CONSTRUCTING SKILLS FOR AFRICAN PROSPERITY

Market analysis, advice and solutions for the AEC sector

KnowledgePoint Where learning lives

Summary

Countries across Africa continue to rebuild from the economic fallout resulting from the COVID-19 pandemic. The war in Ukraine, conflict in the Middle East, surging global inflation, and rising interest rates have put further pressure on African governments, many of whom now face extreme liquidity challenges, impaired debt repayment capacity, and threats of debt distress and default. There are, however, signs of optimism with several African countries featured in the world's fastest-growing economies.

Millions in the greater Horn of Africa are facing acute hunger as the region faces one of the worst droughts in recent decades, compounded by years of conflict and instability. As families face severe food insecurity, many have left their homes in search of food and water, and pasture for animals. Large-scale displacement is challenging already congested cities.

The region's infrastructure remains a challenge – and that's now, how will it cope with a rapidly growing population? Many are struggling with access to vital utilities such as electricity and safely managed drinking water and sanitation. Slums and informal settlements persist. And across the region many roads are unpaved. These all have an impact on GDP and regional productivity.

A shortage of skills is having a major impact across Africa. In a world being transformed by digital technologies, the shortage of general and specialist digital skills is particularly acute. And many predict the problem will only get worse in left unaddressed.

On top of with this, the continent is haemorrhaging talent, particularly the youth and the middle classes. This voluntary emigration is often triggered by the fierce global competition for talent. Countries are being challenged to stem the outflow of talent, to make the skills and job market more attractive. These are all factors placing demands on the AEC (Architecture, Engineering, and Construction) sector. Players not only need to redress infrastructure debt, they need to respond to requirements driven by urbanisation and economic growth. Funding gaps, regulatory complexities, and the skilled labour shortages mean innovative, and practical solutions, are required to build resilience across the sector – and the continent as a whole.

In this report we explore some of the unique challenges and opportunities affecting the region. We consider factors impacting the rate of change and adoption of technologies in the sector.

We also ponder how, in a region facing a significant "youth bulge", capability and skills gaps which exist now, could be further widened in the future.

This report is for policymakers, educational institutions, employers and training organisations. Drawing on industry exemplars, we offer practical solutions and suggest actions for players across the AEC ecosystem. Investing in digital capabilities of citizens underpinned by both technological and human capacity offers the most robust strategy for the future. A critical mass of skilled workforce that can effectively master and apply emerging technological advancements & their sophisticated integration within every aspect of the social, economic and political systems is needed.

African Union¹



Economic positivity: Foundation for investment

Africa's economies continue to bounce-back after COVID-19. They demonstrate resilience against a range of challenges - climate change, geopolitical tensions, rising inflation, food insecurity and rising debt.

Even as they navigate such complexities, the economic outlook for the majority of countries across the continent in 2024 looks positive. The Economist Intelligence Unit forecasts that Africa will be the world's second-fastestgrowing major region in 2024, predicting positive growth stories for most states.²

The continent is poised for growth fuelled by a youthful population, burgeoning technological advancements and increasing foreign investments. However, it is a nuanced picture with persistent infrastructure gaps and political instability and uncertainty.

12

of the world's 20 fastest-growing economies in 2024 will be in Africa, and African real GDP is forecast to grow by

3.2% in 2024, up from 2.6% in 2023.²

The Africa Union estimates that the poor state of infrastructure translates into a

2%

reduction in GDP each year for most African nations and as much as a



decrease in industrial productivity.³



Population growth: Accelerating need for transformation

By 2030, young Africans

are expected to make up

of the world's youth.6

42%

The global population reached a significant milestone in November 2022 – 8 billion!

The latest projections by the United Nations suggest the world's population could grow to around 8.5 billion in 2030 and 9.7 billion in 2050; it is projected to reach a peak of around 10.4 billion people during the 2080s and to remain at that level until 2100.⁴

Africa's booming population is set to reshape the continent and the world beyond. The continent has the fastest-growing population in the world – it saw an annual growth rate of 2.45 per cent in 2021.⁴ By 2050, the African population is forecast to rise to at least 2.4 billion and will continue to grow beyond 4.2 billion, four times its current size in the next 100 years.⁴



African subregions by population (historical and projection)



Construct to live, learn and work

By 2030, the continent's working-age population is set to increase by two-thirds, from 370 million adults in 2010 to more than 600 million in 2030.⁵ The share of this population with at least a secondary education is set to increase from 36% in 2010 to 52% in 2030.⁵ This increasingly educated workforce offers hope for the development of the continent – assuming the outflow of skilled workers can be stemmed with a promise of well-paid jobs, stable infrastructure and economic potential.

People need places to live, learn and ultimately work. The AEC sector can play an important role to meet the needs of a rapidly growing population, increased urbanisation and a burgeoning workforce. The activities of the industry are vital to the achievement of national socio-economic development goals of providing shelter, infrastructure and employment.



Changing workplaces, workforces and expectations

In communities across a continent which has an increasingly youthful (and booming) population, workplaces and workforces need to change.

An estimated 15 to 20 million increasingly welleducated young people are expected to join the African workforce every year for the next three decades.⁵ The global march of digital transformation creates new opportunities and challenges for workers, workplaces and business owners.

As the World Economic Forum (WEF) puts it: "the Fourth Industrial Revolution will interact with a range of additional socio-economic and demographic factors affecting the region, resulting in major disruptions to labour markets, growth in wholly new occupations, new ways of organizing and coordinating work, new skills requirements in all jobs and new tools to augment workers' capabilities".5

This is all happening on a continent which is underutilising its human capital potential. The Human Capital Index finds that Sub-Saharan Africa currently only captures 55% of its human capital potential, compared to a global average of 65%.⁵

Human capital optimization in Africa



World Economic Forum⁵

Estimates and projections of employment, regional and sub-regional, Africa, 2010-25

Region/subregion	Employment-to-population ratio (percentages)					Employment (millions)						
	2010	2019	2022	2023	2024	2025	2010	2019	2022	2023	2024	2025
Africa	59.5	58.2	58.4	58.6	58.7	58.8	367	458	498	514	529	545
North Africa	42.8	39.1	39.7	39.6	36.6	39.8	60	65	70	71	72	74
Sub-Saharan Africa	64.5	63.3	63.2	63.5	63.5	63.5	307	393	429	443	457	471

International Labour Organisation⁷

Modernising the AEC workforce

The construction industry can play a pivotal role in Africa's prosperity, from building homes and offices, to ensuring that people across the continent have access to crucial basic services and key infrastructure. The industry has the ability and a responsibility to create jobs and develop people as much as it does the region's buildings and infrastructure.

However, the African construction sector has historically been characterised by manual labour and traditional building techniques. Across the continent, many construction sites have seen the poor and vulnerable employed in high-risk, physically demanding and poorly paid work. These workers often had little security - no long-term view of employment or assurance about payment for work done.

Working practices across the African construction industry

I produce hand drawings
I produce 3D digital models
I produce 2D digital drawings that are not generated from a 3D model
I use structured information that is linked to 3D digital models
I produce Building Information Model (BIM) objects
None of these

There have also been limited opportunities to upskill and transition into higher paid, more stable, less demanding trades - workers often moved from site to site, living week-to-week and chasing short-term contracts.

In the AEC sector, the need to modernise and improve workplaces is increasingly converging with the march of digital transformation. Around the world digital technologies, such as Building Information Modelling (BIM), Geographic Information Systems (GIS), and project management software, have become indispensable tools in the construction industry. They've proven their worth - they've shown how they can enhance efficiency, reduce costs and improve project outcomes.



Yet, the AEC sector across Africa has yet to fully embrace their potential – there are pockets of excellence, but still work to be done. Coupled with this, there's a significant digital skills gap in Africa's construction workforce. Without sufficient investment in human capital, not enough qualified workers will enter the construction industry to keep pace with growth.⁹

According to the WEF, Sub-Saharan Africa faces a range of opportunities to invest in its skills base, leveraging existing strengths to increase local value-add across a broad range of industries. One example is investment in specialist skills and local talent in the building and construction trades due to rapid urbanization and a continent-wide need for infrastructure development.⁵

Education, skills and work in Africa will determine the livelihoods of nearly a billion people in the region and drive growth and development for generations to come. As one of the youngest populations in the world, it is imperative that adequate investments are made in education and learning to prepare citizens for the world of tomorrow.

As the global transformation of work unfolds in Africa, policymakers, business leaders and workers must be prepared to embrace this period of transition.

As 15 to 20 million increasingly well-educated young people are expected to join the African workforce every year for the next three decades, delivering the ecosystem for quality jobs – and future skills to match – will be imperative for fully leveraging the continent's demographic dividend.⁵



The AEC industry must fundamentally rethink how it designs, constructs, and operates the built environment. Innovative

firms around the world are doing this already by adopting new technologies that improve efficiency and productivity like building information modelling, prefabrication and modular construction, generative design, and robotics.¹⁰

The digitally-enabled AEC workforce

Digitalisation has extended the use of technologies in the construction sector. Adoption of 3D modelling, prefabrication, and virtual and augmented reality has increased the need for digital skills and the advent of new roles. As the AEC sector moves towards more digitally-oriented roles, companies are seeking data engineers, data scientists, coders and developers. Companies are investing in employees to develop the skills needed to perform the job and gain knowledge of digital technologies such as BIM, digital twins, smart project management, and connected construction.

Job role	Description
Architect	Architects design a range of structures, including houses, apartment buildings, schools, libraries and commercial buildings.
BIM coordinator	BIM (Building Information Modelling) coordinators are responsible for digital processes associated with the design and construction stages of a project. They ensure 3D models, drawings and structural data are hosted in one, accessible place and deliver project information model to clients.
BIM manager	A BIM Manager is responsible for the implementation of Building Information Modelling (BIM) and the Digital Construction procedures at the design, construction and handover stages of a project.
Civil engineer	Civil engineers design major transportation projects. They conceive, design, build, supervise, operate, construct and maintain infrastructure projects and systems in the public and private sector, including roads, buildings, airports, tunnels, dams, bridges, and systems for water supply and sewage treatment.
Designer and drafter	Designers and drafters convert the designs created by engineers and architects into technical drawings. These technical drawings are then used to build structures and manufacture products
Structural engineer	Structural engineers design, plan and oversee the construction of new buildings and bridges, or alterations and extensions to existing properties or other structures.
VR/AR specialist	VR/AR specialists create immersive virtual and augmented reality experiences that are used to experience and evaluate construction projects before they are built.



Urbanisation and infrastructure demands

The COVID-19 pandemic hit the construction sector hard across Africa. The economic downturn caused by the pandemic dampened output across the residential, commercial, industrial and institutional sectors.

Recovery is mixed across the continent.

Construction activity has shown signs of improvement in the major economies of Kenya and Nigeria, as well as in the eastern continental group of Uganda, Rwanda and Zimbabwe. However, the market in South Africa has been sluggish.¹¹

The industry in Egypt is expected to expand by 8.4% in real terms in 2024, supported by the government's continued focus on infrastructure investments, coupled with rising foreign direct investment (FDI).¹² Nigeria's construction sector is expected to experience annual average growth (AAGR) of 3.2% between 2022 and 2026.13 The market in Ethiopia is projected to attain an AAGR of more than 8% during 2024-2027, in part due to development projects being restarted.¹⁴



Especially roads, connect people, resources, and information. From providing physical access to markets, customers, suppliers, to reducing transportation and transaction costs. Roads and other transport and communication infrastructure are the arteries of the economy, facilitating innovation, specialization, and competitiveness across the continent.³⁰

Over the short term, investment in the construction sector is likely to be driven by government spending on infrastructure projects. And this is much needed.

For example, sub-Saharan Africa has an enormous infrastructure deficit. Some 61% of people lack access to safely managed drinking water; 73% lack access to safely managed sanitation; 50% live without access to electricity; and 48% reside in slums or informal settlements.¹⁶ In addition, just 47% of the region's roads are paved.¹⁶

Investment is clearly needed to address the infrastructure gap. The Economist Intelligence Unit predicts the construction sector will continue to benefit from a large pipeline of ongoing and planned energy sector projects, the region's expanding transport infrastructure and further investment in electrification projects to expand generation capacity and transmission networks.²

Governments in countries like Egypt, Morocco and Algeria have launched ambitious infrastructure projects to modernise transportation networks, expand energy production and promote economic growth. Investment in infrastructure is called out in national plans such as Kenya Vision 2030¹⁷ and Nigeria Agenda 2050.18

This surge in infrastructure spending has spurred construction activity and attracted foreign investment. For example the Moroccan government has been heavily investing in infrastructure to meet its target of producing 52% of its energy from renewable sources by 2030. The country is home to the Quarzazate Solar Power Station, the largest concentrated solar power facility the world.¹⁹

Africa has

52 cities

with populations of one million or higher, the same number as for Europe.²⁷

Financial institutions such as the World Bank, the European Investment Bank and the African Development Bank have already provided funding for such sustainable energy projects in Morocco. In Nigeria, major projects include the Lagos-Calabar Railway, Eko Atlantic and the Mambilla Hydropower Project.²⁰

The potential benefits of such infrastructure investments are well-recognised. Economists also predict broader impact such as equivalent or greater job creation potential in childcare, elder-care and education, which also often produce more genderbalanced labour market outcomes. For example, the direct and indirect job creation effects of an investment of 2% of GDP in South Africa would amount to 511,000 jobs in construction (with 29.6% of direct jobs going to women) and 414,000 jobs in care (with 61.4% of direct jobs going to women).²¹

Agenda 63 Goal 10: World class infrastructure criss-crosses Africa.

African Union²⁹

Increasingly urban

Africa has the second-highest urbanisation rate in the world, driven by factors like rural-urban migration, population growth and economic opportunities. By 2050, 56% of its population will be urban. And in the next 10 years, Africa's 20 biggest cities are expected to grow by 50%.²² These present new opportunities in infrastructure development and services.

However, such rapid urbanisation challenges already fragile infrastructure – it also increases the demand for housing, schools and workplaces.

Housing-related activities and investment are major economic drivers, serving as an important contributor to economic activity and job creation. Moreover, access to adequate, safe and affordable housing is at the core of Goal 11 of the 2030 Agenda for Sustainable Development (i.e., attaining Sustainable Cities and Communities).²³

The demand for housing alone is huge.

According to statistics from the Centre for Affordable Housing Finance in Africa, Africa faces a shortfall of at least 51 million housing units.²⁴

For example, the West African Economic and Monetary Union community (Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo), is facing a deficit of decent housing of around 3.5 million units. A total of 250,000 additional houses would have to be built each year to respond to the combined impact of demographic growth and rapid urbanisation.²⁵

Furthermore, on average, more than 3,600 non-residential and residential buildings (excluding single home dwellings) will need to be constructed around the world.²⁶

Many people across the AEC ecosystem will be required to fulfil this demand – planning, building and managing such projects. Digital technologies, such as BIM, can play a significant part in smoothing the path of these projects. But only if the workforce is equipped with the specialist skills it needs to maximise its benefits. African cities become new homes to over

40,000 people a day.²⁴

Africa's urban population has doubled from 19% to 39% over the last 50 years, which means more than

360m new city dwellers.²⁷

The pandemic has caused major shifts in migration patterns, including huge movements of people in and out of urban areas. Furthermore, climate change and conflicts tend to have disproportionate impacts on cities. These factors mean that the world is far from achieving the goal of sustainable cities.

United Nations²⁸



Benefits of BIM

In the ever-evolving Architecture, Engineering, and Construction (AEC) sector, BIM can be a transformative force.

Around the world, it has become an in-demand tool which has proven to energise the construction sector, enabling the digital management and design of buildings and engineering processes. The use of BIM is viewed as key to increasing innovation and directly responsible for improvements in productivity.

According to the 2022 African BIM Report, there's broad acceptance of the need for BIM and the role it will play in the delivery of contracts among construction professionals across the continent.⁸

Perceptions of BIM in working practices



The case for technology in construction

By integrating data and fostering interdisciplinary coordination, BIM streamlines construction processes, reduces costs, and enhances sustainability. It facilitates efficient collaboration, improved decision-making, and enhanced project outcomes. It serves to enhance workflows and mitigate risks across the entire lifecycle of a construction project.

By leveraging these digital technologies, integrated collaboration, and data-driven decision-making, the construction landscape can be transformed. We will see enhanced project delivery, and a shift towards a more sustainable and resilient built environment.

Benefits of BIM for owners



As such, the integration of BIM as a standard practice will promote industry-wide innovation, productivity, and economic growth. It will play a part in shaping a future where our built environment reflects the aspirations of the region and reflects the needs of our communities.

Evidence to support the adoption of BIM

BIM offers significant potential across the AEC ecosystem. The value derived is slightly different for the different players across AEC.

For owners: owners stand to be significant beneficiaries from BIM. According to McGraw Hill Construction's research, there are several positives for owners.³¹

For architecture and engineering: according to research from Dodge Data & Analytics, architecture and engineering firms report benefits for a range of factors across business growth, improved sustainability and operational efficiency.³² For construction: the positive experience is similar for construction firms. According to research from Dodge Data & Analytics, construction firms report benefits a number of growth, quality and project management factors.³²

BUSINESS GROWTH



IMPROVED SUSTAINABILITY

Exceed performance targets 80%

Reduced emissions 77%

Reduced materials usage

76%



OPERATIONAL EFFICIENCY

Better collaboration

93%

Fewer errors



stakeholder buy-ins

Increased

82%

Improved forecasting



WINNING BUSINESS



A case for collaborative training – Quality Standard for Information Technology (QSIT), Egypt

Stakeholders across the AEC ecosystem, from architects to contractors, must invest time in understanding BIM software and workflows to harness its full potential. Clear communication and collaboration are vital. Training should be tailored by role, whilst also making sure each stakeholder understands dependencies and relationships within workflows and projects.

QSIT's training program enables individuals to effectively utilise BIM software to create, manage, and collaborate on BIM projects. Participants can leverage the software's capabilities to enhance design processes, improve coordination, reduce errors, and achieve better project outcomes.

Antoine Shahir, Head of Digital Engineering from QSIT: "Attendees at training often reflect the multi-disciplinary nature of the ecosystem. Participants have roles in structure, architecture, MEP, BIM co-ordination and urban planning.

"We undertake pre-training assessments to understand the existing skill levels and customize the training accordingly and this takes into account different usage requirements from different roles."

> The mandate for change and technological adoption in construction has never been stronger, and financial and strategic investors continue to fuel a rapid expansion of the construction technology industry. The COVID-19 pandemic... served to provide additional urgency to the pre-existing productivity and data-visibility issues facing construction companies.³³

McKinsey



According to the World Bank report, the delivery of infrastructure projects in several sub-Saharan African countries lacks efficiency; and are normally knotted with delay, cost overrun, low productivity, and dispute among stakeholders.³⁴

A continent increasingly adopting BIM

In the ever-evolving Architecture, Engineering, and Construction (AEC) sector, the adoption of Building Information Modelling (BIM) has emerged as a transformative force.

BIM adoption across Africa is still in its early stages, but usage is growing. According to the 2022 African BIM Report, 44% of construction professionals surveyed were using BIM on their projects.⁸ Several factors are contributing to this growth: increasing awareness of the benefits of BIM, access to BIM software and training, and the support of governments and industry associations.

Although there is still some way to go, the adoption of BIM represents an opportunity in the region's journey towards sustainable and efficient construction practices. It can help the region's AEC sector take a step forward.

As other countries and regions have proven BIM has the potential to energise the construction sector, enabling the digital management and design of buildings and engineering processes, across the region.

However, the successful integration of BIM into construction practices across requires not only technological investments but also on the development of a skilled workforce capable of harnessing its full potential.

MOROCCO

BIM adoption in Morocco is in its early stages, with over 10% of construction professionals using BIM. The government has also developed a BIM roadmap to promote BIM adoption in the country.³⁶

ALGERIA

The adoption of BIM is growing, although the use is still relatively limited. According to a study conducted by the Algerian Association of Engineers in 2018, around 15% of construction companies in Algeria were already using BIM.³⁵

GHANA

The level of BIM adoption by AEC professionals within Ghana is low. Only a few professionals use it mainly for 3D modelling and presentations. According to a small-scale study of architects, only 8 out of 30 of those surveyed used BIM.³⁸

NIGERIA

Over 20% of construction professionals are using BIM on projects. The government has also developed a BIM roadmap to promote BIM adoption in the country.³⁶

TUNISIA

Interest in BIM is growing and many construction companies in Tunisia are starting to use it to manage their construction projects. According to a study conducted by the Tunisian Union of Industry, Commerce and Handicrafts in 2019, around 25% of construction companies in Tunisia were already using BIM.³⁵

EGYPT

Over 40% of construction professionals are using BIM on their projects. The government has also taken steps to promote BIM adoption, such as by establishing a BIM roadmap and developing BIM standards.³⁶

ETHIOPIA

According to a survey from 2020 awareness of BIM by practitioners in the sector was more than 70% but adoption is still relatively low.³⁷

KENYA

It is estimated that more than 15% of construction professionals across Kenya are using BIM on their projects. The government has also established a BIM task force to promote BIM adoption.³⁶

RWANDA

A study of AEC professionals revealed only 29.1% of the total respondents were aware of BIM and that 82.9% of those who were aware have been using it while 17.1% have not. The same study highlighted how implementing BIM would be vital to boom the country's construction industry, and recommendations for mandating its use had been made to the Ministry of Infrastructure, Institution of Engineers Rwanda, Rwanda Institute of Architects, and others.³⁹

SOUTH AFRICA

30% of construction professionals use BIM on their projects. The government has also mandated the use of BIM on all public projects over R100 million.³⁶

CASE STUDY

Building a BIM culture in Tunisia



HANA ELLEUCH BIM Expert & Founder of Prodesign, Tunisia



In Tunisia, the adoption of BIM is still in its early stages, but there is growing interest in the technology among architects, engineers, and construction professionals. The Government has taken a number of steps which have helped to create the right environment for the adoption of BIM. Organisations from across the public and private sector are increasingly using BIM in the delivery of major projects.



2017

The Tunisian government launched a national initiative called "Smart Tunisia" aimed at promoting the use of advanced technologies, including BIM, to enhance the country's economy and competitiveness. The initiative includes training programmes for professionals and students in the AEC industry to improve their knowledge and skills in BIM.

2019

The government showed support for the implementation of BIM in the AEC sector, with the Ministry of Equipment studying the benefits and challenges of BIM adoption in Tunisia. The first pilot implementation of BIM with SNIT involved training sessions in Autodesk's BIM software for engineers and architects. In the same year, Tunisian Architects organised certified Autodesk Revit Architecture training sessions.

Such training initiatives are essential for promoting the adoption of BIM and ensuring that AEC professionals have the necessary skills and knowledge to effectively use BIM tools in their projects.

2022/23

The Ministry of Higher Education launches the first BIM Master's degree in the Architecture and Urbanism National school.



Several large construction companies and architectural firms in Tunisia have already implemented BIM in their projects, and others are planning to do so. Examples include:

- The Tunis Financial Harbour Project: This is a largescale development project located in the capital city of Tunis. BIM was used extensively in the design and construction phases of the project, with the aim of improving coordination and collaboration among the project stakeholders.
- The University of Sfax Engineering School: BIM was used in the design and construction of this building, which was completed in 2016. The use of BIM helped to improve the accuracy of the design and reduce construction errors, resulting in a faster and more efficient construction process.
- The Monoprix Hypermarket in Sfax: BIM was used in the design and construction of this commercial building, which was completed in 2017. The use of BIM helped to improve communication among the project stakeholders and reduce project costs.
- Mall of Sousse: was completed and opened to the public in 2018.

Across Tunisia, BIM is increasingly seen as a way to improve collaboration and communication between project stakeholders, reduce errors and rework, and enhance project efficiency and quality.



Educating and skilling for a digital economy

By 2030, the number of global digital jobs is expected to rise to around 92 million.⁴⁰ The WEF suggests these digital jobs could help to balance skill shortages in higher-income countries, while boosting opportunities for younger workers in lower-income countries: "If managed well, global digital jobs present an opportunity to utilize talent around the world, widening the talent pool available to employers and providing economic growth pathways to countries across the income spectrum."

To harness digital technologies and innovation to transform African societies and economies to promote Africa's integration, generate inclusive economic growth, stimulate job creation, break the digital divide, and eradicate poverty for the continent's socio-economic development and ensure Africa's ownership of modern tools of digital management.

African Union¹

But there's already a digital skills gap across the Africa. Nation states need to address and move quickly beyond this - but that's going to take significant effort and investment. They will need to find ways to keep young and middle-class talent. And there's another challenge – or opportunity coming down the track. A youth "bulge" will result in 375 million young people entering the labour market by 2030.¹

Analysis from the WEF finds "the region's capacity to adapt to the requirements of future jobs—measured by assessing the quality and extent of its education and staff training systems, post-basic education attainment and breadth of skills—relative to the region's exposure to these future trends—measured by assessing the impact of latest technologies, local economic diversification and complexity, employee productivity and unemployment—leave little space for complacency."⁷

Sustainable Development Goal 4

"Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all"⁴⁵

Flow and stock of skills development over the life cycle

	F	uture workforce (flow)		Current workforce (stock)		
What Skills?	Cognitive, socioemotional	Cognitive, socioemotional, ICT, higher-order skills	Cognitive, socioemotional, technical, ICT, higher-order skills	Foundational, cognitive, socioemotional, technical, job-specific, ICT, higher-order skills		
	.	Primary Middle Seconda				
When and for whom?	Early childhood	Children & youth		Youth & older adults		
How to develop?	ECD, ba	sic and postsecondary ec	ducation	Short-and long-term training (remedial), OJT		
Main actors?	families, schools	s, TVET providers, univers	sities, employers	Families, TVET providers, employers		

World Bank⁴²

Research by Autodesk reveals that organisations are increasingly prioritising digital skills. In the AEC sector, digital design, digital project management and AI are predicted to be in high demand as companies try to gain a competitive edge through emerging technology.⁴¹

A skills-focused education system needs to make sure that skills supply keeps up with industry demand. Education has a role to play in producing the people needed to drive digital transformation across the AEC sector – the right number of people, with the right skills at the right levels to develop and adopt digital systems, such as BIM. In addition, the application of digital technologies will need to contribute to the reshaping of educational and training curricula – from pre-primary to tertiary and lifelong learning.

At the core of a competitive digital economy is a strong foundation in digital skills and human capital.³⁰

Comparison of workforce constraints and availability of formal training



A complex picture

Across Africa employers cite inadequate skilled workforces as a major constraint to business growth. Coupled with a mismatch between the number of educated young people seeking jobs and the availability of formal, high-quality jobs, there is the added constraint of young people being inadequately prepared for such roles. Closer dialogue between education providers and industry is needed to align and optimise the region's demand and supply of skills. Additionally, the continent's employers and educators need better tools to enable them to better understand labour markets' new and emerging skills requirements.

Africa's education and industrial policies need to strike a balance between encouraging the private investment necessary to create new formal jobs using advanced technology and ensuring that all new labour force entrants have the basic skills and infrastructure to make an adequate living.⁴³

Urgent action is also needed to improve the quality of education in Africa to fulfil the objects of the UN Sustainability Goals. Across the continent, good progress toward achieving universal primary education. But more needs to be done to improve primary completion rates, the quality of education, and secondary and tertiary enrolments especially given:²⁷

- ▶ 30 million children are out of school.
- 35% of the youth have no access to secondary education or technical skills development.
- Half of all children reach adolescence without achieving literacy or numeracy.
- For many young people, six years of school are insufficient to build literacy skills.
- Public spending in education currently averages around 5% of Africa's GDP from just over 1% in Central African Republic to 12% in Lesotho.



As the evidence suggests investment is required at all levels. It starts with continuing investment at primary level, driving up the rates of primary completion – through tertiary and lifelong learning. The availability of digital skills which allows individuals and businesses to harness the opportunities associated with digital transformation, doesn't just start and stop with universities and businesses.

Afterall, "the litmus test of any education system should be whether all children are learning the basic skills necessary to progress through the education system and contribute to national development".⁴³

Education systems need to be flexible, inclusive, proactive and tuned into producing a new breed of workforce that readily and continually learns and unlearns on a wide array of complex skills and competency required in the ever-changing digital world.¹ Curricula need to encourage critical thinking, creativity and emotional intelligence as well as accelerate acquisition of digital and STEM skills to match the way people will work and live in the future.

There are some great initiatives across the continent. In 2019, the African Development Bank launched its Coding for Employment digital training programme. The programme identified 14 centres of excellence and has trained more than 90,000 young Africans (47% women) in ICT. The Bank aims to expand this programme over the next 10 years to 130 centres of excellence across Africa, creating nine million jobs and empowering young people to become innovative players in the digital economy and eradicate child labour.²⁹

As one of the youngest populations in the world, adequate investments need to be made in education and learning that hold value in the labour market and prepares citizens for the world of tomorrow.



Building capability and capacity

It is clear significant investment is needed to boost the AEC sector's digital capacity and capabilities.

Elsewhere (and in pockets across the continent) digital tools have proven to enhance efficiency, accuracy, and collaboration in project management, design and implementation. They not only ensure future readiness, they enable players across the AEC ecosystem to adapt to evolving technological landscapes effectively.

One of the recommendations in the African Union's digital transformation strategy is to "...ensure that teachers access digital training and promote the development of trainthe-teachers programmes, both for their own professional development and for educating students on the use of technology to help create a scale-up and multiplier effect."¹ This is further borne out in national plans, such as Nigeria Agenda 2050 in which the government says it will "develop inclusive train-the-trainers programme that will retool teachers and facilitators at all levels" as part of its digital literacy and skills strategy.¹⁸ The development of improved and innovative training programs is ranked as the number one strategy to attract next generation talent into the sector.

KPMG⁴⁶

79%

actively seek out opportunities to learn and develop new skills.⁴⁷



Egypt – First Option and Nile University, El Sheikh Zayed, Giza, Egypt



Kenya – ADCC International East Africa and Jomo Kenyatta University of Agriculture and Technology

Nile University (NU) is partnering with key local and international institutions to develop a generation of architects and urban designers who can contribute to the prosperity of cities. One partner is First Option, who was asked to deliver BIM and Revit training for partners and university staff, and to support the delivery of a BIM curriculum.

Kamal Shawky from First Option: "The program is part of NU's mission to deliver national and regional unique opportunities for Egyptian teachers and researchers. They do this so they can contribute to the international production of knowledge and to build a strong and sustainable relationship with pioneer institutions worldwide.

"This train-the-teacher model is already working. To date, we've trained more than 50 teachers and trainers from partner organisations and the university. Each had experience of AutoCAD and some Revit knowledge prior to the training program. We anticipate that around 150 undergraduate students in the construction department will benefit from this initiative every year." Architect Tim Akwara from ADCC International East Africa worked with lecturers in architecture and interior design at from Jomo Kenyatta University of Agriculture and Technology in Juja, Kiambu County. "At the heart of the collaboration with the university was the ambition to expand the reach and adoption of digital skills amongst the teachers who will then transfer these skills to their students. We delivered training on BIM workflow for architecture using Autodesk Revit.

"The reason for this focus is that Kenyan Government has recently mandated use of BIM in all development projects. They recognise its impact on effective collaboration and timely completion of projects in order to realise faster returns on investment."

Chairman of the university's architectural department, Hashim Nadi commented: "Tim Akwara and Nicholas Owuor gave a stunning presentation on BIM workflow at the department of Architecture at JKUAT. It covered the BIM workflow using Autodesk Suite (AEC collection). The use of software within this suite allows for collaboration between different industry stakeholders, affording them better design through simulation at all stages of building delivery."



Nigeria – Costech and various tertiary institutions

Costech in Nigeria has delivered several digital skills trainthe-teachers initiatives in partnership with universities across the country. Femi Aderinola from Costech: "Our trainthe-teachers initiatives have proven to be a cornerstone in our digital skills development strategy. We have conducted extensive training sessions with educators from various universities and institutions in Nigeria, including: University of Maiduguri, Ladoke Akintola University of Technology, Ahmadu Bello University, University of Lagos, Raberto School, Kwara State University, University of Ilorin and the First Technical University in Ibadan.

"In addition to university partnerships, we have also extended our expertise to technology leaders within companies, such as Primetech, Adeniyi Coker Consulting Limited, Yolas Consultants, Mar & Mor Engineering, MOMAS Electricity & Meters Manufacturing Company Limited, and many others. These training programs have been pivotal in developing the capacity of industry leaders and mentors in the domain of digital skills, with a particular focus on BIM."



Blueprint for instructor preparation: learning from best practice



NANCY K. TREMBLAY Manager, Autodesk Certified Instructor Program



MICHELE M. BROCCARDO Manager, Autodesk Learning Partner Program Development To provide the best learning experiences to their students, trainers need both subject and instructional expertise.

They need to be prepared to deliver information effectively, respond to participant/student questions and lead activities that reinforce learning. That's where train-the-trainer (or instructor) programmes come into their own.

We spoke to Nancy Tremblay and Michele Broccardo at Autodesk about the importance of instructors – and their perspectives on to best prepare them to deliver meaningful learning experiences. Autodesk Certified Instructors (ACIs) are credentialed professionals, affiliated with Autodesk Learning Partners, recognized for their product mastery, delivery, and instructional skills.

What are the key components of an effective trainthe-trainer program, and how do they contribute to successful knowledge transfer and skill development?

When we develop learning experiences for Autodesk Certified Instructors (ACI), we utilize a collection of curated and research-backed learning content and courseware with multiple content types. This includes role-aligned learning content that teaches in-demand industry skills, in-depth modules on the topics and technologies that align with the learner's industry focus, scaffolded content that creates increasing levels of challenge for the learner during the duration, and hands-on projects to give the learner an opportunity to engage more deeply with concepts or workflows appropriate to their focus industry.

Customer feedback regarding industry standards and market legitimacy are also taken into consideration when we are developing curriculum for our ACIs and ensures successful skill development and knowledge transfer for our ACI's success.

Which methodologies or frameworks can be used in train-the-instructor programs to enhance learning retention and engagement?

In our experience, there are several tools which can be used to enhance learning retention and learner engagement. There are a few methodologies and frameworks which are worth investigation:

Adult learning principles

Andragogy: This emphasizes adult learners' desire for self-directed learning, relevance to their work, and sharing of experiences. Train-the-trainer programs can incorporate activities that allow participants to reflect on their own experiences and practice new skills in a safe environment.

Experiential learning

Bloom's Taxonomy: This is used to classify learning objectives into different levels of complexity. It is a powerful tool for educators and instructors, including those designing train-the-trainer programs, as it helps structure learning activities and assessments to promote deeper understand and most important technical knowledge transfer & retention. Learning by Lecture, Demonstration, & learner participation.

Social learning

Co-operative learning: This involves participants working together in small groups to achieve a common goal. Train-the-trainer programs can utilize group discussions, peer coaching, and collaborative projects to encourage interaction and knowledge sharing.

Instructional design

ADDIE model: This outlines the five phases of instructional design: Analyze, Design, Develop, Implement and Evaluate. Train-the-trainer programs can benefit from using ADDIE to ensure the training is well-structured, meets the needs of the learners, and includes assessments to measure effectiveness.

Additional techniques

- Microlearning: Breaking down complex topics into short, digestible chunks can improve focus and retention.
- Gamification: Incorporating game mechanics like points, badges, and leaderboards can increase motivation and engagement.
- Storytelling: Using stories and case studies can make the training materials more relatable and memorable.
- Technology Integration: Utilizing online platforms, simulations, and other technology-based tools can create a more interactive and engaging learning experience.

By incorporating these methodologies and techniques, trainthe-trainer programs better equip participants with the skills and knowledge they need to deliver effective training sessions that resonate with their audience and lead to lasting learning.

What strategies do you recommend for selecting and preparing instructors who participate in train-the-instructor programs to ensure they are equipped to effectively deliver training?

We review Autodesk product knowledge, product certifications, history in training others, references and industry knowledge, for any instructor joining our programs.

One of the first areas of investment we make in an instructor is an Autodesk-developed pedagogical training course, which helps improve their instructional skills and teaches an instructor how to apply instructional methodologies in the classroom. We require instructors to maintain industry knowledge with self-paced courses developed by Autodesk or through their participation in industry-related conferences.

Ongoing support and mentorship play a crucial role in sustaining the effectiveness of our train-the-trainer initiatives by addressing the gap between initial training and real-world application. Mentors can answer questions, provide feedback on practice sessions, and offer guidance on adapting training materials to specific audiences. They can also identify areas where trainers need further development and recommend additional resources or training opportunities.

Support groups or communities, such as the ACI Community on LinkedIn, allow trainers to connect with their peers, share experiences, and learn from each other. This fosters a sense of belonging and keeps them motivated.

Learning path support and mentorship are not just add-ons to train-the-trainer programs, but essential elements for ensuring their long-term success. By providing a supportive environment where trainers can learn, grow, and share their expertise, organizations can create a pipeline of effective trainers who can deliver high-quality training programs for years to come.



Developing the youth

With more than 60% of its population under the age of 25, Sub-Saharan Africa is already the world's youngest region today – and, by 2030, will be home to more than one-quarter of the world's total under-25 population.⁴

The Digital Jobs in Africa initiative from the Rockefeller Foundation highlights: "Even if the potential of disadvantaged youth were fully recognized, the digital economy faces the same critical gap between supply and demand that defines the broader labour market – there are simply more higher potential youth entering the workforce each year than there are new digital jobs being created."⁴⁸

Investing in Africa's youth is of critical importance. Across the continent the burgeoning youth demographic needs to be equipped with knowledge and skills for gainful employment. They need to be given reasons to stay, and the tools to learn, earn and live.



African Development Forum⁵⁰

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With the right education and training, coupled with welldefined national development strategies and employment policies, Africa's large and fast-growing youth population could be a great asset for development and provide a comparative advantage in world markets.⁴⁹

While national populations in most parts of the world are aging, young people are now in the majority in many African countries. Whether they live in the cities and towns of a rapidly urbanizing Africa, or in rural villages and settlements; whether they come from middle-class backgrounds or from vulnerable families that are living in poverty, one thing is certain—these young people have high expectations, and African policy makers are increasingly concerned about how to meet them.

LEARNING FROM TRAINING PARTNERSHIPS





Multifaceted approach to developing Nigerian youth – Costech, Nigeria Student advocate program – BIM Africa

As part of its commitment to preparing the workforce of tomorrow, Costech's youth-centric programs are designed to empower the next generation with digital skills vital for their future careers. Costech actively engages with teenagers and students of higher education, equipping them with the industry skills needed for their future careers.

Focused on developing digital skills, some initiatives have been conducted in partnership with institutions such as Ajayi Crowther University, Ladoke Akintola University of Technology and Raberto Schools. Examples include:

- Annual Summer Bootcamps for teenagers and young adults (ages 8-18 years). Participants received training in website development, 3D printing, designing 3D models using TinkerCAD and Fusion 360, UI design using Adobe XD, and Scratch programming.
- FREE annual internship program to help build skills for young undergraduates and professionals in Nigeria. The intake comes from both rural and urban regions across the country, making the program accessible nationwide.
- Annual design competitions. These competitions have seen participants and winners go on to achieve greater success.

Femi Aderinola from Costech said: "The initiatives outlined collectively aim to equip Africa's youth with the digital skills they need to thrive in the workforce. We believe that by providing access to quality training and educational opportunities, we contribute to the growth and development of both individuals and the industry as a whole." BIM Africa's student advocate program involves selecting a student advocate team in universities across various African countries. Student advocates are undergraduates studying courses related to Architecture, Engineering and Construction, and had to be in their penultimate or final years of study in the University.

The selected student advocates are trained virtually on BIM and how to create a BIM awareness program in their various institutions. The events in each institution are then ranked; advocates in the top-ranking universities attend fully-funded BIM and construction-related opportunities (internship or conference) outside their country of study. Software used included Autodesk Revit, BIM 360, Navisworks Manage, Infraworks and Civil 3D. Other sessions also explored BIM processes and standards.

In one year, the program involved training 140 student advocates from 70 institutions. And over 800 attendees in various local programs conducted by advocates in their institutions.

Moses Itanola, BIM Africa said: "The potentials of a bottom-up knowledge diffusion approach towards achieving digitization of the built industry are limitless. Exposing Tertiary Institution Students to the capabilities and modalities of Building Information Modelling (BIM) before their entry into professional practice creates a gradual knowledge diffusion and process adoption. The Student Advocacy Program is a program designed to create BIM awareness amongst students of Tertiary Institutions in Africa."



Embedding BIM understanding in degree programs – Quality Standard for Information Technology, Egypt

This workshop initiative has been designed to introduce current students to the fundamental concepts and practical applications of BIM within the AEC industry.

To date, three Egyptian universities have been involved: Cairo University, German University in Cairo, and Mansoura University. Around 30 students have attended at each university; these were undergraduate and graduate students pursuing degrees in fields such as architecture, civil engineering, construction management, and related disciplines.

The program includes an overview of BIM, its history and its relevance in the AEC industry. It covers the evolution of traditional design and construction processes to BIM methodologies.

Antoine Shahir, Head of Digital Engineering from Quality Standard for Information Technology: "This program is aligned to national strategies to uplift students' skills and produce a new generation that is qualified and up-to-date.

"We're equipping students with practical skills in using BIM software and technology. These students will become proficient in BIM, making them more valuable to potential employers. We also discuss and promote the use of BIM standards and protocols, thereby ensuring that students are well-versed in best practices and industry standards."



Certification: The cornerstone of skills

AEC businesses are being challenged to build teams that can keep up with the pace of technological change. Frustrated by digital skills gaps, many are investing in skilling and upskilling initiatives for their employees. They are realising the benefits of this investment – improved quality of work, as well as productivity and efficiency gains.

Students are preparing for careers in an AEC which needs to be transformed by digital technologies. They must stand out from the crowd in competitive job markets - they must demonstrate they have the skills and knowledge businesses need to capitalise upon the latest technologies.

Certifications offer a credible, third-party assessment of skills and knowledge. Embedding professional certifications within academic programs offers benefits for students and institutions alike. Dovetailing professional certifications with training programs can reap rewards for the AEC sector across the continent.

of decision makers worldwide said certified team members provide added value above and beyond the cost of certification⁵¹

R7%

of managers say that certified employees produce higher quality work⁵²

of managers believe that certification helps to significantly improve overall productivity⁵²

72%

of managers feel that IT certification significantly increases employee work efficiency (i.e., completing tasks in less time)52

of employees feel more confident in their abilities and 78% of employees are more satisfied with their jobs after earning certifications⁵³

of managers say they are better able to meet client requirements with credentialed employees⁵³

of managers say that certified employees give their organization an edge over competitors⁵

Similar to an engineering license, having certification is proof that you have met the minimum requirement to deliver without major casualty. First, it is a globally recognized and respected credential that demonstrates professionalism in the use of Autodesk software. It helps individuals stand out, therefore presenting the opportunity to showcase their skills to potential employers and partners. Second, knowing how to use software isn't just enough. getting certified makes a difference. Third, in the academic area, certifications help clients and partners trust you with their knowledge acquisition journey.

Certified Instructor

COSTECH

Kenneth Tobechukwu Ugwuanyi, Costech, Nigeria Autodesk Certified Professional in AutoCAD for Design and Drafting



Certification not only validates your skills but also empowers you to stay relevant and competitive in the ever-evolving field of BIM and design.

Ahmed Muharram Heteba, CAD MASTERS, Egypt Autodesk Certified Professional in Revit for Architectural Design and Revit for Structural Design

Constructing African skills: Play your part

Digital skills are clearly drivers of economic competitiveness and resilience – they are a means to bridge the economic divide and empower individuals and communities.

As the continent experiences burgeoning population growth and increasing urbanisation, there is a growing recognition of the importance of digital skills in driving economic growth and fostering innovation – and, in turn, addressing a range of societal issues.

If 2.4 billion people are going to call Africa home by 2050, it is clear the AEC sector has the potential to be a change maker for the continent. But to fulfil this role, it needs to transform. Players across the sector need to adopt new working practices and embrace technology – by doing so they'll increase efficiency, improve safety standards and contribute to sustainability goals.

Governments and educational institutions need to inspire an increasingly youthful population – they need to accept collective responsibility for preparing them for careers in a transformed construction landscape. The occupational composition of the economy, as well as the skills and knowledge necessary to perform many jobs across the AEC sector, are changing.

Action is needed. And the time is now.









Governments

Invest in digital literacy at all levels of education – from primary to tertiary, students of all ages need to be equipped with core digital skills.

Inspire the young to design and build – ensure national skills strategies recognise the needs of the AEC sector, and enable exposure to workplaces and careers guidance.

Make use of BIM the norm – mandate it on projects, adopt international standards and learn from best practice around the world.

Academia

Prepare a BIM-ready workforce – embed career-relevant practical skills and certification into curricula and help your students to stand out from the crowd.

Build capacity and capability – work in partnership with training providers and industry on train-the-trainer programmes.

Help your students to master industry-relevant technology – partner with software providers, such as Autodesk, to offer your students free access to technologies used in workplaces around the world.

Businesses

Become an advocate for BIM – it has the potential to increase your organisation's efficiency and effectiveness as well as the effectiveness of the AEC sector as a whole.

Train, train, train – allocate resources to training your staff so they can acquire skills and knowledge required to effectively master BIM tools and software.

Open your doors to the next generation – offer work experience opportunities or advice to those seeking a career in the sector.

Individuals

Invest in your skills and knowledge – develop specialist skills needed to transform the AEC sector by seeking out learning and training development opportunities throughout your life.

Boost your credibility and employability – acquire industryrecognised certifications to validate your skills and knowledge, and enhance your employability and progression opportunities.

Embrace digital – explore new tools and technologies to advance digital transformation across the continent, both broadly and in the AEC sector specifically.

Conclusion

Africa is at a critical juncture

On the one hand, rapid urbanisation, population growth and increased demand for modern infrastructure, have the potential to drive the economic growth the continent craves. On the other hand, it is dealing with ongoing conflict, the after-effects of the COVID-19 pandemic as well as the impact of climate change.

The continent could build its way clear, if there was significantly more investment in education and in digital technologies. It is time to reverse the digital literacy and digital skills lag. The AEC sector across Africa has been slow to adopt the latest digital technologies, particularly BIM. There are, however, glimmers of hope as countries increasingly recognise (or mandate) its value. Its full potential will only be realised with structural and policy changes. It is time to accelerate digital transformation.

But no one person or organisation can do these things alone. Now is the time to harness the power of collaboration.



About the Autodesk Learning Program

Autodesk Authorized Training Centers (ATCs) are Autodesk preferred training providers who can help with employee professional development. They work with Autodesk Certified Instructors (ACIs) who are recognized for their product mastery and instructional skills. ATCs work with employers to evaluate business needs and adapt their training to workflow and processes. ATCs offer flexible delivery methods from classroom to instructor-led virtual training to ensure that your team gain the required skills in a way that minimizes business interruption.

Authorized Academic Partners (AAPs) are Autodesk preferred service providers to the academic market that help with faculty professional development and add value to programs and courses.

Our customers are training and learning organisations and teams; they design, create and deliver learning programmes. We work in partnership with them, providing practical solutions which support these efforts. In doing so, we make a real difference to them and their learners. We help them achieve positive learning experiences and outcomes, boost customer and learner satisfaction, and realise cost and resource efficiencies.

46

With Autodesk courses and certifications, businesses can gain the knowledge and skills needed to create high-quality building and infrastructure designs. Students can develop the skills they need to build productive careers in the AEC sector.

AAPs can offer comprehensive end-to-end service packages that combine training with access to Autodesk software and curriculum resources. They embed Autodesk professional certification within their courses, which are of value to faculties and students. AAPs can support and recognize students by rolling out projects, competitions, and extra-curricular training activities.

About KnowledgePoint

KnowledgePoint adds value to learning organisations by delivering a range of learning support services. From learning materials fulfilled in both print and digital to administrative services and global training network management, we make life easier for our learning industry partners.

As the Autodesk Learning Partner Distributor for the EMEAR territory, we manage the training partner network including recruiting, revenue management, and providing ongoing support and enablement to academic, training and learning partners.

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