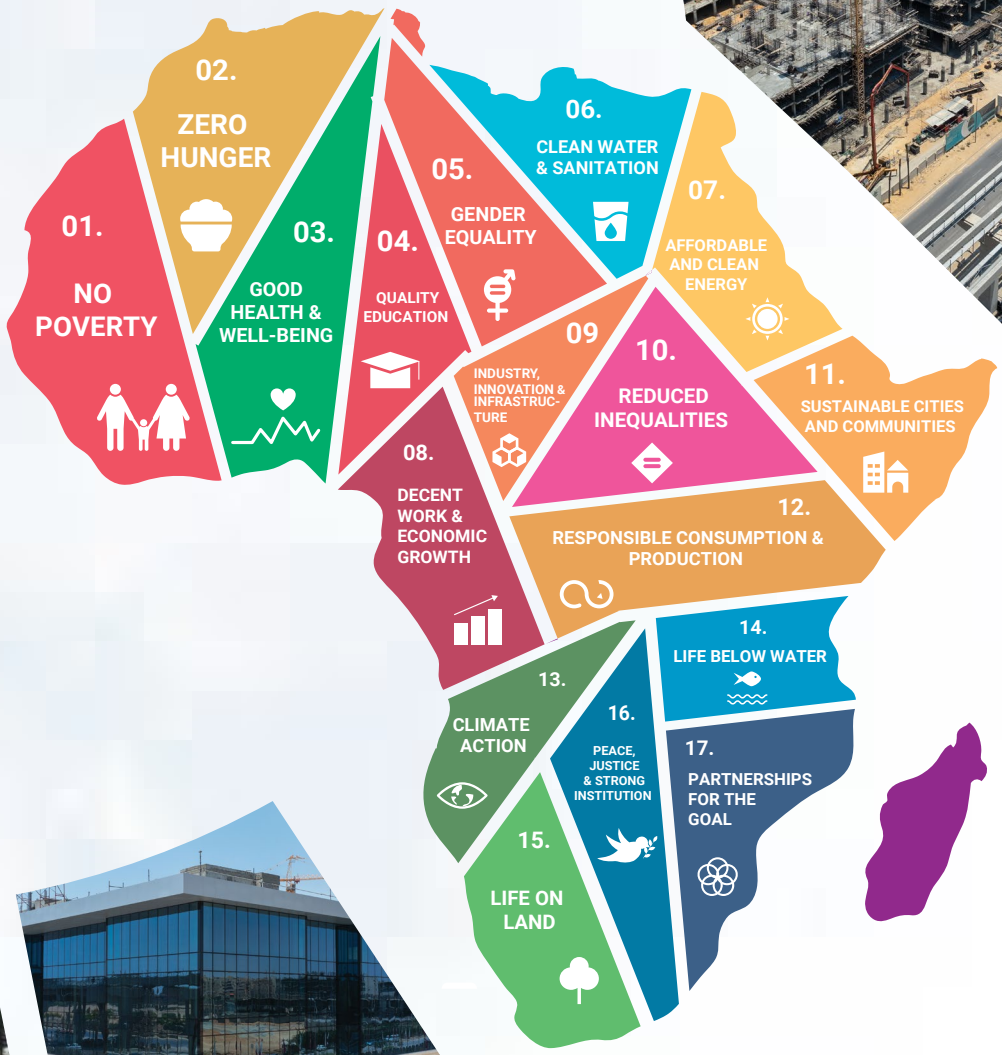




AFRICAN BIM REPORT 2024




The African BIM Report (ABR) is authored by the Research and Development Committee of BIM Africa and provides a biennial status review of the adoption and implementation of Building Information Modelling (BIM) across the African built industry.

The electronic copy of this report can be downloaded at: www.bimafrica.org/reports.

Disclaimers

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The African BIM Report 2024 is a testament to the collective efforts of our vibrant community, highlighting the progress, challenges, and opportunities in the adoption of Building Information Modeling (BIM) across the continent. This report would not have been possible without the dedication of our volunteers, who worked tirelessly in researching, analyzing, and compiling insights that shape the future of BIM in Africa. This year, we received about 600 responses to the African BIM Survey (ABS) 2024 from diverse industry segments across all regions of Africa. Their invaluable contributions provide a comprehensive understanding of BIM implementation, challenges, and opportunities, playing a critical role in informing policies, industry practices, and corporate strategies. We extend our deepest gratitude to everyone who contributed to this report, as their insights will help drive meaningful digital transformation within Africa's built environment.

In recent years, several African countries have taken significant steps in formalizing BIM adoption. Egypt, Ethiopia, Morocco, and South Africa have made notable progress, with some publishing national BIM standards while others are actively working towards policy frameworks to integrate digital construction methodologies. These advancements highlight the continent's commitment to digital transformation in the built environment.

BIM Africa has been at the forefront of driving this transformation through advocacy, knowledge sharing, and strategic collaborations. Over the past two years, we have engaged in global discussions, representing Africa on platforms such as "Building and Climate Global Forum" in Paris as a proud member of the Global Alliance for Buildings and Construction (GlobalABC). Our participation in key industry dialogues and initiatives has reinforced our mission to promote sustainable, efficient, and technology-driven construction practices.

Looking ahead, we remain committed to fostering BIM adoption across Africa through impactful initiatives. The upcoming BIM Africa Summit will serve as a pivotal gathering for stakeholders to exchange ideas, showcase innovations, and shape the digital future of construction on the continent. Additionally, the African BIM Awards will celebrate and recognize excellence, spotlighting individuals and organizations that are driving meaningful change in the industry.

As we continue this journey, we invite all stakeholders—governments, professionals, academia, and industry leaders—to collaborate in building a resilient and digitally advanced African construction sector. Together, we can create sustainable and inclusive built environments for future generations.

Dr. Ons Najjar Mansour
Co-Director

Dr. Noha Saleeb
Co-Director

Introduction: Unleashing Africa's Potential Through BIM Innovation

As Africa undergoes one of the most rapid urban transitions in history—with cities expanding at 3.5% annually and over 950 million people expected to call urban areas home by 2050—the continent's construction sector faces a crossroads with urgent demand for resilient infrastructure, affordable housing, and climate-smart development. In this era of unprecedented growth, Building Information Modelling (BIM) is emerging as a cornerstone of innovation, bridging ambition with execution. BIM transcends traditional blueprints and 2D drawings; it is a digital revolution transforming how Africa designs, constructs, and stewards its built environment. By integrating data-rich 3D modelling, real-time collaboration, and lifecycle management, BIM empowers stakeholders to deliver projects faster, with reduced waste and enhanced precision. Its potential extends beyond cost savings a catalyst for sustainable development, enabling smarter resource use, carbon footprint reduction, and assets tailored to Africa's diverse climates and cultures.

This year, ABR 2024 focuses on Sustainability and Circularity through investigating alignment of Africa's BIM and Integrated Digital Delivery adoption with the 17 United Nation's Sustainable Development Goals (SDGs). Adopting the UN SDGs in construction is crucial for fostering a more sustainable and equitable African future. By integrating the SDGs, the African construction industry can significantly reduce the continent's environmental impact, promote social inclusion, enhance economic growth, protect Africa's rich biodiversity, and address critical issues like climate action, responsible consumption, and sustainable cities. This approach encourages using eco-friendly materials, energy-efficient designs, and innovative technologies that minimize waste and lower carbon footprints. Moreover, it ensures infrastructure projects contribute to better living conditions, improved health, and increased resilience against climate-related disasters. Ultimately, aligning the African construction practices with the SDGs builds a world where development meets present needs without compromising the ability of future generations to meet their own.

The Experts Vision highlights BIM adoption's growth potential to improve project delivery, reduce costs and enhance transparency. It also highlights challenges like high Capex and Opex costs (particularly infrastructure/operations), lack of standards and resistance to change. Mandating BIM in public projects can support and encourage firms to adopt the process. Through Project Studies and Stakeholders' Survey Insights, we explore how BIM is reshaping project delivery—from concept to maintenance—and driving accountability in an industry plagued by delays and cost overruns. We also confront barriers hindering widespread adoption: limited digital infrastructure, resistance to cultural change, and the need for localized training programs. The report highlights the need for emerging Industry 4.0 technologies such as AI, Digital Twins, IoT, Big Data analysis, Blockchain, Robotics, for better asset monitoring, prediction and enhanced decision making for sustainable performance. Crucially, the report also highlights innovative pathways emerging across the continent, such as public-private partnerships and homegrown BIM startups adapting tools to African contexts.

BIM is proving its value in tackling complex challenges, but progress remains uneven. Some regions embrace digital transformation, while others grapple with fragmented policies, skills gaps, and legacy systems. The divide underscores a critical truth: African BIM success depends not only on technology but on fostering collaboration ecosystems. The urgency of this transformation cannot be overstated. As climate change intensifies and urban populations surge, BIM offers a framework to build faster… better—prioritizing energy efficiency, disaster resilience, and inclusive design. However, unlocking its full potential demands collective action. Governments must champion supportive policies, educational institutions must cultivate digital fluency, and industry leaders must share cross-border knowledge.

This prologue frames BIM as a shared vision for Africa's built future, leapfrogging outdated practices, redefining global standards, and creating infrastructure that serves generations. The journey is complex, but opportunities are unparalleled. As you turn the pages, consider this not just a report, but a call to reimagine Africa's cities when technology and collaboration converge. The blueprint for progress is here. Let's build it together. Let's take the first step today to transform Africa's construction industry and unlock BIM's full potential for our continent.

Acknowledgements

The BIM Africa Research and Development Committee acknowledges the guidance and leadership of the Board of Directors, Strategic Advisory Board, Country Representatives, and the Operations and Programs team for the publication of this report. We appreciate all individuals, communities, professional institutes, and corporate organisations that contributed to the report and shared the African BIM Survey 2024 with their members.

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PROJECTS

African BIM Report 2024

Leveraging Building Information Modelling (BIM) for Seamless Project Management: A Case Study.

PROJECT: Extension of Cascavelle Shopping Mall

ORGANISATION: Ekium Amio Ltd.

SOURCE: Lauréna Erriah, Nikant Napaul.

COUNTRY: Mauritius

Introduction:

In contemporary construction projects, Building Information Modelling (BIM) has emerged as a pivotal tool, transforming traditional methodologies into efficient, collaborative, and data-driven processes. This article elucidates the integration of BIM in a prominent project involving the renovation and extension of a shopping mall situated on the picturesque west coast of Mauritius Island. Through a comprehensive overview of BIM implementation across various project phases, this report highlights its significance, resource requirements, measurable impacts, sustainability considerations, and alignment with UN Sustainable Development Goals (SDGs).

Organisation Overview:

Ekium AMIO Ltd is an integral part of EKIUM, an engineering group present in twelve different countries with expertise in industrial engineering, building services engineering, plant engineering in a plethora of sectors, namely energy, manufacturing, military, pharmaceutical amongst others. Ekium AMIO is located in Mauritius and from there provides services all across sub Saharan Africa, as well as in the Indian Ocean.

Project Overview:

The project encompasses two distinct phases:
1- the modelling of the existing shopping mall
2- the extension thereof.
In the initial phase, advanced 3D laser scanning technology was used to capture precise data in Point Cloud format, subsequently modelled using Revit software for architectural and structural components. For the extension phase, our project team, serving as BIM managers, meticulously developed a BIM Execution Plan (BEP) to establish protocols and workflows. Coordination meetings were conducted with all project stakeholders and Autodesk Construction Cloud facilitated seamless collaboration through a Common Data Environment (CDE) and Asite for Document management. Moreover, rigorous clash detection methods were instituted to ensure coordination and mitigate conflicts during construction.

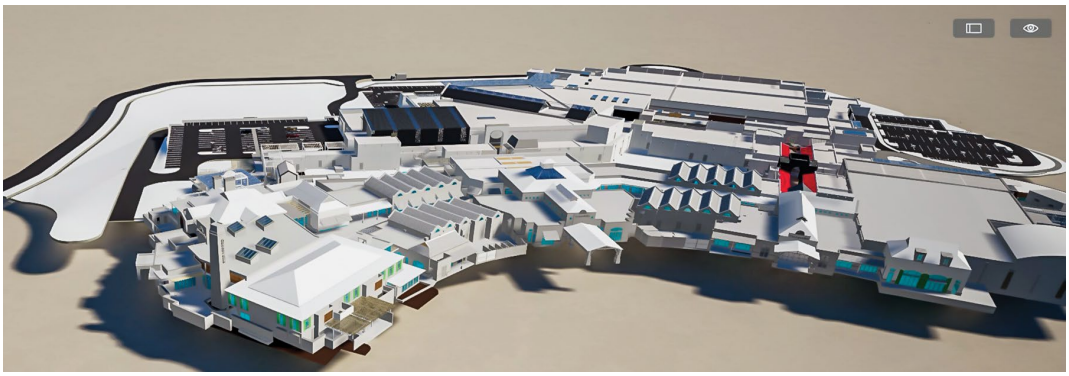


Figure 1: Image of Development Model

BIM Use Aspects:

BIM was extensively utilized throughout the project lifecycle, spanning from initial data acquisition to construction monitoring and beyond. The technology facilitated accurate visualization, coordination, and communication among multidisciplinary teams, enhancing decision-making and streamlining workflows. Notably, BIM played a pivotal role in clash detection, resource allocation, and project monitoring, ensuring timely delivery and optimal utilization of resources.

BIM Uses on the Project

- Design Authoring (Author Design):

This aspect involves the creation and development of architectural and structural designs using BIM software such as Revit. Through collaborative authoring, the project team generates detailed models that serve as the foundation for subsequent project phases.

- Design Review (Review Design Model):

Design review entails the evaluation and validation of design models to ensure compliance with project requirements and stakeholder expectations. By conducting comprehensive reviews, potential discrepancies or conflicts are identified and addressed early in the design process, minimizing rework and optimizing design quality.

Figure 2: 3D of fully coordinator Model

• 3D Coordination (Coordinate Design Model):
3D coordination is essential for integrating multidisciplinary design elements into a cohesive and clash-free model. By coordinating architectural, structural, mechanical, electrical, and plumbing (MEP) systems in a three-dimensional space, clashes and conflicts are identified and resolved proactively, enhancing project coordination and reducing construction errors.

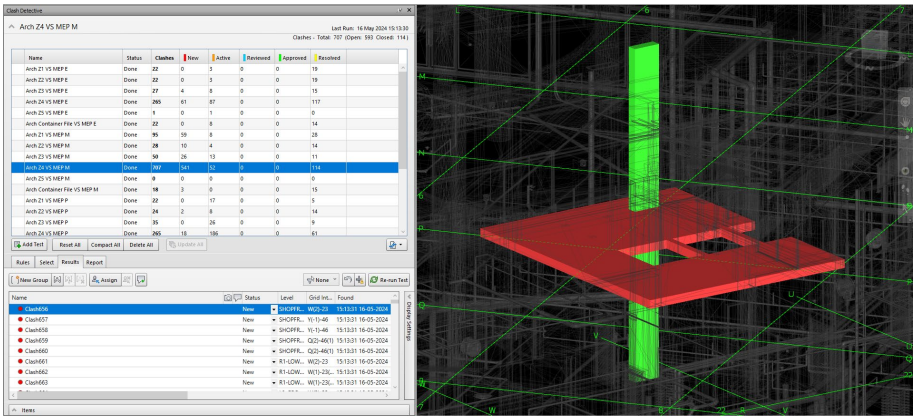


Figure 3: Image showing clash detection and resolution between disciplines

• Record Modelling (Compile Record Model):
Record modelling involves the compilation and documentation of project information throughout its lifecycle.
By maintaining an accurate and up-to-date record model, project stakeholders can track changes, monitor progress, and ensure compliance with project specifications and regulatory requirements.

• Existing Conditions Modelling (Capture Existing Conditions):
This aspect focuses on capturing and modelling existing site conditions using advanced technologies such as 3D laser scanning. By accurately documenting the existing built environment, project teams can make informed design decisions, mitigate risks, and minimize conflicts during renovation or expansion projects.

Scan to BIM process is structured as follows:
Step 1 – Planning, site inspection, mobilization
Step 2 – Laser Scanning & Survey Process
Step 3 – Data treatment through the specific software & methodology.

Figure 4: Overlay of point cloud data & 3D Model

- **Asset Management (Monitor Assets):**

Asset management encompasses the tracking, monitoring, and maintenance of project assets throughout their lifecycle. By leveraging BIM data, project stakeholders can effectively manage assets, optimize maintenance schedules, and enhance operational efficiency.

- **Resources Required and Standards Utilized:**

The successful implementation of BIM necessitated a confluence of technological resources, skilled personnel, and adherence to industry standards.
Key resources included advanced 3D laser scanning equipment, Revit software for modelling, and Autodesk Construction Cloud for collaboration and data management.
Furthermore, adherence to *ISO 19650-2&4* standards ensured consistency, interoperability, and data integrity throughout the project lifecycle.

- **Measurable Impact of BIM Usage:**

The integration of BIM yielded tangible benefits, manifesting in enhanced project efficiency, reduced rework, and improved decision-making. By facilitating real-time visualization and coordination, BIM mitigated clashes and conflicts, thereby minimizing delays and cost overruns. Moreover, the centralized data management approach facilitated seamless information exchange, fostering collaboration, and enhancing project transparency.

- **Sustainability Considerations:**

In alignment with global sustainability initiatives, the project embraced principles of circularity and resource efficiency by making use of the existing building instead of pulling it down. BIM enabled the optimization of material usage, waste reduction, and energy efficiency through advanced simulation and analysis capabilities. The collaborative process also minimised the need for face to face meetings.

- **Alignment with UN Sustainable Development Goals:**

The project aligns with several UN Sustainable Development Goals, notably Goal 9 (Industry, Innovation, and Infrastructure) and Goal 11 (Sustainable Cities and Communities). By leveraging BIM technology to improve infrastructure planning, optimize resource utilization, and enhance urban development, the project totally aligns with the philosophy of the smart city it is situated in.

Goal 9 (Industry, Innovation and Infrastructure):
The innovation starts at the conception of the project itself with the way the commercial outlet was designed, benefiting fully from the digital transition tools of the construction industry.
Goal 11 (sustainable Cities and Communities)
The commercial mall sits at the heart of a smart city – designed to enhance community living and minimise travel.

Conclusion:

In conclusion, the integration of Building Information Modelling (BIM) in the renovation and extension of the shopping mall exemplifies its transformative impact on modern construction projects. Through advanced technologies, collaborative workflows, and adherence to industry standards, BIM facilitates efficient project management, enhances sustainability, and aligns with global development objectives. As the project progresses, continued innovation, and utilization of BIM promise to further optimize construction processes and deliver enduring value to stakeholders and communities alike.

Golden Gate Project

PROJECT: Golden Gate Project

ORGANISATION: Redcon Construction/ Polar Construction and Project Management

SOURCE: Mohamed El Sarha

COUNTRY: Egypt

REGION: Northern Africa

Background

3D Impression of the Golden Gate Project.

Golden Gate Project (Project):

The Golden Gate project, developed by Redcon Properties, spans 160,000 square meters in New Cairo. It features interconnected districts with mixed-use buildings, offices, and retail spaces. Sustainability is a priority, integrating natural elements and maximizing shade. The project aims to create a pedestrian-friendly environment while meeting global environmental standards.

Redcon Construction (Contractor):

REDCON Construction, celebrating its 30th anniversary, is a major player in Egypt's EPC industry. With a diverse portfolio spanning eight companies, REDCON contributes to various sectors, including construction, aluminum and glass façade solutions, steel production, ready-mix concrete, technology infrastructure, and real estate development. Guided by core values and social responsibility, REDCON's impact extends across residential, manufacturing, infrastructure, education, hospitality, commercial, industrial, healthcare, solar, renewable energy projects, and transportation networks. The company is committed to shaping a brighter, more sustainable future for Egypt and beyond.

Redcon Properties (Client):

Redcon Properties (formerly known as Redcon for Offices and Commercial Centers) was established in 2019 as the real estate development arm of REDCON Group, leading in diverse mixed-use communities.
The company operates with sustainability as its core value, where it leads the Egyptian real estate sector in the implementation of sustainable building and green architecture, with Golden Gate as its first flagship project.

Polar for construction and project management (Project management and BIM Consultancy):

POLAR has been growing since 2010, leading to a division into two separate entities in 2020, (Development and Project Management). As of 2022, we rebranded as Polar Construction and Project Management, with a renewed focus on providing comprehensive solutions in Project Management, Construction, BIM Management, and Facility Management.

Polar has been one of the leading companies in the Egyptian market since its establishment and dominated several fields such as construction, development, and BIM Management. Polar is an integrated facilities management company that provides tailored solutions for all facility needs using the latest technologies and trends in the AECO industry whether it is a commercial organization (office, warehouse, industrial, or leisure), a public sector organization (education, local authority, or healthcare), or a retail organization.

BIM USES

In the article about Redcon Construction's use of Autodesk Construction Cloud, Building Information Modeling (BIM) plays a crucial role across various lifecycle phases:

Design and Preparatory Work:

BIM facilitates collaboration between technical office-based teams during design and preparatory project work.
Teams can create and synchronize clear BIM models in the cloud, reducing conflicts and saving time.

The BIM Workflow is set according to ISO 19650 1 and 2 beginning from the design phase and updating the design in each stage on the Common Data Environment in real time and using the platform workflows.

Construction and On-Site Work:

Site-based teams pick up projects immediately after design completion, thanks to synchronized BIM data on the Common data environment .
Autodesk Construction Cloud ensures data consistency, reducing stress and rework by sharing the documents, models and information from site to the technical offices on the cloud in real time.
We have used Fuzor in the 4D and 5D Analysis and simulation by creating a laser scan every quarter to check the progress tracking and creating as-built models.

Operation and Beyond:

BIM data remains accessible throughout the project lifecycle and even by preparing the BIM data to be loaded by information and data for the operation phase to facilitate the facility management handover process.
Standardized processes and schedules in Autodesk Construction Cloud enhance efficiency and data-driven decision-making.
The project is preparing the BIM model to be used as a digital twin in the operation phase by early preparing and asset information requirement to requires the information from its source

COVID Adaptation:

During the pandemic, technical officers continued working remotely using BIM collaboration tools in other projects as this feature has created an awareness of using the CDE cloud-based platforms in the golden gate project.
Without this, coordination would have been challenging with separate files and no central coordination.

Data Insights and Sustainability:

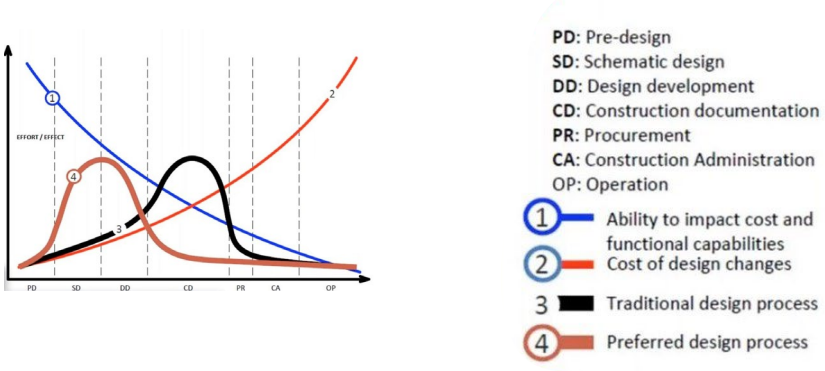
Autodesk Construction Cloud provides valuable data for managing future projects and estimating.
The platform enables paperless work, streamlining workflows and improving project data accuracy.
In summary, BIM in Autodesk Construction Cloud enhances communication, collaboration, and efficiency across all project phases.
The project is totally paperless except the contractual documents that must be signed or stamped in every phase that has reduced the printed documents by 95%.

Resources and Standards

In golden gate we have used ISO 19650 part 1 and part 2 and we have used the British LOD and LOI standards. We have used Autodesk Revit, Autodesk Construction Cloud Build module, Autodesk construction Cloud Collaboration pro module, Fuzor, Cyclone and Autodesk Infraworks.

BIM Impact on Project/ Organisation Success.

Shifting the Effort as in macleamy diagram of BIM Effort with phases shows that all the effort is at the design phase that will decrease the number of issues at the construction phase as in the design phase the coordination design issues was 1569 issue versus the construction phase coordination issues are 280 only that means issues was reduced by 80% in the construction phase



McLeamy Diagram: Analysis of the Adoption Rate of Building Information Modeling and its Return on Investment.

The duration of the approval cycle was reduced to 5 working days due to the transparency of the information sharing between all project stakeholders.

And the RFI reached 281 RFI as the project is in the construction phase for 2 years till date.

The project is working on the main 3 stages Schematic design and Detailed Design and construction Stage all at the same time and due to the usage of cloud based CDE (ACC) working with consultant in a different cities and collaboration with contractor, project management and client benefit all these stakeholders from the real-time information sharing and notification.

We have calculated in a case study of 4D Clash using Fuzor that results on return on investment of 4 as there was an area must be poured at a date that will block the maneuvering of the concrete pumps and it cannot be reached even by placing booms, so we had the decision to hold this area before it has been poured in site. This case study has shown the benefit of the simulation of construction methodology before constructing anything at the site.

Sustainability/ Circularity Considerations.

The Golden Gate project by Redcon Properties in New Cairo is designed as a sustainable mixed-use development, and it has been awarded the prestigious EDGE Advanced Preliminary Certificate. This certification is evidence of the project's commitment to sustainability and environmentally conscious construction practices. The project demonstrates substantial energy and water savings, with up to 53% energy savings and 44% water savings compared to conventional buildings.

Local and Recycled Materials:

The project emphasizes the use of locally extracted and manufactured building materials, as well as recycled content products, to support the local economy and reduce environmental impacts. The goal is to utilize local resources and reduce the environmental impact of long travel distances for materials.

Solid Waste Management and Inclusive Community involvement:

The project develops a solid waste management plan and emphasizes community-led action to manage waste effectively. The plan aims to reduce landfill waste, consumption of natural resources, and harmful emissions associated with waste disposal.

UN Sustainable Development Goals Alignment.

In terms of alignment with the United Nations Sustainable Development Goals (UN SDGs), the project's sustainability features, such as energy and water efficiency, suggest alignment with several SDGs, including:

- SDG 6 (Clean Water and Sanitation): Through its water-saving practices.
- SDG 7 (Affordable and Clean Energy): By reducing energy consumption.
- SDG 11 (Sustainable Cities and Communities): As it is a sustainable mixed-use development.
- SDG 13 (Climate Action): By minimizing the carbon footprint and implementing environmentally friendly practices.

Additionally, the project has signed a memorandum of understanding with Schneider Electric to integrate AVEVA's advanced software solutions, which will further enhance the sustainability of the development. This includes managing energy and water consumption efficiently and supporting digital transformation for a sustainable future in Egypt.

Leveraging Building Information Modelling for Circularity and Material Reuse in the Global South.

PROJECT: Heritage Greenhouse - Material Re-Use

ORGANISATION: University of Pretoria

SOURCE: Calayde Davey

COUNTRY: South Africa

REGION: Southern Africa

Background

Study Area and Team

This project centres on two heritage greenhouses located at the University of Pretoria, South Africa. These structures will potentially be deconstructed, either for demolition or reconstruction. The property owner, University of Pretoria Facilities Management, has entrusted a local heritage architecture firm to oversee the initiative, allowing access to the greenhouse structures (Figure 1). This is a transdisciplinary team, which includes architecture, engineering, quantity surveying and facilities management professionals and post-graduate students-in-training.

This postgraduate unit involves a transdisciplinary student team of architecture, structural, quantity surveying, and civil engineering students. Students utilize LiDAR and photogrammetry to scan the buildings. Together, they define a circularity-oriented BIM workflow, articulating appropriate levels of modelling detail, and systematically capture vital information for selective deconstruction and re-use. This hands-on, transdisciplinary approach underscores the significance of choosing appropriate physical and digital tools for specific tasks, emphasizing the effectiveness of even basic tools in gathering essential digital information (Figure 2).

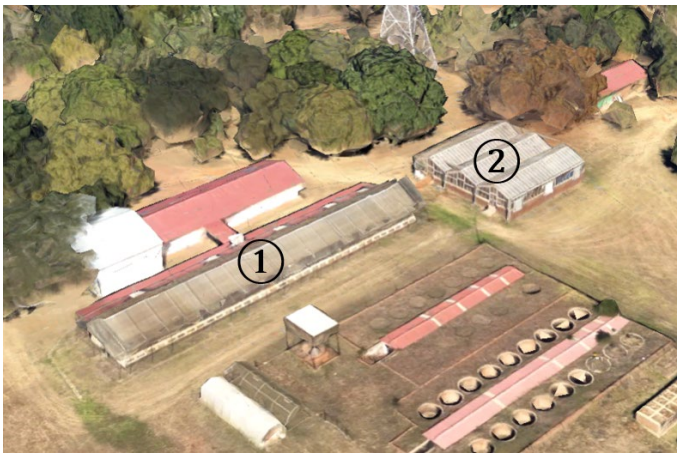


Figure 5: This project focuses on two steel-framed heritage greenhouses i.e. Greenhouse 1 and Greenhouse 2 (Davey & van der Merwe, 2023).

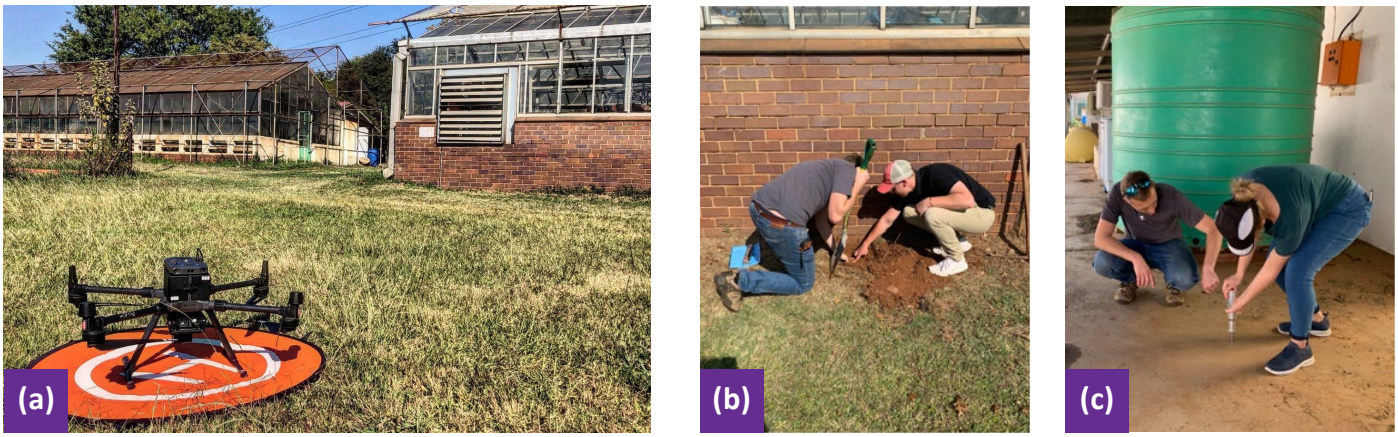


Figure 6: Capturing relevant information for the BIM model involved a range of different tools, ranging from drone operated LiDAR and photogrammetry (a), to non-destructive material testing (b), and simple pick axes and shovels to determine foundation sizes (c). (Davey, van der Merwe 2023).

After thorough exterior and interior scans, a BIM model materialized from the resultant point cloud and field-work efforts. This model is continually updated as digital classification of crucial structural particulars improves (Figure 3), crafting a circularity-oriented material inventory. By the seventh week, the students collaboratively showcased their progress during the quarterly exams, both as a transdisciplinary team and as individual researchers with distinct areas of specialization.

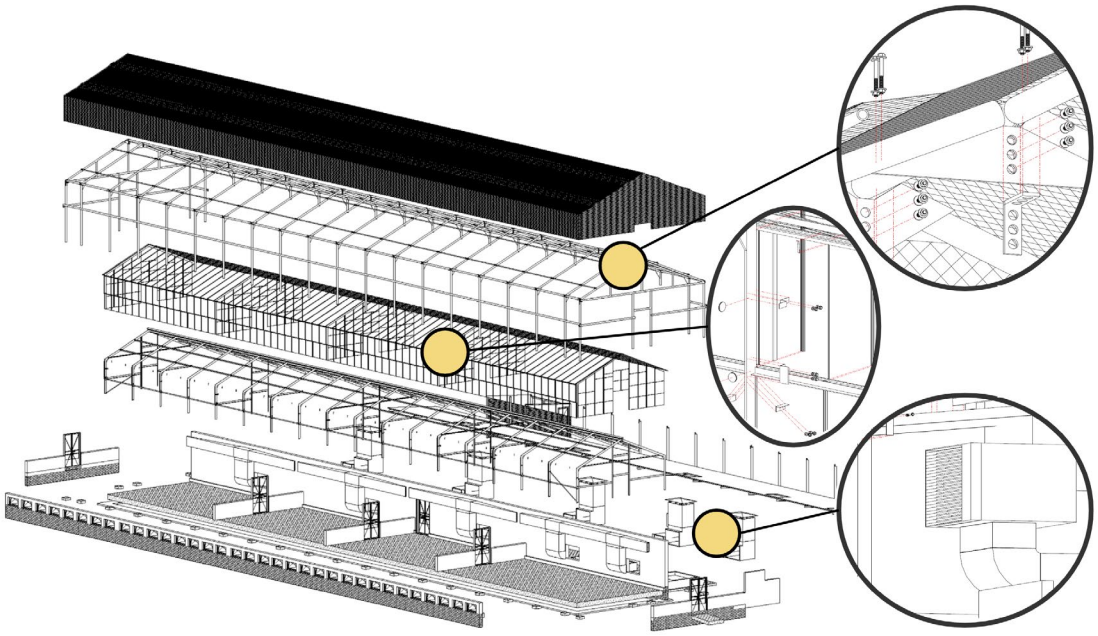
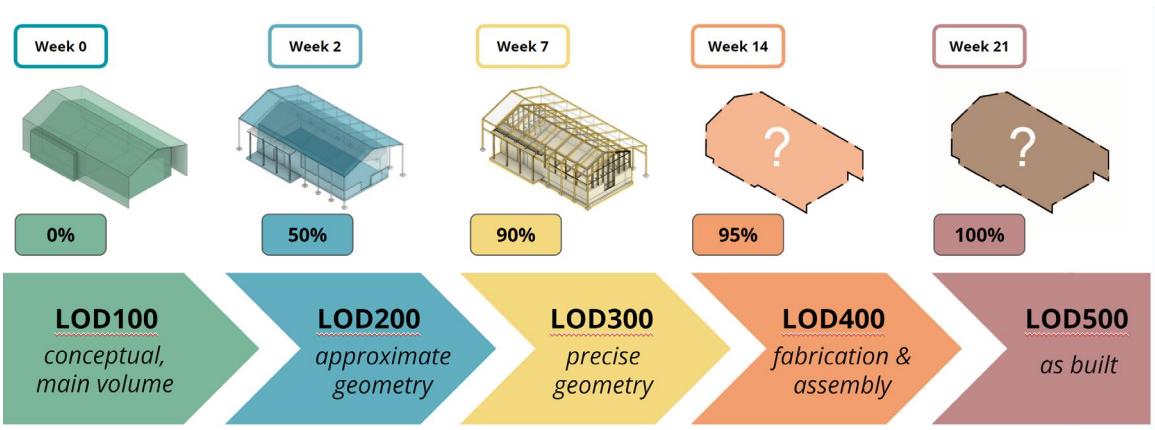


Figure 7: By week seven, the transdisciplinary team had built a shared LOD 300 BIM model for Greenhouse 1 (Potgieter, Davey, & van der Merwe, 2023).



Resources and Standards.

Initially, the original students crafted an organizational framework outlining roles and responsibilities (Figure 4). This initial representation underscored disciplinary boundaries, each confined to its designated domain. However, by the conclusion of the academic quarter, the students devised a refined flowchart for oral examination. Remarkably, in just seven weeks, disciplinary barriers dissolved, roles evolved, and fresh team members voluntarily integrated.

This transformative learning encounter can only occur within a transdisciplinary classroom, where students fully comprehend the significance of genuine collaboration and learning-by-doing. This innovative setting accentuates students' recognition of collaboration's immediate and long-term value, fostering novel insights, shared impacts, and diverse perspectives through collective learning. As students exchange methods, skills, and diverse viewpoints across disciplines, a dynamic learning environment emerges, mirroring the intricacies of real-world projects. This invaluable learning experience extends beyond textbooks and disciplinary boundaries.

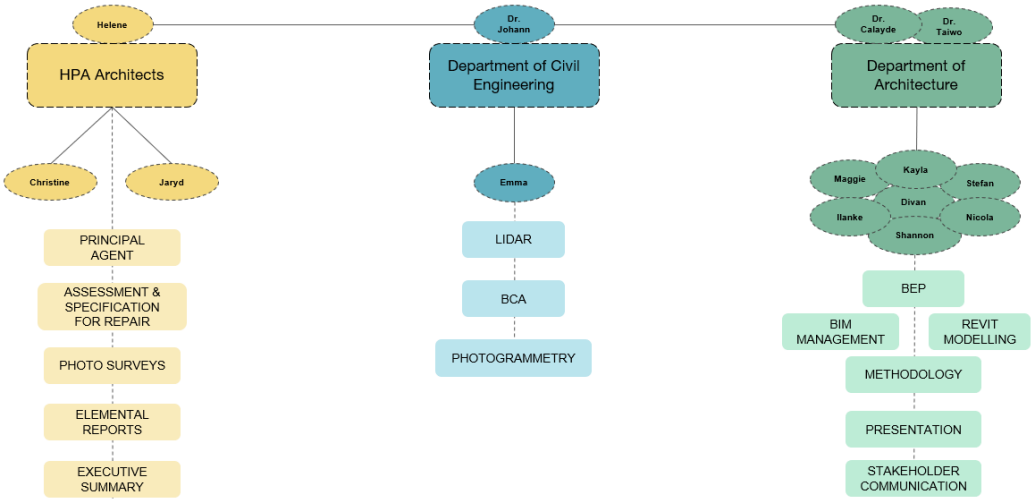


Figure 4: During the first week, students formulated their perception of the project within a discipline-specific organizational framework, rooted in their existing comprehension of tasks and roles. Distinct silos emerged for the client (represented by HPA Architects), engineering, and architecture roles (Student Exam Submission, Q2, Davey, van der Merwe 2023).

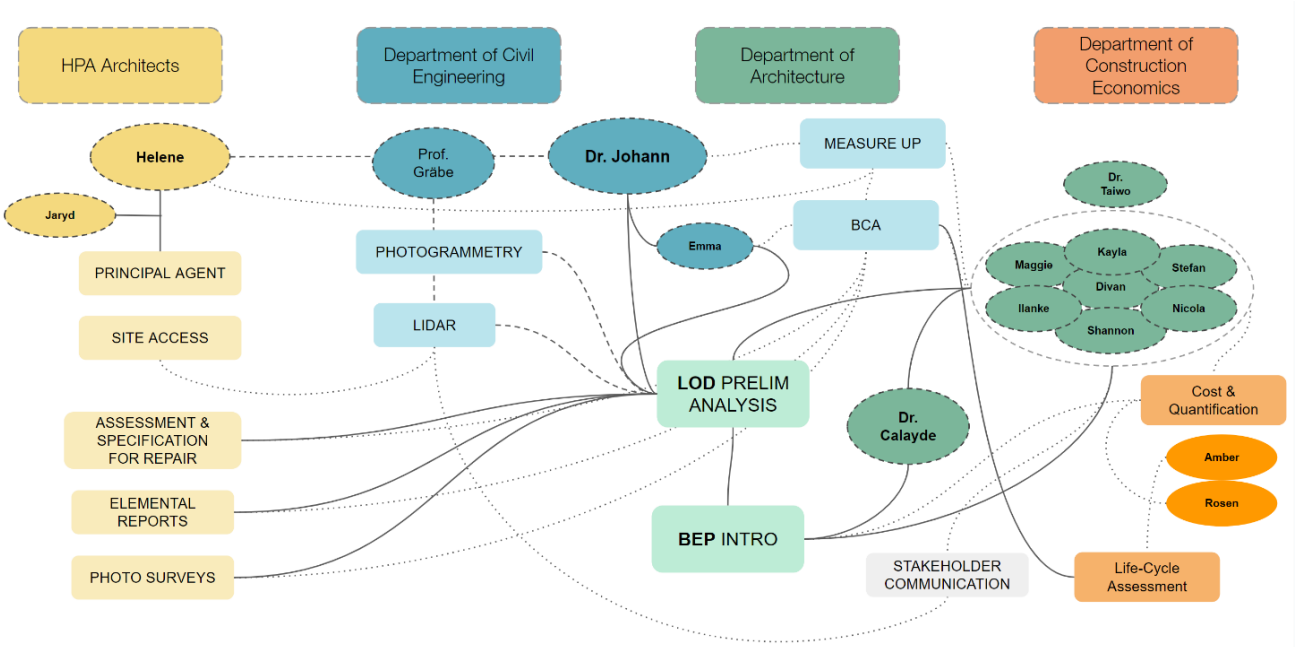


Figure 5: By the seventh week, a noteworthy transformation occurred as disciplinary silos within the organizational flowchart were dismantled, mirroring the emergence of an interactive, value-driven, and skill-sharing transdisciplinary project environment (Student Exam Submission, Q2, Davey, van der Merwe 2023).

While formally focussed on architecture and civil engineering students, the initiative attracted interest from students from other departments. As the original group struggled with how to quantify their models for varying detail levels, quantity surveying (QS) students voluntarily joined to help them. The QS students prepared presentations on QS methodologies, significantly impacting the original team's understanding and outcomes (Figure 6). This sensitized the entire student cohort to the QS discourse, an experience the original students will not encounter in traditional education settings.

Furthermore, while the structural engineering student delved into her individual research on structural Life-Cycle Assessment (LCA), the QS team swiftly offered their disciplinary perspective on LCA as well. This additional perspective significantly enriched the comprehension and intricacy of LCA for all involved, intensifying the team's inquiry and kindling heightened enthusiasm for broader circularity concerns.

As such, this transdisciplinary learning environment organically transitioned into a flipped-classroom model, where diverse students mutually instructed each other in core disciplinary skills using shared BIM models. Cross-skilling within a shared digital ecosystem not only reshapes perspectives on the subject matter but also fosters collaboration, critical thinking, and creative complex-problem solving skills among all participants.

The impacts of this transcended the student body, extending to the professional architectural team as well, who eagerly embraced the opportunity to glean deeper insights from new knowledge. As a result, the benefits extended to both students, industry professionals, and the postgraduate teaching team. Impressively, the student team attained an average mid-year exam score of 75% (A), underscoring their sustained enthusiasm and self-directed commitment to the project, even without extensive guidance from the teaching team.

Figure 6: Quantity Survey (QS) students voluntarily joined, enhancing the initiative through teaching QS tasks to the original team (Student-led Transdisciplinary Flipped-Classroom Q2, Davey, van der Merwe 2023).

The students (now including QS's) showcased their work at the BIM Harambee Conference (Figure 7), spotlighting the transdisciplinary classroom as a case study for built environment education. It highlighted collaborative learning via BIM workflows within the African context. The integration of transdisciplinary exposure within core curriculum gained recognition from both industry and academia, noted by numerous conference stakeholders. The presentation earned praise not only from industry experts but also external educators (Figure 8), leaving a lasting desire to support the continuity of this educational model. Significantly, specific students garnered job offers, fuelled not solely by technical expertise, but by their exceptional collaborative abilities. Their capacity to function harmoniously as a team and create shared value underscored the significance of these interpersonal skills, highlighting how their skills were recognized as invaluable assets in the professional workforce.

Figure 7: Transdisciplinary student team exhibiting their work at the BIM Harambee 2023 (Davey, 2023).

Congratulations to the School of Architecture for offering the Future of Work BIM workshop. This workshop was an exemplary example of an education-industry collaboration that involved preparing our young designers, engineering and construction students for the challenging and rapidly changing technological environment.

We appreciate the extension of this invitation to fellow academics and look forward to continuing discussions and interactions relating to the topic.

Figure 8: Sample of feedback from the BIM Harambee 2023, where the interdisciplinary classroom was demonstrated to both industry and educators alike (Davey, 2023).

BIM Impact on Project/ Organisation Success

The project follows after a systems-thinking design studio and field work executed by the architecture students during the preceding academic quarter. While this studio primarily honed evidence-based design-thinking skills, it also sensitized students to a comprehensive understanding of waste issues in the construction sector and potential avenues for repurposing construction waste. Noteworthy student studies emerged from this studio, such as a comprehensive mapping of construction waste in Pretoria to elucidate material types and quantities (Figure 9 and Figure 10), and an exploration of waste utilization in building materials for informal settlements around Pretoria (Figure 11).

This exposure sensitised students to the broader global waste challenge, fuelling their motivation to seek practical solutions. The impact was palpable, as the majority of design students voluntarily enrolled in the advanced research unit (discussed in this application). These students were driven by a deep desire to cultivate practical and technical proficiencies to solve the global challenge and to develop methodologies and tools to address this overarching issue. The unique advantage of the transdisciplinary classroom setting allowed them to gain hands-on experience within a safe-to-fail experimental environment while preserving their core disciplinary competencies essential to their respective professional degrees.

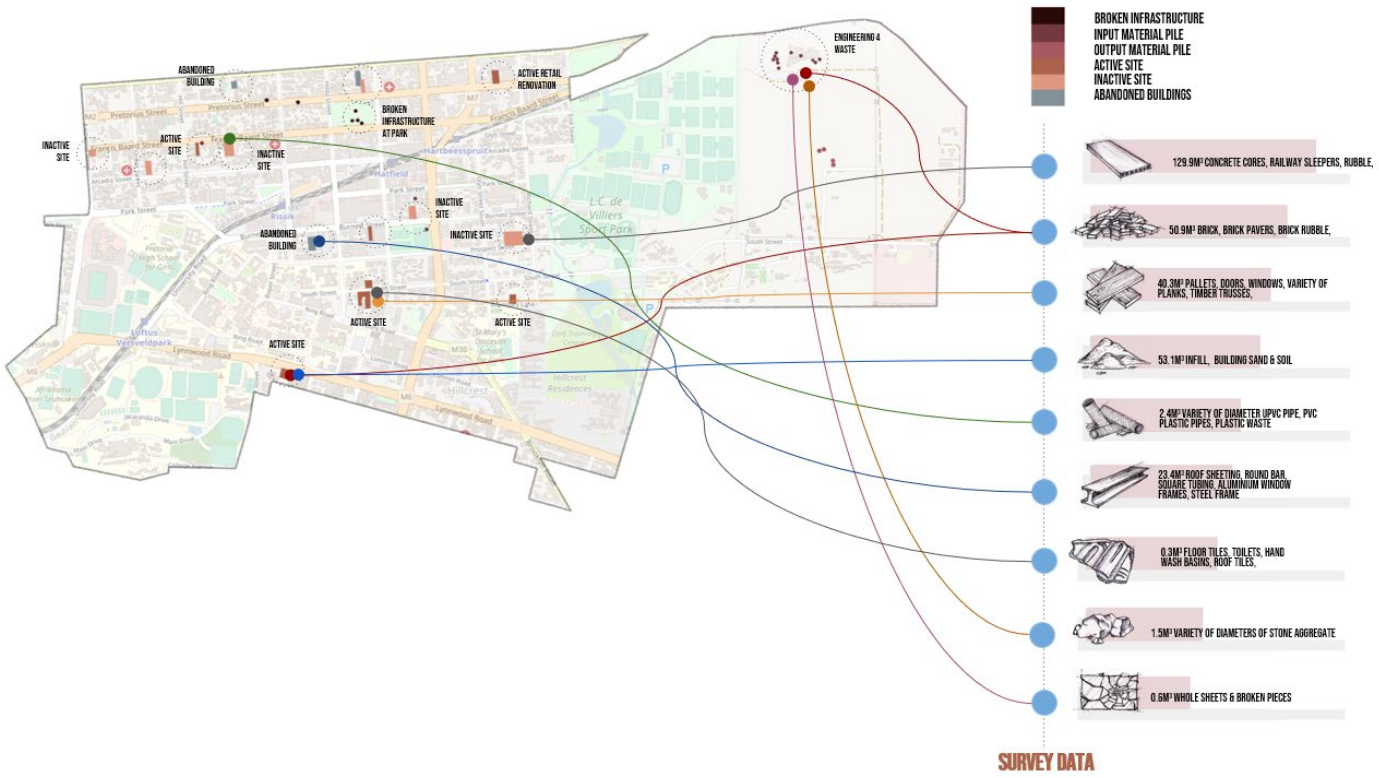


Figure 9: As part of a preceding design studio, architecture students mapped the distribution of construction waste over roughly 25 km2 in the centre of Pretoria (Urban Strategy Studio Exam Submission Q1, Davey, 2023).

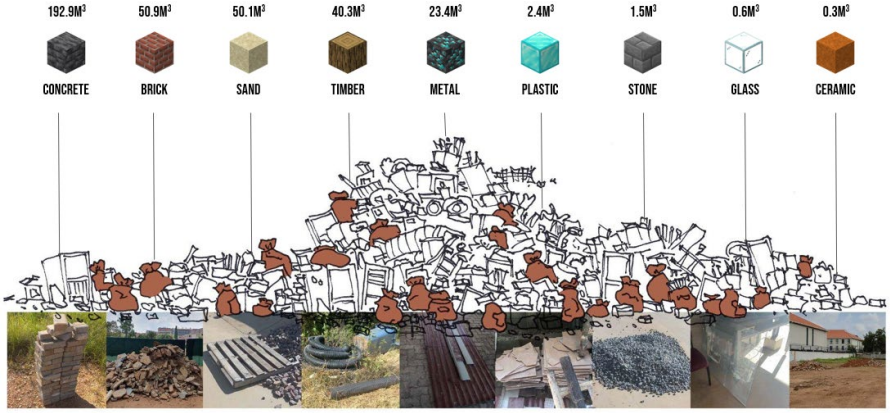


Figure 10: Insights from the preceding studio heightened students' awareness regarding the magnitude of waste generated by the construction industry (Urban Strategy Studio Exam Submission Q1, Davey, 2023).

Figure 11: The reality of material waste and re-use in South African informal urban environments (Van der Merwe, 2023).

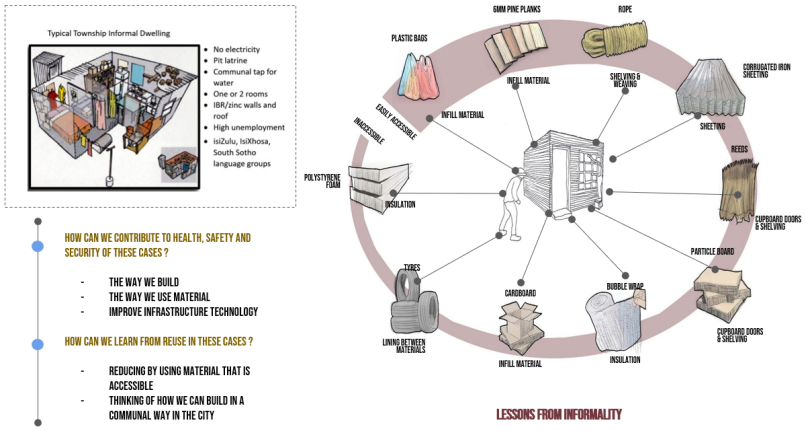


Figure 12: A student study investigating ways in which waste is used for construction of informal settlements around Pretoria. This explorative study forms the basis for subsequent interdisciplinary research at the University of Pretoria (Extracts from Urban Strategy Studio Exam Submission Q1, Davey, 2023).

UN Sustainable Development Goals Alignment

Aligned with the United Nations' Sustainable Development Goals (UN SDGs), this transdisciplinary initiative addresses multiple facets of responsible resource consumption and waste reduction to foster sustainable urbanization, particularly in the Global South.

Specifically, UN SDGs 9, 11, and 12 come into focus as students gain a deeper understanding of responsible resource consumption, develop technical skills in digital tools and Life-Cycle Assessment (LCA), and embrace the value of transdisciplinary works that will guide their future careers.

In this era of unprecedented environmental challenges, a symbiotic integration of circularity and education becomes paramount in reshaping the construction industry's future. Through collaborative efforts, innovative thinking, and a transdisciplinary approach, we can pave the way for a more sustainable and regenerative built environment that benefits both the present and future generations.

Conclusion:

The 2050 edge: African building stock and digital economy.

Exploring innovative digital methods for integrating circular design-for-reuse principles could achieve many objectives simultaneously. First, it can allow us to extend current and future African built environment stock beyond the typical end-of-life scenarios. Second, while improving circularity and climate-risk challenges, this approach brings multiple disciplines together to focus on a shared digital project, which leads to upskilling in 21st century skills. To achieve this at scale, we would need to produce a new kind of African built environment professional, a young professional with foundational transdisciplinary abilities, who works really well across disciplinary siloes, and has a BIM framework as core professional skill-set. By nurturing these kinds of holistic and digitally competent built environment professionals, the future cities of Africa could look quite different.

Leveraging Reality Capture and BIM Technology for Enhanced Construction Efficiency: A Case Study from GDMB Co. Ltd.

PROJECT: Kiota School, Karen Campus, Nairobi, Kenya.

ORGANISATION: GDMB

SOURCE: Samuel Gathukia

COUNTRY: Kenya

REGION: Eastern Africa

Background

GDMB Co. Ltd. is a registered Building and Civil Works firm operating within East Africa. The company leverages innovative construction technologies to enhance productivity and maximize efficiencies in project delivery. GDMB aims to catalyze regional development and contribute to building a stronger, more connected East African community. The firm is a certified reseller of OpenSpace AI for the East African region, underscoring its commitment to cutting-edge technology adoption.

BIM Use(s)

GDMB employs Reality Capture technology using the OpenSpace AI platform. This involves mounting a 360-degree camera on a hard hat to digitize and document construction conditions during regular inspection walkthroughs. The focus of this study was the ongoing construction of a school building block, with captures conducted bi-weekly.

Integration with BIM:

The evolving construction was regularly captured and compared with the BIM model representing the design intent. The site conditions were expected to mirror the 3D design model. Any necessary changes in the site conditions were reflected in real-time updates to the BIM model, ensuring an accurate as-built BIM model at the project's conclusion

Resources and Standards

BIM Standards:

As the focus was on the construction phase of the projects, compliance on BIM ISO19650 standards and coordination was not emphasized. The Architectural 3D model despite not being the coordinated/ federated model was used as the BIM Model for design comparison.

IFC Format: The BIM model was developed using the Industry Foundation Classes (IFC) ISO 16739-1:2018 standard, focusing solely on architectural aspects without integrating Mechanical, Electrical, and Plumbing (MEP) components.

BIM Impact on Project/Organizational Success

(a) Enhanced Communication:

The integration of 360-degree images with the BIM model significantly simplified communication between office and site teams. Visual side-by-side comparisons of the images and the BIM model enabled site teams to understand designs and instructions more effectively, facilitating better insights and prompt action.

(b) Dispute Avoidance:

The establishment of a common data environment for all visual documentation served as a crucial repository of objective and verifiable visual information. This approach helped in mitigating disputes, which are a major cause of project delays and budget overruns globally.

Sustainability/ Circularity Considerations

(a) Operational Efficiency:

Fully documenting construction sites and mapping 360-degree images onto drawings simplified operations and maintenance processes beyond the defect notification period, reducing unnecessary rework.

(b) Material Reuse:

The visual documentation of construction materials and installation procedures provided valuable insights. Understanding these methodologies potentially facilitates material reuse, thereby promoting circularity in construction practices.

UN Sustainable Development Goals Alignment

The project aligns with the following United Nations Sustainable Development Goals (SDGs): **SDG 9: Industry, Innovation, and Infrastructure** - This goal aims to build resilient infrastructure, promote sustainable industrialization, and foster innovation.
SDG 11: Sustainable Cities and Communities** - This goal focuses on making cities inclusive, safe, resilient, and sustainable.

Conclusion

GDMB Co. Ltd.'s implementation of Reality Capture and BIM technologies has yielded significant improvements in project communication, dispute avoidance, and operational efficiency. By aligning with global sustainability goals, the company demonstrates a commitment to innovative and sustainable construction practices that benefit the broader East African region.

Transforming Construction: The Impact of Digital Technologies on Managing Complexity.

PROJECT: City of Arts and Culture

ORGANISATION: Orascom

SOURCE: Shahenda Shokry

COUNTRY: Egypt

REGION: Northern Africa

Introduction

This report aims to showcase the successful implementation of BIM technology in the City of Arts & Culture. The primary objective was to optimize the engineering & construction phases of the project, ensuring heigh end accuracy and efficiency, while minimizing resources, cost & time consumption.

Project Brief

Project stands as a pioneer art core in all over Egypt located in new administrative capital.

The Project consist of:
(i) Art city (North city, South city and Utilities buildings) with small scale buildings with built up area 22,000m2.
(ii) Main Building with combined and congested spaces with built up area of 85,000 m2, contains the following:

1. Main Opera Hall.
2. Concert Hall.
3. Drama Hall.
4. Rehearsals Halls, 4D cinema, VIP Zones.
5. Actors' rooms, Kitchens and Restaurants.
6. More Than170 Winches Moving Mechanism
7. Advanced Electromechanical Equipment.
8. Required challenging noise criteria for each hall.

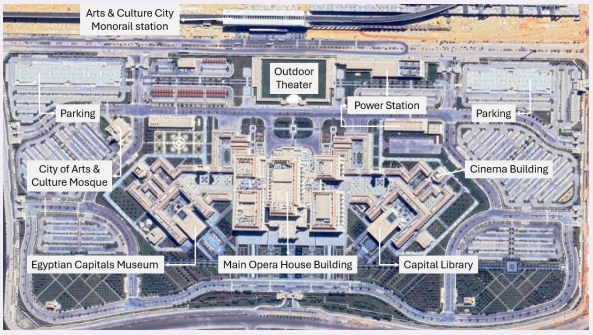
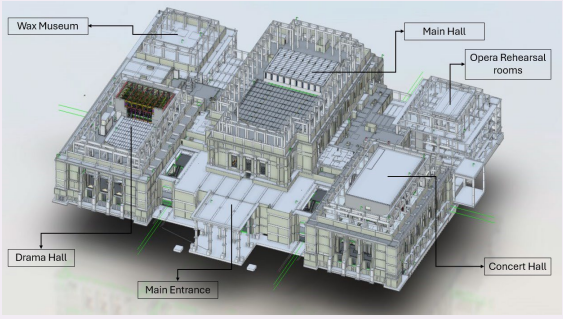


Image of City of Arts & Culture Masterplan.

9. Fits up to 2150 Seats.
10. Proscenium opening of size 10m x 15m and extends to 18m x 23m
11. Stage footprint of area 2165 m²
12. More than 20 moving mechanisms to control seating capacity and provide more functionality for the hall.
13. Using Slip form concrete for hall structure walls with thickness 600mm to 800mm and total concrete quantity is 9500 m3 with total Perimeter of walls is 980 m - Max Height is 42 m



Axonometric View, Opera House Building, City of Arts and Culture.

3D render of Main Building Opera House Building, City of Arts and Culture.

BIM Use(s)

The Opera House Main Building was the main scope of BIM as it is the largest opera house in the Middle East, hosting the three main halls with complicated special systems & with huge VIP entrances. Moreover, Chillers Building was added to the BIM scope due to its complicated MEP systems. Chillers building is on a built-up area 4,925 square meters. Chillers Building hosts switch gear room, RMU room, generators, transformers & MDB's room.

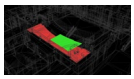
Project Key Challenges and BIM effective role:

Complexity

- Unique Iconic Design with Latest technology.
- Delayed, Partial & Uncoordinated Design Drawings.
- Continuous Design Modification through Project life cycle.

Perform design study and value engineering more efficiently using 3D models for consttructibility

Study design relations in 3D model for elevations



Design Clash detection by Navisworks

Special Works

- Challenging Noise Criteria
- 2D & 3D imported
- Wooden work.
- Use of Special Moving Machanisms.
- Use of Special Audio, Video & Lighting systems.

Design Changes (Tracking —-2 Management)

With the increased number of RFIs due to design change. Extracting and Tracking of the RFIs is a huge challenge need to be addressed by BIM Use.

Construction

- Fast Track Project
- Complicated & Special site execution.
- Construct high level of complex details and relations need to be fully coordinated before execution to avoid any delay or extra cost due to rework.

3 - Integration between multiple local & foreign subcontractors:

Implement all approved data on model, coordinate & detect clashes / coordinate with received model from other main contractor or subcontractor.

Stakeholder Coordination

- High level of coordination with other main contractors and subcontractors.
- Receiving 3D models instead of 2D drawings from other stakeholders.

Extraction (Shop -4 drawings, Composite drawing, BOQs and BOMs

Covid - 19

During construction, the pandemic effected on service provider resources existence in site.

Common data environment -5 (BIM360)

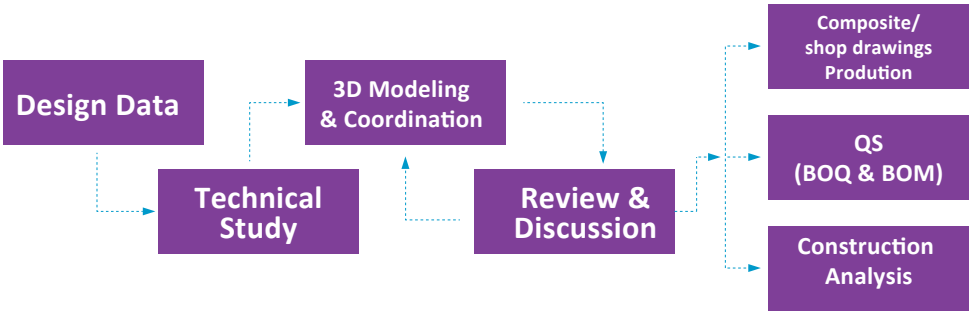
Facilitate communication and coordination especially during not existence of service provider's resources on site.

BIM Implementation Plan:

Scope Clarification: In order to execute the Project Scope successfully, understanding the project requirements, project challenges & identifying the list of BIM uses were a must.

Resources Assignment: Technical office team side by side with BIM service provider were assigned to cover all the project aspects & requirements.

Workflow Identification: Workflows were clearly defined during the engineering & construction phases starting with the design analysis, tracking design updates followed by coordination & solving technical conflicts between trades, going through the production of composite shop drawings, Trades drawings & the extraction of actual quantities for the whole project.



Digital Technologies Uses:

Solving Design Discrepancies:

(a) Clash detection in early stages on regular basis using the BIM models, helped in improving constructability with less time consumption.
(b) Well-coordinated shop drawings extracted from the BIM models enhanced the construction efficiency on site.
(c) Clash reports are exported regularly using standardized templates to detect & solve different issues.
(d) Clash tracking log updated on weekly basis to track active clashes and archive any approved changes received from the consultant/Owner representative.

Design Changes

Continuous implementation of design updates, approved Material, consultant comments, RFI's and IRs inside the models. Helped in more resource optimization and accurate quantification.

Quantities Extraction:

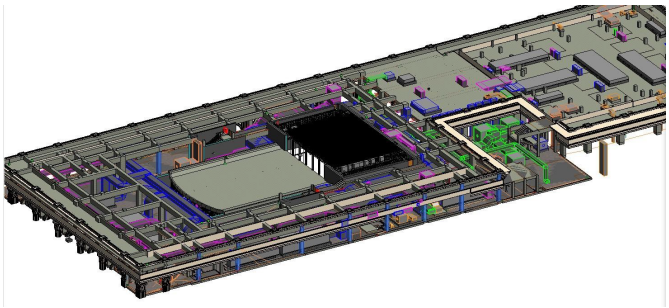
<RFI LOG>

A	B	C	D
Type	RFI NU	Level	IfcDescription
RFI Flag	OC-ECG-OP-AR-RFI-0712	06-Upper Roof	embedded plate clash with door opening
RFI Flag	OC-ECG-OP-AR-RFI-0725	02-First	
RFI Flag	OC-ECG-OP-AR-RFI-1353	Ground	
RFI Flag	OC-ECG-OP-ST-	04-Third	
RFI Flag	OC-ECG-OP-ST-RFI-0265	06-Roof	only truss over highest seats by more than 5m at least doesn't have to be painted and also the catwalk
RFI Flag	OC-ECG-OP-ST-RFI-0265	04-Catwalk-Steel	all catwalk steel doesn't have to be painted
RFI Flag	OC-ECG-OP-ST-RFI-0289	01-Ground	
RFI Flag	OC-ECG-OP-ST-RFI-0291	00-Basement	
RFI Flag	OC-ECG-OP-ST-RFI-0296	05-Fourth	CONFLICT BETWEEN BEAM TYPE TEXT AND DRAWING
RFI Flag	OC-ECG-OP-ST-RFI-0296	06-Roof	Conflict between beam type text and drawing and TOC
RFI Flag	OC-ECG-OP-ST-RFI-0296	06-Roof	Conflict between beam type text and drawing and TOC
RFI Flag	OC-ECG-OP-ST-RFI-0302	01-Ground	there was conflict in this column location
RFI Flag	OC-ECG-OP-ST-RFI-0304	03-Second	clarify level of toc and slab thickness
RFI Flag	OC-ECG-OP-ST-RFI-0304	03-Second	missing data about all this area
RFI Flag	OC-ECG-OP-ST-RFI-0304	03-Second	this area is void
RFI Flag	OC-ECG-OP-ST-RFI-0304	02-First	ther's opening between the wall asn the slab
RFI Flag	OC-ECG-OP-ST-RFI-0310	00-Basement	
RFI Flag	OC-ECG-OP-ST-RFI-0317	03-Second	which beam will be used as there is conflict
RFI Flag	OC-ECG-OP-ST-RFI-0317	02-First	conflict in beam section
RFI Flag	OC-ECG-OP-ST-RFI-0318	Ground	can't be applied as it's already poured in site with diff level
RFI Flag	OC-ECG-OP-ST-RFI-0322	01-Ground	beam width shall be 200 not 300
RFI Flag	OC-ECG-OP-ST-RFI-0322	Ground	beam width shall be 200 not 300
RFI Flag	OC-ECG-OP-ST-RFI-0324	03-Second	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	04-Third	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	04-Third	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	04-Third	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	04-Third	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	01-Ground	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	01-Ground	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	02-First	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	02-First	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	02-First	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	03-Second	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	03-Second	change beam section
RFI Flag	OC-ECG-OP-ST-RFI-0324	03-Second	change beam section

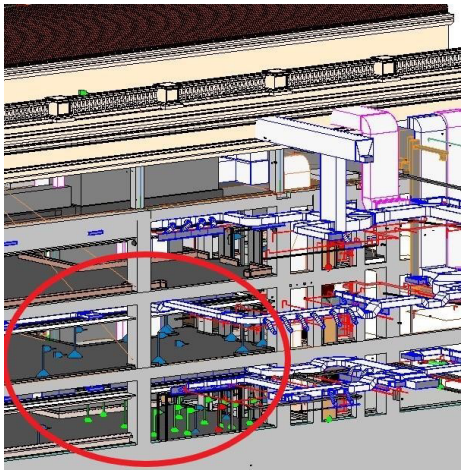
<Structural Column Schedule>

A	B	C	D	E
Volume	Family and Type	Top Level	Base Level	Count
10.675 m³	Concrete-Rectangular-Column: C402	05-Fourth	04-Third	4
8.126 m³	Concrete-Rectangular-Column: C407	05-Fourth	04-Third	2
28.275 m³	Concrete-Rectangular-Column: C408	05-Fourth	04-Third	8
9.500 m³	Concrete-Rectangular-Column: C410	05-Fourth	04-Third	2
5.700 m³	Concrete-Rectangular-Column: C411	05-Fourth	04-Third	1
6.672 m³	Concrete-Rectangular-Column: C416	05-Fourth	04-Third	2
4.750 m³	Concrete-Rectangular-Column: C418	05-Fourth	04-Third	1
21.898 m³	Concrete-Rectangular-Column: C420	05-Fourth	04-Third	4
25.400 m³	Concrete-Rectangular-Column: C423	05-Fourth	04-Third	5
6.972 m³	Concrete-Rectangular-Column: C432	05-Fourth	04-Third	2
16.253 m³	Concrete-Rectangular-Column: C436	05-Fourth	04-Third	2
16.733 m³	Concrete-Rectangular-Column: C437	05-Fourth	04-Third	2
2.904 m³	Concrete-Rectangular-Column: C502	05-Fourth	04-Third	1
5.700 m³	Concrete-Rectangular-Column: pc106	05-Fourth	04-Third	4
15.130 m³	Concrete-Rectangular-Column: PC403	05-Fourth	04-Third	4
4.075 m³	Concrete-Rectangular-Column: PC404	05-Fourth	04-Third	2
5.150 m³	Concrete-Rectangular-Column: PC406	05-Fourth	04-Third	6
21.182 m³	Concrete-Rectangular-Column: PC408	05-Fourth	04-Third	10
8.400 m³	M_Concrete-Rectangular-Column: C501	05-Fourth	04-Third	5
11.202 m³	M_Concrete-Rectangular-Column: C502	05-Fourth	04-Third	4
13.344 m³	M_Concrete-Rectangular-Column: C503	05-Fourth	04-Third	2
37.950 m³	M_Concrete-Rectangular-Column: C504	05-Fourth	04-Third	7
21.120 m³	M_Concrete-Rectangular-Column: C505	05-Fourth	04-Third	4
2.776 m³	M_Concrete-Rectangular-Column: C507	05-Fourth	04-Third	1
9.148 m³	M_Concrete-Rectangular-Column: C508	05-Fourth	04-Third	4
21.120 m³	M_Concrete-Rectangular-Column: C512	05-Fourth	04-Third	4
5.610 m³	M_Concrete-Rectangular-Column: C513	05-Fourth	04-Third	1
345.766 m³				

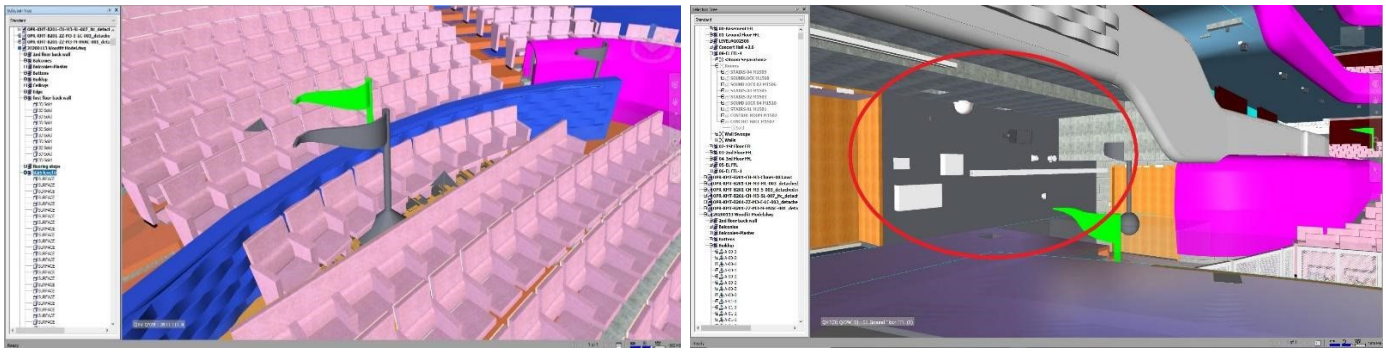
(Different QS schedules were extracted from BIM models to fulfill all project departments requirements)



Actions (Missing Design under balcony)



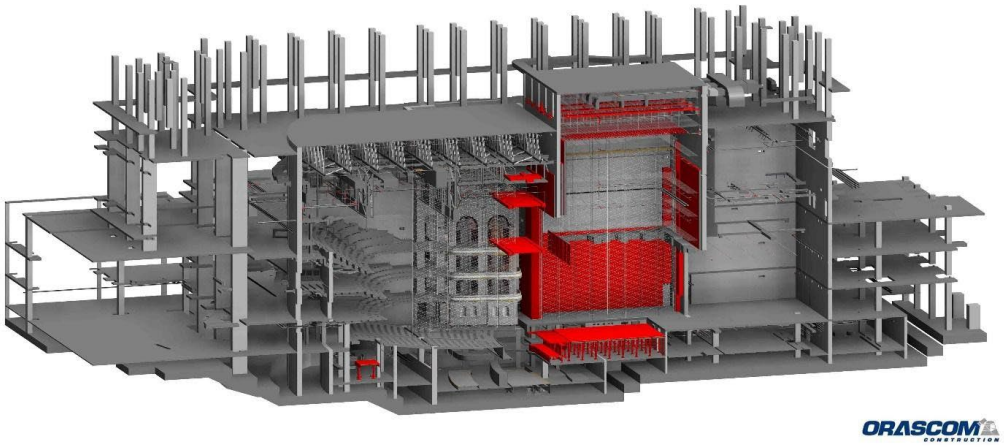
(This photo illustrates RFI flags pointing out different issues where RFI log can be extracted for RFIs' tracking)



(This shot emphasizes a clash with seats remain at the parterre and sound cock pit)

Integration between multiple local & foreign subcontractors:

Several subcontractors collaborated in the Project. Subcontractors' models were integrated with the main model to ensure more accurate & efficient coordination.



(Special systems, moving mechanisms)

Efficient Construction Sequencing:

Utilizing BIM technology provided more visualization for the proposed construction sequencing received from the planning team at early stages of the project. In addition, BIM models helped in Site progress tracking, solving site discrepancies & decision making.

Common data environment:

Utilizing a Cloud base CDE was crucial for communication and coordination especially during non-existence of service provider's resources on site.

Composite Drawings Extractions:

high level of Coordination between complicated systems inside the three halls and Main Entrances, boosting composite drawing extraction.

Main Opera Hall:

- Fits up to 2150 Seats.
- Proscenium opening of size 10m x 15m and extends to 18m x 23m
- Stage footprint of area 2165 m²
- More than 20 moving mechanisms to control seating capacity and provide more functionality for the hall.
- Using Slip form concrete for hall structure walls with thickness 600mm to 800mm and total concrete quantity is 9500 m3 with total Perimeter of walls is 980 m - Max Height is 42 m

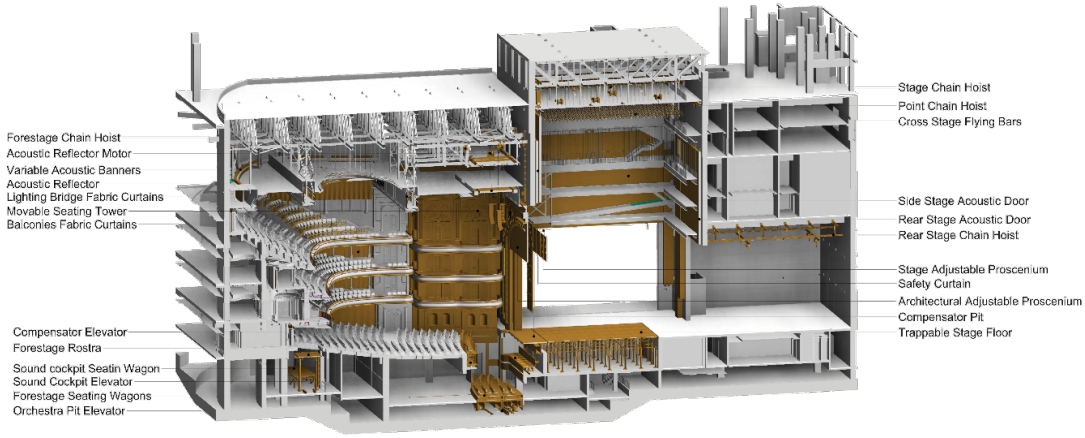


Image of Virtual Construction Model for Main Opera Hall

3D render of Main Building (Opera House Building), City of Arts and Culture.

Concert Hall:

- Fits up to 1200 Seats.
- Stage foot print of area 800 m²
- Consist of ORGAN (4000 Pipes).
- Challenging Noise criteria of rating NC 15
- Organic Wood cladding with complicated relations with each other and with other trades designed to perform extraordinary musical performances.
- Using Slip form concrete for hall structure walls with total concrete quantity is 2500 m3 total Perimeter of walls is 130 m and Max Height is 35 m.

3D render of Concert Hall Building, City of Arts and Culture.

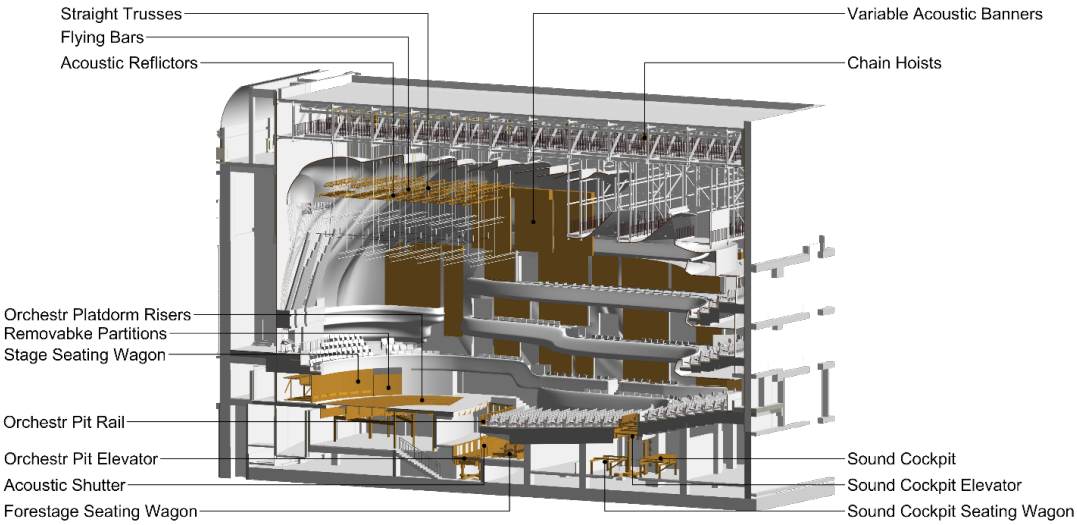


Image of Virtual Construction Model for Concert Hall Building

Drama Hall:

- Fits up to 600 Seats.
- Proscenium opening of size 9m x 8m and extends to 12m x 8m stage footprint of area 718 m²
- Challenging Noise criteria of rating NC 25
- Wood Cladding full acoustic treatment to reach the point of maximum speech clearance.
- Using Slip form concrete for hall structure walls with Thickness 400mm and 600mm, total concrete quantity is 2000 m3, total Perimeter of walls is 125 m with Max Height is 35 m.

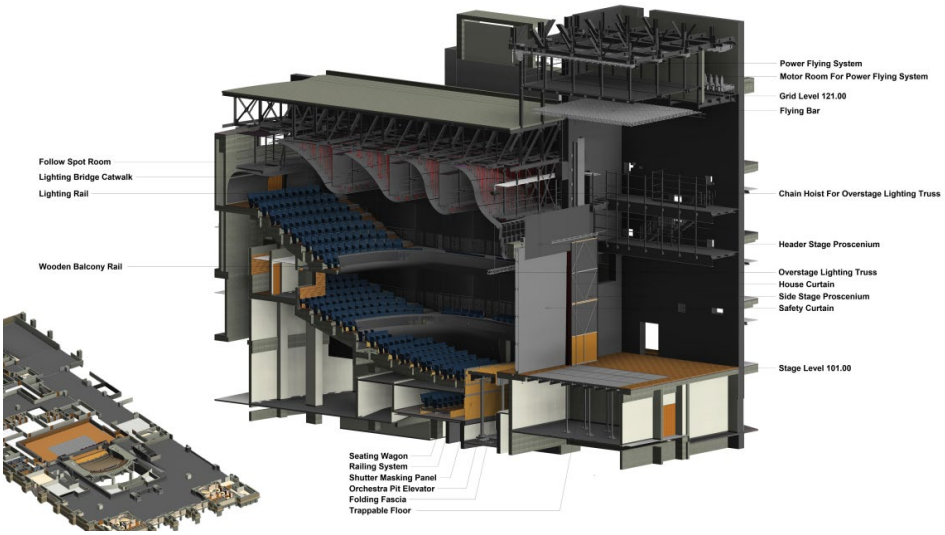
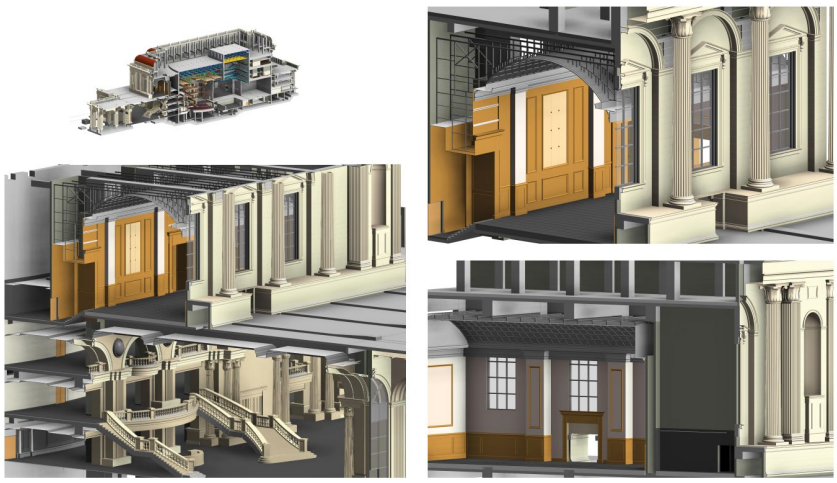


Image of Virtual Construction Model for Drama Hall Building

Elevations, Entrances and VIP Zones:

Complexity in relations between variable internal spaces and Eternal elevations finishing material (GRC, GRG, Marble, etc..) and relations with all other trades.



VIP Section and Main Entrance 3D Section

Main Entrance Rendered Impression.

Overall View of the New Capital Opera Building.

Conclusion

The implementation of BIM technology added value to the overall project by achieving the project's goals with higher efficiency, enhancing the quality of the entire construction process, reducing cost & time, and integrating with multiple subcontractors & complex mechanisms.

This kind of complex project would have been so hard to coordinate effectively using the traditional methods. Additionally, BIM aided the fast and precise Engineering deliverables, extraction of quantities and enhanced the site constructability.

Lessons learnt:

- Implementation of BIM technology in complex mega projects is a deal winner for all project aspects & for all projects' stakeholders.
- Well-tailored training programs for different departments as per project needs.
- Involvement of all project departments in BIM process at early stages of the project reduces time & cost expenses significantly.
- Analyzing and studying BIM requirements is a must.

Maximizing Construction Projects' value through design and cost management.

PROJECT: AGC Tenwek Hospital Cardio-Thoracic Centre

ORGANISATION: MaceYMR

SOURCE: Wambui Maina, Vincent Osogo

COUNTRY: Kenya

REGION: Eastern Africa

CLIENT: AGC Tenwek Hospital

ARCHITECTS: TRIAD Architects

CIVIL/ STRUCTURAL ENGINEER: EngPlan Consulting Engineers Ltd

MEP (MECHANICAL, ELECTRICAL, AND PLUMBING) CONSULTANTS: Loadline Engineering Services

COST MANAGER: Mace YMR

MAIN CONTRACTOR: ARK Construction Ltd

Background

AGC Tenwek Hospital Cardiothoracic Centre is a hub of cutting-edge healthcare located in Bomet County, Kenya. The project entailed delivery of a facility with two 5-storey office blocks towering above a podium with retail facilities above ground and 2 basements parking levels. The development boasts a Gross Built Up Area (GBA) of about 36,400m².

Since the project brought together multiple stakeholders including the client and financiers, adoption of Building Information Modelling (BIM) enhanced communication of the design intent to non-technical stakeholders, thereby fast-tracking decision making. Further, the financiers required that the design was fully coordinated before commencement of works on site and the design team was required to be conversant with 3D modelling to support this requirement.

BIM Uses & Impact on Project and Organisation Success

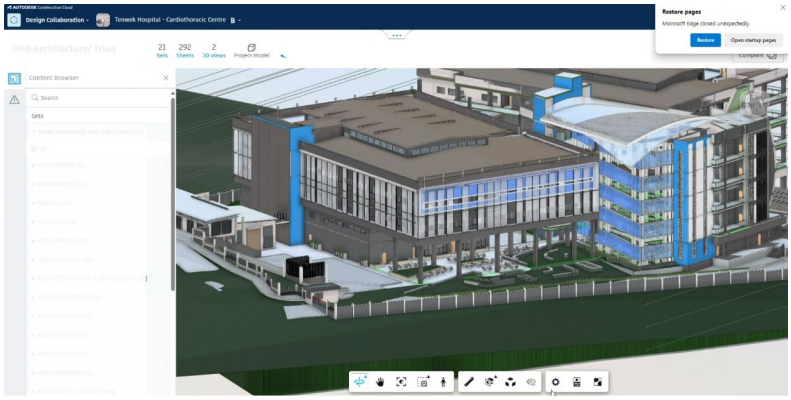
BIM for Design and Design Coordination

HFG Architecture (USA) adopted Sketchup for the architectural concept as it allows for more flexibility in changing designs and allows for easy massing at this stage. For ease of collaboration, the design was migrated to Autodesk Revit 2019, aligning with the structural and building services engineers, Professional Engineering Consultants (PEC) USA and Medical Equipment Mitchell Planning (USA) who developed their initial engineering concepts on Autodesk Revit.

From RIBA 3, a Kenyan consulting team advanced the design, facilitated the related statutory approvals and periodically monitored construction implementation. The project team constituted of Triad Architects, Engplan Consulting Engineers (Civil/ Structural Engineers), Loadline Engineering Consultants (Building Services Engineers) and Mace YMR (Cost Managers).

To facilitate collaborative and streamlined workflows across the design team, Autodesk Construction Cloud's BIM 360 Design was adopted. This aligned the stakeholders' co-ordination effort as identification of design clashes was seamless. The real-time notification of clashes and tracking of their rectification reduced the design time, that would otherwise have been enormous for a project of this scale and complexity.

Elemental services scheduling was done within the BIM 360 Design Model, retaining all project data within the model, and allowing exploration of specification alternatives during design and implementation, making tracking and documentation of material changes during implementation both fast and effective.



Architectural Model by Triad Architects/ HFG Architecture

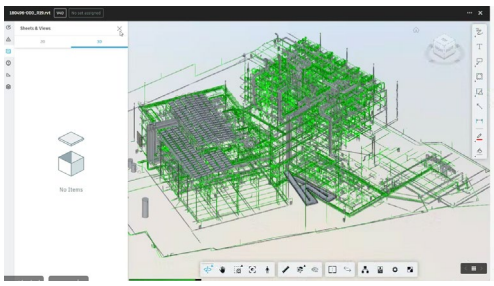
It also allowed continual value engineering by modelled exploration of materials and finishes alternatives, which reduced the cost at project completion down by 11% from the initial cost projection. Lumion and Enscape real-time rendering software were key in this exploration, aiding in speedy client decision making. The setting out of the building was done by georeferencing all the setting out coordinates onto a digital total station within the BIM 360 Design Model. This allowed accurate locating of the large building footprint of 36,400 sqm on an irregular site

Procore was adopted for site management, allowing for easier site inspection, documentation of construction management data, raising of snags, requests for information, and documentation and tracking of inspection notes.

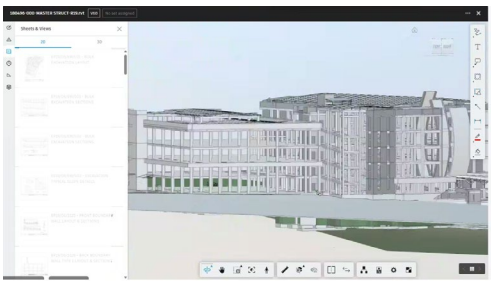
Procore's inbuilt presets allowed for assignment of responsibilities, including timeline targets for completion of works and rectification of issues identified. Progress of rectification of issues identified was also easily monitored on Procore.

This increased collaboration raises the concerns on protection of intellectual property and organizations' need to draw value from their back of house efforts and innovations in structuring the models, developing templates, and elemental families. Triad Architects strongly holds the opinion that, for now, the industry will grow best in application of technology by benevolent sharing of knowledge by all.

Ultimately, to harness digital opportunities, organizations must go beyond simply leveraging emerging technologies. A cultural shift is necessary, in addition to investing in a workforce with the right skills to effectively synthesize data..



Building Services Model by Loadline Engineering Services



Structural Model by EngPlan Consulting Engineers Ltd

BIM for Costing (Estimation and Control)

Cost determination is crucial for construction projects as it enables stakeholders to make informed decisions on budgets and ultimately, project feasibility.

The BIM models developed by the design team contained comprehensive information about building components, materials used and quantities. Mace YMR developed detailed cost estimates early in the project lifecycle which pivoted conversations on value engineering as well as cost optimization strategies. The costing team relied on the BIM models for visualization of complex elements of the project which aided in establishing accurate cost estimates.

Intensive design review and coordination were done pre-contract to minimize changes downstream. These changes were fed to the cost team through Autodesk Construction Cloud, providing a single source of reference for all design changes. This allowed for consistent version control which significantly reduced the effort required in updating costs, hence depicting the impact of changes in real time.

During delivery, Mace YMR identified an opportunity for further refinement of the cost estimation process by leveraging the data engrained in BIM Models. In more recent years, Mace YMR has created a workflow that allows the use of models for cost management. This was driven by the challenges faced when working in 2D workflows such as:

1. Time-consuming quantity extraction from 2D drawings.
2. Lack of collaboration and only having a sight at the designs when they are completed.
3. Different interpretations of the sections and elevations lead to inaccurate quantities.

The team is now actively involved during the preparation of the BIM execution plan, listing information requirements which would include the following:

1. File types that are compatible with the costing software in use and any limitations are pointed out.
2. The properties required at the different stages of the design.

The team is currently working on adopting standard work breakdown structures such as ICMS that would be used in framework projects to speed up the costing process, and quick adjustment for iterations.

However, this process would affect the workflow of the designers and hence require increased collaboration with the design team.

3D Render of AGC Tenwek Hospital Cardio-Thoracic Centre

Sustainability and Circularity Considerations:

The project included a 300 kV solar power system to reduce dependence on grid electricity. Water harvesting tanks were installed to collect rainwater, which will be utilized for various utility services such as laundry and gardening, as well as for firefighting purposes.

BIM Impact on Project/Organization Success: Collaboration was significantly enhanced throughout the project. A large team of consultants was involved, each fulfilling different roles and contributing to the development of various building information. Given that hospitals inherently possess complex designs with numerous building services, utilizing Revit and BIM 360 streamlined the review process, optimizing both time and human resources, allowing tasks to be completed on schedule.

Alignment with UN Sustainable Development Goals:

Goal 8 - Decent Work and Economic Growth: During its three-year construction phase, the project employed over 500 workers, with more than 70% sourced from the local community. Contractors were encouraged to train local laborers with skilled teams brought in from Nairobi. Additionally, the project team ensured that all workers received compensation in line with the Ministry of Labor's regulations. Contractors underwent audits for compliance, and workers were allowed to appoint team leaders to address any unfair labor practices. After construction, the hospital will create over 300 operational jobs in its initial phase, further benefiting the community.

Goal 9 - Industry, Innovation, and Infrastructure: Located in rural Kenya, the project significantly impacted Bomet County. Local materials were utilised, promoting regional trade and sourcing most labour locally. Additionally, a portion of the funding was allocated for upgrades to the sewer system and water treatment plant, benefiting not only the Critical Care Unit (CCU) but also the wider Tenwek community. Locals were also employed and trained in the production of concrete blocks and pavers used for construction.

3D Render of AGC Tenwek Hospital Cardio-Thoracic Centre

Conclusion

"In conclusion, to harness digital opportunities, organizations must go beyond simply leveraging emerging technologies. A cultural shift is necessary, alongside investment in a workforce with the right skills to effectively synthesize data and apply it strategically. At the same time, sustainability should be embedded within digital workflows to align with long-term environmental and social goals, such as the UN SDGs. By integrating technological advancement with responsible resource management, organizations can drive meaningful progress and create a lasting impact.

EXPERTS VISION

African BIM Report 2024

Comparative Analysis of Expert Opinions about BIM Adoption in Africa

EXPERT INTERVIEWEES

ANIS MAHMOUD, CEO of Ama Group.

ABUBAKAR LAWAL, Technical Sales Manager at Worldsview.

CHIAMBA CANIVETE, Civil Engineer and Lecturer at Instituto Superior Técnico Militar.

KEHINDE ADEYEMI, Civil and Structural Engineer, Director at BIM Africa.

MARIUS BIERMAN, Virtual Design and Construction Manager at Murray & Dixon Construction.

NAJIB ADOUANE, Head of Digital Delivery at JESA, Vice President and Managing Director of the Moroccan chapter of BuildingSMART International.

ALEXANDRE NZIRORERA, Civil Engineer and Managing Director of Nziza Training Academy.

ONYEMA UDEZE, Architect, Director at BIM Africa, and Co-Founder of Blaze.

SELVAN MURUGAN, Digital Practice Leader at Zutari and Professional Project Manager.

VITY NSALAMBI, Architect, Founder of Toshe Limited, President of the Angolan Institute of Architects, and Vice President of the International Union of Architects.

WAMBUI MAINA, Senior BIM Manager at Mace Group.

Introduction

Building Information Modeling (BIM) has transformed the architecture, engineering, and construction (AEC) industries, becoming a vital tool for streamlining workflows, enhancing collaboration, and improving project outcomes. As BIM continues to evolve, its adoption across different regions and industries offers a glimpse into how technological advancements are reshaping traditional practices. This article explores the experiences of various professionals implementing BIM across Africa, with their varied educational backgrounds, roles, and responsibilities. It delves into their approaches to BIM implementation, the integration of 4.0 technologies, adherence to standards, and the impact on project costs and sustainability. By analyzing the challenges they face and the level of adoption in their regions, we gain insights into the current state of BIM and its potential future trajectory.

BIM Implementation

The integration of Building Information Modeling (BIM) across Africa reveals a diverse landscape of practices, tools, and processes. This analysis compares the workflows, project types, software, and collaboration tools employed by various professionals and organizations, highlighting both the advancements and challenges in BIM adoption on the continent.

Workflows and Processes: Regional and Organizational Approaches

BIM workflows and processes vary significantly across Africa, with some regions demonstrating advanced integration while others focus on foundational practices. At AMA Group in North Africa, Anis Mahmoud exemplifies a comprehensive approach to BIM, integrating advanced workflows across all projects. His firm utilizes a range of modeling, coordination, and collaboration tools, adhering to ISO 19650 standards. AMA Group's BIM workflow includes the development of critical documents such as Organizational Information Requirements (OIRs), Asset Information Requirements (AIRs), and Exchange Information Requirements (EIRs), ensuring a structured and standardized approach to project execution.

Similarly, Abubakar Lawal at Amana Consortium Limited in Nigeria focuses on BIM implementation during the planning and design stages, employing tools for design, civil engineering, and cloud-based collaboration to enable real-time communication and agile processes. However, Lawal notes challenges with MEP teams not fully complying with BIM standards, highlighting an area where further refinement and training are needed.

In Southern Africa, Chiamba Canivete adopted BIM in civil engineering projects, transitioning from traditional methods to modern information management. His processes include creating BIM Execution Plans (BEP) and OIRs, guided by ISO 19650 standards, with project deliveries in neutral data formats like IFC to meet specific organizational needs. The integration of digital modeling platforms, clash detection tools, and site localization technologies reflects a balanced approach to BIM adoption.

> Structured workflows and robust training, aligned with ISO 19650 standards, are key to bridging gaps in BIM adoption, fostering consistency, collaboration, and efficiency across regions.

Project Types and BIM Application

BIM implementation across Africa is applied to a wide range of projects, from residential and commercial developments to industrial and public sector projects. Adeyemi in Nigeria employs BIM across multiple project levels, from basic 2D coordination (Level 0) to integrated collaborative processes (Level 3), within sectors such as commercial, residential, and healthcare facilities. His approach includes a comprehensive toolkit comprising design, project management, and coordination platforms. Essential BIM deliverables, such as construction documentation, requests for information (RFIs), record models, and material scheduling, highlight a broad and integrated application of BIM processes across diverse project types.

In contrast, Marius Bierman at Murray & Dixon Construction applies BIM workflows primarily in heavy industrial and civil works. Due to consultants' reluctance to share 3D models in specific sectors, Bierman's team often generates BIM-enabled models in-house. This approach underscores the adaptability required in regions where collaboration and data sharing practices are still evolving.

Software and Collaboration Tools

The choice of BIM software and collaboration tools across Africa varies based on project needs and regional capacities. In Morocco, Najib Adouane transitioned from using LIDAR and laser scanning for scan-to-BIM to comprehensive workflows covering the entire project lifecycle, from conceptual design to operations. His approach integrates modeling tools, open data standards like IFC for interoperability, and advanced tools for clash detection and AI-driven 4D and 5D planning. Adouane's focus on assessing client information needs and setting clear digital objectives ensures that BIM processes are customized to each project's demands.

In Rwanda, Nziza Academy trains professionals in a variety of BIM applications, emphasizing foundational skills in design and coordination tools for modeling and quantity surveying. Although BIM use is currently concentrated in design teams rather than during the tender phase, Nzirorera from Nziza Academy highlights the importance of collaboration between all stakeholders, especially in donor-funded projects. This phased approach underscores the growing adoption of BIM in regions where the integration of these technologies is still developing.

Document Management and Standards Compliance

Document management and adherence to standards play a pivotal role in BIM implementation across Africa. In South Africa, Zutari has developed a comprehensive BIM Management System that aligns with ISO standards and formalizes project delivery processes. By leveraging advanced design and collaboration platforms and integrating Common Data Environments (CDEs), such as cloud-based solutions and project management systems, Zutari ensures seamless project coordination and data management. Their workflows incorporate all ISO 19650 standard documents—OIR, AIR, EIR, BEP, TIDP, MIDP, and RACI—into a unified BIM framework, to achieve a highly structured and standardized approach to BIM processes.

Summary

The implementation of BIM across Africa is characterized by a blend of advanced workflows, diverse project types, and varying levels of software integration. While some regions and organizations are at the forefront of BIM adoption, leveraging cutting-edge tools and adhering to international standards, others are focusing on foundational skills and gradual implementation. The differences in document management practices and compliance with standards further highlight the need for continued training, collaboration, and investment in technology to ensure that Africa fully realizes the potential of BIM in transforming the construction and engineering sectors.

Integration with Industry 4.0 Technologies

The integration of Industry 4.0 technologies with Building Information Modeling (BIM) reveals a diverse landscape of adoption across various organizations and regions. While some firms are at the forefront of incorporating advanced tools like AI, AR, and VR, others are navigating challenges related to infrastructure, costs, and local market dynamics.

Augmented and Virtual Reality (AR/VR)

The use of AR and VR in BIM varies widely among the respondents. For instance, AMA Group owns AR and VR equipment, but these technologies are mainly used for marketing, demonstrations, and training, rather than for active project work. The broader adoption of such industry 4.0 technologies has been significantly hindered by the migration of skilled talent to more developed economies. In contrast, Zutari has integrated AR and VR into their BIM processes for collaborative visualization, underscoring a more advanced application of these tools. Meanwhile, Bierman's company is cautiously preparing to implement AR and VR, preferring to first establish a strong foundation with existing technologies. This indicates a general recognition of AR and VR's potential, but with varying levels of commitment and readiness to deploy these tools in

Integration with Industry 4.0 technologies, including AR, VR, and AI, is advancing project efficiency and collaboration, though it faces infrastructural challenges.

Artificial Intelligence (AI)

AI's role in enhancing BIM processes is evident across several organizations. Lawal and his team are actively integrating AI with Virtual Design and Construction (VDC) to enable real-time project visualization and improved coordination, even as they contend with infrastructure limitations. Similarly, Adeyemi has successfully leveraged AI to create accurate as-built models, although the technology's high costs remain a barrier. Canivete also highlights the use of generative AI layered on design and model review tools to optimize design processes. Additionally, Vity Nsalambi emphasizes AI's significance in tackling global challenges, such as climate change, by making design practices more efficient and sustainable. The consensus across these responses suggests that AI is becoming an integral part of BIM, with its adoption driven by the potential for increased accuracy, efficiency, and innovation, though the extent of its use is often limited by financial and infrastructural constraints.

Reality Capture and Data Integration Tools

The adoption of advanced reality capture and data integration tools marks a significant step forward in BIM implementation for some organizations. Bierman's company uses 3D point cloud scanners, drones, and 360-degree photogrammetry to capture site conditions and monitor progress, coupled with 4D simulations that integrate these data streams with programming and modeling efforts. Adouane's organization, JESA, employs tools like data-driven P&ID diagram design software to integrate data across systems, facilitating seamless information flow.

These technologies represent a higher level of detail and accuracy in BIM, enabling organizations to enhance project outcomes through improved data integration and real-time analysis.

Digital Twins and Cloud Technology

The concept of Digital Twins, which involves creating a virtual replica of physical assets for enhanced facility management and operational efficiency, is gaining momentum. Udeze notes that, while Digital Twins are not yet widely implemented locally, there is significant interest in this area among researchers and industry professionals exploring advanced BIM applications. Zutari is particularly invested in developing a Digital Twin future, supported by robust cloud technology and data strategy platforms. This points to an emerging consensus on the importance of Digital Twins as the next evolution in BIM, though widespread adoption remains in its early stages.

Specialization and Local Challenges

Not all organizations are pursuing the integration of Industry 4.0 technologies with equal vigor. Nziza's focus is on providing specialized training in engineering and construction, deliberately excluding 4.0 technologies, as these are covered by other providers in Rwanda. This approach contrasts with Wambui Maina, who, despite having academic knowledge of Industry 4.0 technologies, has found limited opportunities to apply them practically due to local industry practices and project scopes. Mahmoud also highlights the challenge of talent migration, which hampers the adoption of new technologies like AR and VR in their region. These responses reflect the diverse challenges and strategic decisions that influence the level of Industry 4.0 technology integration with BIM, with some organizations prioritizing foundational BIM skills over advanced technological adoption.

Application of Industry 4.0 technologies with BIM ranges from marketing to collaborative visualization, with broader adoption hindered by talent migration and varying readiness across firms.

Summary

In summary, while there is a clear and growing interest in integrating Industry 4.0 technologies with BIM, the level of implementation varies widely across organizations. AI, AR/VR, and advanced reality capture tools are being explored and adopted to varying degrees, with some firms making significant strides while others focus on overcoming local challenges or building foundational BIM capabilities. The trend toward Digital Twins and cloud technology indicates the future direction of BIM, though this remains an emerging field with many organizations still in the early stages of adoption.

Adherence to Standards

Standardization as a Pillar of Continuity and Quality

In Africa's evolving construction landscape, adherence to international standards is increasingly recognized as a crucial component for ensuring quality and consistency in project outcomes. A comparative analysis of several key industry players across the continent reveals a commitment to standards such as ISO 19650, albeit with varying degrees of implementation and adaptation to local contexts.

Standardization as a Business Strategy

In Tunisia, Ama Group adheres rigorously to ISO standards, particularly ISO 19650 and ISO 9001. This approach has proven beneficial, particularly in maintaining process continuity and embedding knowledge within the organization. By standardizing procedures, Ama Group effectively mitigates the impact of high employee turnover—a common challenge in regions with frequent talent migration. This adherence not only ensures quality but also facilitates the efficient onboarding of new employees, contributing to long-term business stability.

Similarly, in South Africa, Zutari has integrated ISO 19650 into its BIM Management System, emphasizing consistency and repeatability in project outcomes. This system is supported by a dedicated Quality Team that maintains and audits compliance, ensuring rigorous control and quality assurance across all projects. This structured approach underscores the importance of standards in delivering reliable and high-quality project outcomes.

Aligning with International Standards

In Nigeria, Lawal of Amana Consortium Limited aligns his practices with UK standards, particularly in infrastructure projects. Although local standards are still developing, the adoption of international benchmarks helps bridge the gap, ensuring that projects meet both global and local requirements. However, as noted by Kehinde Adeyemi, also from Nigeria, the consistent application of these standards remains a challenge in the region, highlighting the need for further development and enforcement of local standards.

In South Africa, Murray & Dixon Construction is making significant strides towards ISO 19650 certification. Their Virtual Design Construction (VDC) division is extensively trained in these principles, and they have adopted Autodesk Construction Cloud (ACC) to align with international standards. This commitment reflects a broader industry trend towards enhancing BIM capabilities through rigorous adherence to recognized standards.

> Adopting international standards like ISO 19650 bridges the gap for regions with evolving local guidelines, while reinforcing BIM practices with globally recognized benchmarks.

Adapting Standards to Local Contexts

In Morocco, Adouane is at the forefront of efforts to adapt ISO 19650 to local contexts. His work with the Moroccan Institute of Standardization includes the development of a BIM object platform tailored to local materials and specifications. These efforts are complemented by a governance committee tasked with overseeing standardization and aligning with BuildingSMART International standards. Such initiatives are crucial for promoting digital transformation and improving project outcomes across the region.

Canivete in Angola also integrates ISO 19650 into his work, adapting these standards as necessary to fit specific project requirements. His approach includes using templates from institutions like BuildingSMART and Penn State University, ensuring that work quality and progress are measured consistently. This adherence is further reinforced through university curricula, promoting rigorous training and literacy in international BIM standards.

The Role of Education and Advocacy

Education and advocacy play a vital role in promoting standardization across the continent. In Rwanda and Tanzania, Nzirorera emphasizes the importance of ISO 19650 in his teaching but acknowledges the need for developing local standards that address specific regional challenges. Similarly, in Nigeria, Onyema Udeze relies on ISO 19650 to guide roles, responsibilities, and common data environments during the design phase, ensuring clarity and consistency across project teams.

In Kenya, Maina advocates for the adoption of ISO 19650 in information management, stressing its importance in ensuring data consistency and accuracy throughout the project lifecycle. This approach addresses potential gaps in information production and delivery, ensuring that projects are managed effectively from inception to completion.

Integrating Standards with Local Initiatives

Efforts to integrate international standards with local initiatives are evident across Africa. For instance, Nsalambi in Rwanda and Angola aligns his practices with ISO guidelines while adapting them to local contexts, contributing to improved project outcomes and reduced errors. His involvement in initiatives like PTBIM 2024 further demonstrates a commitment to fostering knowledge exchange and standardization across Portuguese-speaking countries.

Summary

The commitment to international standards, particularly ISO 19650, is a unifying theme among leading construction and engineering firms across Africa. While the degree of adherence and adaptation varies, these standards provide a critical framework for ensuring quality, consistency, and efficiency in project delivery. As local standards continue to develop, the integration of international benchmarks will play an increasingly important role in shaping the future of the construction industry on the continent.

Training Strategies

In analyzing the training strategies for Building Information Modeling (BIM) across Africa, several themes and points of consensus emerge among the interviewees, while some differences highlight the unique challenges and approaches in different regions.

Comprehensive Training Approaches

There is a strong consensus on the importance of comprehensive and inclusive BIM training strategies across different regions. Interviewees like Mahmoud, Abubakar, and Nzirorera emphasize the need for training that targets all levels of expertise, from senior management to semi-skilled workers. Lawal's "BIM in Action Strategy" in Abuja and Alexandre's 23 industry-specific programs highlight this broad-based approach. Likewise, Mahmoud's partnership with Tunisia's Ministry of Vocational Training to create BIM programs for managers, modelers, and coordinators further reflects this inclusive strategy. Zutari's efforts stand out, having certified 113 BIM Information Managers under ISO 19650 training programs, aiming for 200 by 2024. Additionally, Zutari's investment in e-learning platforms tailored for the AEC industry ensures that all 2,400 staff members have access to essential BIM knowledge, reinforcing the organization's commitment to widespread BIM education.

Integration of International Standards

Another point of consensus is the importance of aligning training with international standards. Canivete, Bierman, and Adeyemi all highlight the integration of standards such as ISO 19650 into their training programs. Bierman's focus on ISO 19650 through online BIM training solutions and Canivete's embedding of international BIM standards into university curricula in Angola show a clear commitment to maintaining global best practices. This consensus suggests that aligning with international standards is seen as crucial for advancing BIM practices across Africa.

Emphasis on Digital Literacy and Change Management

Several interviewees, particularly Adouane and Murugan, stress the importance of digital literacy and change management in their training strategies. Adouane emphasizes the need to address digital illiteracy and upskill all involved in BIM processes, while Murugan's training at Zutari includes a strong focus on change management through comprehensive certification programs. This reflects a broader understanding that technical skills alone are insufficient without the ability to manage the cultural and organizational changes that come with BIM adoption.

External Collaborations and Partnerships

There is a noticeable divergence in how organizations engage with external partners for BIM training. Nsalambi and Maina emphasize the importance of external educational partnerships and collaborations with software vendors to support local BIM initiatives. In contrast, Udeze and Adouane focus more on internally driven training programs supported by expert-led sessions or digital consultant guidance.

Udeze's work with Ziggurat's Global Masters in BIM Management and LinkedIn Learning courses, and Adouane's top-down training approach at JESA, highlight a preference for leveraging internal resources and expert instruction.

Tailored Training for Specific Needs

Tailoring training to specific roles and industries is another area where a majority consensus exists. Alexandre, Adouane, and Udeze all provide examples of training programs customized to the needs of particular professions or projects. Alexandre's tailored programs for architecture, construction, real estate, and banking, and Adouane's specialized training for designers, project managers, and Digital Execution Managers, illustrate this focus on role-specific training. This tailored approach is widely recognized as essential for effective BIM adoption, ensuring that training is relevant and impactful.

> Customized training and continuous learning drive effective BIM adoption, ensuring skills stay relevant and impactful in a rapidly evolving industry.

Investment in Continuous Learning

The importance of continuous learning is emphasized by several interviewees, including Bierman and Maina. Bierman's ongoing participation in international lectures and online BIM training solutions, and Maina's contributions to industry knowledge through papers and presentations all demonstrate a shared commitment to keeping pace with the evolving BIM landscape.

Summary

In summary, there is a strong consensus among African BIM leaders on the need for comprehensive, standards-aligned training that addresses digital literacy and is tailored to specific roles. The commitment to continuous learning and the strategic use of external collaborations or internal expertise are common themes, though the emphasis varies between regions. Overall, these insights reflect a shared vision for advancing BIM practices across Africa, with training playing a pivotal role in this transformation.

BIM Benefits

BIM's adoption has varied across regions and sectors, but its benefits are increasingly recognized by professionals. This section explores the perspectives of various experts on the tangible and intangible advantages BIM offers in project execution.

Across the board, the interviewees acknowledge the significant benefits BIM brings to project execution.

Mahmoud emphasizes the role of BIM in improving prefabrication processes, noting a 5% to 10% cost improvement. Similarly, Udeze highlights the benefits of precise cost estimation and enhanced collaboration, which lead to expanded capabilities and improved project efficiency.

Adeyemi and Canivete focus on the operational benefits, with Adeyemi noting the ease, speed, and accuracy BIM brings, resulting in substantial savings. Canivete echoes these sentiments, particularly praising BIM for early clash detection, which prevents costly design changes later in the project lifecycle.

Bierman and Adouane highlight BIM's impact on communication and transparency. Bierman points out how BIM improves understanding of project requirements and facilitates technical communication with clients, while Adouane emphasizes the role of BIM in enhancing transparency, which, although challenging for some stakeholders, leads to better governance and accountability.

While all interviewees recognize BIM's benefits, Maina and Nsalambi specifically mention its role in improving collaboration and project delivery timelines, with Nsalambi emphasizing its importance in public sector projects.

Summary

The consensus is clear: BIM offers substantial benefits, particularly in improving project coordination, reducing costs through early detection of issues, and enhancing transparency. However, the degree to which these benefits are realized can vary depending on the specific implementation and industry context.

Impact on Cost

The impact of BIM on project costs is a critical consideration for firms deciding on its adoption. This section analyzes the interviewees' views on how BIM influences project costs, both in terms of savings and initial investments.

Most interviewees agree that BIM leads to long-term cost savings, though the extent varies. Mahmoud reports a 5% to 10% cost improvement, emphasizing the need for process maturity and stakeholder alignment. Canivete concurs, noting that while BIM's initial costs can impact productivity, the long-term savings in maintenance and operations are significant.

Adeyemi provides a concrete example, citing nearly 100 million Naira in savings due to early issue identification. In fact, as Bierman highlights, calculating BIM's ROI is more complex and would yield an even higher figure, as it encompasses both tangible benefits, like reduced material wastage, and intangible advantages, such as enhanced project management.

Adouane and Udeze discuss the strategic aspects of BIM implementation. Adouane highlights the importance of KPIs and digital strategies, pointing out that proper BIM execution can lead to substantial time and cost savings. Udeze advises viewing BIM as a long-term investment, starting with pilot projects to minimize costs and organizational disruption.

Nsalambi and Maina both note that while the initial investment in BIM is high, the long-term benefits, including reduced need for revisions and accelerated project delivery, make it a valuable tool for managing project budgets and timelines.

Summary

There is general agreement that BIM positively impacts project costs, particularly through long-term savings. However, the initial investment and the complexity of measuring ROI can be challenges. Strategic implementation and process alignment are crucial to maximizing cost benefits.

Impact on Sustainability

Sustainability is an increasingly important aspect of construction, and BIM's role in enhancing sustainable practices is under scrutiny. This section evaluates the interviewees' perspectives on how BIM contributes to sustainability goals.

The integration of sustainability into BIM processes is widely recognized, though practical challenges remain. Mahmoud points out the theoretical viability of combining BIM with sustainability but notes the lack of clear financial incentives as a barrier. Lawal and Canivete are more optimistic, highlighting how BIM reduces waste through digital submissions and better material management.

Adeyemi and Bierman emphasize the efficiency gains that BIM brings, which contribute to sustainability by reducing waste and optimizing resource use. Adouane and Maina delve into more advanced applications, such as LEED certification and life cycle assessments, with Adouane discussing JESA's approach to minimizing environmental impact through BIM-integrated strategies.

Udeze and Murugan underscore the role of BIM in early-stage sustainability analysis, utilizing digital tools that enable detailed assessments of environmental impacts. Nsalambi acknowledges the potential of BIM in sustainability but notes that practical applications are still limited in his experience.

> BIM enhances sustainability in construction by reducing waste, optimizing resources, and supporting certifications like LEED to achieve environmental goals.

Summary

While BIM's contribution to sustainability is acknowledged by all, the extent of its impact varies. Advanced applications like life cycle assessments and LEED certification demonstrate BIM's potential, but practical challenges, such as financial incentives and implementation hurdles, remain.

Challenges Facing BIM Adoption

Despite its benefits, BIM adoption faces several challenges that vary by region and industry. This section compares the challenges identified by the interviewees, highlighting common issues and regional differences.

High software costs and resistance to change are common challenges noted by most interviewees. Mahmoud and Lawal point out the financial barriers, with Mahmoud specifically mentioning the issue of cracked software versions hindering collaboration. Lawal also highlights the steep learning curve and infrastructure limitations that affect BIM implementation in Nigeria.

Canivete and Adeyemi discuss the organizational and technical challenges, such as the need for overhauling workflows and addressing interoperability issues. Bierman adds that siloed mentalities and legal complexities further complicate BIM adoption, while Adouane and Nzirorera emphasize the lack of clear BIM specifications and government commitment as significant hurdles.

Udeze and Murugan address the cultural resistance within the industry, particularly among experienced professionals who are reluctant to adopt new methods. Nsalambi notes that infrastructure limitations, such as internet access and electricity, along with the absence of supportive policies, are major barriers to broader BIM adoption.

Summary

The challenges of BIM adoption are multifaceted, involving financial, organizational, technical, and cultural barriers. While some challenges, like high costs and resistance to change, are common across regions, others, such as infrastructure limitations and lack of regulatory support, are more region-specific.

BIM Adoption in Africa by Region

The adoption of Building Information Modeling (BIM) across Africa reveals a complex and varied landscape, characterized by disparities in maturity, implementation, and enthusiasm. The following analysis synthesizes responses from experts across different regions, identifying key trends, challenges, and opportunities that define the BIM adoption journey on the continent.

Northern Africa

In Northern Africa, for example Tunisia, the adoption of BIM is characterized by a significant gap between the aspirations of government entities and the actual implementation within the industry. According to Mahmoud, while companies like Ama Group have made strides in BIM maturity, the lack of a formalized government strategy has resulted in an uneven and largely aspirational adoption process. This suggests that while there is an understanding of the benefits of BIM, the absence of structured guidelines and incentives from the government has slowed widespread implementation.

Western Africa

In Western Africa, the situation is notably varied. Both Lawal and Adeyemi underscore that BIM adoption in Nigeria remains in its nascent stages. Lawal highlights a reluctance among stakeholders and government agencies to embrace digital formats, with traditional methods dominating especially in the design and procurement processes. Adeyemi adds that while international standards are recognized, they are not consistently applied, indicating that the built environment in Nigeria is robust but still evolving in terms of BIM integration.

On a similar note, Udeze points out that Nigerian architectural firms typically hover between Levels 1 and 2 of BIM maturity, reflecting a mixed use of BIM and CAD tools. MEP firms, in particular, still rely heavily on CAD, only resorting to BIM when absolutely necessary. This suggests that while there is some progress, comprehensive BIM adoption across disciplines remains limited.

Southern Africa

Southern Africa presents a more advanced but still inconsistent picture of BIM adoption. Bierman notes that while architects and engineers are leading in BIM implementation, challenges persist, particularly in information sharing. The property development sector stands out with robust adoption, largely due to its need for end-to-end project control. However, Murugan observes that despite rapid growth among consultants and design firms, broader industry adoption remains slow. He mentions that South Africa is on the brink of fully implementing the ISO 19650 Standard, which could potentially accelerate adoption across the supply chain. The ISO Part1 to Part3 has been adopted and the development of a national Annexure is the missing part for seamless adoption.

In Angola, as highlighted by Canivete and Nsalambi, BIM adoption is still at an early stage, with efforts mainly concentrated on fostering understanding and correcting misconceptions about BIM. Both experts stress the importance of collaboration among professionals to promote BIM, though Nsalambi notes that economic and infrastructural challenges continue to hinder widespread adoption. The involvement of key industry players in government commissions reflects a proactive approach to integrating BIM into public sector projects, though these efforts are still in the formative stages.

Eastern Africa

Eastern Africa presents a dichotomy in BIM adoption between countries like Rwanda and Tanzania. Nzirorera highlights that Rwanda is making faster progress in adopting BIM, driven by rapid development and a proactive approach from clients who do not want to fall behind. Conversely, Tanzania faces more significant challenges, including less digitalized workflows and reliance on outdated software, making BIM adoption more difficult.

In Kenya, Maina notes that adoption is still predominantly driven by design consultants, with limited integration across other project phases. The reliance on local drives and email exchanges over more advanced Common Data Environment (CDE) solutions indicates that while there is progress, it is not yet comprehensive.

Consensus and Divergence

Across the regions, there is a consensus that BIM adoption is generally at a low to moderate level, with significant room for growth. A recurring theme is the reliance on traditional methods and the slow pace of governmental and industry-wide adoption of BIM standards and practices. However, there is also a shared optimism, with many experts pointing to increasing awareness and gradual integration, particularly in the design and property development sectors.

The divergence lies primarily in the pace and drivers of adoption. In Northern Africa, the disparity between government aspirations and actual implementation is stark. In Western Africa, the slow adoption is attributed to a reluctance to move away from traditional methods. Southern Africa shows more maturity but faces challenges in widespread industry adoption, whereas Eastern Africa reflects a mixed scenario.

While BIM adoption across Africa remains low to moderate, experts see a growing awareness and gradual integration in the design and property development sectors.

Summary

The level of BIM adoption across Africa is uneven, reflecting a complex interplay of economic, infrastructural, and cultural factors. While there are pockets of progress, particularly in more developed sectors and regions, the overall adoption remains at an early to moderate stage. The insights provided by regional experts suggest that while there is optimism about the future, much work remains to be done to fully realize the potential of BIM across the continent. This includes not only enhancing technical skills and infrastructure but also fostering a cultural shift towards embracing digital methodologies as a standard practice in the construction industry.

Government Support for BIM Adoption

Government backing is pivotal in driving the adoption of Building Information Modeling (BIM) across Africa. The interview responses reveal a diverse landscape of governmental involvement, with some countries taking proactive steps while others lag behind.

In Tunisia, for instance, Mahmoud highlights a significant gap in government support. He underscores the need for a dedicated government team with adequate authority and budget to lead digital transformation efforts. The absence of a clear roadmap and targets hinders progress, despite the maturity of certain private companies in the region.

Nigeria presents a more mixed picture. Both Lawal and Udeze point out the minimal government action, with traditional methods still dominating the industry. Udeze, in particular, emphasizes the lack of mandates or local BIM standards, noting that while organizations like BIM Africa advocate for BIM adoption, there's little serious commitment from the government.

Adeyemi echoes this sentiment, calling for more robust government policies to standardize and promote BIM practices across the country.

In Angola, BIM adoption remains voluntary, as Canivete mentions. However, there are ongoing discussions about potentially making BIM mandatory in the future. Nsalambi advocates for more substantial government involvement, particularly in integrating BIM into educational curricula and professional development programs. He stresses that policy initiatives are essential to overcome local challenges and foster a more conducive environment for digital transformation.

South Africa, on the other hand, shows more structured governmental support. Bierman details efforts such as the South African Bureau of Standards publishing parts of ISO 19650 and the Construction Industry Development Board (CIDB) drafting mandates for BIM usage in government projects above a certain threshold. However, both Bierman and Murugan agree that more comprehensive support is needed, particularly in the form of financial incentives, education, and ongoing technical assistance to accelerate industry-wide adoption.

Government involvement in BIM adoption across Africa varies, with some countries advancing through partial mandates, while others face challenges from insufficient policy support.

Summary

Across Africa, government support for BIM varies widely. While South Africa and, to some extent, Angola show more structured efforts, regions like Nigeria and Tunisia lag in terms of policy and practical support. A consensus among the interviewees is that stronger governmental intervention—through mandates, education, and financial incentives—is critical for accelerating BIM adoption across the continent.

Solutions and Recommendations for Enhancing BIM Adoption

To overcome the challenges associated with BIM adoption in Africa, the interviewees offered various targeted solutions and recommendations. These suggestions focus on standardization, education, and policy development, which are crucial for promoting broader BIM integration.

In Morocco, Adouane emphasizes the importance of using open standards to ensure software compatibility and avoid licensing issues. He highlights the Information Delivery Specification (IDS) from BuildingSMART International as a valuable tool for guiding information requirements in IFC files and automating inconsistency checks. Adouane also advocates for regional participation in initiatives such as the Open BIM Awards, which could showcase Africa's growing expertise in BIM.

Nigeria's Udeze and Lawal suggest that establishing local BIM standards and mandating BIM usage in public projects could accelerate adoption. Udeze, in particular, calls for government-sponsored BIM training in tertiary institutions, highlighting the critical role of education in advancing digital transformation.

In South Africa, Bierman and Murugan recommend a comprehensive approach that includes financial incentives, technical support, and education programs. Murugan points out the success of the BIM Community in advocating for the ISO 19650 Standard, indicating that community-driven initiatives can effectively complement government efforts.

In Angola, Canivete suggests that the government should adopt digital portals for project submissions, which would set a precedent for private companies and accelerate BIM adoption. Nsalambi echoes this sentiment, recommending that policy initiatives focus on infrastructure development and BIM training to overcome local challenges and foster a more conducive environment for digital transformation.

Rwanda's Nziroreraalso recommends government regulation of projects based on their size and complexity, with BIM mandates applied where appropriate. He further suggests that training government employees in BIM would ensure more effective oversight and implementation of BIM projects.

Experts across Africa emphasize the need for open standards, government mandates, education, and policy support to accelerate BIM adoption and integration.

Summary

The solutions and recommendations offered by the interviewees align on several key points: the need for standardization, education, and government mandates. Implementing open standards like IDS, promoting regional participation in initiatives like the Open BIM Awards, and government-led training and financial incentives are all seen as critical steps to enhance BIM adoption across Africa.

Alignment with UN Sustainable Development Goals (SDGs)

Building Information Modeling (BIM) is emerging as a critical tool in the journey toward achieving the United Nations Sustainable Development Goals (SDGs), particularly within the context of African countries. Through the integration of advanced technologies, BIM enables more efficient, sustainable, and resilient development practices across the architecture, engineering, and construction (AEC) sectors. As highlighted by professionals like Lawal, Udeze, Alex, and Maina, BIM not only improves design and construction processes but also aligns with several key SDGs, making it an instrumental driver of sustainable development across the continent.

For SDG 6 (Clean Water and Sanitation), BIM plays a pivotal role in optimizing water supply and wastewater treatment systems, thereby supporting better resource management and reducing waste. This aligns with efforts to enhance community well-being through access to clean water and effective sanitation practices. Under SDG 9 (Industry, Innovation, and Infrastructure), BIM enhances collaboration and reduces errors during construction, driving innovation within the AEC sector. Lawal emphasizes that BIM improves infrastructure efficiency, allowing project teams to identify problems and make necessary adjustments before physical construction begins. This innovation is crucial for advancing sustainable practices in the industry.

Projects like those overseen by Mace YMR illustrate the impact of BIM on SDG 8 (Decent Work and Economic Growth), as they generated employment for over 500 workers during a three-year construction phase, with more than 70% of labour sourced from the local community. This emphasis on local labour not only fosters economic stability but also adheres to fair labour practices, empowering workers through rigorous audits and the appointment of team leaders to address concerns. Upon completion, the project is expected to create over 300 operational jobs, significantly benefiting the local workforce.

BIM also supports SDG 11 (Sustainable Cities and Communities) by improving urban planning and lifecycle management of buildings, contributing to the development of sustainable and resilient cities. The initiative from Mace YMR included the creation of apartments for doctors to provide pro bono medical care, demonstrating how thoughtful design fosters community engagement and interaction. The Community Treatment Center (CTC) prioritized green spaces, stimulating various economic activities within rural Bomet County, which enhances the overall well-being and sustainability of the local community.

Furthermore, the deployment of 6D BIM addresses SDG 13 (Climate Action) by integrating energy analysis and environmental simulations, which directly influence the design of energy-efficient building forms and systems. This approach helps mitigate the effects of climate change and reduce carbon emissions, underscoring BIM's potential in creating low-carbon built environments. Lastly, BIM fosters SDG 17 (Partnerships for the Goals) by facilitating collaboration and data sharing across sectors through shared platforms.

Summary

In summary, the integration of Building Information Modeling (BIM) in Africa not only advances multiple Sustainable Development Goals (SDGs) but also addresses critical challenges facing the continent, such as urbanization, resource scarcity, and climate change. By enhancing infrastructure efficiency, fostering sustainable urban planning, and promoting local employment, BIM serves as a vital tool for transforming the AEC sector into a more innovative, resilient, and sustainable industry. The collaborative efforts of professionals in the region highlight BIM’s potential to significantly improve the quality of life for communities across Africa, paving the way for a more sustainable future.

The Future of BIM in Africa

Looking ahead, the future of BIM in Africa holds significant promise. Interviewees expressed optimism about the potential for widespread adoption and integration of BIM technologies across various sectors.

Mahmoud sees a bright future for BIM in Tunisia and Africa at large, noting that as global projects increasingly look towards the continent, international players will need to collaborate with local firms. This creates an opportunity for African countries to enhance their capabilities and compete on a global scale by demonstrating proficiency in digital technologies like BIM.

In Nigeria, both Lawal and Udeze are hopeful about BIM's future, especially as digital integration initiatives like Nigeria's 3MTT program gain traction. Udeze envisions growth beyond the design phase, with BIM enhancing real-time collaboration and reducing paper dependency on construction sites. This broader adoption, however, hinges on addressing current cost barriers and fostering industry-wide digital transformation.

Canivete and Nsalambi share a similarly optimistic view for Angola. They foresee the potential for BIM to achieve standards comparable to those in the West within the next five to ten years, provided that there is increased education, governmental support, and a cultural shift towards BIM usage. Nsalambi, in particular, stresses that advanced technologies like BIM should complement rather than define architectural practice, ensuring that these tools enhance rather than replace the intrinsic qualities of the profession.

South Africa's Bierman and Murugan also anticipate continued growth in BIM adoption. They predict that as more stakeholders understand the internal and value chain benefits of BIM, its use will become increasingly standard practice. Murugan envisions BIM becoming essential for managing projects from inception to digital twins, driving innovation and efficiency across the global construction sector. The challenge for BIM will be once efficiency reaches a peak, the competitive edge for organizations will shift towards agile innovation to produce better outcomes.

Adouane highlights the integration of BIM with broader digital transformation, extending beyond building design to encompass infrastructure and other construction types. He notes that as digital transformation accelerates, technologies like AI and machine learning will play crucial roles in optimizing solutions and handling complex calculations. Morocco is already adapting BIM to local needs, positioning itself as a leader in this digital transformation.

Nzirorera from Rwanda shares an optimistic outlook as well, despite current slow adoption. He notes that the influx of foreign companies with BIM expertise will accelerate local progress, particularly among young graduates and through platforms like BIM Africa. With continued efforts, Nzirorera believes that the region could achieve full BIM adoption similar to European standards.

The future of BIM in Africa is optimistic with anticipated widespread adoption driven by international collaboration, digital integration, and advanced technologies.

Summary

The future of BIM in Africa is filled with potential, with interviewees across the continent expressing optimism about its growth and integration across various sectors. Education, governmental support, and technological advancements, particularly in AI and machine learning, are seen as key drivers of this transformation. As African countries enhance their BIM capabilities, they position themselves to compete on a global scale, making BIM a central component of the continent's digital future.

Conclusion

The insights gathered from these industry professionals underscore the transformative potential of BIM in shaping the future of construction and design across Africa. Despite varying levels of adoption and the challenges posed by regional disparities, the commitment to advancing BIM practices is evident. As technology continues to evolve, so too will the integration of BIM with 4.0 technologies, pushing the boundaries of what is possible in the built environment. With ongoing training, government support, and a focus on sustainability, the future of BIM in Africa looks promising. The experiences shared in this article highlight not only the successes but also the areas where improvements are needed, offering valuable recommendations for the continued growth and implementation of BIM in the region. As we look ahead, the collaborative efforts of industry leaders, educational institutions, and policymakers will be crucial in driving the widespread adoption and maximizing the benefits of BIM across the continent.

Bio of the respondents

Abubakar Lawal

(Nigeria, Western Africa Region)

"We're at a pivotal moment for the AEC industry in Nigeria. As advanced technologies like AI converge with traditional practices, we must adapt quickly. This evolution will redefine our industry, pushing for frameworks that resonate with both stakeholders and government entities."

Abubakar Lawal, Technical Sales Manager at Worldsview, boasts 15 years of experience in infrastructure projects, with roles ranging from design to construction supervision and project teams' coordination. He is actively involved with the BIM Africa Initiative, where he advocates for integrating BIM into infrastructure development across Nigeria.

Wambui Maina

(Kenya, Eastern Africa Region)

"The key to BIM's success lies in understanding its foundational principles and tailoring its application to meet organizational and client needs. As foreign investors increasingly recognize BIM's benefits, their influence could drive local adoption, significantly enhancing project management and efficiency across the industry."

Wambui Maina is a Senior BIM Manager at Mace Group with expertise in structural engineering and BIM coordination. Starting her career at Howard Humphreys E.A., she transitioned from structural design to leading BIM efforts, focusing on design alignment and clash resolution under ISO 19650 standards. At Mace, she oversees BIM quality assurance for projects across Kenya, the UK, and India. Holding a Master's in Construction Management and multiple certifications, she has published papers and won the University of Nairobi's Joint Building Council Prize in 2021 for research on BIM's role in reducing construction cost and

Alexandre Nzirorera

(Rwanda/Tanzania, Eastern Africa Region)

"Being part of BIM Africa is about more than just participation—it's about driving real change. Let's continue our collaborative efforts to influence BIM adoption in developing and underdeveloped countries, strengthening BIM Africa's impact on the global stage."

Alexandre Nzirorera is a civil engineer with 9 years experience. He now leads Nziza Training Academy, an Autodesk-authorized training center in Rwanda, which has expanded its operations to Tanzania. Under his leadership, Nziza has become a top Autodesk academic partner in the Middle East and Africa. Since 2022, Nzirorera has represented Rwanda at BIM Africa, bridging the technology skills gap by connecting local professionals with international experts.

Anis Mahmoud

(Tunisia, Northern Africa Region)

"To truly compete globally, Africa must stop being just the workforce and start being the powerhouse. The future of BIM in Africa isn't just about following global trends—it's about enhancing local capabilities to compete globally. African countries must consolidate their expertise and negotiation power to influence software producers, reducing costs and driving real digital transformation."

Anis Mahmoud, CEO of Ama Group, brings over 35 years of experience in civil engineering. His expertise spans engineering, construction management, and general contracting, with a strong focus on the digital transformation of the construction sector in Tunisia and across Africa. He holds an MBA and a BIM Master's certification from Ziggurat Institute of Technology, and is a key advocate for the adoption of Building Information Modeling (BIM) within the region.

Chiamba Canivete

(Angola, Southern Africa Region)

"We're standing at the crossroads of an industry evolution, where AI and digital tech will reshape how we build the future. Imagine a future where BIM is widely implemented across Africa—better information sharing, enhanced collaboration, and improved infrastructure will transform the construction sector, making Africa a better place to live and work."

Chiamba Canivete is a civil engineer and lecturer at the Instituto Superior Técnico Militar with 10 years experience of teaching and consulting in construction supervision, planning, building, and conservation. With a Master's degree in Sustainable Construction and Rehabilitation from the University of Minho, Portugal, Canivete focuses on BIM implementation in Angola. He is currently pursuing the buildingSMART Professional Certification.

Kehinde Adeyemi

(Nigeria, Western Africa Region)

"A proficient BIM manager isn't just a luxury—it's essential. By maximizing coordination and effectively managing BIM implementations, we can achieve substantial cost savings and significant improvements in project execution and management."

Kehinde Adeyemi is a civil and structural engineer with over 14 years of experience in the building industry, specializing in highways, infrastructure design, geotechnical investigation, and structural engineering. His work emphasizes the practical application of these technologies to enhance project delivery and communication, solidifying his role as a leading advocate for BIM adoption in Nigeria. He is a director at BIM Africa.

Najib Adouane

(Morocco, Northern Africa Region)

"To truly establish Africa as a digital hub, we need to align with international standards and foster continent-wide collaboration. This approach will be key to advancing BIM and driving digital transformation across the continent."

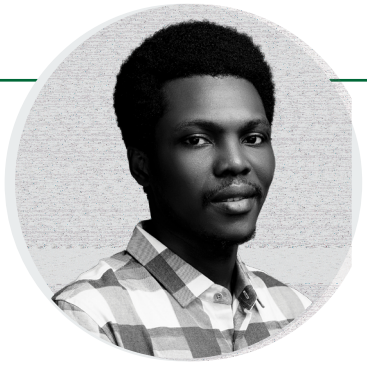
With over 22 years of experience in digitalization, Najib Adouane is a pioneer in the adoption of BIM in Morocco. His work includes integrating photogrammetry and LiDAR technology for scan-to-BIM workflows. Currently leading the Digital Delivery Department at JESA, Adouane focuses on implementing international project management standards across various sectors. He is the Vice President and Managing Director of the Moroccan chapter of BuildingSMART International.

Marius Bierman

(South Africa, Southern Africa Region)

"Education, training, and ongoing support are critical to overcoming the challenges of BIM adoption. Government incentives, like tax benefits for BIM investments, can ease financial burdens. Collaboration between industry associations and the private sector will drive tailored solutions and best practices, unlocking BIM's full transformative potential."

Marius Bierman, is the Virtual Designer Construction Manager at Murray & Dixon Construction. With a Master's in engineering management and ongoing PhD studies in BIM, Bierman is recognized for his commitment to digital construction. He has certifications from the Royal Institute for Chartered Surveyors and Operam Academy.



Onyema Udeze

(Nigeria, Western Africa Region)

"For small African firms, continuous upskilling is essential to stay relevant in the industry. Start with investing in BIM training and integrating basic practices into workflows. Gradual adoption of digital tools will not only enhance efficiency but also position these firms to compete on a global scale."

Onyema Udeze, is a co-founder at Blaze and an architect with specialized expertise in BIM modeling and coordination. An Autodesk Certified Professional for Revit Architecture, Mechanical, Electrical, and Structural disciplines, he contributes to the field through educational content on platforms like LinkedIn Learning and by lecturing on advanced BIM methodologies at Ziggurat Institute of Technology. He is also a director at BIM Africa.

Selvan Murugan

(South Africa, Southern Africa Region)

"Under Zutari's leadership, we're not just adopting BIM—we're setting the standard for digital construction practices. Our commitment to BIM excellence is driving innovation, delivering superior project outcomes, and advancing sustainable solutions in the industry."

Selvan Murugan, a Digital Practice Leader with extensive experience in the engineering and construction industry, leads digital transformation initiatives at Zutari, a multidisciplinary engineering consultancy. He is Certified as a Professional Project Manager (PMP) and recognized by the Engineering Council of South Africa. Murugan's work centers on advancing digital technologies as well as BIM capabilities across various sectors, including the built environment, transport, energy, water, and manufacturing.

Vity Nsalambi

(Rwanda/Angola, Eastern/Southern Africa Region)

"To achieve sustainable digital transformation in Africa, we need a dual approach—grassroots initiatives that foster local change and top-down policies that mandate BIM adoption. This balance will address Africa's unique challenges while unlocking its vast potential."

Vity Nsalambi is an architect and holds a BIM manager certification from the Global Institute of Technology. He has served as a studio teacher at Universidad Agustin Netto in Angola since 2007 and founded Toshe Limited, an architecture firm in Rwanda, in 2015. Nsalambi, also serves as the President of the Angolan Institute of Architects and as a Vice President of the International Union of Architects representing Africa.

BIM ADOPTION SURVEY

African BIM Report 2024

FINDINGS OF THE AFRICAN BIM SURVEY 2024

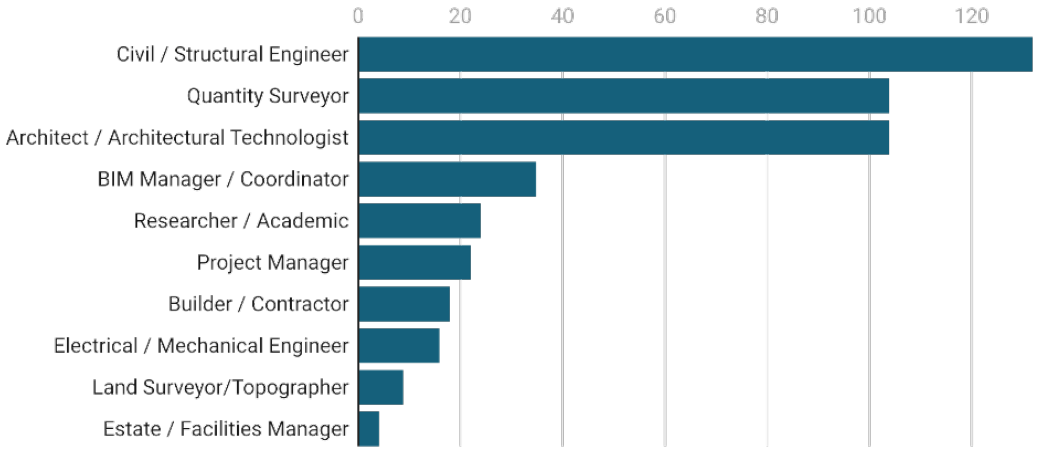
Building on insights gathered from the 2020 and 2022 editions, the African BIM Survey (ABS) 2024 represents a continent-wide instrument for monitoring industry progress in adopting Building Information Modeling (BIM) and digital innovations within the construction sector. ABS 2024 encompasses all regions of Africa and recorded about 600 responses from diverse industry segments. To maximise accessibility, ABS 2024 was made available in the most widely spoken official languages across the continent: English, French, and Arabic.

A structured methodology was employed to distinguish respondents with direct implementation experience from those without, ensuring robust and nuanced data analysis. In line with emerging technological trends, ABS 2024 assessed the adoption of cutting-edge technologies such as artificial intelligence and blockchain. Additionally, it explored new key areas like classification systems, non-graphical information management, and the integration of BIM in advancing sustainability goals. A particular focus was placed on examining BIM delivery alongside the 17 United Nations Sustainable Development Goals (SDGs).

We extend our gratitude to all individuals and organisations that responded to and shared the ABS 2024. Your contributions play a critical role in advancing knowledge and informing policy, individual practices, and corporate strategies. We expect that the findings from this research will drive meaningful digital transformation within Africa's built environment.

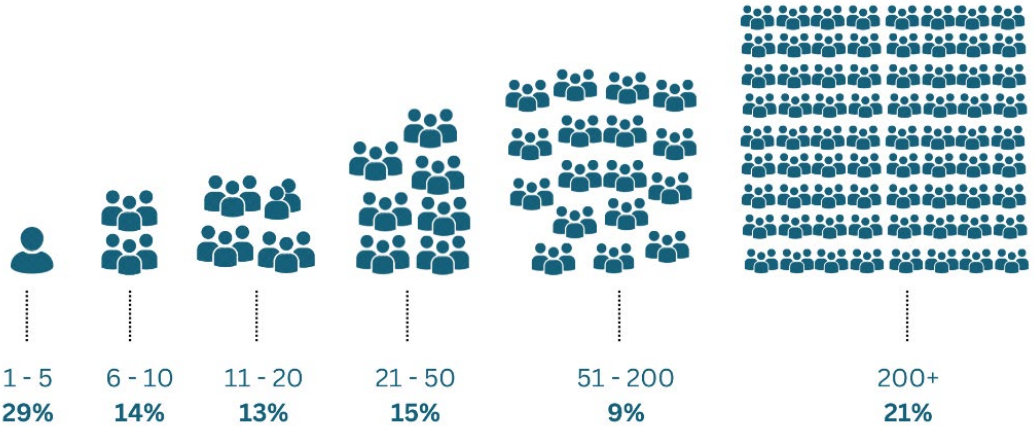
1. Main profession of respondents

ABS 2024 continues to reflect the diverse professional landscape of Africa's construction sector. The majority of respondents come from the design and construction professions, with civil engineers (27%), quantity surveyors (22%), and architects (21%) being the most represented. There is also participation from BIM managers (5%) and project managers (4%), indicating an emerging focus on specialised BIM management roles. Researchers and the academic community (5%) are also included, integrating scholarly perspectives. No representation was recorded for policymakers and sustainability consultants, signalling sectors with potential for further engagement in BIM-related initiatives.



2. About your Organisation - Including yourself, approximately how many people are employed in your organisation?

Similar to previous African BIM Surveys, respondents from small and medium enterprises (SMEs) with 1–200 employees continue to dominate, comprising approximately 79% of respondents. Participation from larger firms (200+ employees) has declined, representing 21% compared to 25.7% in 2022. While larger organisations often have more significant resources to invest in technology and innovation, SMEs demonstrate agility, allowing them to adopt new technologies quickly and efficiently without the constraints of corporate bureaucracy. The concentration of smaller organisations suggests that the African construction industry remains a fertile ground for innovative entrepreneurial ventures and potentially diverse workforce dynamics, which may influence industry trends and future workforce policies.

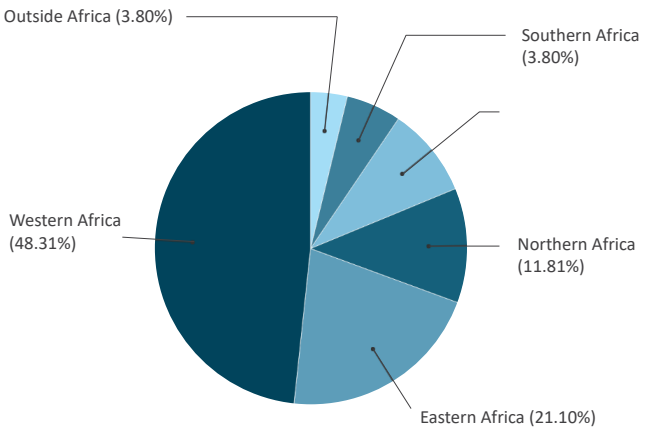


3. What is your location?

ABS 2024 received responses from 32 countries across all regions of Africa. West Africa continues to lead in participation, accounting for 48% of respondents, with significant contributions from countries such as Nigeria, Ghana, and Benin.

Eastern Africa followed with 21% of respondents, primarily from Kenya, Ethiopia, and Tanzania. This growth highlights the region's increasing interest in digital tools to support its rapidly developing construction sector. Northern Africa contributed 11.8%, with notable participation from Egypt, Morocco, and Algeria, reflecting their connection to international construction practices. Central Africa, comprising countries such as Cameroon, DR Congo, and Gabon, accounted for 9.28%, showing incremental improvements in BIM awareness.

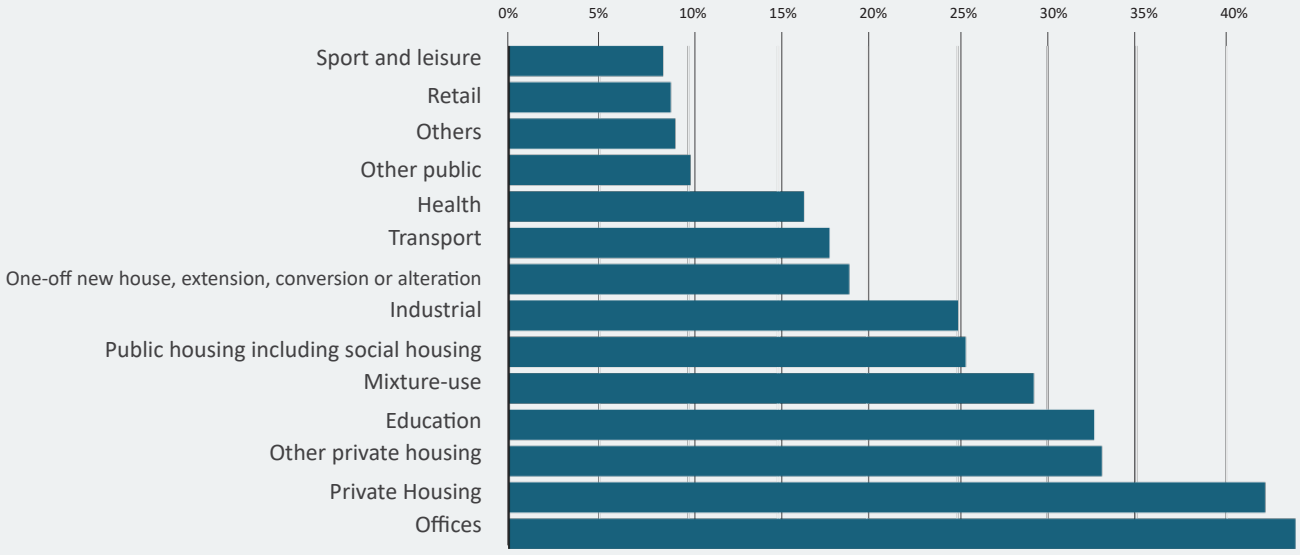
The low representation (5.70%) from the Southern Africa region is observed (a sharp contrast to 24% in 2022). ABS 2024 also included 3.16% of responses from outside Africa, indicating a global interest in the continent's digital transformation.



4. In the last twelve months, which of the following construction project types have you been involved in?

The largest proportion of respondents reported working on office projects, with 43.88% participation. This reflects the ongoing demand for commercial infrastructure to support Africa's urban and economic development. Similarly, private housing projects featured prominently, representing 42.19% of respondents, showcasing the continued emphasis on addressing residential needs. Other private housing, such as non-commercial residential developments, accounted for 33.12%, further underscoring the importance of housing in the region. Educational projects were also significant, with 32.70% of respondents involved, driven by the expansion of educational infrastructure to meet population growth. Industrial projects and public housing, including social housing, represented 25.11% and 25.53%, respectively, indicating efforts to develop critical infrastructure and address housing deficits.

Other project types, such as mixed-use developments (29.32%), transport (17.93%), and health (16.46%), highlight the varied focus of construction activities across the continent. Lower participation was noted in sectors like retail (9.07%), sport and leisure (8.65%), and culture and entertainment (10.97%), reflecting their more specialised and less frequent nature. These findings demonstrate the broad range of construction projects being undertaken in Africa. While the results do not precisely reflect the use of BIM, they provide a snapshot of where BIM adoption efforts could be concentrated to align with industry priorities.

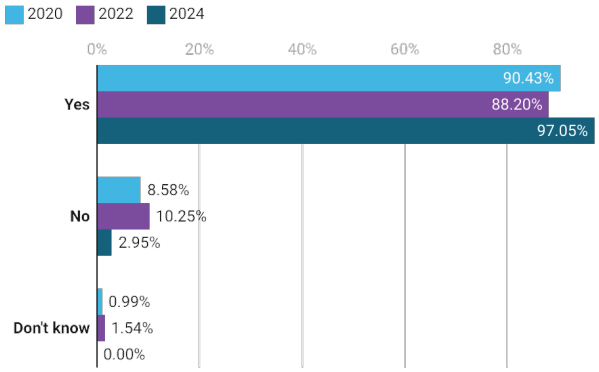


5. Before taking this survey, have you ever heard of BIM (Building Information Modelling)?

ABS 2024 demonstrates a notable increase in awareness of BIM, with 97.05% of respondents indicating they had heard of BIM prior to the survey. This marks a significant rise from 90.43% in 2020 and 88.20% in 2022, reflecting the effectiveness of targeted awareness campaigns, training programs, and industry initiatives across Africa.
However, while this growth in awareness is encouraging, it does not necessarily translate to widespread implementation or proper understanding of BIM. As seen in other questions, the adoption rate of BIM remains substantially lower than awareness levels, with many organisations yet to integrate BIM into their processes.

This disparity suggests that while the term "BIM" is widely recognised, its actual value and full scope—beyond its association with 3D modelling tools—may still be misunderstood by some industry professionals.

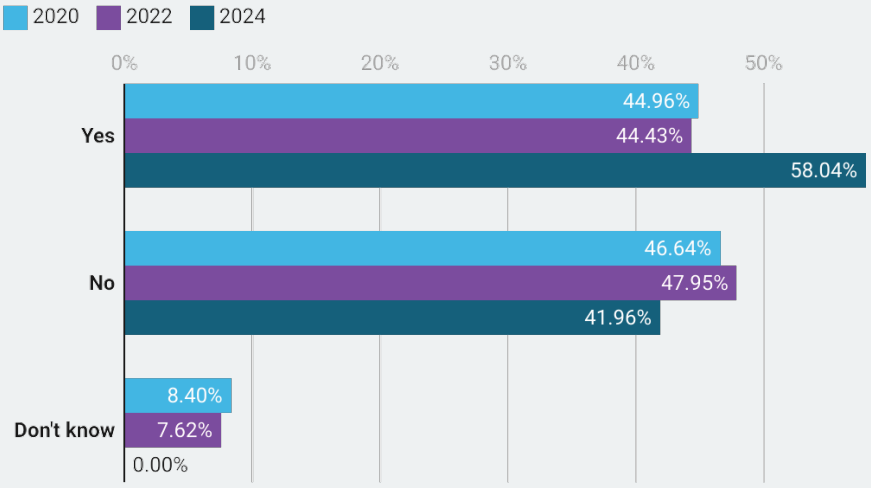
It is also important to note that misconceptions persist, with some respondents likely equating BIM solely to advanced 3D design software rather than understanding it as a collaborative process that integrates data and workflows across a project's lifecycle. Bridging this gap between awareness and informed adoption will require continued education efforts, clear industry standards, and accessible tools to help stakeholders realise the broader benefits of BIM for project delivery and management.



6. Before taking this survey, have you implemented BIM (Building Information Modelling) in your work processes?

ABS 2024 shows an increase in respondents who have implemented Building Information Modelling (BIM) in their work processes, with 58.04% indicating prior implementation. This marks a noticeable rise from 44.44% in 2022 and 44.96% in 2020, suggesting a positive trend toward adoption across the African construction industry. However, the data also reveals that 41.96% of respondents in 2024 have not implemented BIM, demonstrating that despite growing awareness (as shown by the 97.05% awareness rate), a significant proportion of professionals remain disconnected from actual usage. This underscores the persistent gap between understanding the concept of BIM and integrating it into practical workflows.

In addition, many of the respondents who have implemented BIM are not yet using it consistently across all their projects. For some, BIM is still limited to specific, high-value projects, while others remain in the piloting stage, experimenting with workflows and tools without fully integrating BIM into their organisational processes. This highlights that while implementation numbers have risen, the extent and depth of adoption remain uneven.



After the last two questions, ABS 2024 was divided into two segments to evaluate the opinions of respondents who have heard and implemented BIM differently from those who have heard but not implemented it. All respondents who had not heard of and had not implemented BIM were excluded, and they were directed to the necessary resources to enhance their knowledge and capacity.

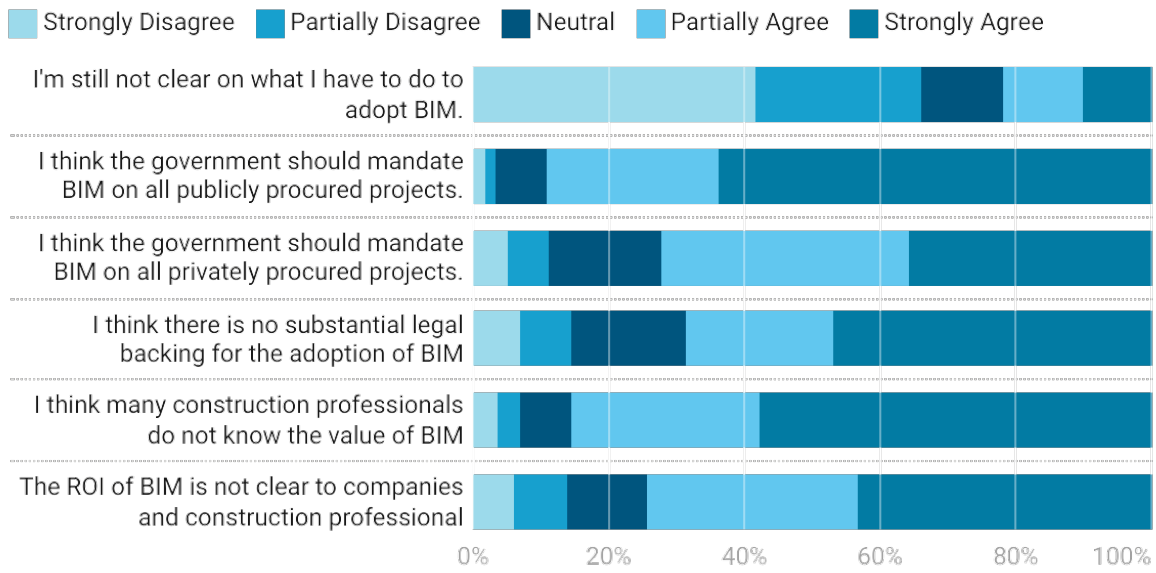
SECTION A – HEARD AND IMPLEMENTED BIM

7. What is your opinion on the role of Government, legal and ROI in BIM adoption?

There is overwhelming support for government mandates on BIM in public projects, with 64% strongly agreeing and 25% partially agreeing. This reflects a preference for strong public-sector leadership. Opinions on private-sector mandates are more divided, with 36% strongly agreeing, 36% partially agreeing, and 16% neutral.

Nearly half (47%) believe there is insufficient legal backing for BIM adoption, with 22% partially agreeing. This suggests a perceived gap in regulatory frameworks, potentially hindering broader implementation. Policymakers and industry leaders need to provide stronger frameworks and success metrics to accelerate adoption.

A majority (58%) strongly agree that many construction professionals do not understand BIM's value, while 28% partially agree, highlighting the importance of industry-wide education and advocacy. The lack of perceived value and ROI among many professionals and organisations could slow the pace of adoption. However, 66% of respondents disagreed that they lack clarity on BIM adoption requirements, suggesting that most professionals have some understanding of the process required to implement BIM.

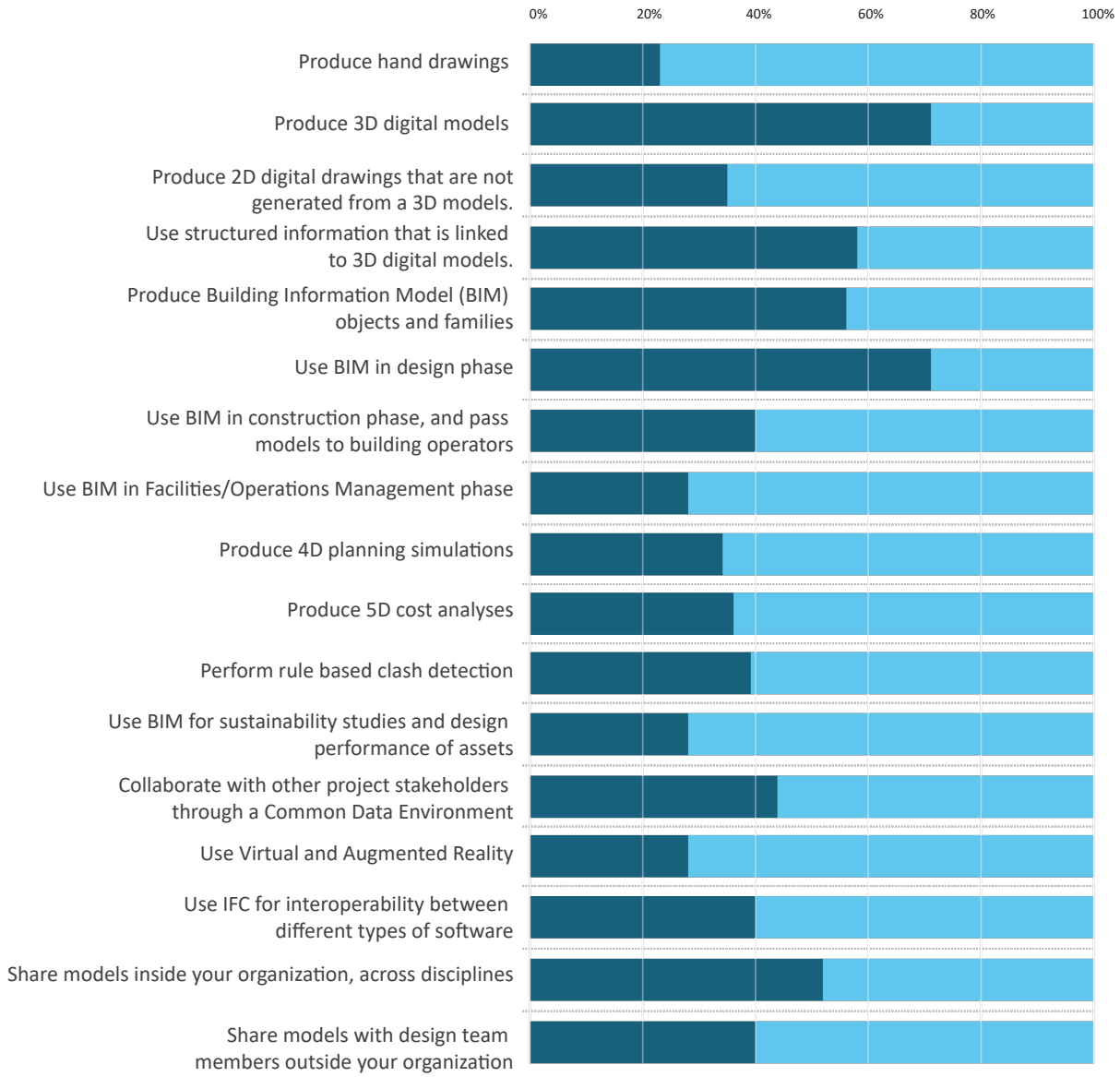


8. Which of the following statements apply to you / your organisation's adoption of BIM?

ABS 2024 highlights diverse BIM adoption practices, with 71.11% of respondents producing 3D digital models and 70.67% using BIM during the design phase. However, usage drops in later stages, with 39.56% applying BIM during construction and 28.00% using it in Facilities/Operations Management. While structured information linked to 3D models (58.22%) and the creation of BIM objects (56.00%) are common, advanced practices like 5D cost analyses (36.00%) and 4D planning simulations (34.22%) remain underutilised.

Collaboration is improving, with 44.44% using a Common Data Environment and 52.00% sharing models internally, though only 39.56% share models externally. Advanced tools like Virtual and Augmented Reality (28.44%) and Industry Foundation Classes for interoperability (40.00%) show growing but limited adoption. Traditional workflows persist, with 22.67% producing hand drawings and 35.11% relying on standalone 2D drawings.

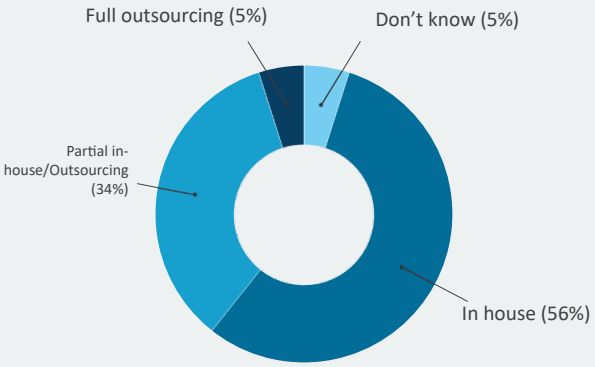
These findings highlight BIM's strong presence in design but limited adoption across project phases. Expanding its use in construction, operations, and collaboration will require targeted investments in education, technology, and integration efforts.



9. How does your firm or your work implement BIM?

ABS 2024 reveals diverse approaches to implementing BIM across firms. A majority (56%) of respondents indicated that their firms manage BIM processes entirely in-house (though a reduction from 63% in 2022), demonstrating the continued strong commitment to developing internal capabilities.

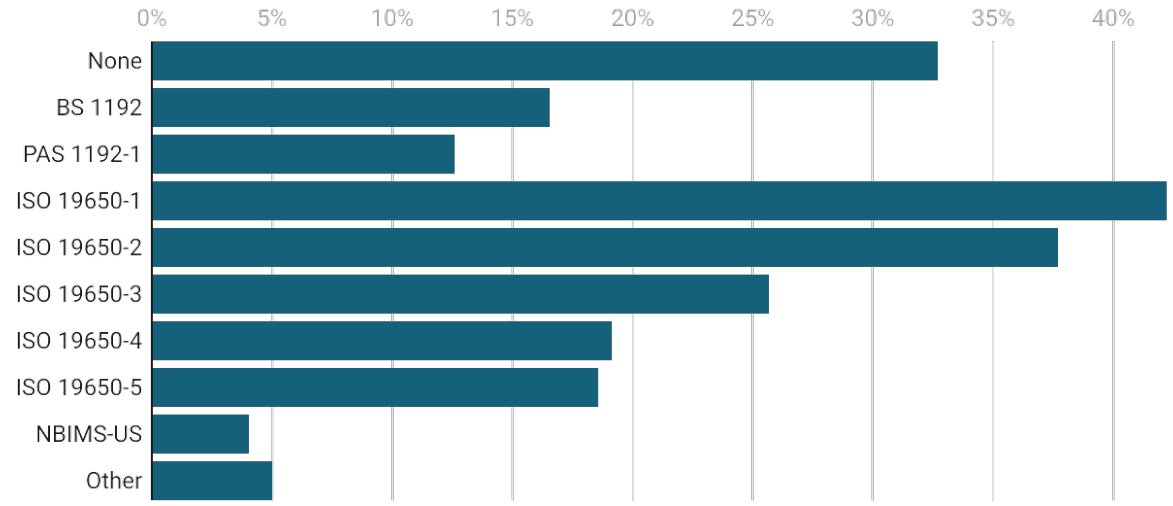
Over a third (34%) of firms have adopted partial outsourcing, which suggests that they are navigating resource and expertise gaps by integrating external support. Only a tiny proportion (5%) rely entirely on external providers for BIM.



10. What BIM standards have you adopted or utilised?

International BIM standards are being increasingly adopted, with the ISO 19650 series leading the way. ISO 19650-1 is the most widely used standard, adopted by 42.21% of respondents, followed by ISO 19650-2 (37.69%) and ISO 19650-3 (25.63%). However, 32.66% of respondents reported using no specific BIM standard, highlighting a significant gap in standardised practices.

Legacy standards like BS 1192 (16.58%) and PAS 1192-1 (12.56%) still see some use but are being replaced by ISO frameworks. The limited uptake of NBIMS-US (4.02%) reflects its niche application. A small portion (5.03%) reported using "Other" standards, including ISO 9001 and regional frameworks. While the growing preference for ISO standards is encouraging, the significant proportion of people who do not use any standard underscores the need for increased awareness and support to drive the broader adoption of consistent practices.



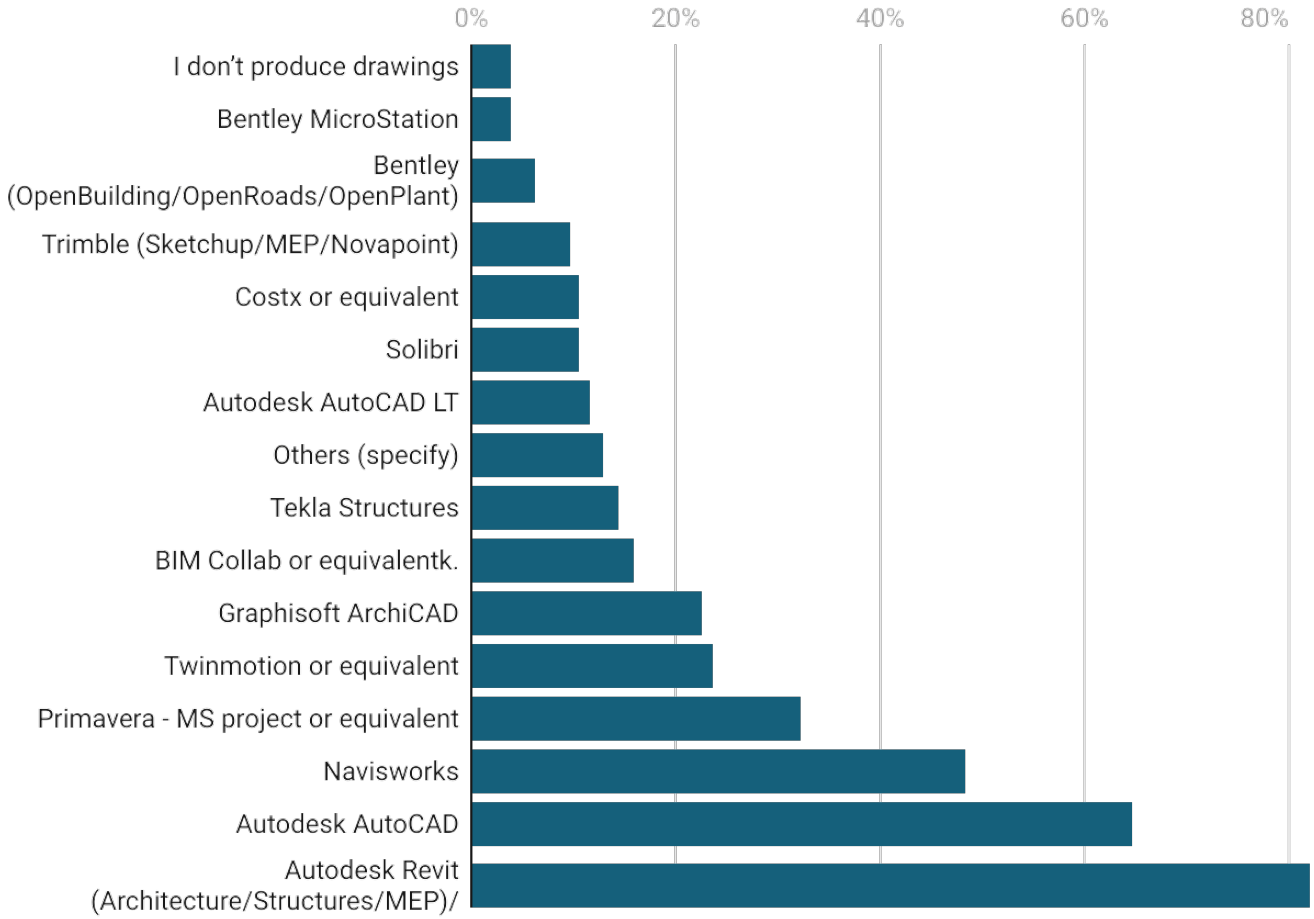
Others includes; Not sure and ISO 99091

11. Which software do you use in your projects?

The findings of ABS 2024 show widespread use of Autodesk Revit, which 82.13% of respondents adopted, making it the most popular BIM tool. Autodesk AutoCAD follows with 64.73%, reflecting the continued relevance of 2D drafting alongside BIM workflows. Navisworks is used by 48.31%, highlighting its importance for project coordination and clash detection.

Other notable tools include Graphisoft ArchiCAD (22.71%), Primavera/MS Project (32.37%), and Twinmotion (23.67%), which cater to design, scheduling, and visualisation needs. Specialised tools like Tekla Structures (14.49%) and BIM Collab (15.94%) are less common but serve niche applications.

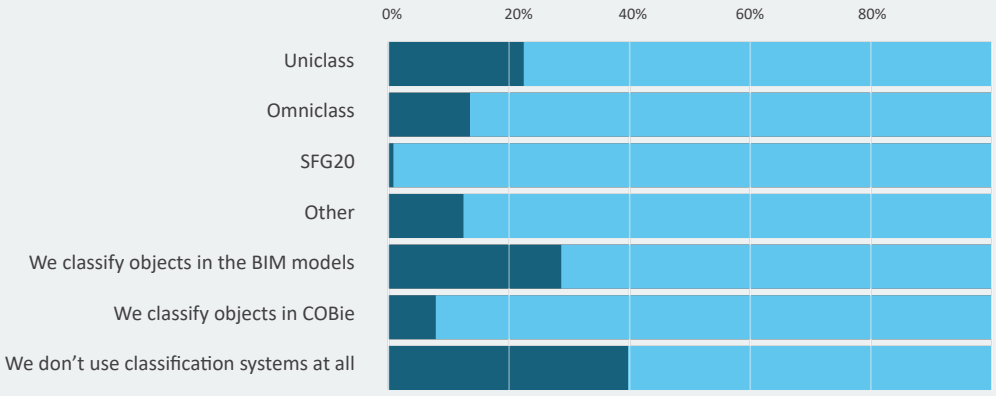
A small portion of respondents (3.86%) do not produce drawings, while 13.04% reported using other tools, including ETABS and Synchro Pro. These findings demonstrate a firm reliance on established BIM tools, with the growing adoption of advanced project management and visualisation software. The variety of tools used underscores the need for interoperability to enhance collaboration.



Others includes; Civil 3D, InfraWorks, ProtaStructure, Orion, Trimble Connect, Trimble Quadri, Synchro Pro, TQS, Autodesk Collaborate Pro, Enscape 3D, Bexel Manager, ACCA Software, Rhino, midas Structures Planswift, Trimble Vico Office, Dalux, Autodesk Robot Professional, ProjectWise, ETABS, CSI SAFE.

12. What Classification systems do you use in the models or on-graphical information like COBie?

A large proportion (40%) of respondents do not use classification systems at all, revealing a significant gap in structured data management practice and the potential risk of inefficiencies. The most common activity, reported by 29%, indicates a focus on classifying objects directly within BIM environments. Uniclass was utilised by 23% of respondents, making it one of the most common classification systems in use. Omniclass was also adopted by 14%, while SFG20 is rarely used, with only 1% of respondents indicating its application. COBie was used by 8%, suggesting limited but specific application of COBie classification processes.

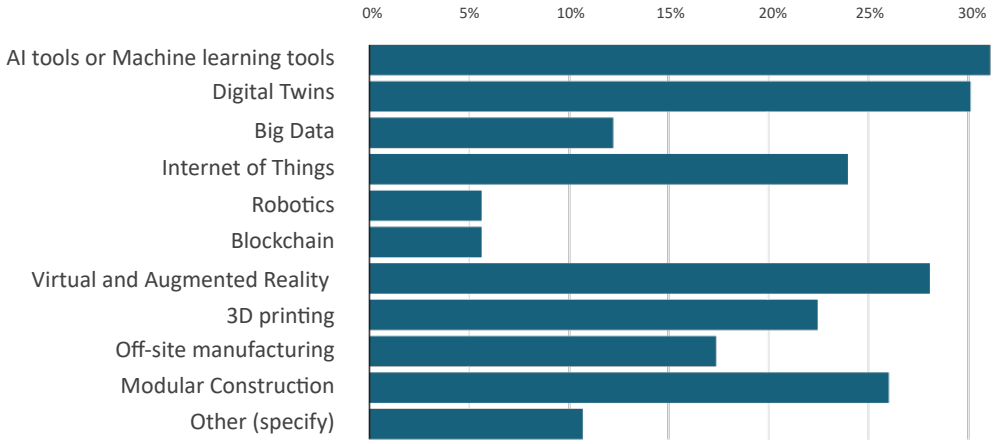


13. What new technologies have you attempted to use on projects for automation, data analysis or prediction?

There is a growing adoption of innovative technologies for automation, data analysis, and prediction in construction projects. AI tools and machine learning lead the adoption, used by 31.12% of respondents, reflecting the rising interest in predictive analytics and decision-making enhancements. Digital Twins follow closely at 30.10%, indicating a focus on creating virtual replicas to optimise asset management and performance.

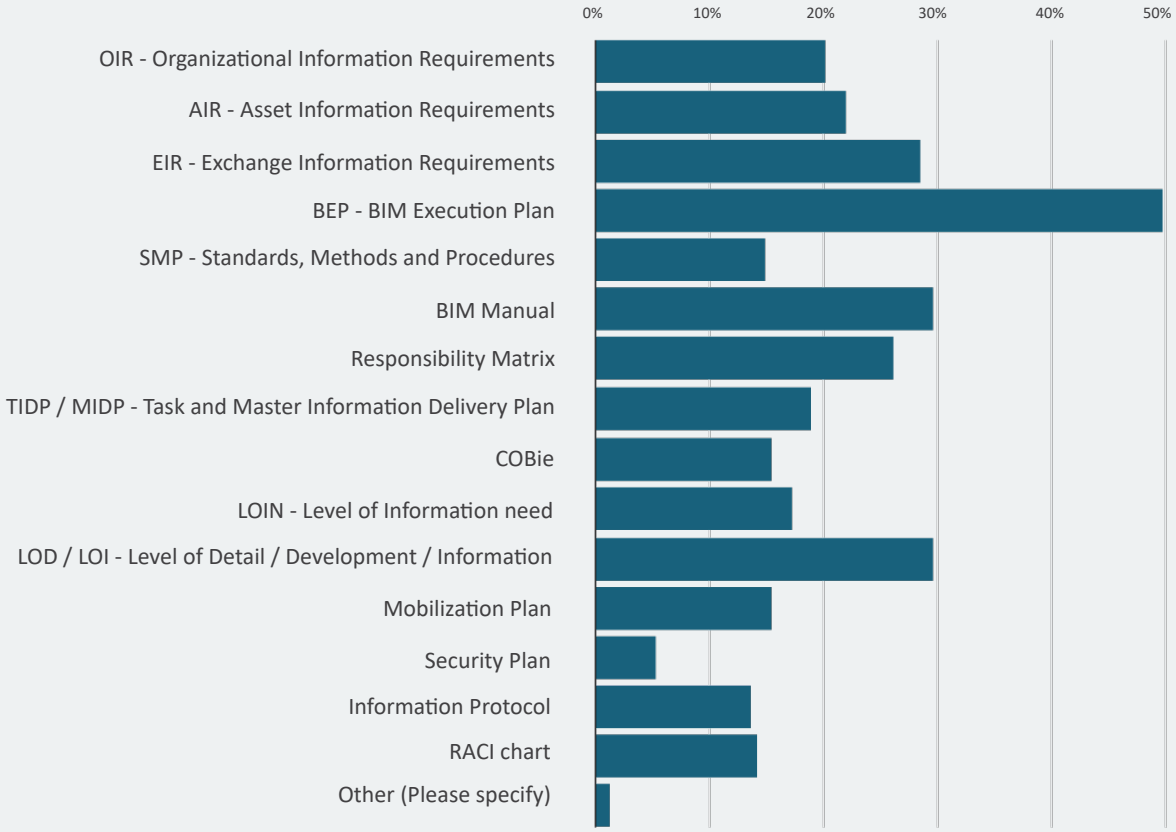
Other notable technologies include the Internet of Things (23.98%), which supports real-time data collection and monitoring, and virtual and augmented reality (28.06%), widely used for visualisation and immersive project management. Modular construction, adopted by 26.02%, off-site manufacturing (17.35%) and 3D printing (22.45%), reflects the growing interest in prefabrication and innovative building techniques. Adoption of Big data (12.24%), robotics (5.61%), and blockchain (5.61%) remain limited, likely due to higher costs and complexity.

A small percentage (10.71%) reported using other technologies, including GIS integration, laser scanning, and parametric automation, highlighting specialised innovations tailored to specific project needs. These findings showcase a positive trajectory in embracing advanced tools while emphasising the need for greater accessibility and training to scale adoption further.



Others includes; None, GIS Integration, Laser Scanning, Scan to BIM, Parametric Automation

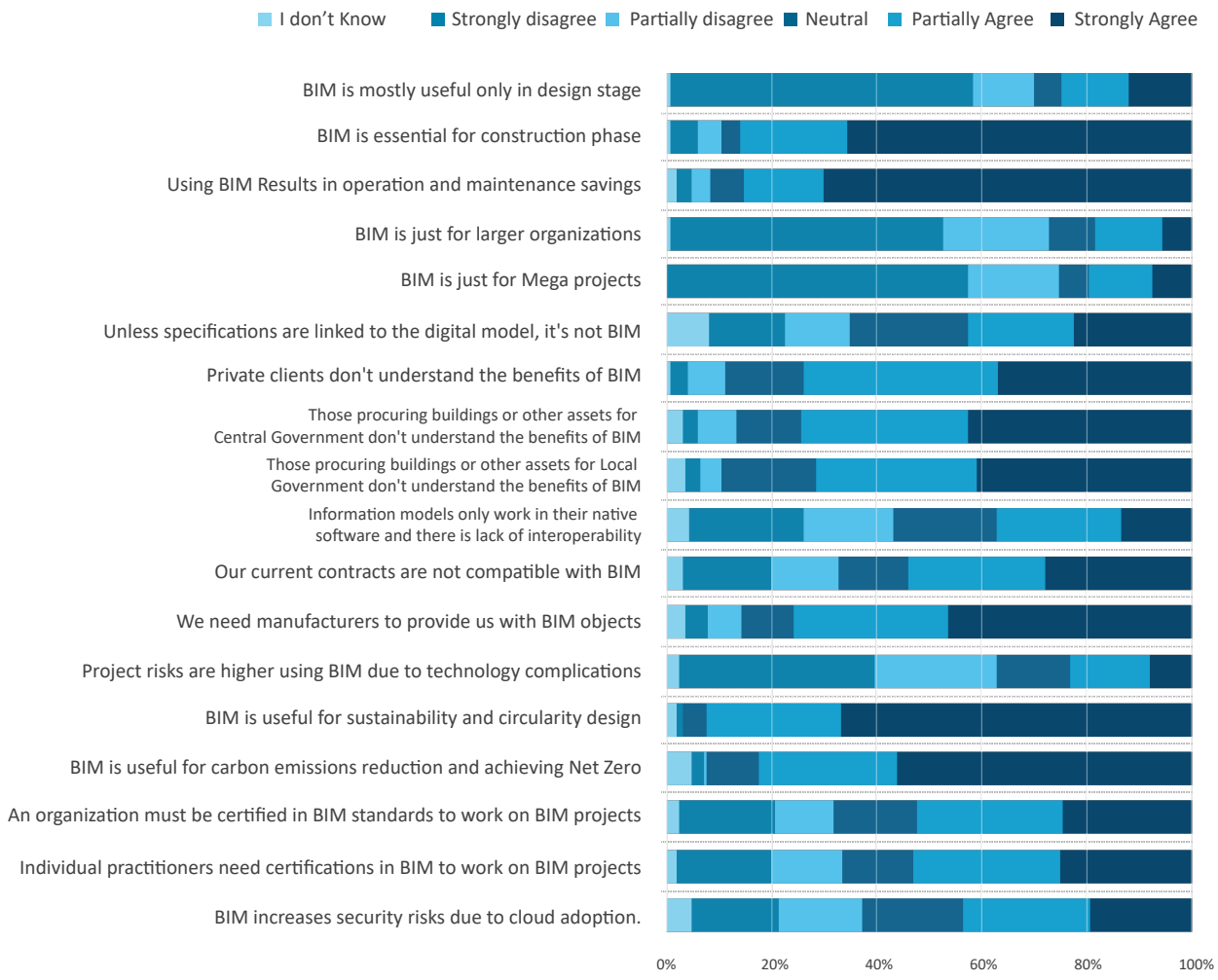
14. Which of the following non-graphical information and documents do you produce or use on your projects for BIM collaboration?



The BIM Execution Plan (BEP) is the most widely used document, with 49.70% of respondents indicating its use. This reflects its critical role in establishing BIM processes and workflows on projects. Exchange Information Requirements (EIR) follows at 28.40%, underscoring its importance in defining the scope and objectives of information exchange.

Documents such as BIM Manuals and Level of Detail/Development (LOD/LOI) are used by 29.59% of respondents, suggesting their value in standardising BIM practices and ensuring consistency. Similarly, Responsibility Matrices (26.04%), RACI Chart (14.20%) and Asset Information Requirements (AIR, 21.89%) highlight the focus on clarifying roles and managing information throughout the project lifecycle. However, certain documents are less commonly used. For example, Standards, Methods, and Procedures (SMP) and COBie are utilised by only 14.79% and 15.38% of respondents, respectively, indicating room for broader adoption. Security-related documents, such as the Security Plan (5.33%), remain underutilised. Interestingly, 20.71% of respondents indicated they use no non-graphical documentation, revealing a reliance on graphical workflows or limited BIM implementation.

15. What is your opinion on the usage of BIM for different lifecycle phases and organisations?

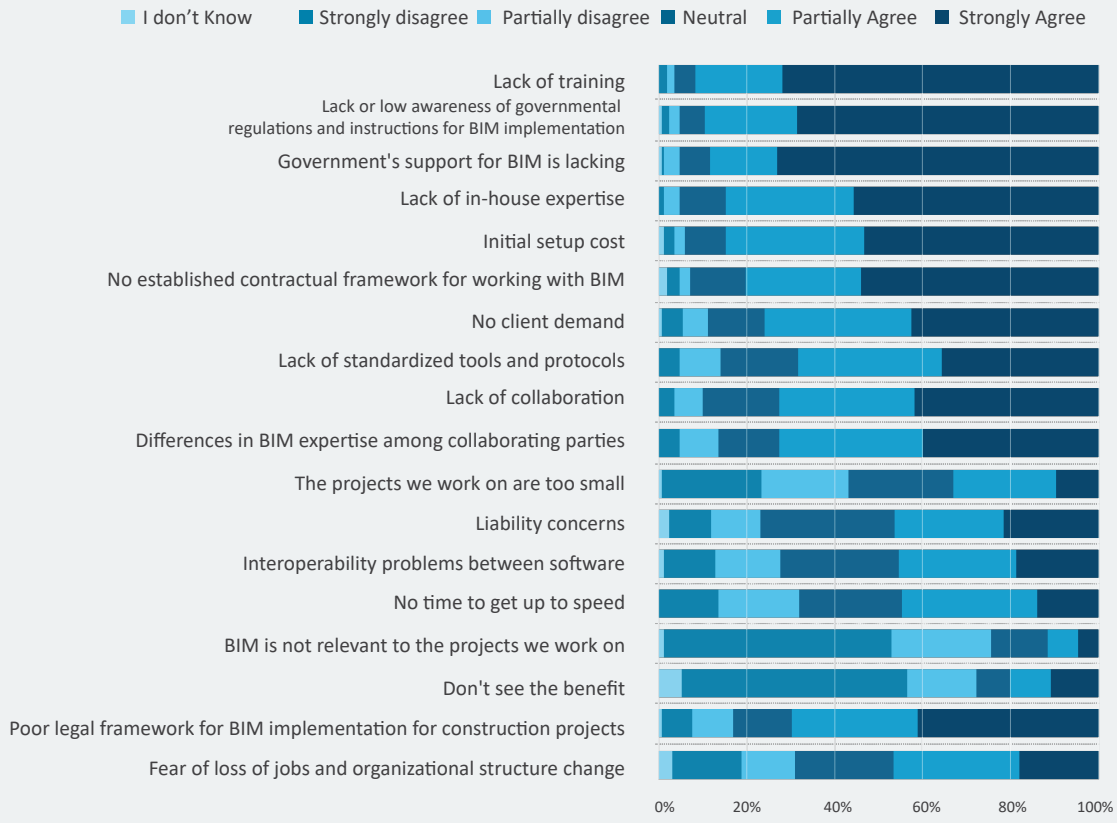


A majority (58%) disagree that BIM is applicable only in the design stage. However, 25% of respondents still view its primary value as limited to design. A substantial majority (66%) believe BIM is essential during the construction phase, indicating growing recognition of its broader applications beyond design. 70% of respondents see the potential for BIM to result in savings during operation and maintenance, reflecting its perceived long-term value. 52% strongly disagree with the idea that BIM is only for larger organisations and 57% reject the notion that BIM is just for mega projects, suggesting that BIM is increasingly viewed as accessible to firms of all sizes.

43% of respondents feel central government, and 41% feel local government clients. 28% of respondents report that current contracts are not compatible with BIM, suggesting that contractual frameworks need to evolve to support BIM processes. 43% of respondents agree that specifications must be linked to the digital model for it to qualify as BIM, highlighting the importance of full integration in BIM practices. 37% of respondents agree that there are interoperability challenges, with information models only working in their native software, which can limit BIM's effectiveness. 54% of respondents report that current contracts are not compatible with BIM, suggesting that contractual frameworks need to evolve to support BIM processes.

However, 67% of respondents believe BIM is beneficial for sustainability and circularity design, and 56% of respondents believe BIM can aid in reducing carbon emissions and achieving Net Zero goals. 46% of respondents agree that manufacturers should provide BIM objects, indicating a need for more BIM-ready resources to streamline implementation. 25% believe organisations must be certified in BIM standards to work on BIM projects, while 25% also feel individual practitioners need certifications, suggesting a debate on standardisation and professional development in the field. A majority (60%) disagree that BIM increases project risks due to technology complications, conflicting with concerns about technology integration and its potential to complicate projects.

16. What is your opinion on the impact of the following factors on BIM adoption?



Lack of training remains the top barrier, with 72.09% of respondents strongly agreeing, showing little change from 72.47% in 2022. Government support for BIM saw a significant rise, with 73.26% strongly agreeing in 2024 compared to 55.06% in 2022, emphasising the need for policies and incentives to drive adoption.

The initial setup cost remains a substantial obstacle, cited by 53.49% of respondents, up from 42.56% in 2022. This reflects ongoing financial challenges, particularly for smaller firms. Similarly, the lack of in-house expertise increased from 42.28% in 2022 to 55.81% in 2024, underscoring the need for skilled personnel.

Collaboration-related challenges also remain prominent. 41.86% of respondents cited a lack of collaboration, and 40.12% reported differences in BIM expertise among collaborating parties. These issues emphasise the need for better coordination, common standards, and shared knowledge among project stakeholders.

Lack of client demand continues to hinder adoption, cited by 42.69% in 2024, a slight improvement from 44.66% in 2022. This suggests incremental progress in aligning client expectations with BIM adoption. Conversely, the perception that projects are too small remains relatively unchanged, reported by 9.88% in 2024 compared to 15.03% in 2022. This reflects a growing recognition that BIM is applicable to projects of varying sizes. Similarly, BIM not being relevant was cited by just 4.65% of respondents in 2024, down from 7.58% in 2022, indicating increased awareness of BIM's versatility across project types.

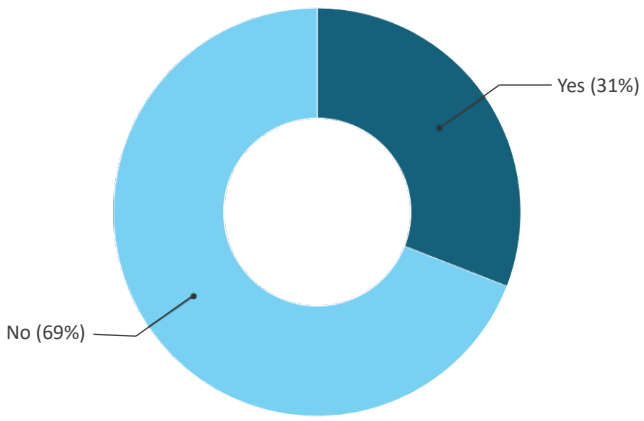
35.67% of respondents cited the lack of standardised tools and protocols as a barrier, reflecting ongoing difficulties in achieving interoperability and consistency across BIM workflows. Liability concerns, cited by 21.76%, also represent a growing issue as organisations become more aware of the risks and legal implications associated with BIM-based projects.

Other barriers were less frequently reported. For example, 18.13% of respondents noted fear of job losses and organisational changes, while 14.12% cited no time to get up to speed. These findings suggest that while such concerns exist, they are less significant than broader issues like training and financial constraints.

These findings underline the importance of addressing both technical and organisational barriers to BIM adoption. Prioritising investments in training, government policies, and standardised tools, alongside fostering collaboration and addressing financial constraints, will be essential to advancing BIM adoption across the African construction industry.

17. Did you explore the BIM Process for Sustainability (i.e. 6D)?

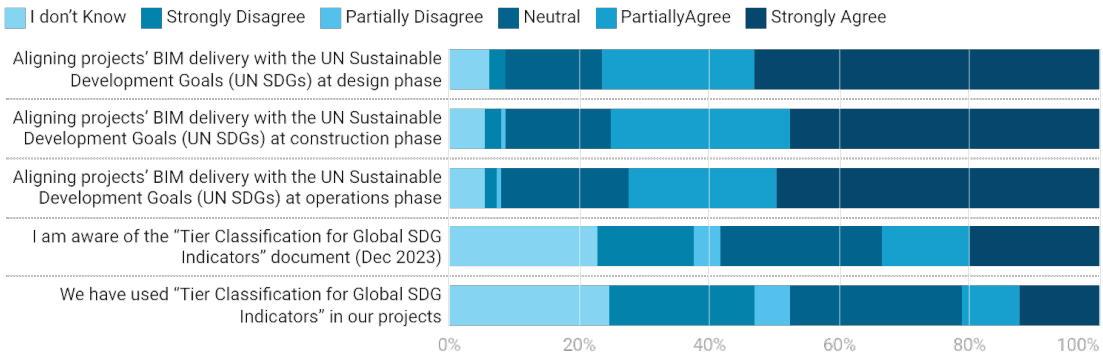
ABS 2024 indicates that while there is growing interest in BIM's role in sustainability, the adoption of the BIM process for sustainability (6D) remains limited. While a third of respondents are exploring 6D BIM, the majority (69%) have yet to fully adopt these practices, suggesting a gap and indicating potential for growth in this area. Given the increasing importance of sustainability in construction, industry leaders may need to provide more resources, case studies, and training to encourage wider adoption of 6D BIM.



18. At which lifecycle phases are your practices aligned with the UN Sustainable Development Goals

A substantial majority (53%) of respondents agree or strongly agree that aligning BIM delivery with the United Nations Sustainable Development Goals (UN SDGs) during the design phase is important, indicating a growing focus on sustainability from the outset of projects. Another 23% partially agree, while only 3% disagree. Alignment during construction is also well-supported, with 48% strongly agreeing and 28% partially agreeing, reflecting continued attention to sustainability during this critical stage.

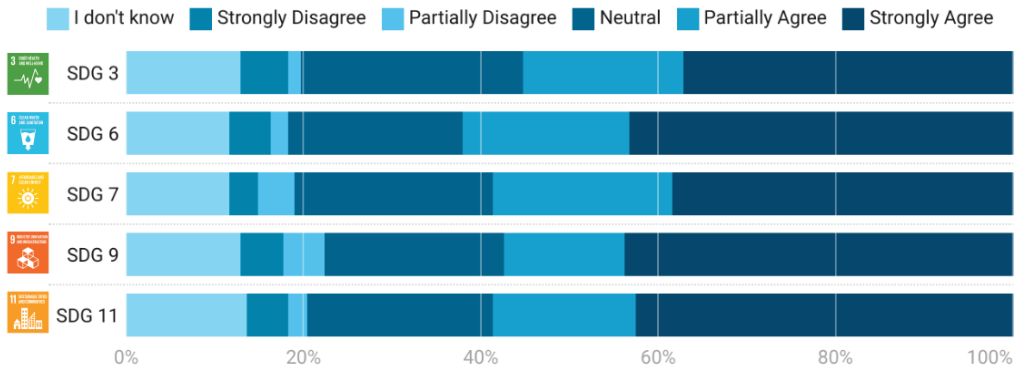
Also, 50% of respondents agree that aligning BIM delivery with SDGs in the operations phase is essential, followed by 23% who partially agree. This suggests that sustainability remains a priority beyond construction in the long-term management of assets. The awareness (20%) and usage (12%) of the Tier Classification for Global SDG Indicators is low, indicating that additional efforts to raise awareness and offer guidance on how these tools can be applied in projects may be needed.



19. Regarding the 17 UN Sustainable Development Goals (SDGs), how strongly do you agree or disagree with the following? We consider the following SDGs in our projects:

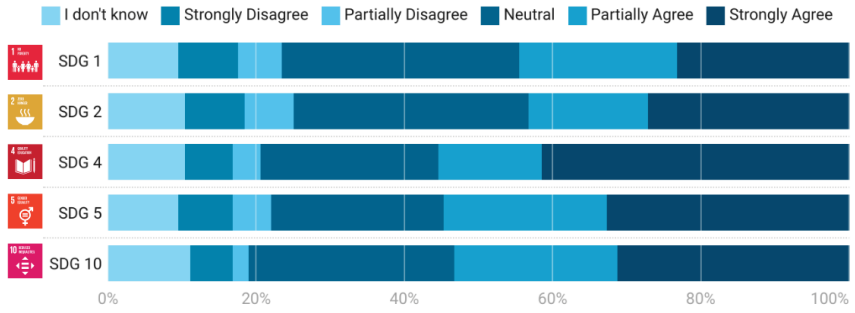
TECHNICAL SDGs

The majority of respondents considered the five technical SDGs (particularly SDG 6: clean water, SDG 9: industry innovation and infrastructure, and SDG 11: sustainable cities), indicating positive alignment with sustainability goals in the technical aspects of their projects. However, for some SDGs (particularly SDG 3: good health and SDG 7: affordable energy), more work is needed to integrate these goals across all projects fully. A significant portion of respondents still express uncertainty or disagreement about certain SDGs, pointing to potential gaps in understanding or implementation.



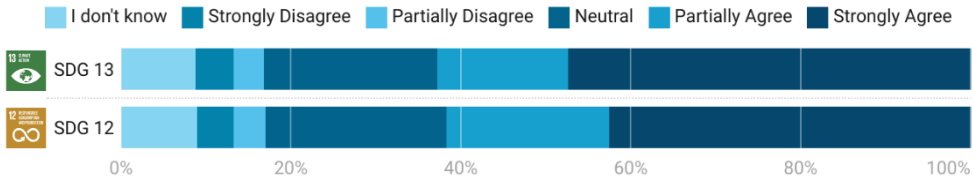
SOCIAL SDGs

A significant proportion of respondents express neutrality or uncertainty across all social SDGs, which may indicate a lack of clarity or focus on how these goals are relevant to their work. SDGs addressing poverty (SDG 1), hunger (SDG 2), and inequality (SDG 10) see higher levels of neutrality and disagreement, suggesting they are less directly incorporated into projects. SDG 4 (Quality Education) and SDG 5 (Gender Equality) receive more substantial support, reflecting an awareness of education and gender equality as critical social goals in the construction sector.



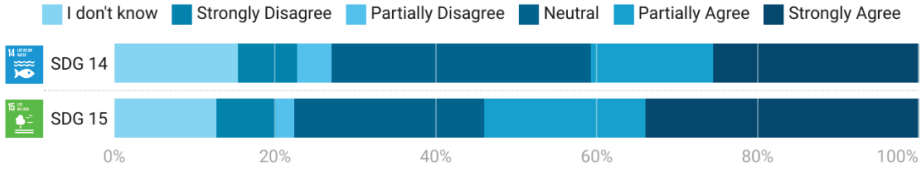
ENVIRONMENTAL SDGs

SDG 13 (climate action) garners slightly stronger agreement than SDG 12 (responsible consumption), suggesting that combating climate change is perceived as a more immediate priority than responsible consumption. About 20%–21% of respondents remain neutral on these goals, with a further 17% indicating disagreement or uncertainty. This highlights the need for more industry-wide initiatives and education to encourage broader adoption.



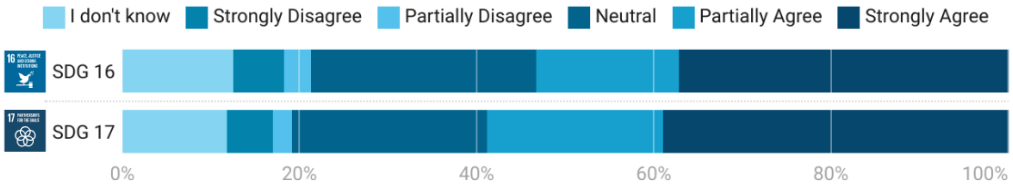
BIODIVERSITY SDGs

A significant portion of respondents remain neutral (32% for SDG 14: life below water and 24% for SDG 15: life on land), possibly due to a lack of clarity or relevance of these goals in construction projects. Approximately 22%–27% of respondents either disagree or are unsure about integrating biodiversity SDGs, indicating a need for more guidance and frameworks to enhance alignment with these goals.



ECONOMICAL SDGs

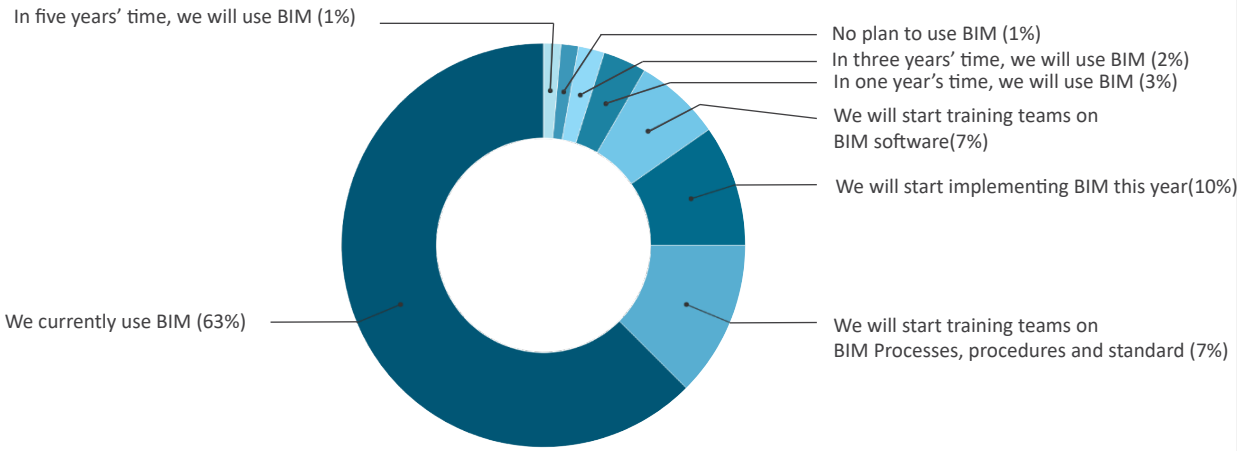
SDG 17: partnership for the goal has slightly stronger support (39%) than SDG 16: peace, justice and strong institutions (37%), suggesting that partnerships are a more emphasised area in project considerations. Compared to other SDG categories, fewer respondents strongly disagree with considering economic SDGs, which may imply general alignment in principle, though actionable steps could still be strengthened.



20. How would you describe your organisation's future use of BIM?

More than half of the respondents indicated that their organisation currently uses BIM, reflecting a solid level of adoption across the industry. Among those whose organisations are not yet using BIM, 9.72% plan to start implementing it within the year, and 19.44% are prioritising training. 6.94% focus on BIM software, and 12.50% on processes, procedures, and standards. These training plans indicate an emphasis on preparing teams for effective BIM integration.

Adoption is expected to continue gradually, with 3.47% of respondents aiming for their organisation to use BIM within one year, 2.08% within three years, and 1.39% within five years. However, a small percentage of respondents (1.39%) indicated that their organisation has no plans to adopt BIM, suggesting that some of the barriers identified above may still discourage some organisations. Overall, these reflect a positive trend toward BIM adoption, with most organisations already using BIM or preparing for its integration.

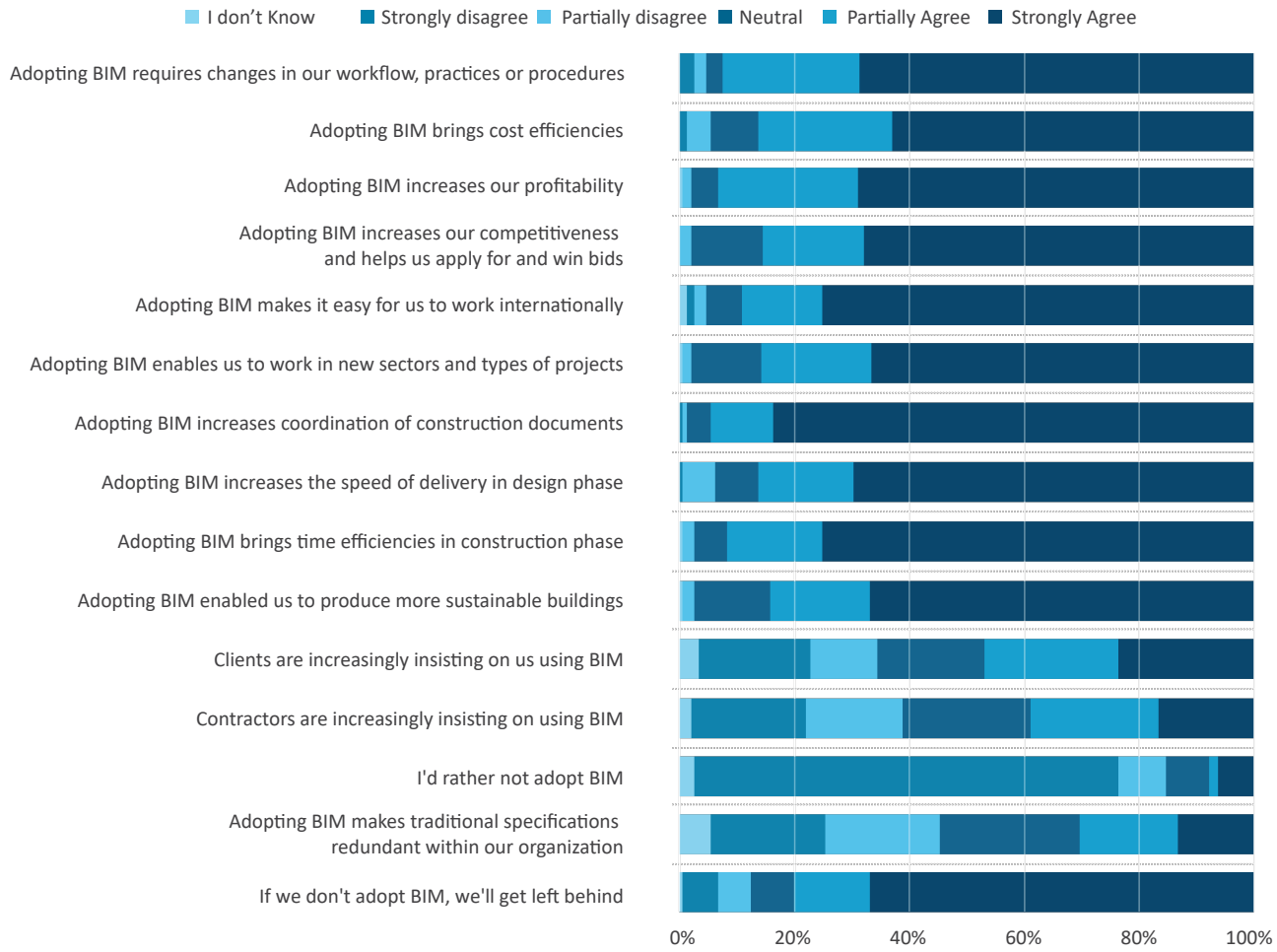


21. What changes does BIM adoption bring to projects in your opinion?

In 2024, 68.49% strongly agreed that BIM requires changes in workflows, practices, or procedures, slightly lower than 76.37% in 2022. This indicates a continued acknowledgement of the adaptation needed for implementation. Similarly, 83.56% strongly agreed that BIM improves the coordination of construction documents, a slight decrease from 85.17% in 2022. This confirms BIM's pivotal role in enhancing collaboration and efficiency. However, external pressures for adoption show a notable decline. In 2024, only 23.45% strongly agreed that clients increasingly insist on BIM, compared to 42.83% in 2022, signalling reduced demand from clients as a driver of adoption. Similarly, 16.67% strongly agreed that contractors insist on BIM, down from 41.21% in 2022, reflecting diminished influence from this stakeholder group.

The responses highlight BIM's perceived value. 63.01% strongly agreed that BIM brings cost efficiencies, while 68.97% strongly agreed that it increases profitability. BIM's ability to facilitate work internationally is widely recognised, with 75.17% strongly agreeing and 66.90% strongly agreeing that it enables the production of more sustainable buildings. Additionally, 75.17% strongly agreed that BIM improves time efficiencies during the construction phase. Resistance to BIM adoption remains low, with 73.61% strongly disagreeing that they would prefer not to adopt BIM, an increase from 61.88% in 2022. Furthermore, 66.67% strongly agreed that organisations risk falling behind if they don't adopt BIM, consistent with 65.68% in 2022.

Overall, while perceptions of BIM's benefits remain positive, reduced external pressure from clients and contractors highlights the need for more vigorous advocacy and collaboration to drive adoption. The ongoing recognition of its impact on workflows, efficiency, and sustainability underscores BIM's growing importance in modern construction practices.

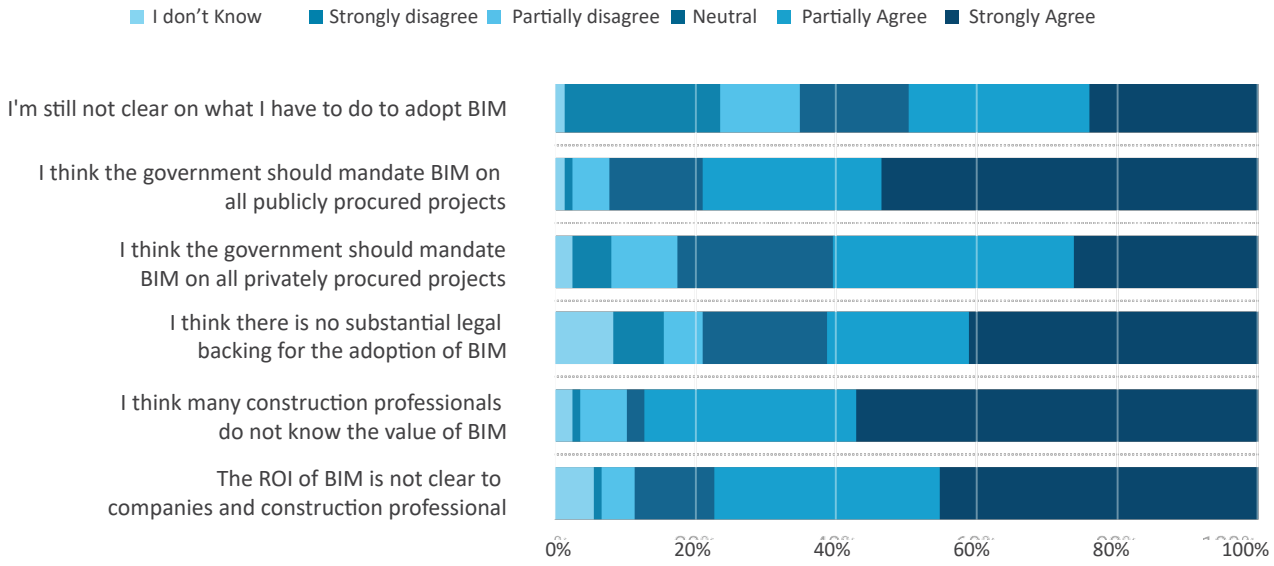


SECTION B – HEARD NOT IMPLEMENTED

22. What is your opinion on the role of Government, legal and ROI in BIM adoption?

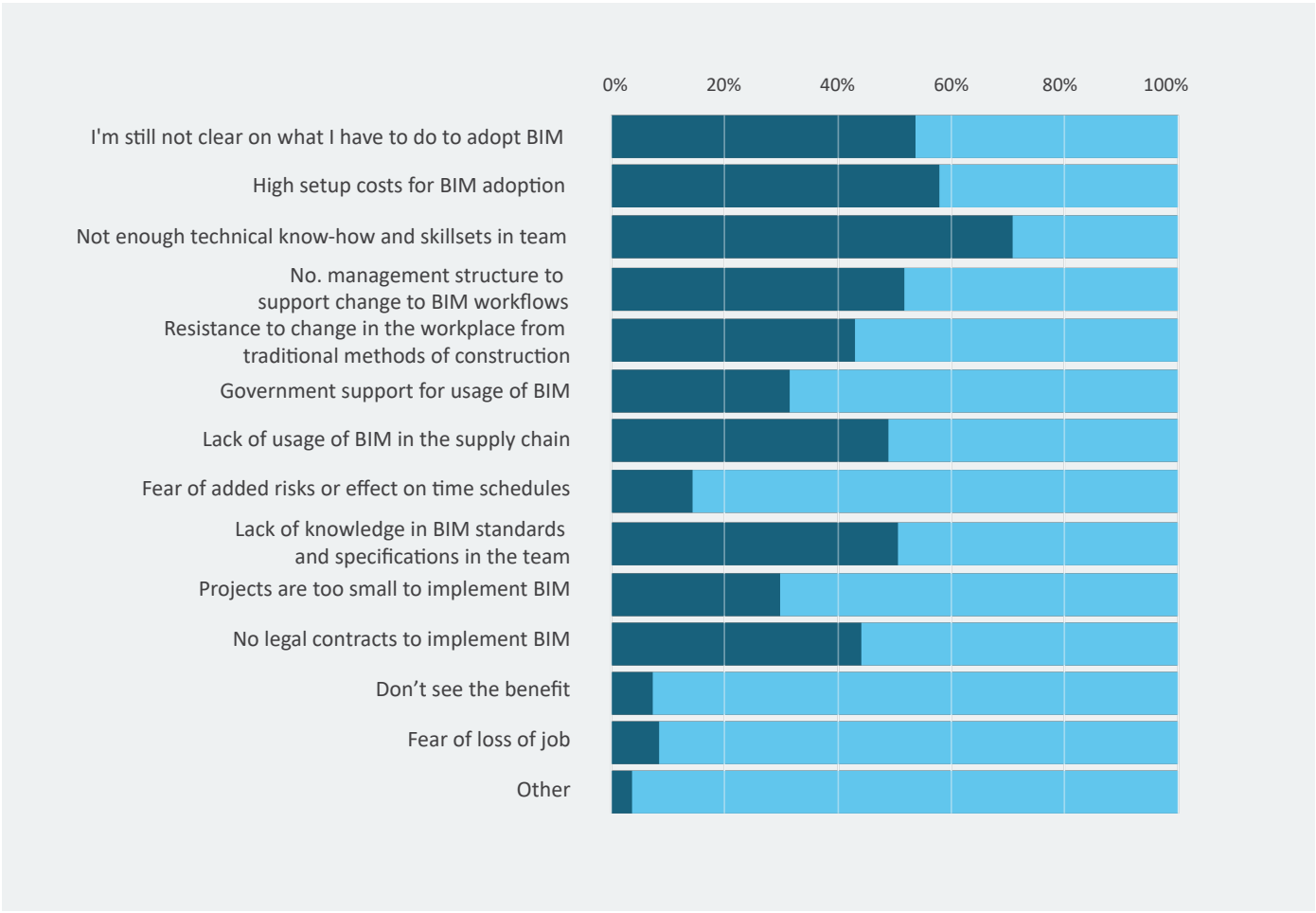
The respondents have heard of but not implemented BIM, and 50% strongly and partially agree that they are unclear on what needs to be done to adopt BIM, showing a significant knowledge gap. 22% strongly disagree, suggesting some respondents feel well-informed about BIM adoption. 54% strongly agree, and 26% partially agree that BIM should be mandated for publicly procured projects, reflecting strong support for government-driven BIM implementation. For privately procured projects, 26% strongly agree, and 34% partially agree, with more respondents expressing neutrality (22%) or disagreement (15%). 41% strongly agree, and 20% partially concur that there is no substantial legal backing for BIM adoption, indicating a perception of inadequate regulatory frameworks. The strong support for public sector mandates on BIM adoption aligns with the perception that leadership from the government could drive wider implementation.

While these respondents have not implemented BIM, 57% strongly agree, and 30% partially agree that many construction professionals do not understand BIM's value, indicating a widespread awareness issue. 45% strongly agree, and 32% partially agree that the return on investment (ROI) of BIM is unclear to companies, further highlighting a knowledge and communication gap. A lack of understanding of BIM's value and ROI among professionals and companies points to the need for better education and case studies showcasing BIM benefits.



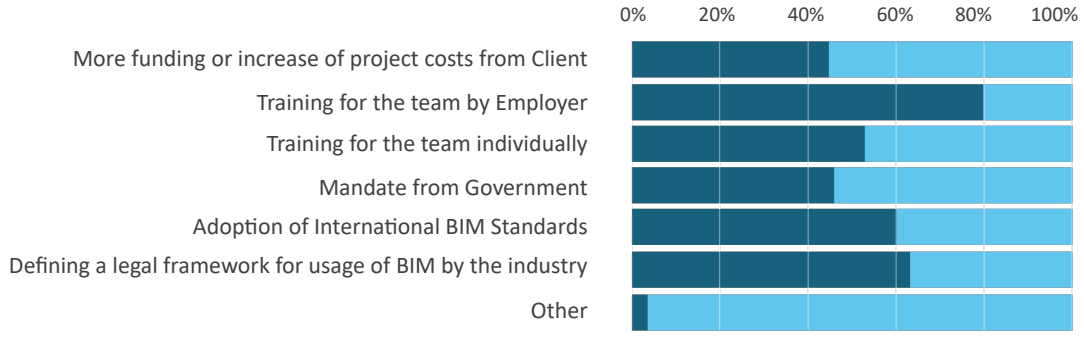
23. What are the barriers why you are not using BIM on projects?

The topmost barrier hindering the respondents who have heard of but not implemented BIM is the lack of technical know-how (71%), signalling an urgent need for workforce training and upskilling. High setup costs (58%) also remain a significant deterrent, requiring strategies like government subsidies or tiered adoption models. Over half of respondents cite a lack of client demand (54%), underscoring the need to educate clients about BIM benefits. Resistance to change (43%) and insufficient management structures (52%) emphasise the importance of leadership buy-in and change management strategies. There is also inadequate knowledge of BIM standards and specifications (51%), hindering practical implementations.



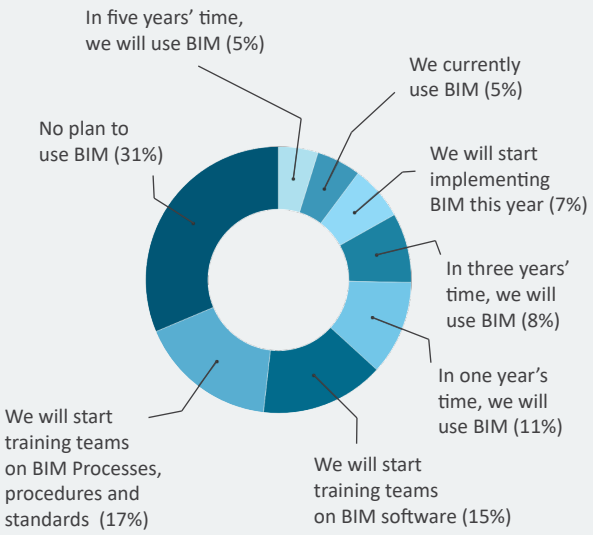
24. What do you feel is needed for you to implement BIM in your workplace?

The overwhelming need for employer-led training highlights a gap in workforce readiness and the responsibility of organisations to invest in their teams. While 80% indicated that training provided by employers is the most significant need, 53% noted that individual training is also a key requirement, showing that employees recognise their role in advancing BIM skills. Nearly two-thirds of respondents emphasise the need for clear legal frameworks (63%) and adherence to global BIM standards (60%) to streamline adoption. Financial barriers also persist, with many pointing to clients as a source for increased funding to offset the initial costs of BIM adoption. A significant portion (46%) sees government mandates as a catalyst for industry-wide change. Other comments include creating awareness, changes in organisational management structure, and access to essential resources.



25. How would you describe your organisation's future use of BIM?

Only about 5% of respondents who have heard of but have not implemented BIM noted that their organisations use BIM in their projects, demonstrating that having an enabling corporate environment can spur increased BIM adoption. 31% indicated that their organisations have no plans to use BIM, representing the largest group, which suggests significant barriers to adoption or resistance to change. A substantial portion is prioritising skill-building, particularly in BIM software (15%), processed and standards (17%), which aligns with previously identified needs for training. 11% expect to use BIM within one year, 8% target a three-year timeline for BIM adoption, and 5% plan for BIM adoption within five years. The high percentage of organisations with no plans to adopt BIM reflects the identified barriers above, such as cost, lack of client demand, or resistance to change.



In closing ABS 2024, all respondents were asked to respond to an open-ended question: What is the future of BIM and digital construction in Africa?

The future of BIM and digital construction in Africa is widely regarded as promising, albeit with significant challenges to overcome. Several respondents noted that Africa's anticipated surge in infrastructure development makes BIM essential for managing large-scale projects efficiently. Also, there is growing recognition of BIM's role in global collaboration, innovation, and aligning with sustainability goals. However, while adoption rates vary significantly across regions and professional fields, various barriers limit the potential for widespread implementation. High initial costs, resistance to change, lack of skilled labour, infrastructure issues (like unstable electricity and internet access), and policy gaps seem to contribute to the slow adoption of BIM.

Interestingly, Africa's predominantly young population is more open to adopting digital technologies. There is a strong demand for skill development through team and individual training, academic programs, and certifications to build capacity in BIM and digital construction. Respondents believe that BIM tools and methodologies need to be tailored to Africa's traditional construction practices, heritage preservation, and local contexts. Developing indigenous BIM tools and software could reduce dependency on expensive, imported solutions. There were also calls for governments to play an active role, including mandating BIM on projects, subsidising costs, and supporting public-private partnerships. In addition, many see integrating BIM into university curricula and professional development as essential.

Many believe BIM will become a cornerstone of Africa's construction industry, akin to the widespread adoption of mobile technology. By addressing cost, policy, education, and localised adaptation, they indicated that BIM could play a pivotal role in transforming Africa's construction industry into a more efficient, sustainable, and globally competitive sector. While adoption may be slow initially, investment in training, government support, and continued advocacy (which BIM Africa is leading) is expected to lead to a brighter future.

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BIM Africa Initiative is a civil society organization formed to enable and regulate the adoption and implementation of Building Information Modelling (BIM) in the Architecture, Engineering, Construction, and Operations (AECO) Industry across Africa

With a focus on SDGs 9, 11, and 17, BIM Africa aligns with the United Nations 2030 Agenda for Sustainable Development by fostering innovation in the Construction Industry through local and global partnerships towards the delivery of Smart, Resilient and Sustainable Infrastructure and Urban Development.

The African-wide advocacy for BIM adoption and implementation is reinforced by extensive academic and market research programs, certification programs, round-table meetings, seminars and webinars, formulation of locally-adapted standards, chapters, volunteering, and professional development opportunities.