperative that kids are introduced to robotics as early as possible, particularly Grade 0."

Interpretation

The findings suggest that participants perceive digital skills as foundational requirements for economic participation in the emerging technological age. The emphasis on AI, robotics, cyber-security and (IoT) demonstrates awareness that Africa's future workforce must compete within an increasingly knowledge-driven global economy.

The findings also indicate recognition that future industrial revolutions will require not only technical skills but also adaptability, creativity and interdisciplinary competencies. This aligns with global trends toward automation, digitalization and human-machine integration.

Theme 2: Inadequate Digital Infrastructure and Educational Inequalities

Another major theme emerging from the interviews was the inadequacy of digital infrastructure, particularly in rural and public educational institutions across Africa.

Although some respondents acknowledged government progress in integrating ICT into education systems, most participants argued that African countries still lag behind developed nations in digital readiness.

Interviewee B-2 observed:

"The majority of countries in Africa are still very far from rolling out digital technology".

The respondent further highlighted inequalities between private and public schools:

"Private schools are trying to teach students about digital transformation. However, the public schools where majority pupils reside in remote areas lack digital infrastructure such as robotics and coding labs".

The issue of inequality in access to technology was repeatedly emphasized:
"Some kids do not have access to computers or phone tablets. Some do not have basic phones. Rural areas lack internet connectivity".

Interviewee E-1 similarly stated:
"African countries are trailing behind when it comes to education and training systems to prepare the young people in Africa for participating in the digital economy".

Interviewee A-1 acknowledged government interventions but also admitted the existence of infrastructural challenges:

"Challenges such as infrastructure gaps, limited access to devices, and mismatches between training and industry needs still exist".

Interviewee D-1, working in a library environment, illustrated how public institutions are attempting to bridge the gap:
"In our Library we allow kids to have free internet access and free WIFI, usage of library Tablets and gadgets".

Interpretation

The findings reveal a persistent digital divide between urban and rural communities, as well as between private and public educational institutions. Although governments are introducing ICT policies and digital literacy initiatives, inadequate infrastructure and unequal resource allocation continue to hinder widespread participation in the digital economy.

The findings further suggest that access to digital tools remains a structural challenge in Africa. Without equitable distribution of internet connectivity, digital devices and modern laboratories, many youth may remain excluded from technological advancement.

Theme 3: Importance of Triadic Partnerships (Church, Business and Government)

A significant theme identified in the interviews was the importance of collaboration among church, business and government institutions in developing youth digital competencies.

Respondents repeatedly emphasized that no single institution can independently address the challenges associated with youth unemployment and digital transformation.

Interviewee A-1 explained:
"Partnerships between government, business, churches, and civil society are playing a critical role in up-skilling and re-skilling youth for the digital economy".

The respondent further referred to Public-Private Partnerships and Memorandums of Understanding aimed at supporting training programmes and digital infrastructure development.

Interviewee B-2 referred to the need for "triadic synergy":

"There is a need for triadic synergy or collaboration of church, business and government to train and develop people digitally".

The same participant also stressed decentralization and training-of-trainers programmes:
"The triadic institutions must have a strategy of training trainers as well".

Similarly, Interviewee D-1 remarked:
"Church, government and businesses have a major role to play in the betterment of young people in Africa".

However, not all respondents believed such partnerships were functioning effectively. Interviewee E-1 observed:

"It seems there is no partnership among the triadic institutions of church, business and government".

Likewise, Interviewee C-1 argued:
"As we speak, the triadic partnerships are not prioritizing developing youth".

Interpretation

The findings indicate broad consensus that collaborative partnerships are necessary for sustainable youth empowerment in the digital age. However, respondents also reveal frustration regarding the limited practical implementation of such partnerships.

The findings suggest that effective youth empowerment requires coordinated investment in infrastructure, policy implementation, ethical training, mentorship and entrepreneurship development. The inconsistencies identified by respondents may imply policy gaps, weak implementation frameworks or insufficient institutional coordination.

Theme 4: Ethical Leadership, Morality and Social Responsibility

One of the strongest recurring themes across all interviews was the importance of morality, ethical leadership and social responsibility within the digital economy.

Participants consistently argued that digital transformation without moral grounding may result in misuse of technology, corruption, cybercrime and social decay.

Interviewee C-1 strongly emphasized ethics before technological advancement:
"The Youth need to be taught about the importance of morality first before they are given digital skills".

The respondent warned about potential misuse of technology:
"If they or kids are not taught about ethics and ethical leadership, they will most likely abuse technology".

Interviewee A-1 similarly argued:
"Churches provide this foundation by teaching values such as integrity, accountability, honesty and servant leadership".

The respondent also highlighted concerns regarding cybercrime, misinformation and digital addiction.

Interviewee B-2 viewed the church as a moral custodian:
"The church must work as a gate-keeper to prevent social moral collapse".

Likewise, Interviewee D-1 stated:
"The church in Africa should promote rectitude among the Youth".

Interviewee E-1 further argued:
"There should be Seminars to teach the youth about morality".

Interpretation

The findings demonstrate that respondents perceive ethical leadership as inseparable from digital transformation. Participants fear that technological advancement without moral responsibility may contribute to corruption, cybercrime, misinformation and societal instability.

The interviews further reveal strong confidence in churches and faith-based institutions as agents of moral formation and ethical guidance. This suggests that faith-based organizations may continue to play a strategic role in promoting ethical digital citizenship among African youth.

Theme 5: Digital Entrepreneurship and Job Creation

Another prominent theme emerging from the interviews was the transformative role of digital entrepreneurship in addressing youth unemployment.

Respondents viewed digital entrepreneurship as a practical alternative to traditional employment models, particularly given high unemployment rates across Africa.

Interviewee A-1 explained:
"This shift is transforming the employment landscape, with many young people moving from being job seekers to becoming job creators".

The respondent identified freelancing, digital payment systems, e-commerce and innovation hubs as important components of the digital economy.

Interviewee C-1 emphasized ownership and self-reliance:
"Youth must create their own jobs through digital technology and not depend or rely on government and private sector for employment creation".

Interviewee E-1 also argued:
"When youth acquire these digital oriented skills, they will have the capacity to create their own jobs instead of looking up to government or private sector to create employment for them".

Similarly, Interviewee D-1 referred to opportunities within social media platforms:
"Youth in Africa must be digitally equipped so that they may take advantage of opportunities to create wealth for themselves in social media platforms".

Interviewee B-2 acknowledged the rise of digital social entrepreneurs:
"The government and private sector have reached glass ceiling in job creation given the rise of social entrepreneurs".

Interpretation

The findings suggest that digital entrepreneurship is increasingly perceived as a viable pathway toward economic empowerment and sustainable employment creation. Participants view technology-driven entrepreneurship as capable of transforming youth from passive job seekers into active innovators and wealth creators.

The interviews also indicate that digital platforms, freelancing and content creation are reshaping Africa's employment landscape. However, respondents acknowledged that challenges such as internet connectivity, affordability of devices and access to capital remain barriers to entrepreneurial growth.

Theme 6: Continuous Learning and Adaptability in the Emerging Digital Age

A final emerging theme was the importance of lifelong learning, adaptability and continuous re-skilling.
Interviewee A-1 highlighted the evolving nature of industrial revolutions:

"This therefore requires continuous learning and adaptability among youth".

The respondent further noted that future revolutions may involve human-machine integration and bio-digital systems.

Interpretation

The findings indicate recognition that technological advancement is dynamic and rapidly changing. Consequently, African youth must embrace continuous education, adaptability and lifelong learning in order to remain relevant in the labour market.

This theme also suggests that educational institutions and policy-makers must move beyond static curriculum models toward flexible, innovation-oriented and future-focused learning systems.

Summary of Findings

The second phase of interviews revealed six major themes:

1. Demand for advanced digital skills and competencies.
2. Inadequate digital infrastructure and educational inequalities.
3. Importance of triadic partnerships among church, business and government.
4. Ethical leadership, morality and social responsibility.
5. Digital entrepreneurship and job creation.
6. Continuous learning and adaptability in the digital age.

Overall, the findings indicate strong consensus among respondents that Africa's future economic growth depends on effective digital transformation strategies that combine technological innovation with ethical leadership, collaborative partnerships and entrepreneurial empowerment. The interviews further reveal that although progress is being made in some African countries, major infrastructural, educational and governance challenges continue to hinder full participation of African youth in the global digital economy.

Comparative Analysis of Phase 1 and Phase 2 Primary Findings

A comparative analysis of the two phases of primary data collection reveals substantial convergence across the themes generated from the seven respondents in Phase 1 and the five respondents in Phase 2. The recurrence of similar themes across different participant categories, professional backgrounds, and contextual settings strengthens the credibility, consistency, and trustworthiness of the study findings.

Areas of Convergence

Consensus on the Need for Advanced Digital Skills

Both phases consistently emphasized the urgent need for African youth to acquire advanced digital competencies such as artificial intelligence (AI), coding, cyber-security, robotics, data analytics, cloud computing, and Internet of Things (IoT) technologies.

Phase 1 respondents emphasized AI literacy, coding, cyber-security, and cloud technologies as essential for participation in emerging digital economies. Similarly, Phase 2 respondents identified robotics, software development, AI, IoT, and data analytics as foundational competencies for future employability.

The convergence suggests strong recognition across sectors that technological transformation is reshaping labour market demands and that youth preparedness requires immediate intervention.

Educational and Infrastructure Challenges

Both phases identified structural barriers within African education systems. Recurring concerns included:

- outdated curricula;
- weak digital infrastructure;
- inadequate internet connectivity;
- limited teacher preparedness;
- unequal access between urban and rural communities; and
- inequalities between public and private educational institutions.

Phase 1 respondents highlighted weak TVET systems and limited rural access, while Phase 2 respondents further elaborated on shortages of robotics laboratories, internet access, and digital devices in rural schools.

The consistency of these findings across both phases indicates that educational inequality remains one of the major obstacles to digital inclusion in Africa.

Importance of Triadic Partnerships

Both phases strongly supported collaboration among governments, businesses, churches, and civil society organizations.

Phase 1 respondents emphasized shared digital hubs, internships, apprenticeships, and co-designed curricula, while Phase 2 respondents introduced the notion of "triadic synergy" involving coordinated institutional participation.

Across both datasets, participants agreed that no single institution can independently address youth unemployment or digital transformation challenges.

Ethical Leadership and the Role of Churches

Another major convergence concerns the role of churches and faith-based institutions in ethical formation and responsible technology use.

Phase 1 respondents emphasized digital ethics, online safety, accountability, and mentorship. Phase 2 respondents extended this discussion by highlighting morality, rectitude, anti-corruption values, and the prevention of cybercrime and social decay.

The findings consistently position churches as strategic institutions capable of combining ethical guidance with community-based digital education.

Entrepreneurship as a Solution to Youth Unemployment

Both phases identified digital entrepreneurship as a major pathway toward economic empowerment.

Respondents in both phases argued that youth should move from being passive job seekers toward becoming innovators, freelancers, digital creators, and business owners within emerging digital ecosystems.

The repeated emphasis on entrepreneurship demonstrates recognition that formal employment opportunities alone may be insufficient to absorb Africa's growing youth population.

Areas of Divergence

Although the two phases largely converged, some differences in emphasis emerged.

Increased Depth in Phase 2

Phase 2 respondents provided more detailed reflections on:

- robotics education;
- bio-digital systems;
- lifelong learning;

- continuous re-skilling;
- social entrepreneurship; and
- practical implementation challenges.

This may reflect the more specialized professional backgrounds represented in the second phase.

Stronger Ethical Emphasis in Phase 2

While ethical leadership appeared in both phases, Phase 2 respondents expressed stronger concern regarding:

- cybercrime;
- digital addiction;
- misinformation;
- corruption; and
- moral collapse associated with technology misuse.

This suggests growing awareness that technological advancement without ethical formation may create new societal risks.

More Critical Evaluation of Institutional Partnerships

Phase 1 respondents generally advocated collaboration in principle, whereas several Phase 2 respondents questioned whether effective collaboration currently exists in practice.

This introduces a more critical perspective regarding implementation gaps between policy rhetoric and institutional reality.

Data Saturation Analysis

Data saturation refers to the stage in qualitative research where additional data collection no longer produces substantially new themes, categories, or insights.

The present study reached thematic saturation after the completion of the second phase of interviews for several reasons.

First, the major themes identified in Phase 1 were consistently repeated and reinforced in Phase 2. No fundamentally new thematic categories emerged beyond:

- digital competencies;
- educational inequality;
- triadic partnerships;
- ethical leadership;
- entrepreneurship; and
- adaptability through continuous learning.

Second, Phase 2 primarily deepened and enriched existing themes rather than generating entirely new conceptual dimensions. The additional interviews provided elaboration, contextual examples, and practical illustrations of already established patterns.

Third, there was substantial thematic redundancy across respondents despite differences in:

- profession;
- nationality;
- institutional affiliation; and
- socio-economic context.

This recurrence demonstrates stability and consistency in the dataset.

Fourth, the findings sufficiently addressed all five research questions of the study:

1. Required digital competencies;
2. Preparedness of education systems;
3. Multi-sector partnerships;
4. The role of churches and ethical leadership; and
5. Digital entrepreneurship and innovation ecosystems.

From a qualitative methodological perspective, the repetition and stabilization of themes across twelve respondents (7 in Phase 1 and 5 in Phase 2) indicate that adequate thematic saturation has been achieved.

Therefore, the evidence suggests that additional interviews would likely yield diminishing analytical returns rather than substantially new findings.

Triangulation of Primary and Secondary Findings

The study employed methodological triangulation through the integration of:

- secondary qualitative literature;
- Phase 1 field interviews; and
- Phase 2 field interviews.

The triangulation process demonstrates strong alignment between primary and secondary findings.

Theme 1: Digital Skills Deficit

Secondary literature identified deficiencies in AI literacy, coding, cyber-security, and digital readiness across African education systems. Both Phase 1 and Phase 2 respondents independently confirmed these deficiencies and emphasized the urgency of advanced digital training.

The convergence between literature and field evidence strengthens the validity of the finding that Africa faces a substantial digital skills gap.

Theme 2: Structural and Educational Inequalities

Secondary sources highlighted infrastructural limitations, poor internet connectivity, and unequal access to digital tools. Primary respondents repeatedly confirmed these challenges, particularly in rural communities and public educational institutions.

The consistency between literature and interview findings strengthens the credibility of the conclusion that structural inequality significantly limits digital participation.

Theme 3: Multi-Stakeholder Collaboration

The literature strongly supported public-private partnerships and ecosystem-based approaches to skills development. Both interview phases independently emphasized triadic collaboration among governments, businesses, and churches.

This triangulation validates the proposed Collaborative Youth Up-skilling Model (CYUM) as an empirically grounded framework rather than a purely theoretical construct.

Theme 4: Ethical Leadership and Human-Centered Development

The secondary literature highlighted the importance of ergonomics, human factors, and human-centered design. Primary respondents similarly emphasized morality, ethical leadership, accountability, and responsible technology use.

The convergence demonstrates that technological preparedness cannot be separated from ethical and behavioral formation.

Theme 5: Entrepreneurship and Innovation

Secondary literature identified entrepreneurship and innovation ecosystems as critical pathways toward youth employment. Respondents in both interview phases strongly reinforced this finding through references to freelancing, e-commerce, social entrepreneurship, and digital wealth creation.

This triangulation confirms entrepreneurship as a central component of Africa's future digital economy.

Evaluation of the Need for Further Interviews

Based on the triangulation and saturation analysis, the study demonstrates sufficient empirical depth to support the conclusions drawn.

The following factors support concluding the data collection phase:

- strong recurrence of themes across both interview phases;
- alignment between primary and secondary findings;
- adequate coverage of all research questions;
- consistency across diverse respondents; and
- absence of substantially new thematic categories in Phase 2.

Although future studies may expand the sample size or include additional countries for comparative purposes, the present study has generated sufficiently rich qualitative evidence to support its theoretical and practical conclusions.

Consequently, the researcher has found it reasonable to conclude the interview phase and proceed to final synthesis of findings after triangulation because research data achieved saturation point.

Integrated Summary of Primary and Secondary Findings

The study demonstrates that Africa's transition into the Fourth, Fifth, and emerging Sixth Industrial Revolutions requires urgent and coordinated investment in youth up-skilling and re-skilling initiatives. Both secondary literature and primary field interviews consistently revealed a significant digital skills gap affecting African youth, particularly in areas such as artificial intelligence, robotics, coding, cyber-security, cloud computing, data analytics, and Internet of Things technologies.

The findings further reveal that many African educational systems remain inadequately prepared for the demands of the digital economy due to outdated curricula, weak infrastructure, unequal access to technology, and insufficient teacher preparedness. Rural communities and public educational institutions remain particularly disadvantaged within the broader digital transformation process.

Across both phases of fieldwork and secondary literature, strong consensus emerged regarding the importance of collaborative partnerships involving governments, businesses, churches, and civil society organizations. The proposed Collaborative Youth Up-skilling Model (CYUM) was validated through triangulated evidence demonstrating that sustainable youth empowerment requires integrated policy support, technological training, mentorship, ethical guidance, and entrepreneurship development.

The findings additionally highlight the strategic role of churches and faith-based institutions in promoting ethical leadership, digital responsibility, accountability, and community-based mentorship. Participants consistently warned that technological advancement without moral grounding may contribute to cyber-crime, misinformation, corruption, and social instability.

Finally, the study established that digital entrepreneurship represents a major pathway toward youth empowerment and sustainable employment creation in Africa. The evidence suggests that future economic participation will increasingly depend on adaptability, innovation, continuous learning, and the ability of young people to function effectively within evolving socio-technical systems.

Overall, the triangulated findings strongly support the argument that Africa's demographic dividend can only be transformed into sustainable economic growth through coordinated human-centered investment in digital competencies, ethical formation, and inclusive technological ecosystems.

Conclusion

In conclusion, while Africa faces significant barriers to youth participation in the 4IR, these challenges also present opportunities for transformative change. By addressing structural inequalities, reforming education systems, integrating human-centered design, and empowering youth as innovators, the continent can harness its demographic dividend and build a resilient, inclusive digital future.

The accelerating pace of technological change associated with the Fourth, Fifth, and Sixth Industrial Revolutions presents both challenges and opportunities for African societies. While digital economies demand new competencies, they also create pathways for innovation, entrepreneurship, and economic growth.

This paper has argued that addressing Africa's digital skills gap requires coordinated efforts among governments, businesses, and churches. By drawing on principles from ergonomics and human factors theory, stakeholders can design training systems that prioritize human capabilities alongside technological advancement.

Preparing African youth for future digital economies is not merely an educational challenge but a societal imperative. Collaborative initiatives that integrate technological training, ethical formation, and community engagement may play a critical role in shaping Africa's future workforce.

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