



27 July 2023

Welcome to

The Future of Work

Building Information Modelling



BIM
Harambee
.Africa

General Arrangements

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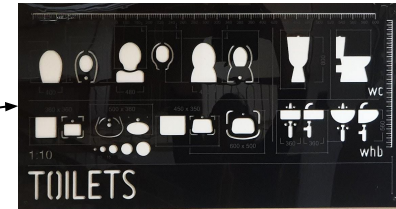
General Arrangements

Coffee and refreshments (cash)

- **Artisans** coffee stand outside Lecture Room 3-3
- **Vida-E Cafe** in the basement/courtyard
- **5 minute walk** to Artisan and Pure Cafe restaurants on campus - ask Boukunde students for directions!

Restrooms

- **Unisex restrooms** @ opposite side of lecture rooms next to architecture studios, on every floor



Emergency Exit

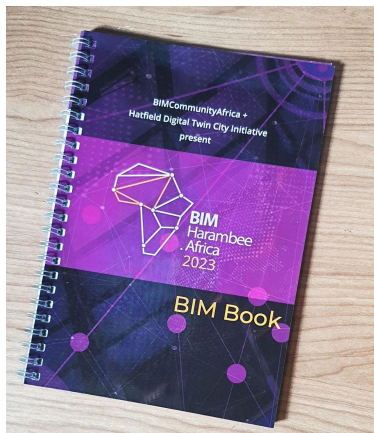
- **Ground** and **Basement** @ north, east and west of building.

BIMHarambee 2023
Youtube Live Stream



POPIA

THIS SESSION IS
BEING RECORDED



2 Day BIMHarambee Event

Department of Architecture, Boukunde, University of Pretoria

Thursday 27 July

Active learning and on-site demonstrations at Boukunde for all.

Morning Session | 09:00 - 11:30

- *What is BIM? No, really?*

Afternoon Session | 11:45 - 16:45

- *Live tech demos on Boukunde*
- *BIM Scavenger Hunt*
- *Direct engagement with industry*

Friday 28 July

Student, Young Professional, and Educator focussed learning sessions.

Morning Session | 09:00 - 11:30

- *AECO Student + Young Professional Session*

Afternoon Session | 12:30 - 15:00

- *AECO Educator Session*
- *Teaching Case Study: BIM for Circularity*
- *Student exhibition on ground floor.*



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BIMHarambee 2023

Thursday



Morning Session

09:00 - 11:30

Afternoon Session

11:45 - 16:45

Department of Architecture, University of Pretoria Campus | 27, 28 July 2023

Thursday 27 July - Seeing is believing day!

Real-World BIM learning from the industry experts!

Follow a real BIM process throughout the day, live at Boukunde!

why and *what-for* of the BIM project space.

What is BIM thinking, processes, or workflows, and what matters most to whom in the built environment.

Live Scan-to-BIM Technologies of Boukunde

We will demonstrate a live scan-to-BIM technologies of Boukunde — your living laboratory!

Boukunde BIM Scavenger Hunt - Yes, Prizes!

In the BIM spirit, we will have a Boukunde BIM Scavenger Hunt!

Using the Boukunde models, mobile devices, and digital assets, can you find the clues and win the prize?

Engage with your industry and peers — ask them questions!

There are student research posters on ground floor and in the Digital Crit Room in the basement!



2023 BIM | The Future of Work | 27, 28 July 2023



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BIMHarambee 2023

Friday

Friday 28 July - My BIM Journey

AECO Student + Young Professional Session



09:00

SAPOA PropTech in South Africa

The future of the SA property market through technology: how the real estate sector is engaging technology to bring the built environment into a digital age and delivering a range of positive outcomes for stakeholders.

Matthew Marshall

SAPOA PropTech Committee

09:15

What is BIM? No, really?

BIM workflows, core concepts and definitions

Machiel Odendaal

Technology Manager,
Modena AEC and Infrastructure

09:30

Boukunde Live-BIM

Outcomes from the live scan-to-BIM of Boukunde and connecting to how BIM is the future of building.

Richard Matchett

Digital Lead, Zutari

15 mins comfort break

10:30

State of the South African Digital Built Environment

Before we “smart city,” we need to BIM. Current environment and possibilities
BIM Mandate and ISO 19650 (with National Annex)

Richard Matchett

Rudd van Deventer

Director, Spaceworx

11:00

What opportunities are there for BIM Professionals?

How do I start my BIM journey as a young professional?

Shameemah Davids

Digital Lead - Europe, AECOM

11:30

Q & A with industry professionals

All speakers



Friday 28 July - My BIM Journey

AECO Educators, Lectures, & Professionals Session



12:30

SAPOA PropTech in South Africa

The future of the SA property market through technology: how the real estate sector is engaging technology to bring the built environment into a digital age and delivering a range of positive outcomes for stakeholders.

12:45

What is BIM? No, really?

BIM workflows, core concepts and definitions and important issues for educators.

13:00

Boukunde Live-BIM

Outcomes from the live scan-to-BIM of Boukunde and connecting to how BIM is the future of building.

10 mins comfort break

13:30

State of the South African Digital Built Environment

Before we “smart city,” we need to BIM. Current environment and possibilities
BIM Mandate and ISO 19650 (with National Annex)

14:00

Teaching Case Study: BIM for Circularity, University of Pretoria

Education case study from the built environment postgraduate research unit.

14:45

What must graduates be able to do in the professional environment?

Skill sets and learnings for interdisciplinary built environment works.

15:05

Q & A with industry professionals

Matthew Marshall

SAPOA PropTech Committee

Suvaniya Pillay

BIM Specialist, Baker Baynes

Richard Matchett

Digital Lead, Zutari

Richard Matchett

Rudd van Deventer

Director, Spaceworx

Calayde Davey, Architecture

Helene Potgieter, HPA

Johann vd Merwe, Structural

Gary Mansfield

Digital Innovation Lead, CKR

All speakers



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27 July 2023

Our legacy through building



Image Credit: Davey, adapted from Sam Rohn (22 February, 2016)

How many buildings are there in the world?


100 Billion Buildings in the World

of all types and sizes in the world.

This number includes **everything** —
from **huts to high-rises**.

The vast majority of buildings are located in Asia and

Africa



The global building stock will exceed

183 Billion

Square Meters in 2026

Navigant Research (26 April, 2018)

2050

70%

of the world population will live
in urban settlements.

UN Convention to Combat Desertification
(27 October, 2020)

Image Credit: Statista (2023)



Today

The world's cities occupy just

3%

of the Earth's land

UN Convention to Combat Desertification
(27 October, 2020)



But account for

80%

energy consumption

But account for

75%

carbon emissions



2050

Yes, new buildings are more energy efficient, sure...but

80%

of buildings that will be standing in 2050 globally *have already been built.*

“We must prioritise upgrading the buildings we already have in order to avoid high embodied carbon emissions for decades to come.”

— Emily Parish, The Climate Group (12 August 2022)

70%

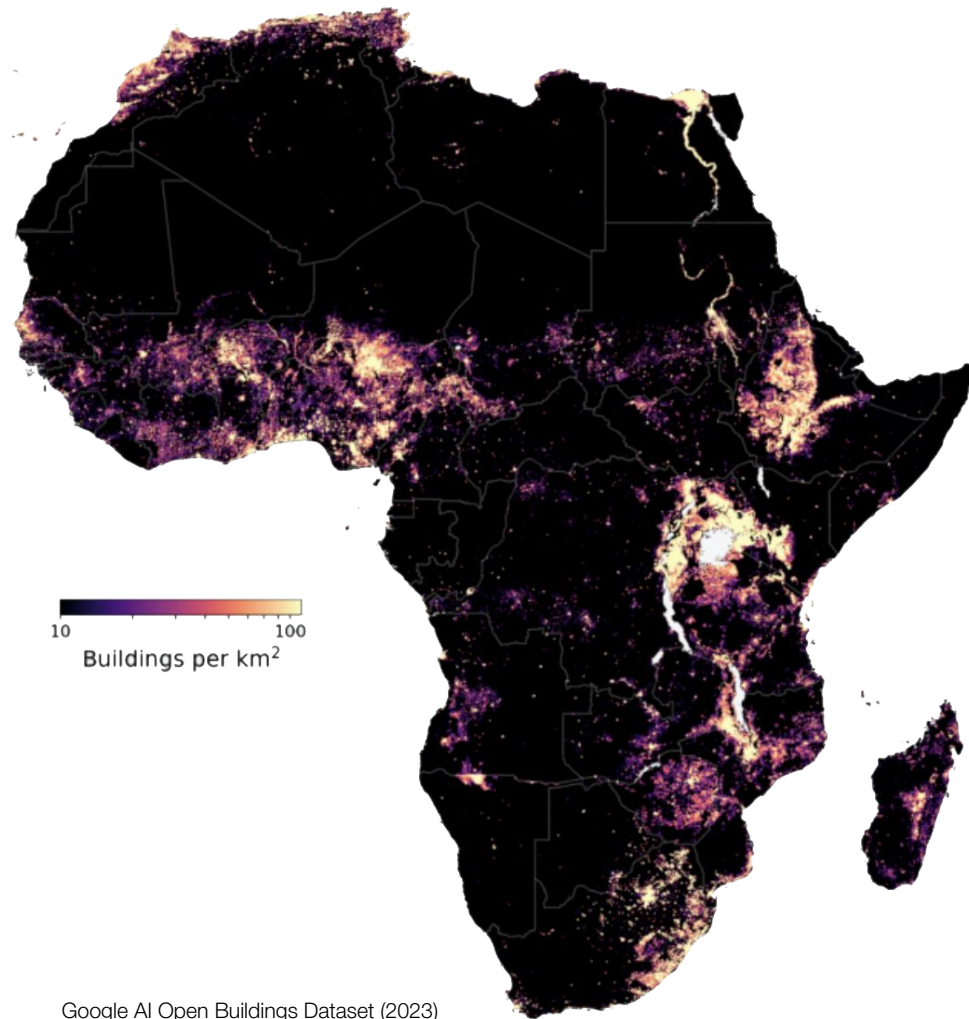
of the African building stock in 2040
still has to be built

majority of this growth will be in *cities*

200%

Additionally, hundreds of smaller African
cities double in size every 20 years

UN Global Status Report for Buildings and Construction (2022);
Vidal (2018)



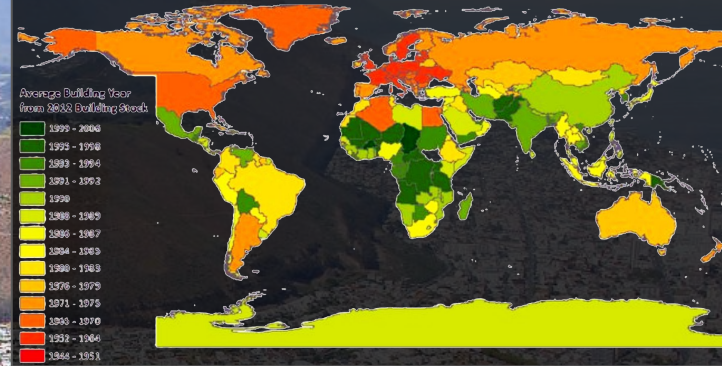
Google AI Open Buildings Dataset (2023)

But, if all the buildings
are built already...

how long do we need to
take care of our existing
building stock?

Average Building Year as of 2012

Daniell, E, J, et al (2014)

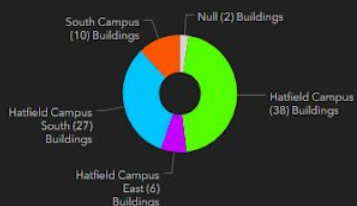


Generally, Average Age

70 yrs

Historical (temples, etc)	500-1000 years
Steel structures	100 - 150 years
Concrete structures	100 years
Private Real Estate	60-80 years
Rigid roads	30-35 years
Flexible roads	8-10 years

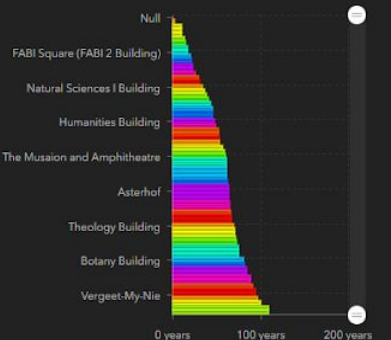
Building Portfolio



- 4017 | Hatfield Campus | Zoology Building
- 4047 | Hatfield Campus | Visual Arts Building
- 4102 | Hatfield Campus East | Vergeet-My-Nie
- 4022 | South Campus | UP Javett Arts Centre
- 4232 | Hatfield Campus South | Tukkieverf
- 4258 | Hatfield Campus | Thuto Building
- 4045 | Hatfield Campus | Theology Building
- 4086 | Hatfield Campus | The MUSAION and Amphitheatre
- 4083 | Hatfield Campus | Technical Services Building
- 4053 | Hatfield Campus | Study Centre Building
- 4038 | Hatfield Campus South | Student Service

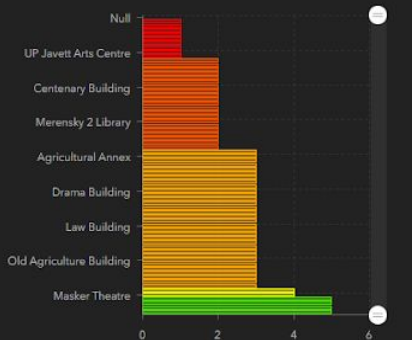
Last update: 7 minutes ago

Building Age (years)



Last update: 7 minutes ago

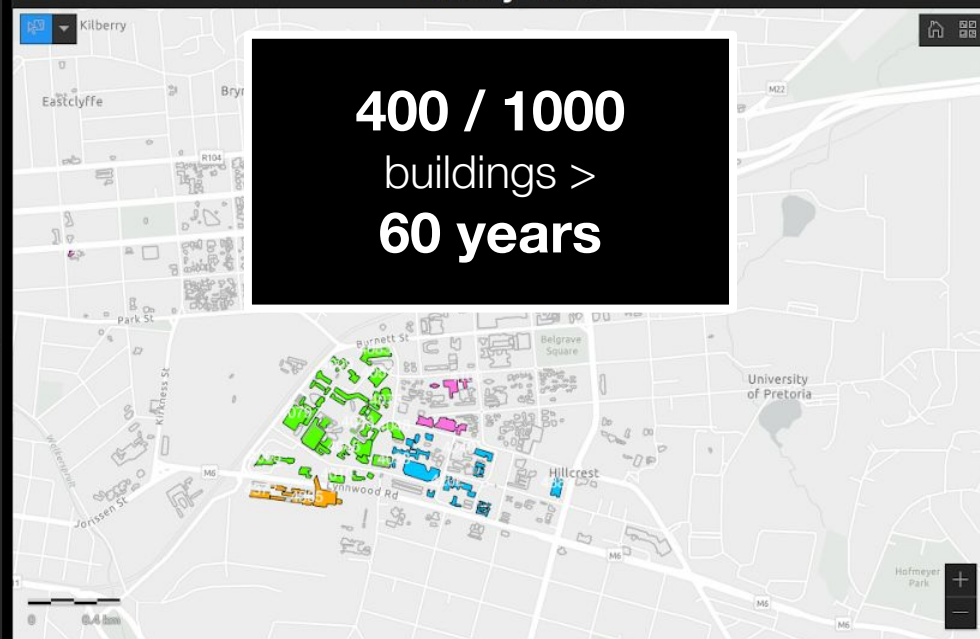
Building Conditions



Last update: 7 minutes ago

Hatfield Digital Twin City

Quality Twin



Eri Community Maps Contributors, Eri South Africa, Eri, HERE, Garmin, METI/NASA, USGS

Powered by Eri

Select building(s) by using [filters](#) (above) - or - map [mouse selection](#) (little blue box on left of map) - or - mouse selection on any of the graphs/maps. You can do [single selections](#) - or - click-drag for [multiple selections](#).

To [reset](#) to full precinct, "unselect" whatever you clicked on - or - click outside anywhere on a "dark grey area"

HATFIELD DIGITAL TWIN CITY - HERITAGE ASSET DATASET

Led by Dr. Davey & Ms Helene Potgieter — Students in Architecture + Geoinformatics

Lifecycle Math

Commercial Building Design (ave max)
3 yrs (dev & design) + 3 yrs (construction)

6%

making a building

High-performing regions
9 months - 24 months = 4%

Merely 6% of a buildings life is in its
design and construction

94%

of its life is in use.

Maintenance, operations, utilities,
deconstruction, upgrades, etc...



How will we create a future human habitat that thrives?



What is our legacy going to be?



Harambee. Together.

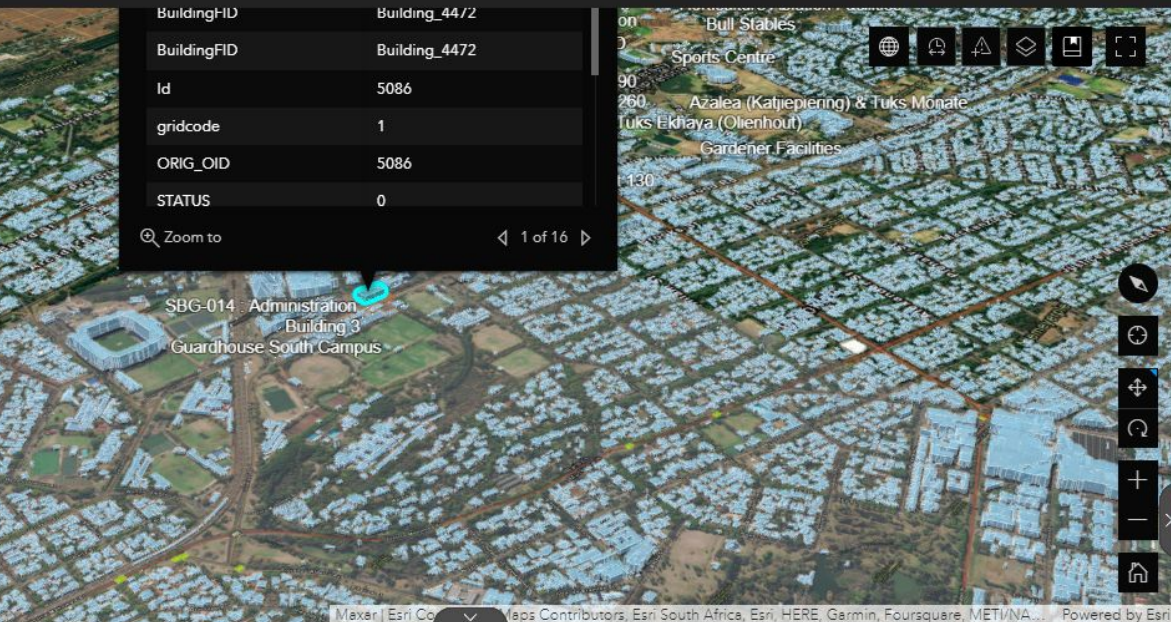
We are building the digital commons
for thriving buildings, cities, communities, and
environments in Africa.



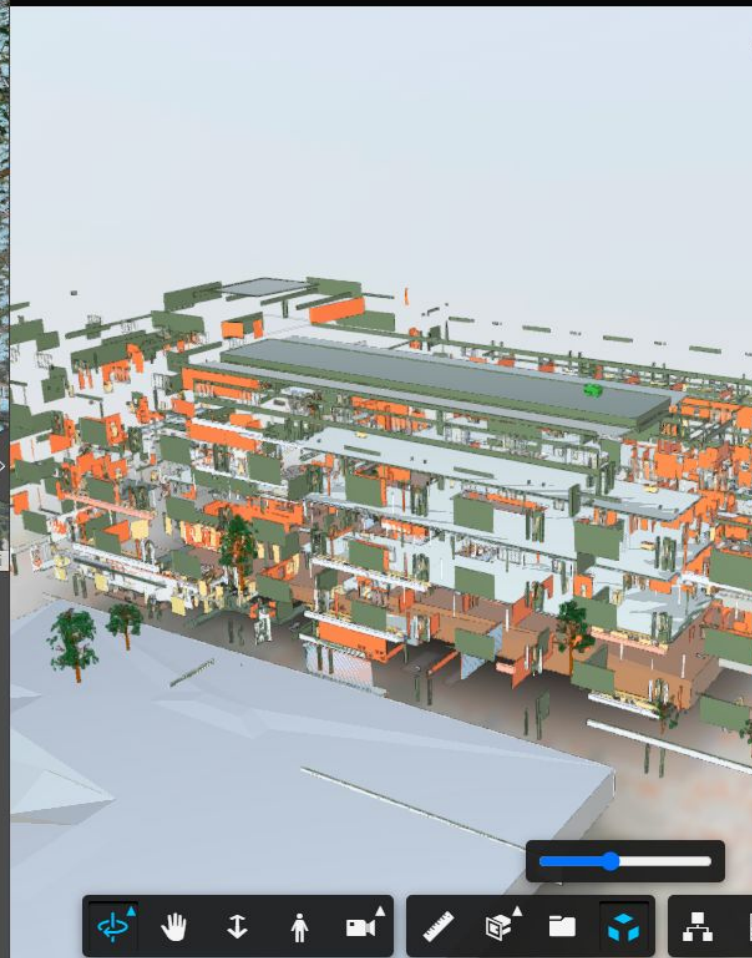
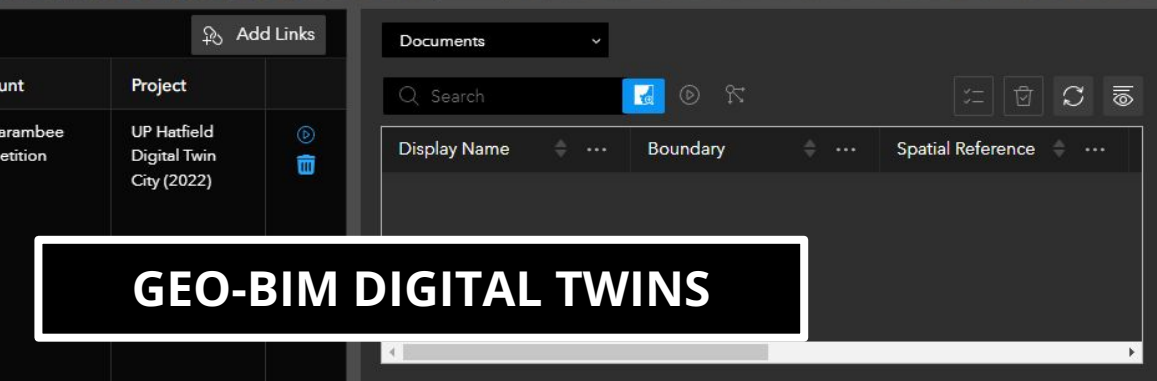
Harambee

Before we Tech, we must Culture

We are building the digital commons
for thriving buildings, cities, communities, and
environments in Africa.



Document: BOUKUNDE MODEL 2.ifc



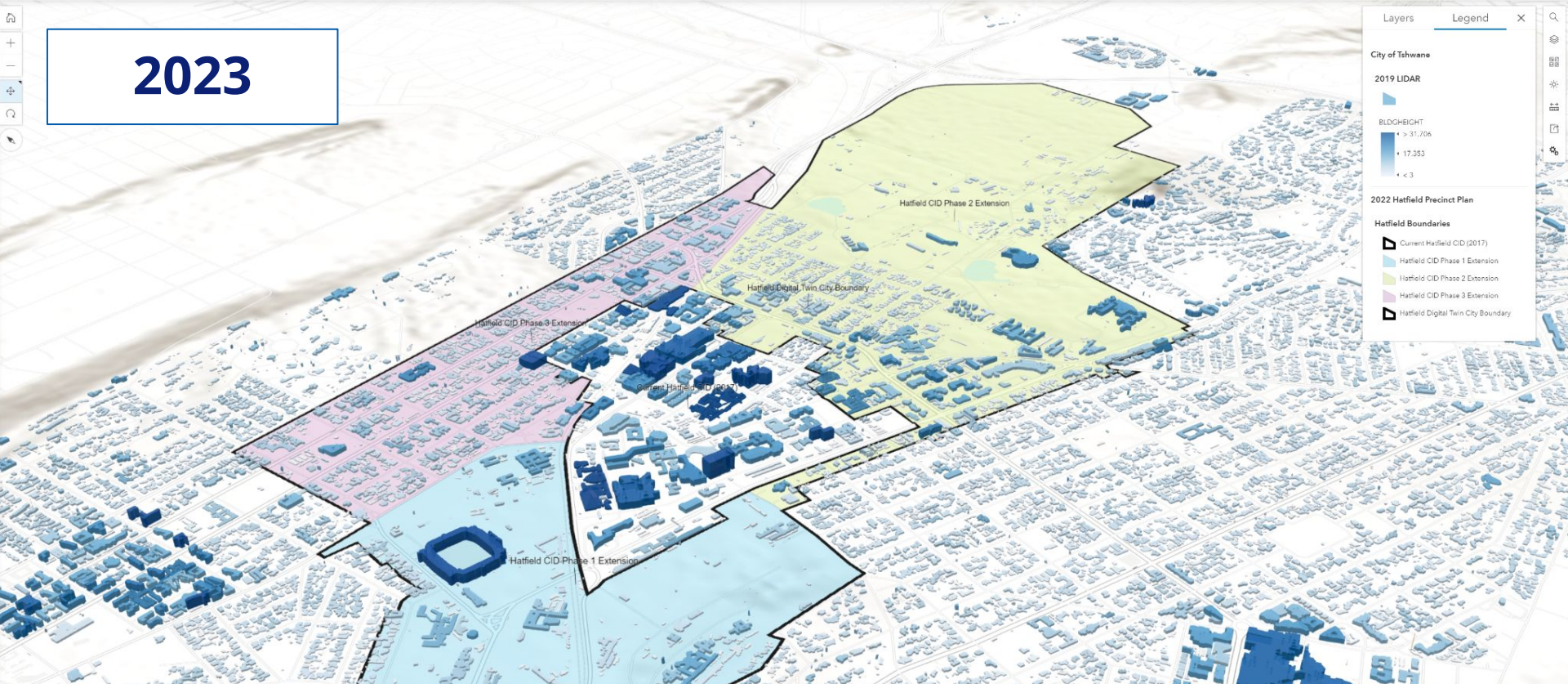


BUILDING REALITY-CAPTURE



REALITY CAPTURE

2023



HATFIELD DIGITAL TWIN CITY LAB
HIGH DENSITY DISTRICT OPEN DATA SYSTEM IMPROVEMENT
Students are updating!



Architecture

**Structural
Engineering**

**Construction
Economics**

**Civil
Engineering**

**Urban
Planning**

**Industry
Partners**

Cities
Public Sector

Owners
Private Sector

Organizations
Service Sector



Architec-
ture

Civils +
Structural

Quantity
Surveying

Geography

Cities

Owners

Organiza-
tions

Industry
Partners



Architecture

Structural
Engineering

Construction
Economics

City of
Tshwane
Public
Sector

UP
Facilities
Private
Sector



Civil
Engineering

Quantity
Surveying

Industry
Partners

Hatfield
CID
Service
Sector



Our goal is not to show you a
“perfect project” but engage you in

BIM Behaviour

Collective Project Culture through BIM Technologies



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1

**Leave your
badge at the
door.**

2

**Do something
good for
someone else.**

3

**Take care of
the future.**



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Harambee
.Africa

Workflows

BIM Work Stages

Collective Project Culture through BIM Technologies

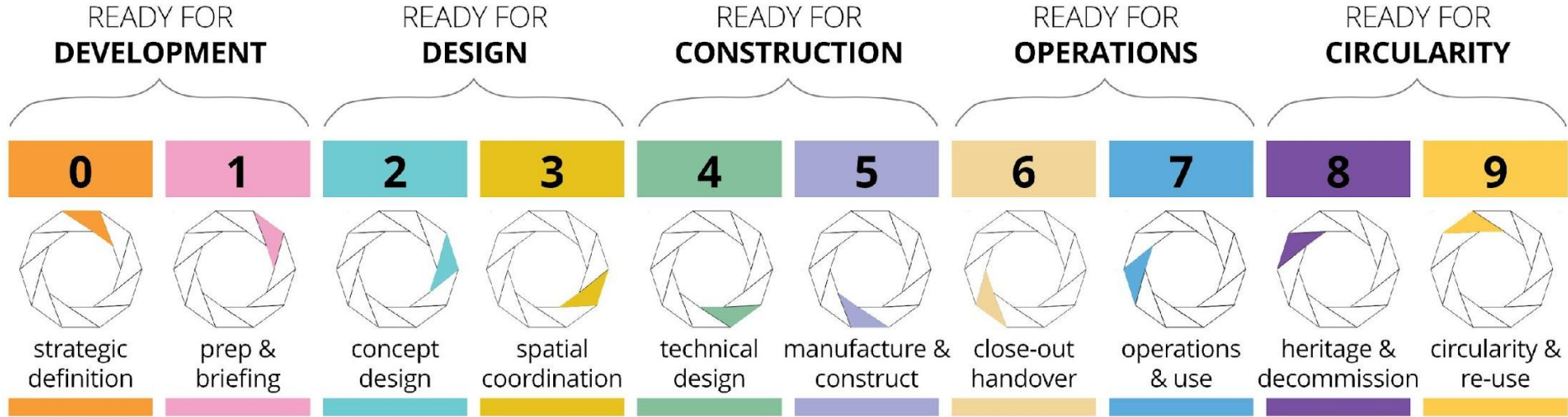
Before we BIM, ask Why?

Owner's Project Requirements

- Why do we want to work together at all?



BIM Work Stages





BIM Work Stages

Stage 0

Strategic Definition: Culture & Purpose

DEPARTMENT OF ARCHITECTURE, UNIVERSITY OF PRETORIA

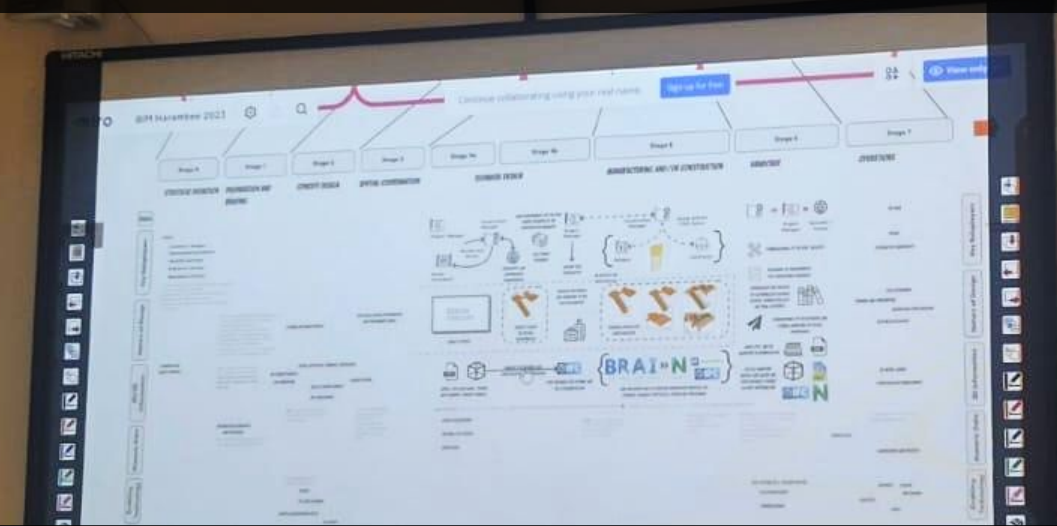


How to BIM in Africa

- To talk about BIM in Africa
- To practice BIM in Africa
- To demonstrate that new and better ways are possible
- To get new people to do better things



- BIM is not about perfect products, but about intelligent processes
- BIM => *Better Information Management*
- Lead and serve others through behavioural change within our work



To expose a new generation of African built environment practitioners to process-driven and collaborative ways of working together



Before we BIM, how do we produce value?

Before we BIM, how do we serve others?

miro

BIM Harambee 2023

SET UP OF VENUE

Process from start to finish - RIBA process

A simple BEP to guide the 2 days - event timelines - the BEP is our agenda/programme.

Calayde to invite actual FM people at UP

Naming conventions etc. The continuation of the information!

What do we do with this data?

Hackathon is the HOW

Finding services are very critical in having the correct data

Write a report that will help FM requirement - how they used the data they collected

Existing infra is the easiest opportunity.

300 to 400 people in auditorium

galleries, lecture halls etc

What happens if the tech doesn't work? Do the work before hand.

overarching - concept of digital planning how to plan how to get outcomes process

opportunity to record the whole process!!!

On the 28th Go through individual data sets. what they what we will do with them. At the end we show a federated view.

STUDENT HARAMBEE @ Boukunde

27 JULY 2023

Technical hackathon of brownfields building

9-11 Meet in auditorium for briefing and set context - each vendor team a space 5 min of what their tech will do (5 min each)

10-11 Each vendor team scans the building using their own tech. Students can follow them around to see how it's done in real time. The scans are processed overnight.

Running capture of the building maybe a hackathon process?

9-12 STUDENTS Focus on what they can expect in the real world

10-12 LECTURE HALL, FACULTY What they need to do to prepare their students

1. Overview - BIM, Digital Twins, Smart Cities, terminology, language

2. ISO 15926 - importance of information management

3. Case studies (how we made it work) - services, architecture, construction, etc - get different people contributing.

think about operations first!

Share real world stories

Integration of BIM

Where they fit in

Applications

Design practical opps and learning opps on both days.

Scheduled programme, move them between groups? Cycle the tech.

Vendors to set up ongoing demos in the venue. - set aside a studio space?

Managing time commitments from participants and vendors - letters from university to claim prof points/CSI points? What's in it for them?

Attractive for industry partners? -

Opportunity with vendors to advertise. Bring people onto site. Running demos. Use the students - venue, access, learn. Industry - people can come in during different parts of the day to view specific demo etc.

In and around boukunde.

FM > Design > FM

Divide undergrads into groups - 7 or 8 groups (1st, 2nd and 3rd year) - collaboratively model 5 or 6 city blocks of Hatfield digital twin project

Get from LOD2 to LOD3 (facade with window).

Try and play minecraft - break down your model in LOD3 and re-construct in minecraft.

Architects - first year and beyond - make the most of the 2 days (hands on and involved). - 100% committed to the 2 days

All other schools - civil engineering/structural engineering, construction economics, QS, urban and town planning, real estate, advance project management

may not be 100% committed to the 2 days.

We need a detailed programme/agenda.

Architecture - very excited - Week 0 for arch - vertical teams and solve a design problem. - Vertical studio for Harambee.

Running capture of building

3 things:

3rd years are working at boys high and sunnyside - scan or fly that site as a field trip

hatfield digital twin city LOD2 - students have experience getting to LOD3 - small teams of 5 people, get a block, get from LOD 2 to LOD 3 - design challenge: coolest block in the city

can facilitate with BIM teacher

Anything creative with the technology - making and doing with tech

Address lack of information in a specific building.

Traditionally no information exists. Getting modern services into old buildings.

Rigger problem - understand that you're building something for people who have a specific purpose - joining construction

TASKS

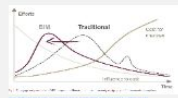
- On 27th - who is going to lead that?
- Scanning the building - what do we do with the scans? Have a revit model of boukunde.
- Static scans of complex part of boukunde site - static scanner - scan complex plant rooms
- Building scan - drone
- 2 x Siam scans - Hannes to do exterior and Zutani to do interior
- openspace guys to do walks through (load floor plans) jaco
- IOT (calayde)

talk about those in the report back on the 28th

Pulled into shared coordinate space.

Federate into revit space.

Make aware of process of registration - different options





But, what *is* BIM,
and why should I care?

BIM in a nutshell

- ☐ Create Information
- ☐ Share information
- ☐ Use information

**... to create, manage and derive value from things
that you can build.**

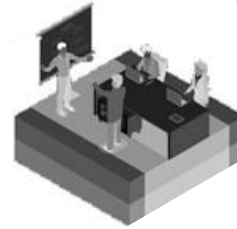


Lifecycle Optimisation

The Development Cycle

*Growth of
Knowledge*

Planning



Conceptual
Design

Design and
Engineering

Procurement

Construction



CAPEX stage to OPEX Stage

The changing players

Facilities Management

*FM
Contractor*

Lifecycle Optimisation

*Owner,
Consultants*

Occupation and
Operations

*Owner,
Operator
Tenants*

Planning

*Architects,
Planners*

Conceptual Design

*Architects,
Engineers, QS*

Design and Engineering

*Architects,
Engineers, QS*

Construction

*Main Contractor +
subbies
Principal Agent
Engineering Consultant*

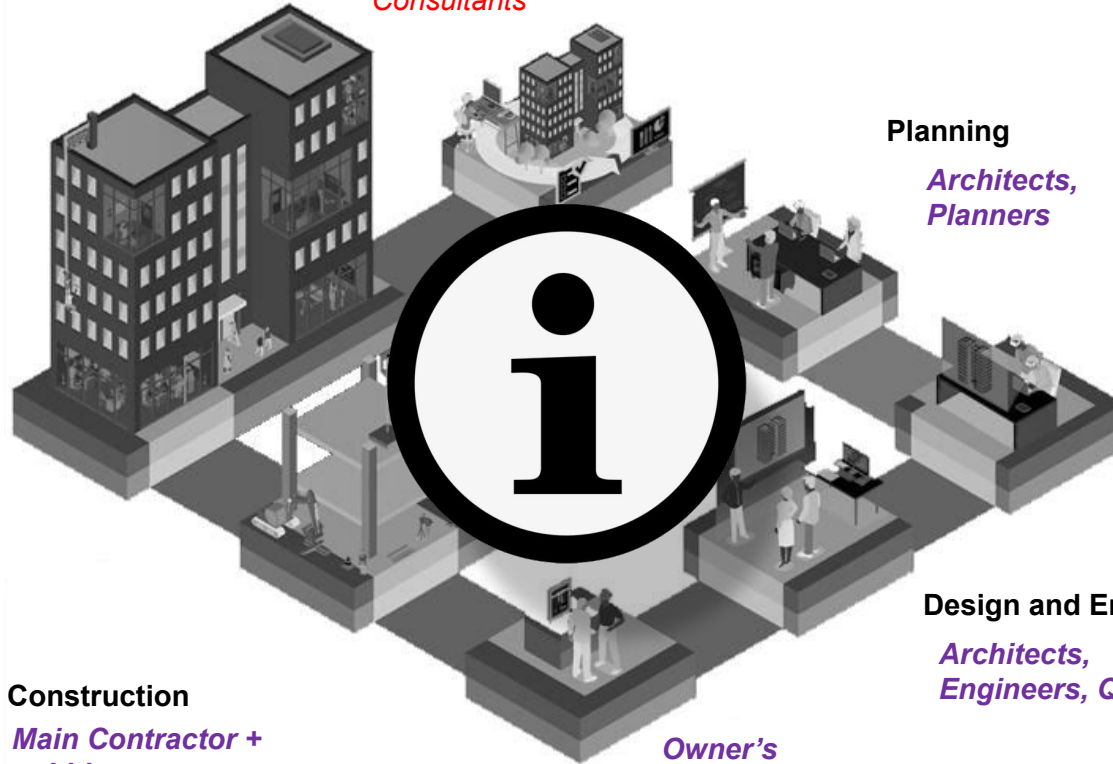
Procurement

*Owner's
Procurement
Professional Team*



Commissioning

*Main Contractor +
subbies
Principal Agent
Engineering Consultant*





That's a lot of information!

How do we avoid chaos?

You need a Standard!!

ISO 19650 = how to BIM

BIM =

Building Information Modelling

Or...

BIM =

BETTER Information MANAGEMENT

ISO 19650-1

Organization of information about
construction – Information management
using building information modelling –

Part 1: Concepts and principles



International
Organization for
Standardization

© ISO 2018 – All rights reserved

ISO 19650-2

Organization of information about
construction – Information management
using building information modelling –

Part 2: Delivery phase of assets



International
Organization for
Standardization

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You need a Team!!

Project Team

Appointing Party = Client

Lead appointed party = Lead

Appointed party = the other guys



You need a plan!!

BIM Execution Plan (BEP)



You need a ...



... and you need some ...



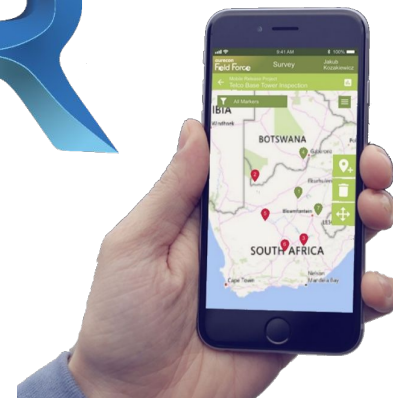
ARCHICAD



esri®



Twinmotion

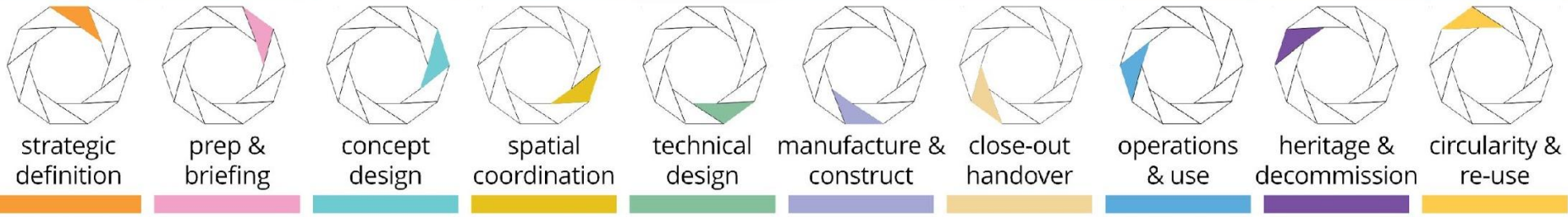




How does that relate to the
AECO scope of work??

BIM Work Stages





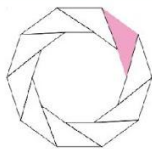
Let's take a look at some of the players in each of these stages

What they do, what tools they use and what they contribute to the information model





strategic
definition



prep &
briefing



concept
design



spatial
coordination



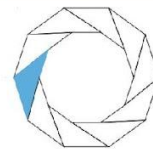
technical
design



manufacture &
construct



close-out
handover



operations
& use



heritage &
decommission



circularity &
re-use

Define what
the outcomes
should be

Initial concepts,
options, selections
and outlines

Tender for the
work, win

Use the asset
/ facility for its
intended
purpose

End of life

Develop the plan
for
implementation

Make sure
everything fits

Build it, tweak it,
change it...
manage it and
record it

Maintain,
modify,
repurpose...

Re-use,
recycle,
salvage,
repurpose

Collect and share
reference info

Detailed design,
quantify, specify,
ready to build

Handover useful
information to
operator

Make sure
everything
still fits





BIM Work Stages

Stage 0

Strategic Definition: Project Works

DEPARTMENT OF ARCHITECTURE, UNIVERSITY OF PRETORIA



BIM Stage 0

Architecture 5.0

Strategic Definition

1. Project overview
2. Information Requirements
3. ISO baseline documents (OIR, AIR, AIM >> EIR)
4. Procurement

Architecture 5.0

Owner's Project Requirements

- We want a to upgrade the lifecycle and utility of Boukunde for future generations.
- We want to create and practice together as new kinds of built environment creators in new kinds of ways.



Architecture 5.0

Constraints

We have a very “limited budget.”

Project Principles

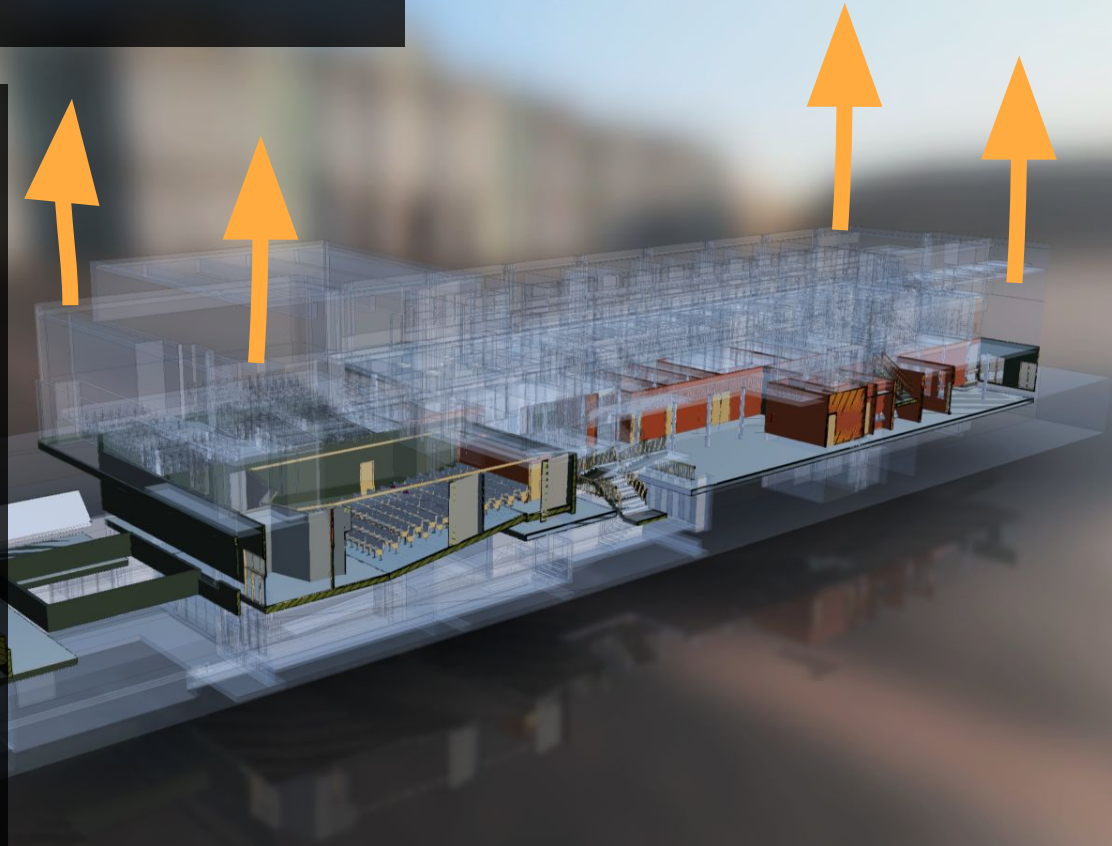
We do not want to mess up the world, so we won't make a “new” building.

It must be awesome for students and learning to take place.

It must be way cooler than Engineering 4.0...hehe

Project Solution

Additional two floors on top of existing building

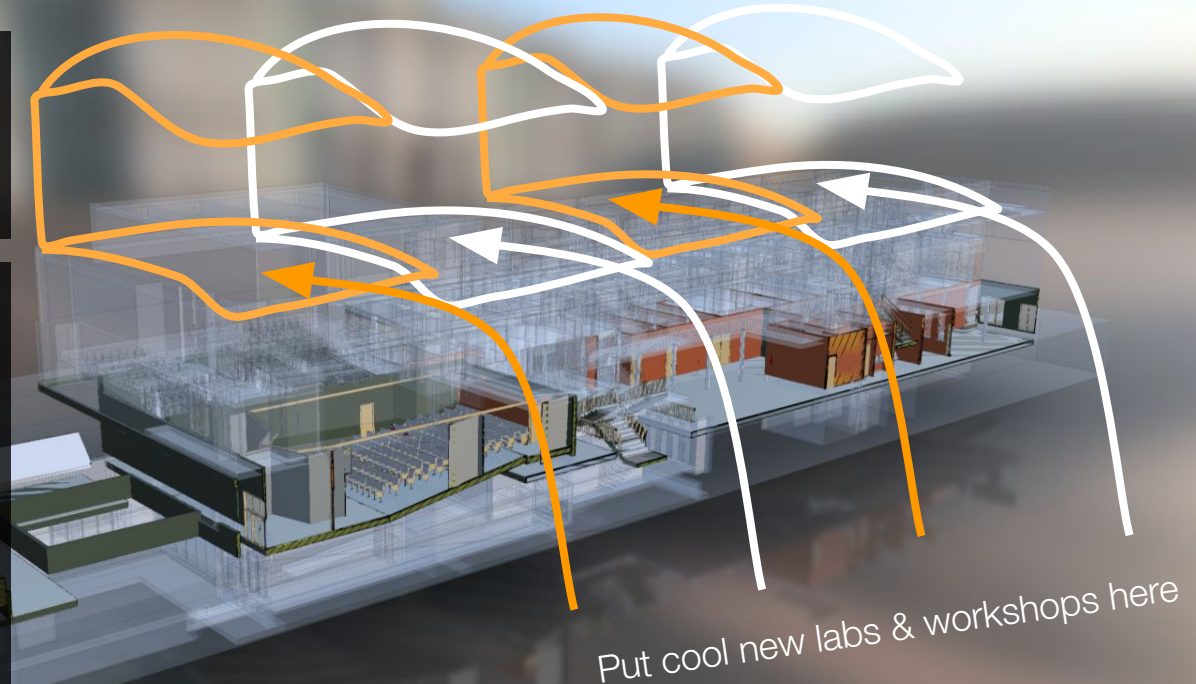


Architecture 5.0

Project Program

Creative workshop areas for learners to work on novel built environment topics

- York Timber Chair
- Green & Living Walls
- Flexible Facades
- Climate Adaption
- Alternative Building Construction Materials
- Future Cities & Urbanism
- Urban Mining & Circularity
- "Digital Learning Zones"
- VR / AR & Community Engagement
- Living Labs & Learning Moments



Put cool new labs & workshops here

Architecture 5.0

What information is needed from this project by the building owner(s) in the future?

Project Information Thread

OIR >> AIR >> PIR >> EIR

Organisational Information Requirements

Asset Information Requirements

Project Information Requirements

Employer's Information Requirements



BIM OIR

Organisational Information Requirements

"What information do we need form this building + design process to ensure effective decisions, reporting and planning happens?"

- Client to-do list for *NOW* and *LATER*
- Outline the essential data and digital deliverables support BIM project delivery process effectively for the whole team.

BIM AIR

Asset Information Requirements

"Begin with the the end in mind"

- Specific things on the project model formats, content, design systems etc...
- Details on the operational systems, building systems information management etc.



BIM Work | Stage 0

BIM PIR

Project Information Requirements

"Who needs what when, and how would they like to receive information?"

- Culture of communication, submissions, information content, information milestones etc
- Define the handover information for the end of the project NOW, not later.

BIM Work | Stage 0

BIM EIR

Employer Information Requirements

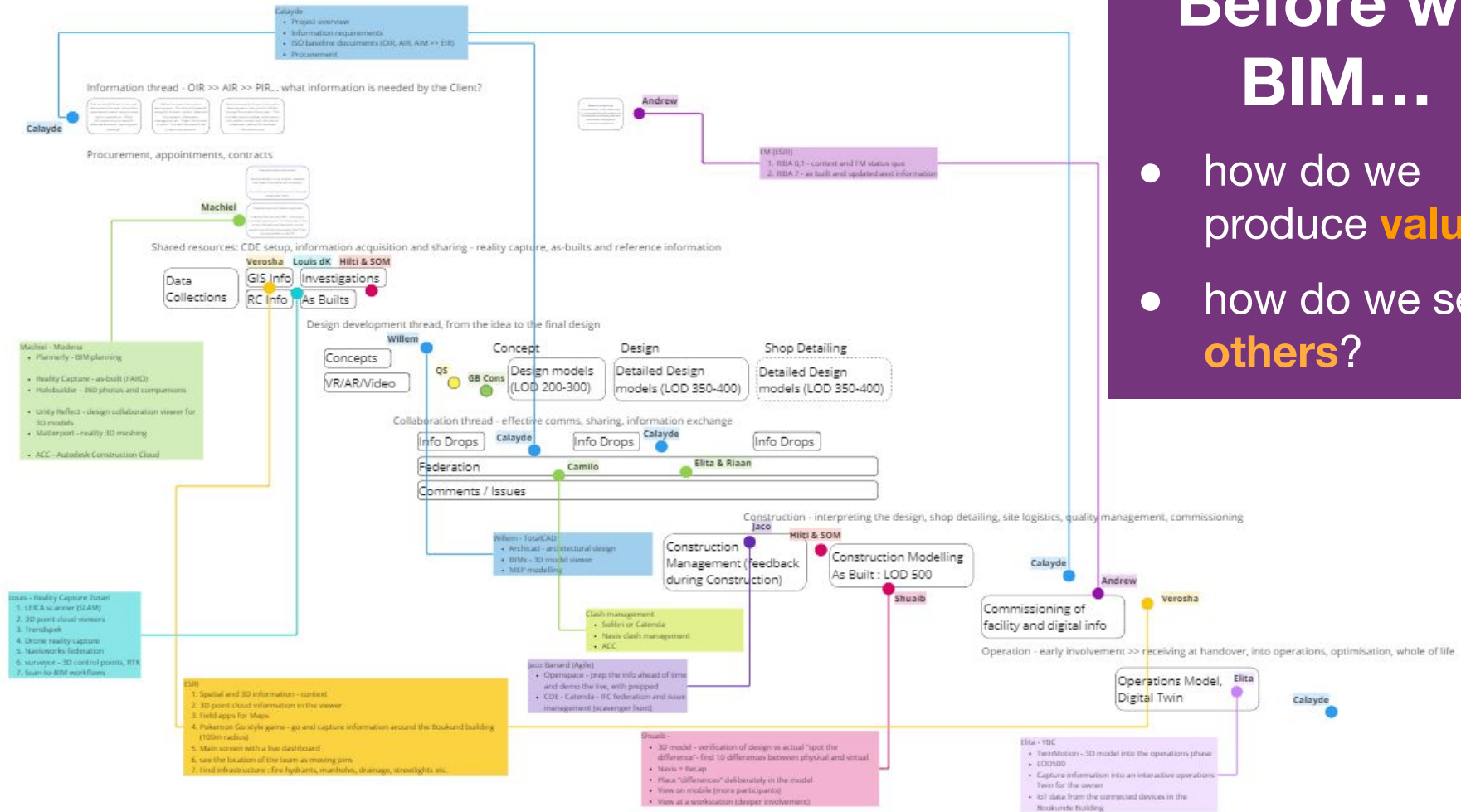
"How will we produce reliable information for proper procurement and contracting?"

- Specific things on the model formats, content, design systems
- Details on the operational systems, building systems information management etc.



Before we BIM...

- how do we produce **value**?
- how do we serve **others**?





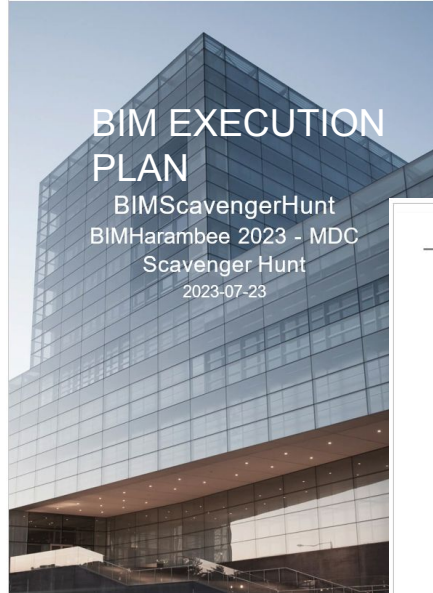
BIM Work Stages

Stage 1

Prep and Briefing

MODENA, SOM, HILTI, ZUTARI, ESRI

BIM Execution Plan - BEP



BIM EXECUTION PLAN

BIMScavengerHunt
BIMHarambee 2023 - MDC
Scavenger Hunt
2023-07-23

plannerly

- 1 INTRODUCTION
 - 1.1 What is a BIM Execution Plan?
 - 1.2 Benefits of a BEP
- 2 KEY COMPONENTS
 - 2.1 Project Information
 - 2.2 BIM Goals and Objectives
 - 2.3 Roles and Responsibilities
 - 2.4 BIM Standards and Guidelines
 - 2.5 BIM Execution Strategy
- 3 IMPLEMENTATION
 - 3.1 BIM Training and Education
 - 3.2 BIM Coordination
 - 3.3 Data Management
- 4 QUALITY CONTROL
 - 4.1 Model Review and Validation
 - 4.2 Clash Resolution
- 5 PROJECT DELIVERY
 - 5.1 BIM Deliverables
 - 5.2 BIM Collaboration

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BEP - SCAVENGER

4

Document ID: H9ZG8G2PHUAGL2NA

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stakeholders.

Quality Assurance/Quality Control (QA/QC) Manager: The QA/QC manager is responsible for ensuring the accuracy and quality of the BIM models and data. They perform regular checks and audits to identify any errors or inconsistencies.

Client/End User: The client or end user is the ultimate beneficiary of the project. They provide requirements, review the BIM models, and ensure that the project meets their needs and expectations.

Other Stakeholders: Depending on the project, there may be other stakeholders involved, such as regulatory authorities, consultants, suppliers, and subcontractors. Their roles and responsibilities are clearly defined in the BEP.

By clearly defining the roles and responsibilities of each project stakeholder, the BEP ensures that everyone understands their tasks and can effectively contribute to the successful implementation of BIM.

2.4 BIM Standards and Guidelines

Specifies the BIM standards and guidelines to be followed throughout the project.

The BIM standards and guidelines are crucial for maintaining consistency and ensuring effective communication among project stakeholders. By adhering to these standards, the project team can streamline processes and enhance the overall quality of the project deliverables.

BIM Standards:

Standard	Description
File Naming Convention	Establishes a standardized naming structure for all project files to ensure easy identification and organization.
Layer Naming Convention	Defines a consistent naming convention for layers within the BIM software to facilitate efficient navigation and management of the model.
Model Element Naming Convention	Outlines guidelines for naming individual elements within the model, ensuring clarity and ease of communication.
Coordinate System	Specifies the coordinate system to be used for accurate positioning and alignment of model elements.

BIM Guidelines:

- **Modeling Standards:** Provides instructions on how to create and maintain the BIM model, including guidelines for modeling accuracy, level of detail, and element representation.
- **Information Exchange:** Defines the required information to be included in the model and the protocols for exchanging data with other project stakeholders.
- **Quality Control:** Establishes procedures for reviewing and validating the model to ensure compliance with project requirements and standards.
- **Collaboration:** Describes the tools, platforms, and protocols to be used for effective collaboration among team members, including file sharing, communication channels, and version control.

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MODENA

Architecture | Engineering | Construction | Infrastructure

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4 Quality Control

4.1 Model Review and Validation

Describes the process of reviewing and validating BIM models for accuracy and completeness.

Validation Checklist	Review Process
<ul style="list-style-type: none"> • Geometry: Check if the model accurately represents the physical elements. • Dimensions: Verify that the dimensions in the model match the design specifications. • Coordination: Ensure that all disciplines' models are properly coordinated. • Clashes: Identify and resolve clashes between different elements in the model. • Levels and Grids: Confirm that the levels and grids are correctly positioned and aligned. • Materials: Validate that the materials assigned to the model elements are accurate. 	<ol style="list-style-type: none"> 1. Preparation: Gather all relevant models and associated documentation. 2. Review: Examine the models to identify any discrepancies or errors. 3. Documentation: Document the issues found and communicate them to the responsible parties. 4. Resolution: Collaborate with the project team to resolve the identified issues. 5. Revalidation: Verify that the resolved issues have been appropriately addressed. 6. Final Review: Conduct a final review to ensure that all models meet the required standards.

Hint: Look for inconsistencies in the model's geometry and dimensions. Pay attention to clashes between different elements. Also, check if the assigned materials match the design specifications.

Hint: To start the review process, gather all relevant models and associated documentation. Then, carefully examine the models for any discrepancies or errors.

Hint: Document any issues found during the review and communicate them to the responsible parties. Collaborate with the project team to resolve these issues.

Hint: After resolving the identified issues, revalidate the models to ensure that the corrections have been properly addressed.

Hint: Conduct a final review to confirm that all models meet the required standards. This includes checking the accuracy of the geometry, dimensions, coordination, and assigned materials.

Hint: Remember to refer to the validation checklist to ensure that all aspects of the BIM models have been thoroughly reviewed and validated.

4.2 Clash Resolution

Provides strategies for resolving clashes and conflicts in BIM models.

Clash resolution is a critical aspect of ensuring the accuracy and integrity of BIM models. It involves

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BIM Harambee .Africa

17

BEP - SCAVENGER

The background image is a dark, atmospheric photograph of a surveying site. In the foreground, a silver surveying tripod stands on a mound of dark, loose soil. A surveying instrument is mounted on top of the tripod. In the upper right portion of the sky, a small, dark drone is visible in flight. The background consists of a dense forest of evergreen trees under a dark, overcast sky. The overall tone is professional and technical.

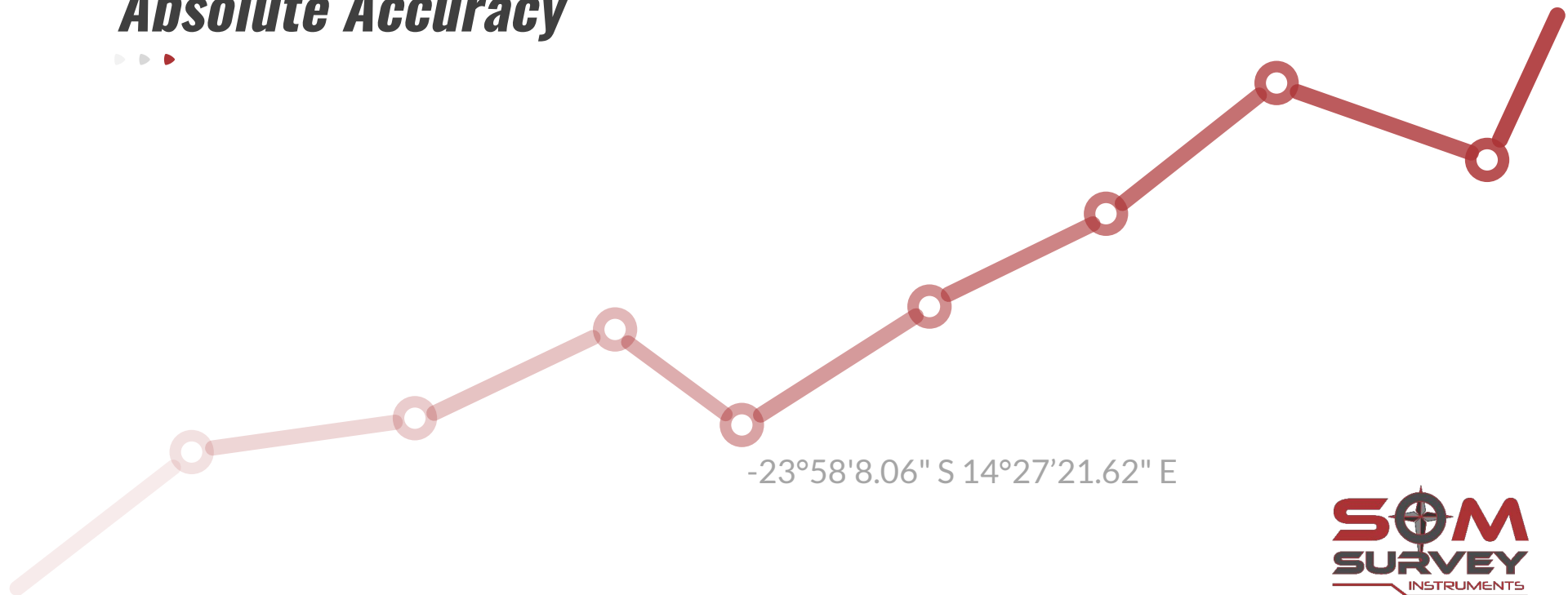
THE IMPORTANCE OF ACCURATE GEOSPATIAL INFORMATION

What is geospatial information and why it's important.

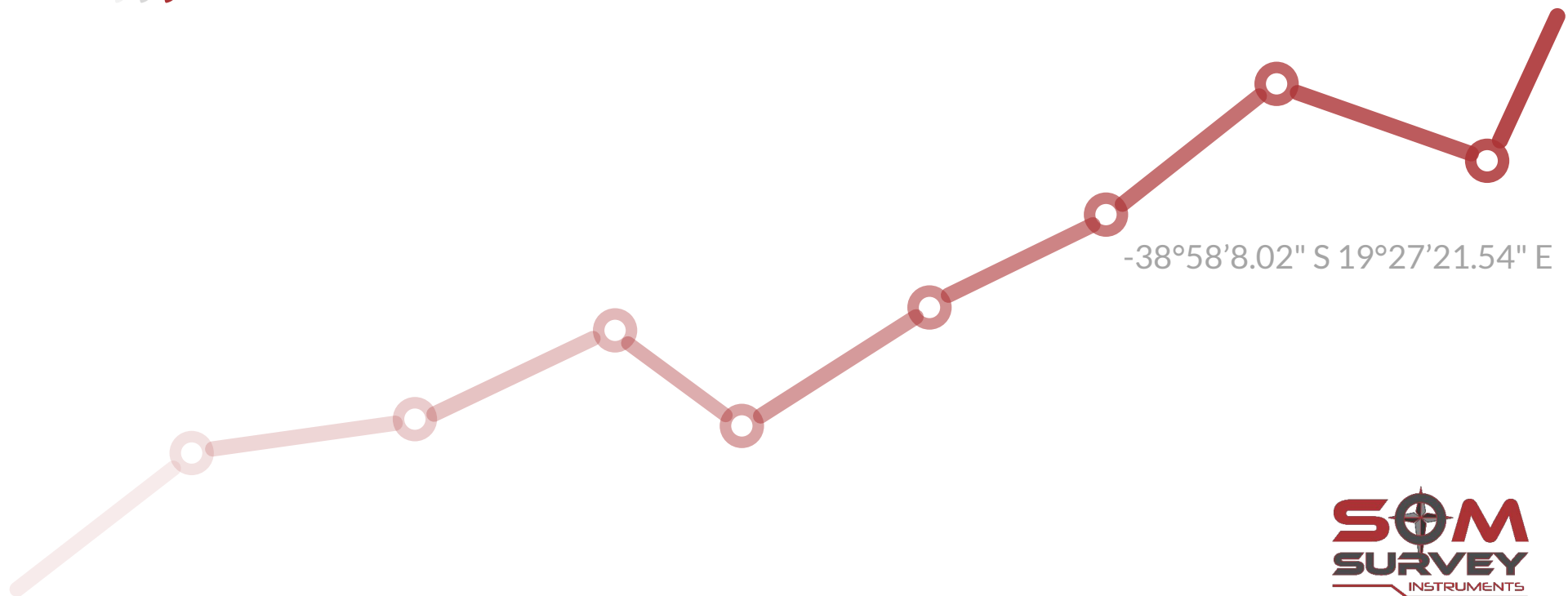


-33°58'8.06" S 18°27'21.82" E

Relative Accuracy VS Absolute Accuracy



The Importance of Establishing Accurate Control on Site



Obtaining Geospatial information - Today

GNSS Receivers

Surveying Drones

LiDAR Scanners



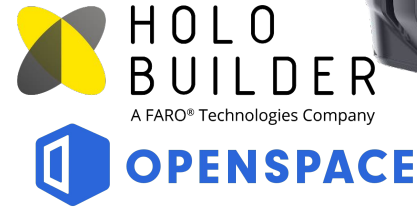
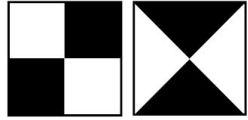
Collect and share reference info

We call this Reality Capture

We digitize real world assets by using technology and software. These Reality Twins becomes the geometric reference information.

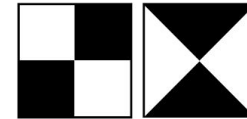


What is used in industry

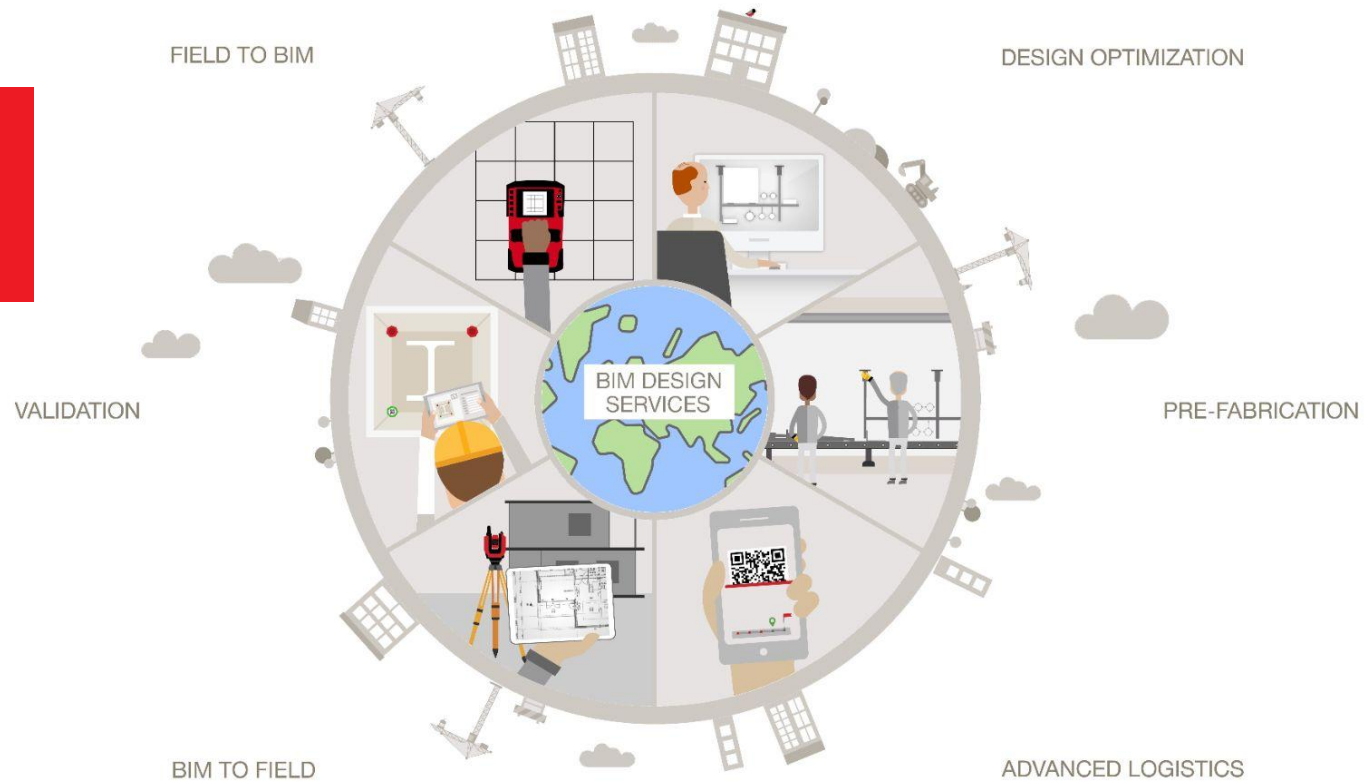


Survey Control

Critical importance to ensure that all data is referenced to the same geographic base information

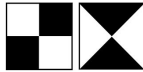


HILTI



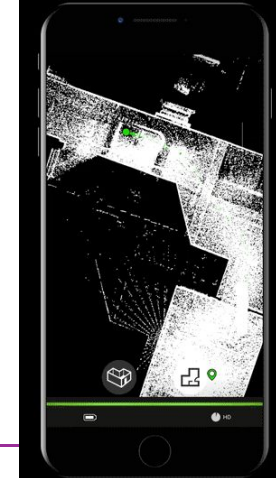
Drone Photogrammetry

Drone photogrammetry is the process of taking a structured set of photos using a flying camera (drone) to capture the site and external information.



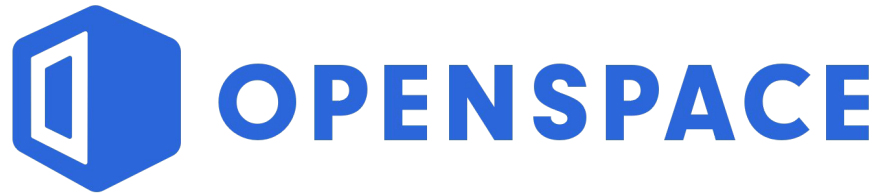
3D Scanning

3D scanning is the process of using a LiDAR handheld SLAM (Simultaneous Localisation and Mapping) or stationery scanner to capture the measurements inside an asset.



3D Images

3D images provides us with the ability to see the internal assets and condition.



What does all of this deliver

- Survey Control – Control point coordinates
- Drone Photogrammetry – Point Clouds, 3D Meshes, Orthophotos, DSM, DTM
- 3D Scanning – Point Clouds, 3D Meshes
- 3D Photos - Imagery



What is the benefits?

- ❑ Rapid data acquisition – **less time on site**, more and higher accuracy information.
- ❑ **Geometrically** accurate information
- ❑ **Virtual site visits** by the project team
- ❑ Document **as-built** conditions
- ❑ Create **detailed layouts** and models that could be used for inspections, project execution planning, spatial planning, design and delivering layouts.
- ❑ Create an accurate **basis for BIM**
- ❑ Capture **locations of assets** in a space
- ❑ **Remote analysis** by relevant skillset anywhere in the world
- ❑ **Integrates** with various of the software in industry through exchange formats.



The Science of Where

Esri's ArcGIS



Location : What is here?



Proximity : What is around me?



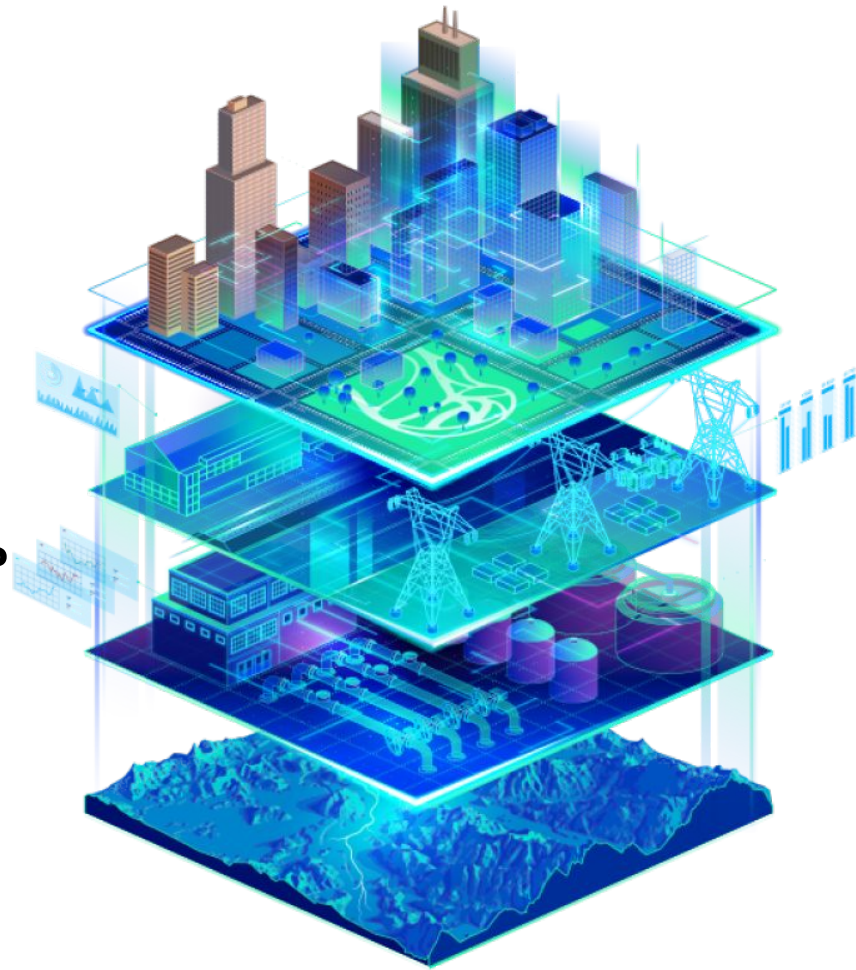
Trends : What has changed here?



Patterns : What patterns emerge?



Modeling : What if? Scenarios

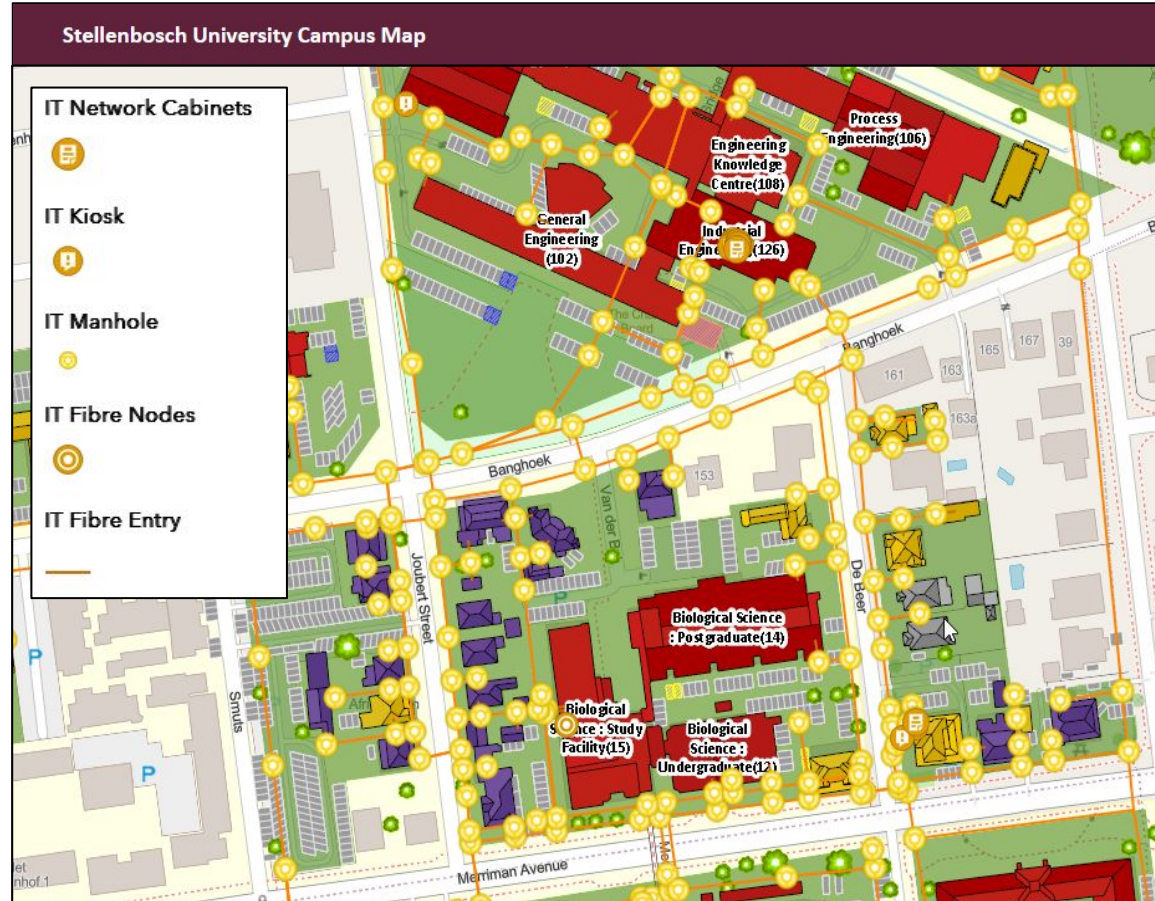


Geographic Information System (GIS)

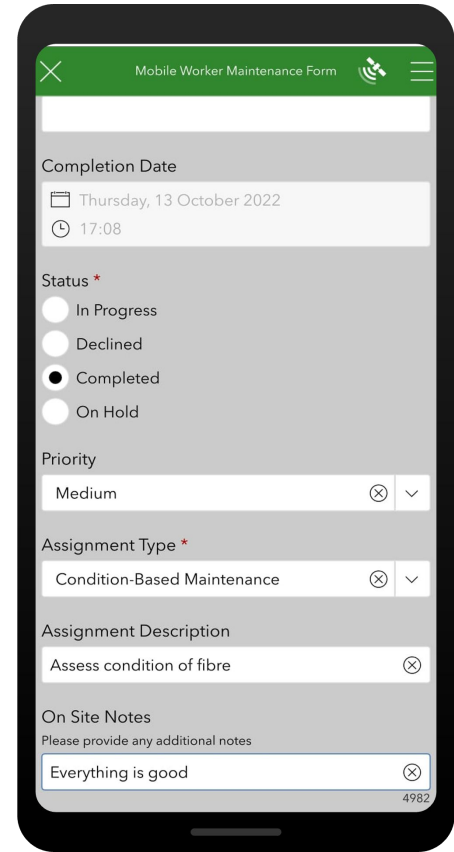
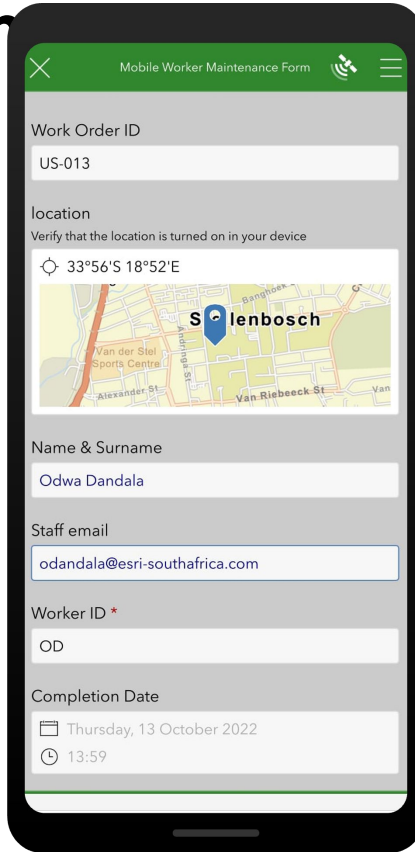
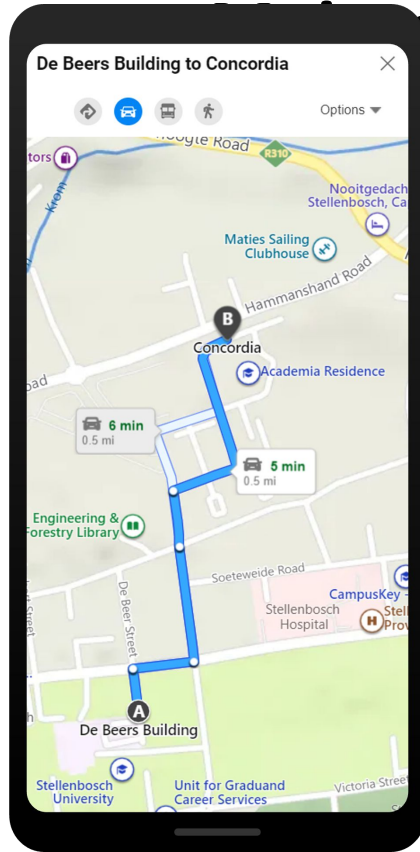
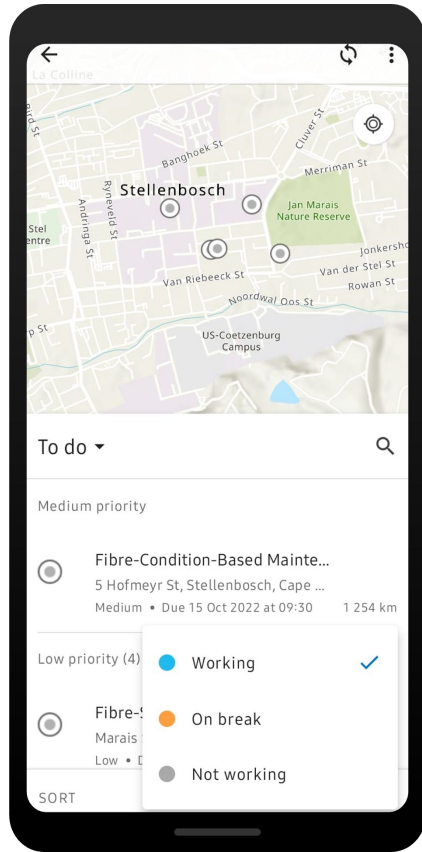
GIS on Campus

GIS Data Collection

- Campus areas
- Walkways
- Facilities
- Infrastructure
- Construction areas
- Parking, Trees, Security
- Signage
- Utilities



GIS: Asset Collection, Verification and



GIS Key Takeaways

GIS is about Where to Build.

- **Site Survey and Site Selection.**
- **Feasibility Analysis.**
- **Environmental Impact Assessment.**
- **Accurate Spatial Data Collection**
- **Asset Inventory Management.**



BIM
Harambee
Africa

BIM Work Stages

Stage 2

Concept Design

TOTALCAD

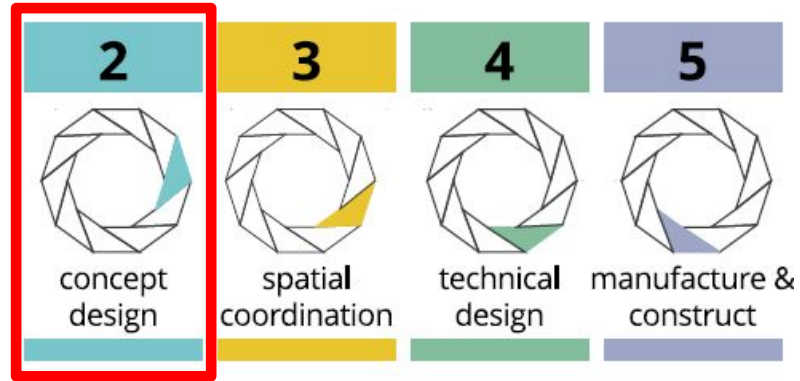
TotalCAD

SOLUTION CENTRE

 GRAPHISOFT. | DISTRIBUTOR

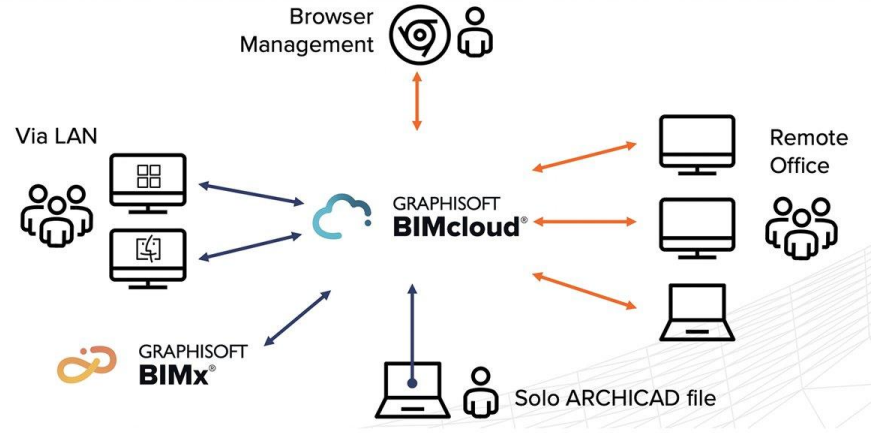


Architectural Design



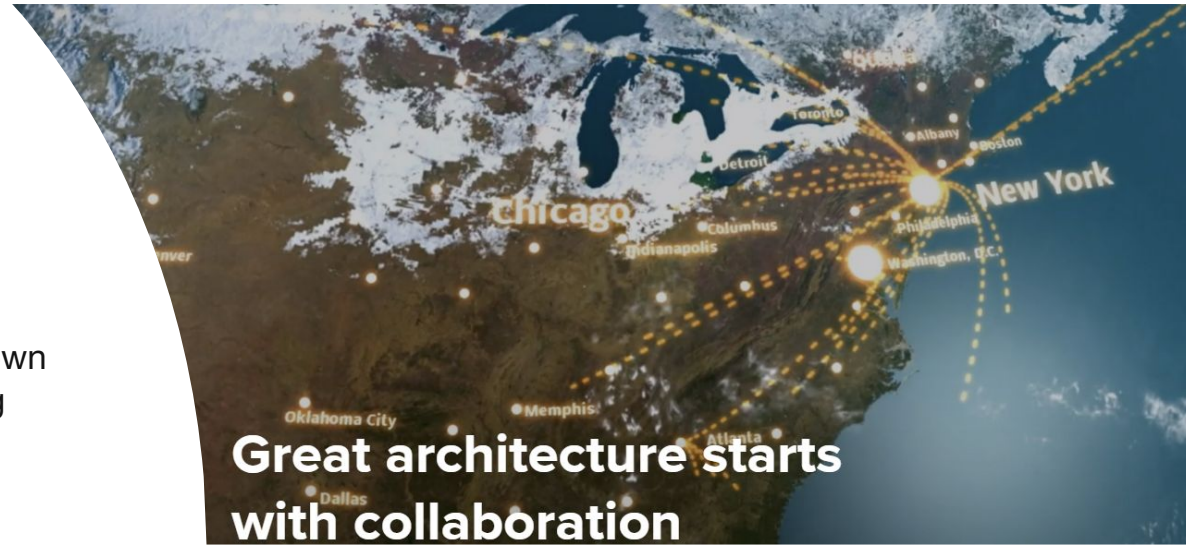


GRAPHISOFT **BIMcloud**®



Architectural Team

- Ronel Basson – KZN
- Gert Coetzee – Cape Town
- Willem Viviers – Gauteng



BIM Authoring Tool

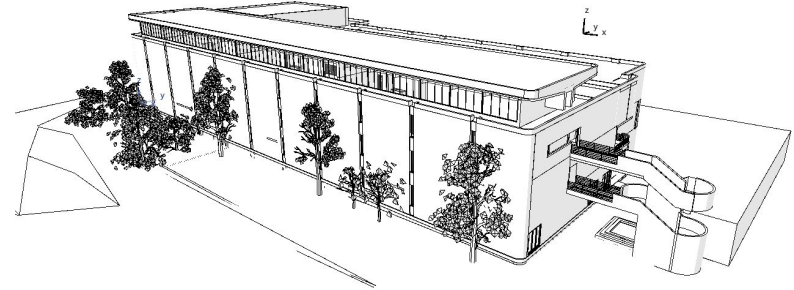
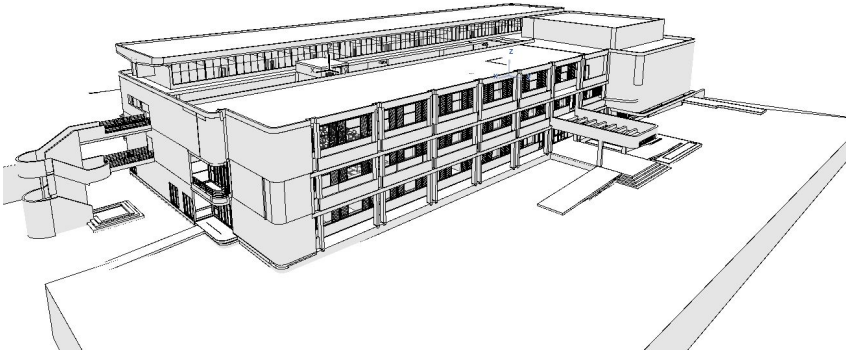


Project Preparation & Setup

- Import existing building data – IFC, GIS, DWG, PDF...
- Quality Assurance (QA)
- Import Classification set (Uniclass 2015 & OmniClass)
- Share file on BIMcloud for team to start

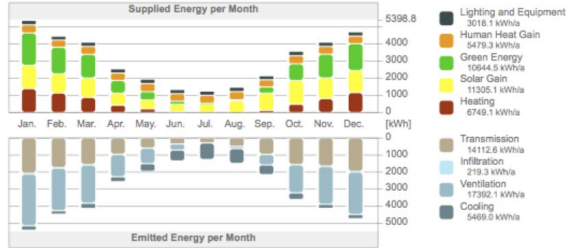


Existing IFC Model

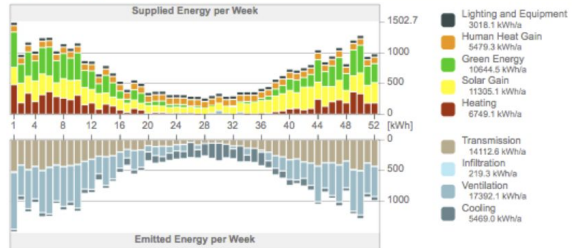


Energy Analysis

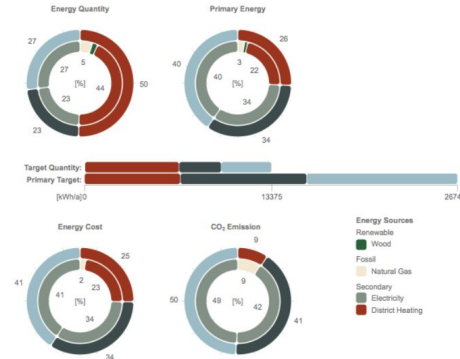
Project Energy Balance



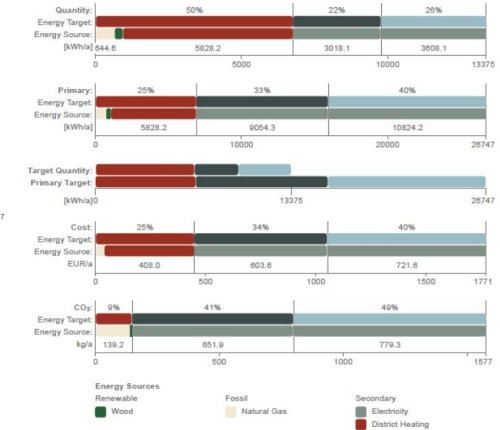
Project Energy Balance



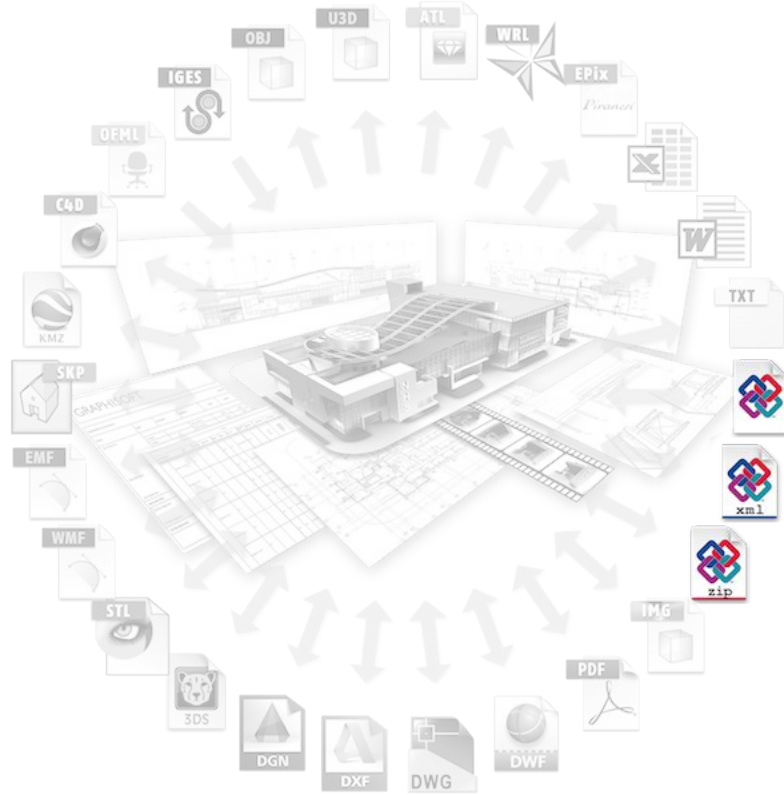
Target Name	Energy	Quantity kWh/a	Primary kWh/a	Cost EUR/a	CO ₂ Emission kg/a
Heating		6749	6868	446	146
Cooling		0	0	0	0
Service Hot-Water		0	0	0	0
Ventilation Fans		3608	10624	721	779
Lighting & Appliances		3018	9054	603	651
Total:		13375	26747	1771	1577



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Lighting & Appliances		3018	9054	603	651
Total:		13375	26747	1771	1577



Project Team Coordination & Collaboration

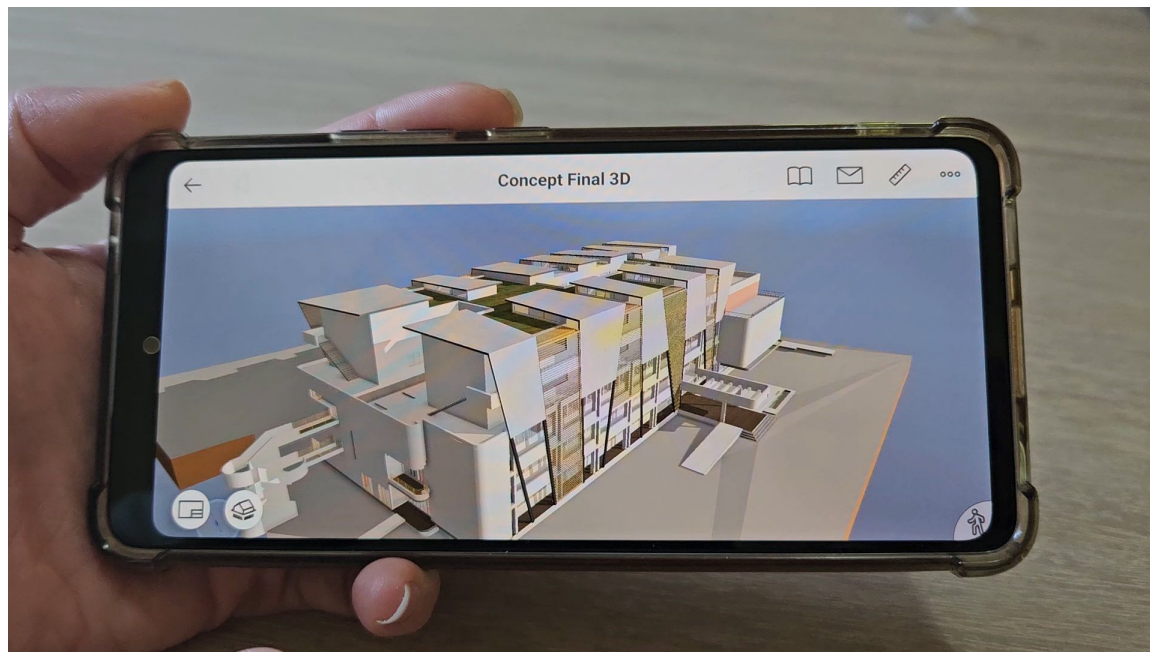


Communicate Concept with Client





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BIMx[®]





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Harambee
Africa

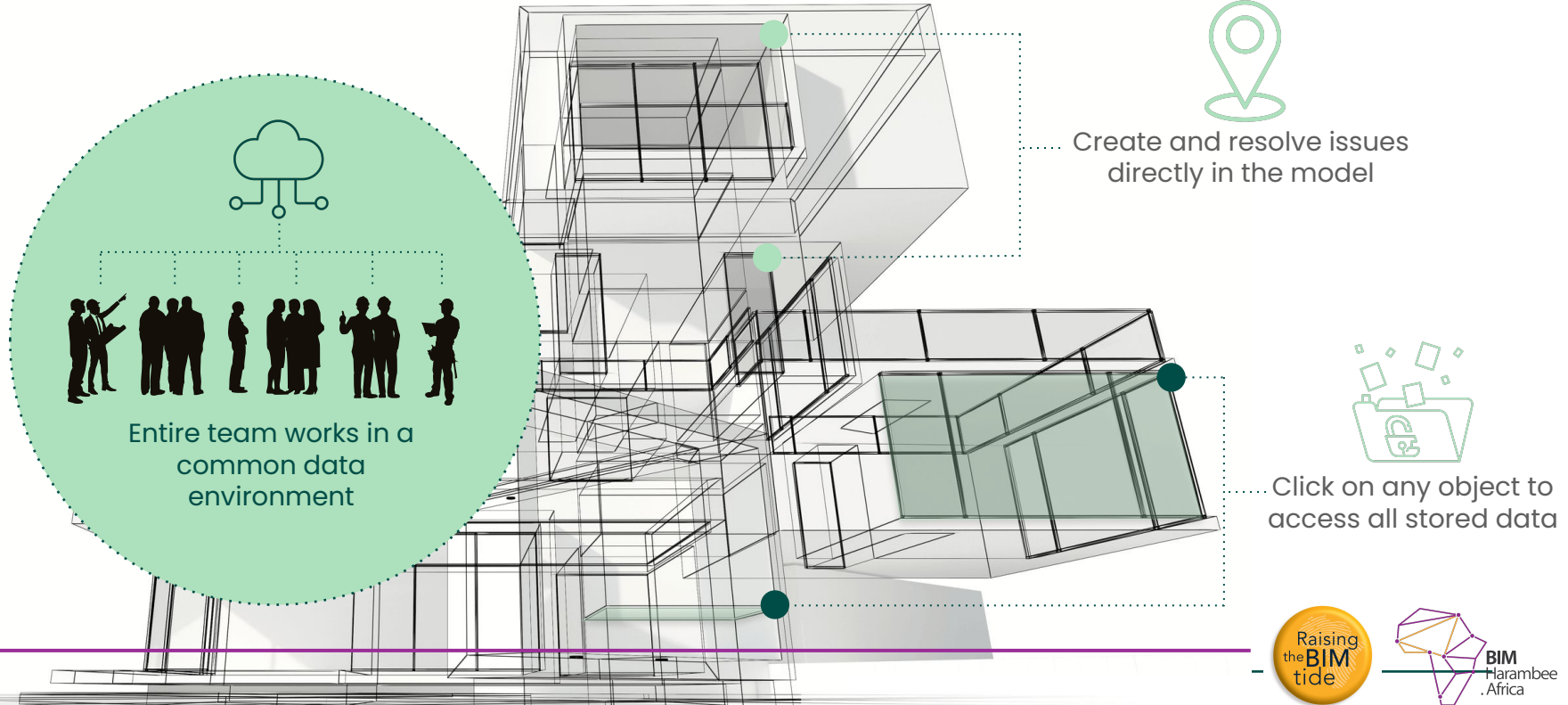
BIM Work Stages

Stage 3

Spatial Coordination

CATENDA

Reinventing communication and collaboration

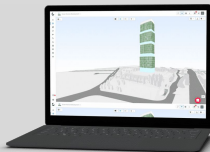


..offering reached full circle

With Catenda, the digital twin can now follow the entire lifecycle of a building

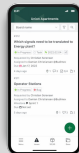
Catenda Hub

Catenda's Common Data Environment powerful cloud based, BIM enabled coordination tool



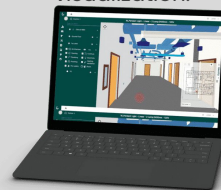
Catenda Site

Catenda Site puts the power of Catenda Hub on the construction site and can provide a segway for using Catenda in the asset management phase



Catenda Duo

A building operating system application enhanced by the power of BIM and visualization.

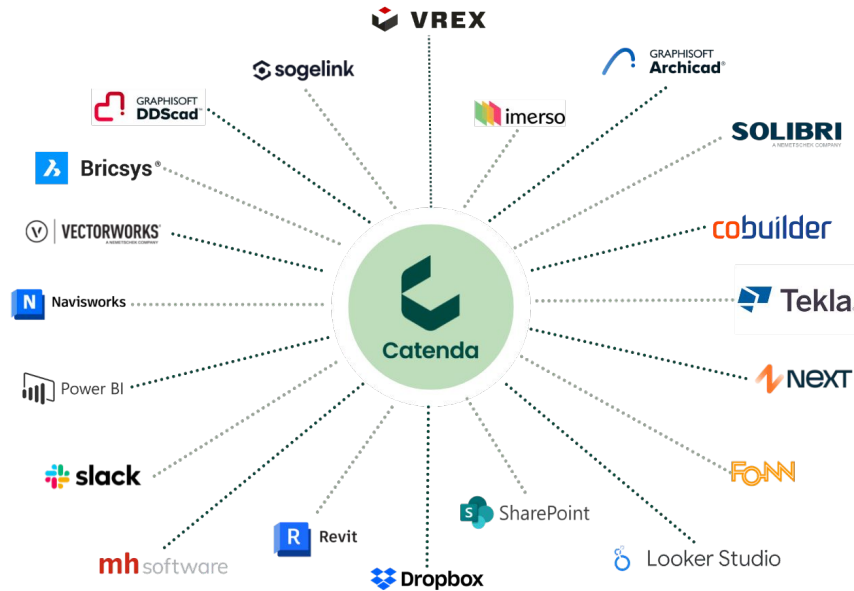


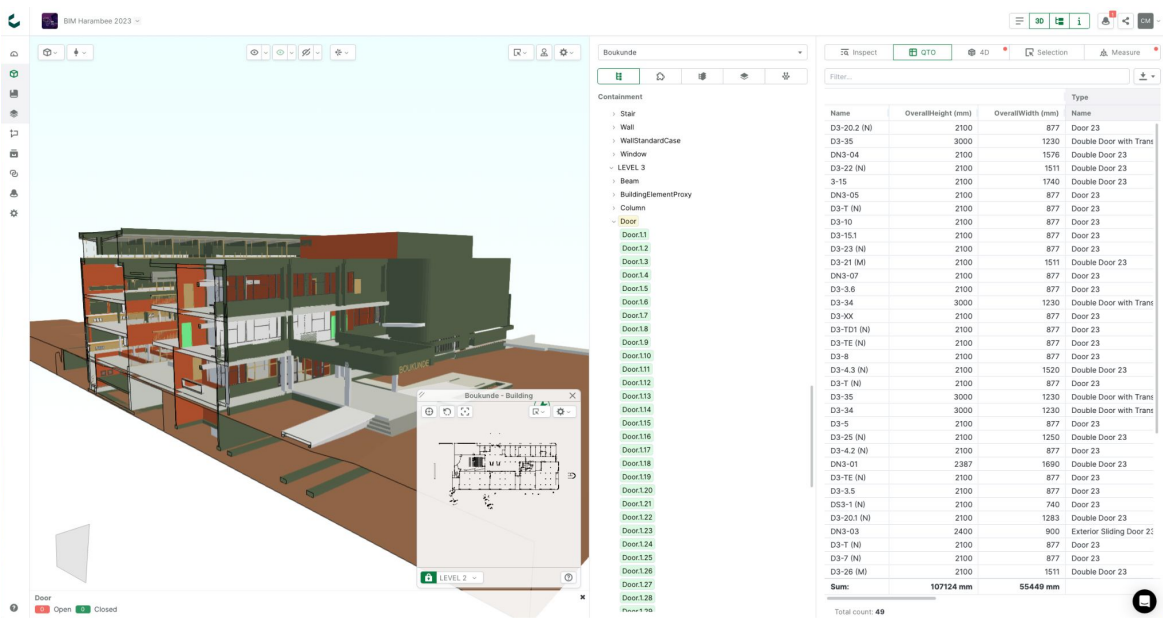
Design

Construction

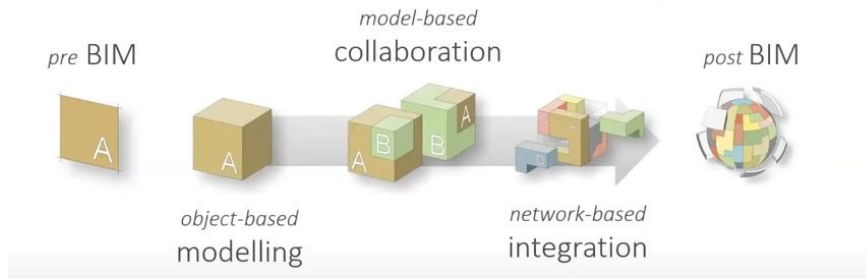
Operations

With a growing ecosystem





- The Common Data Environment (CDE) centralizes all the information and documents needed for the project in one common area.
- Prepare / Manage / Use (Data)
- Object base / Model Based / Network Integration Based
- Knowledge sharing / Data based design





BIM Work Stages

Stage 4

Technical Design

YORK BROTHERS CONSTRUCTION

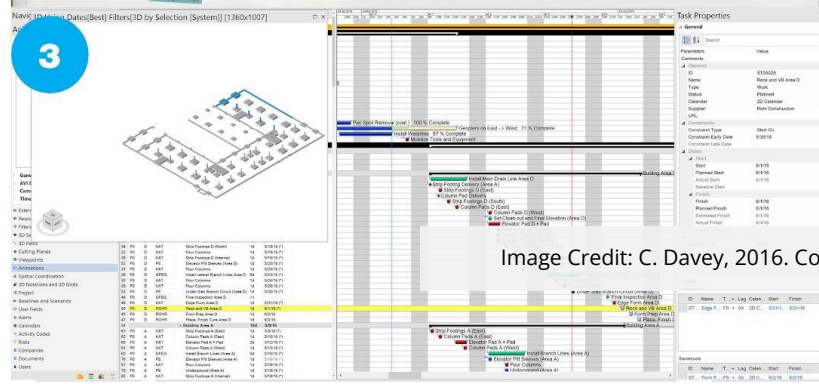
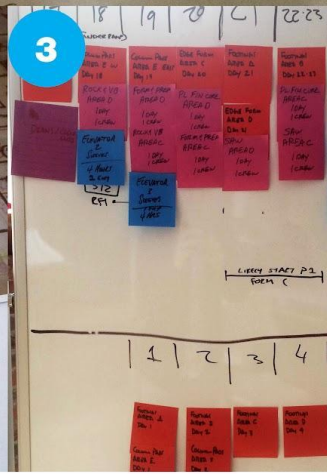
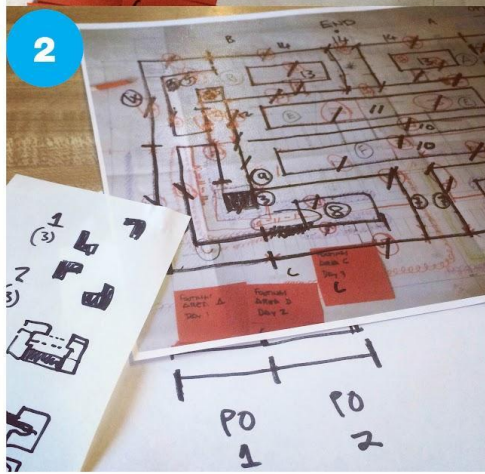
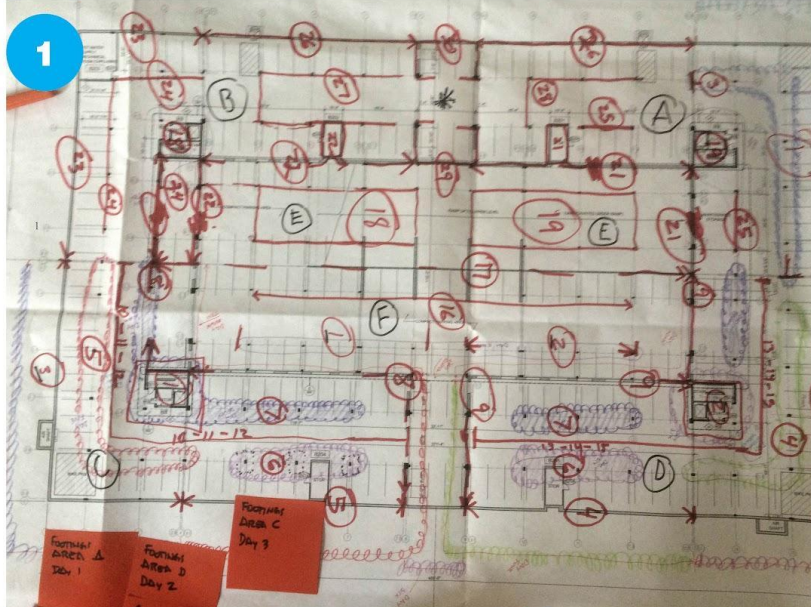


Image Credit: C. Davey, 2016. Copyright.



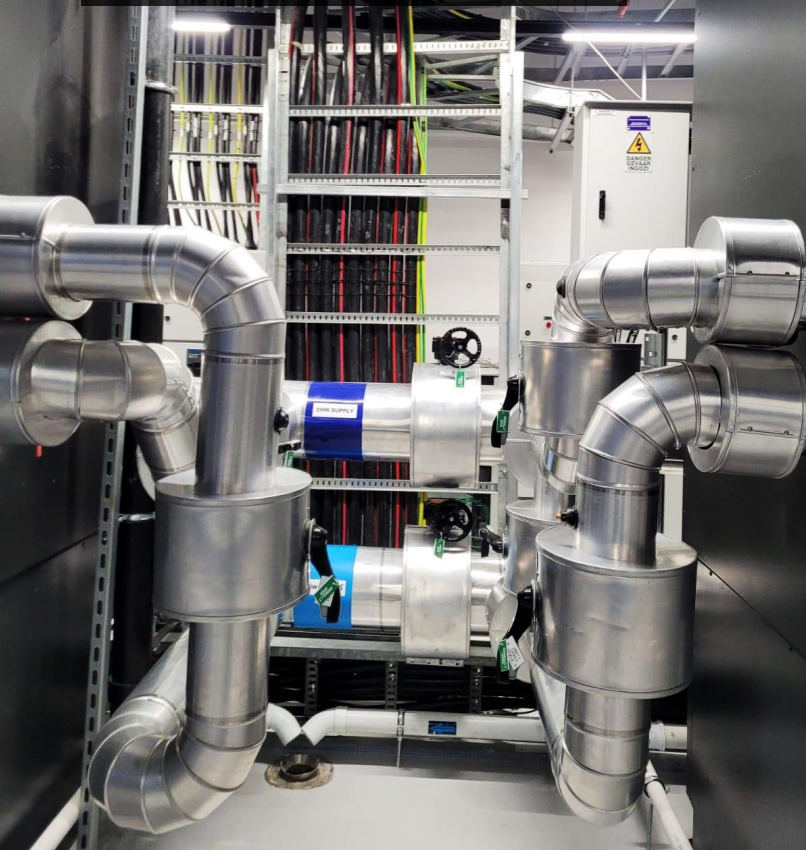
Image Credit: C. Davey, 2016. Copyright.



Image Credit: C. Davey, 2016. Copyright.

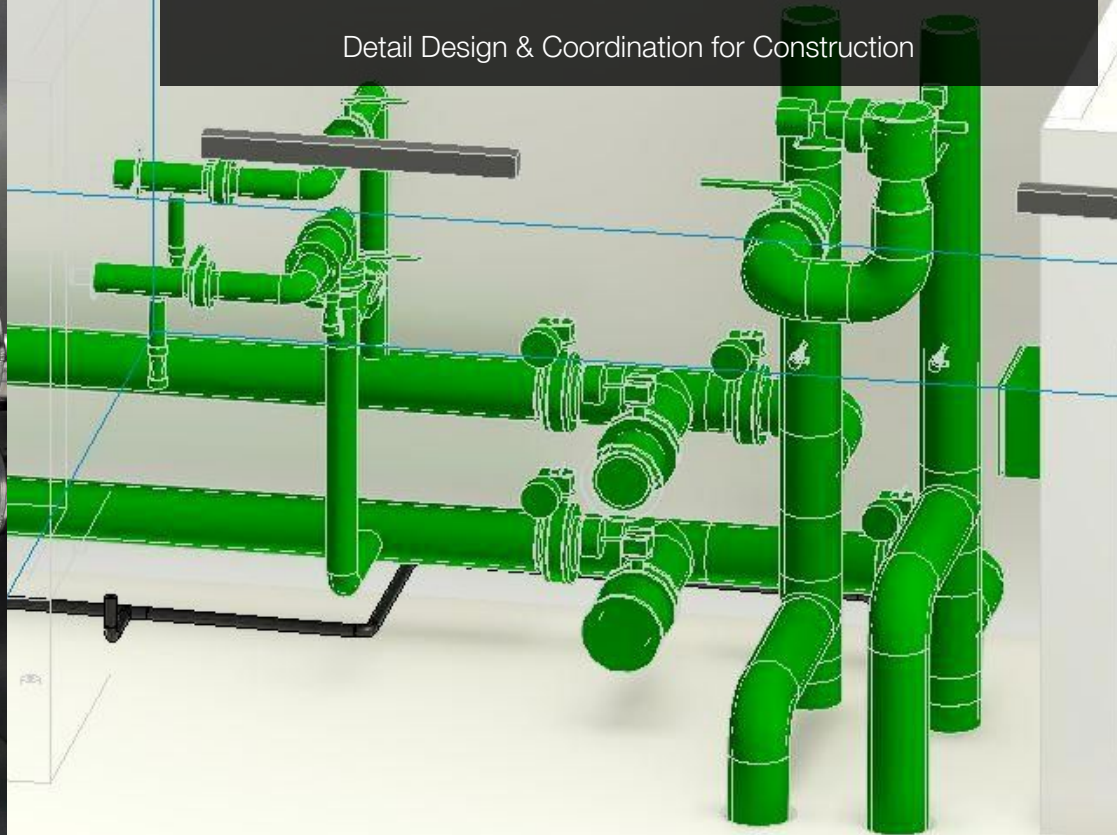
As-Built Reality

Manufactured & Installed



BIM Technical Coordination Model

Detail Design & Coordination for Construction







BIM Work Stages

Stage 5

Manufacture & Construction

OPENSOURCE, BAKER BAYNES

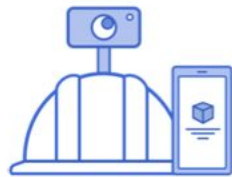


360° Jobsite Capture & Artificial Intelligence

Jaco Barnard,
Managing Director, Agile Business Technology

OpenSpace Automates 360 Documentation & Analytics

HOW IT WORKS



A wearable 360 camera and mobile app (iOS and Android supported).

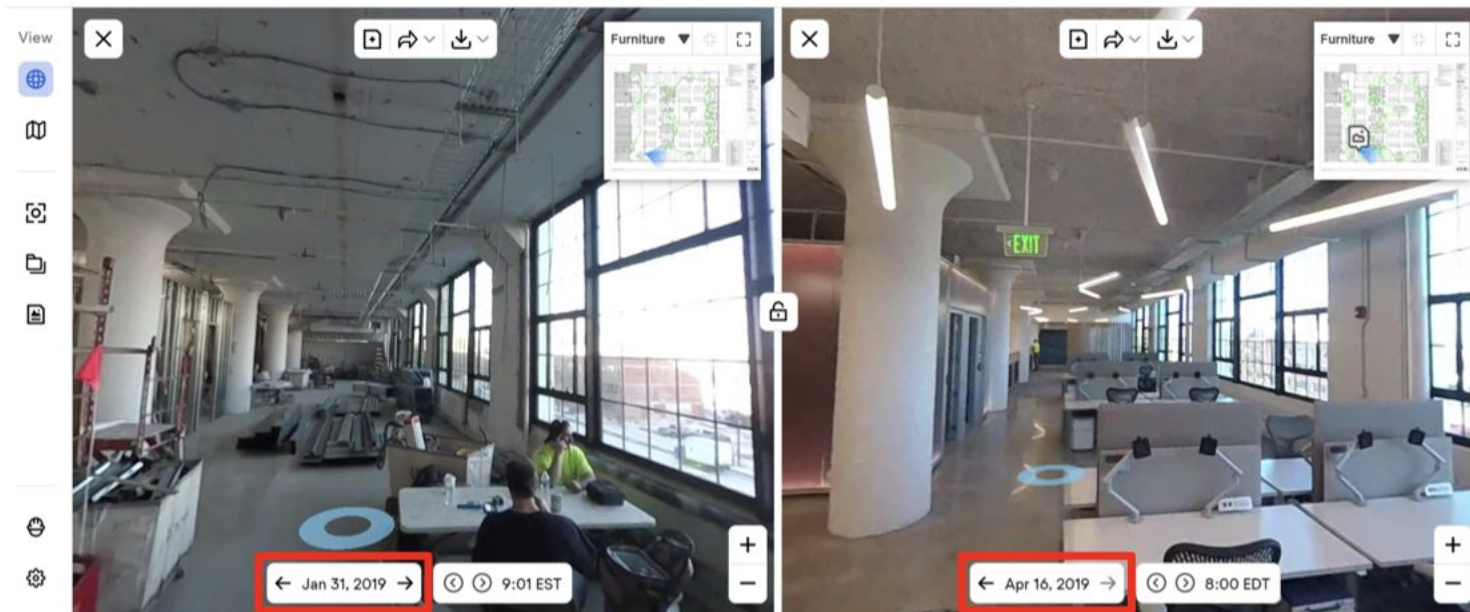


OpenSpace Vision Engine processes, organizes, and securely stores the data

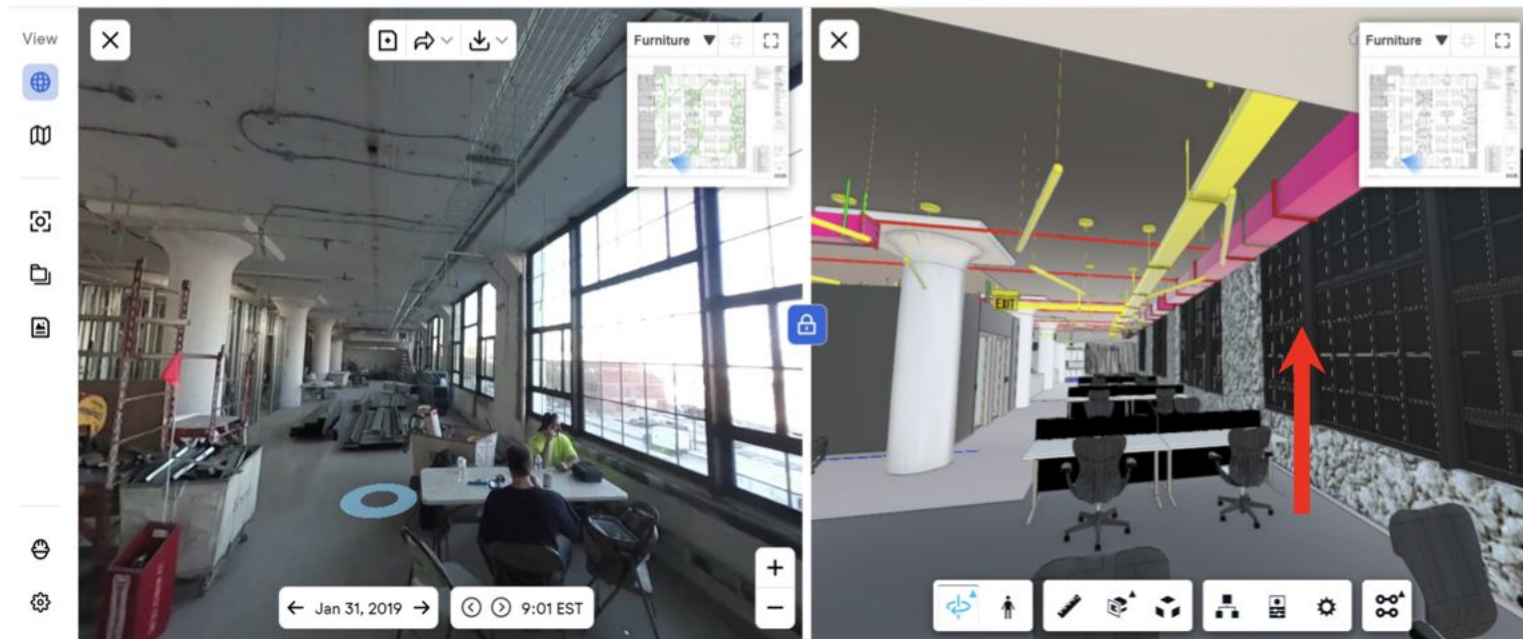


Browser-based virtual jobsite viewer. Integrated with project management software.

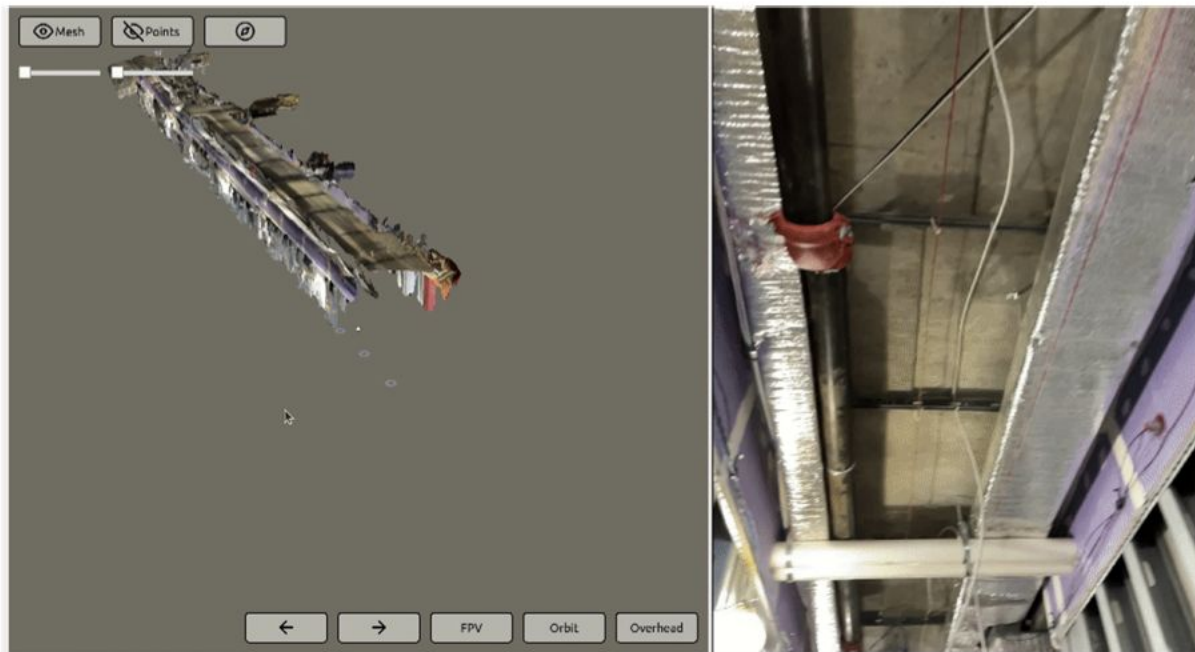
See What Was There Today, Yesterday, a Week Ago, or Even Five Years Ago



Compare Actual Site Conditions to Your 3D Model



3D Scanning with Smart Phones





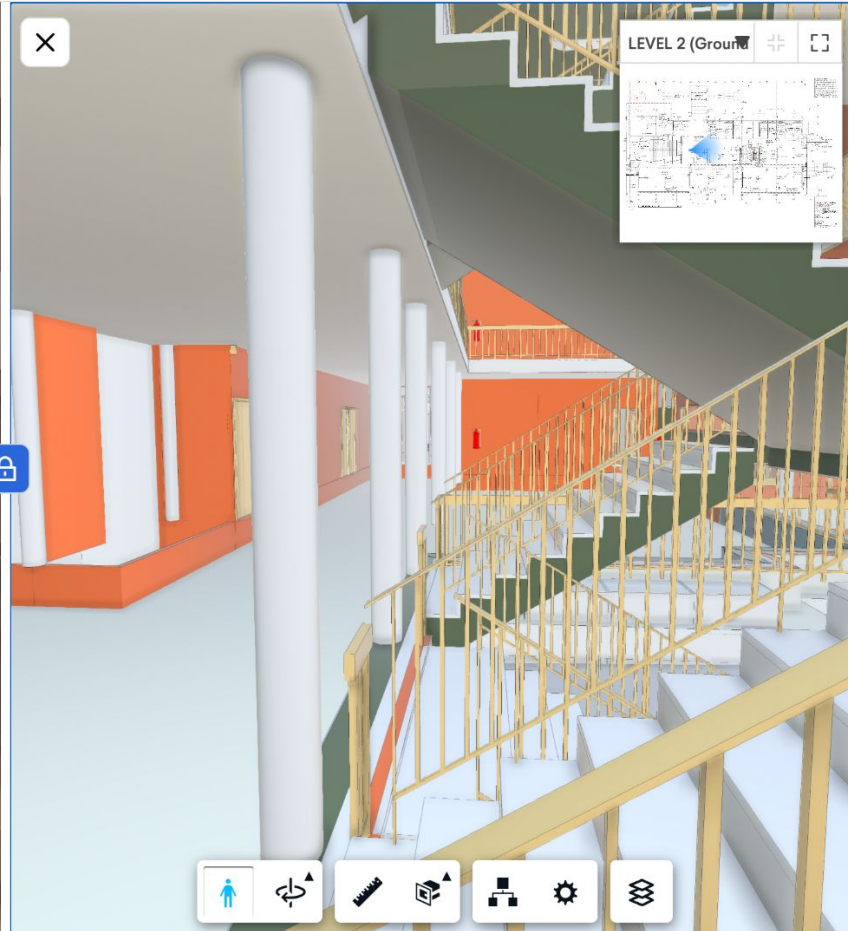
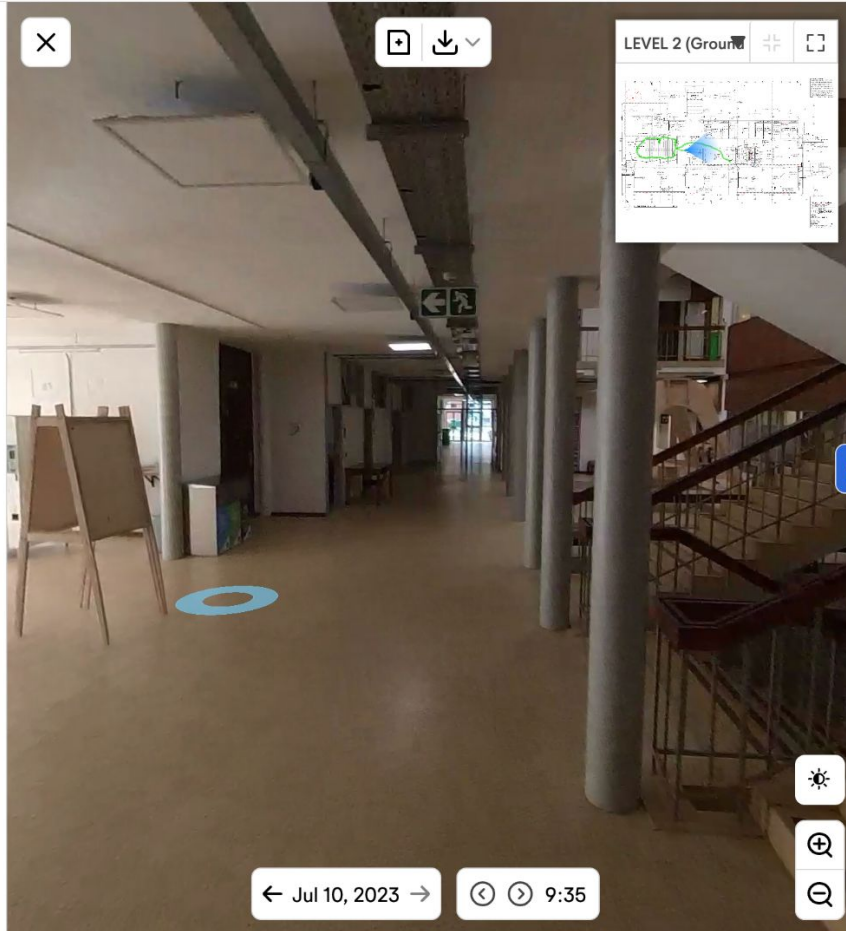
Level 2

University of Pretoria / Boukunde

BOUKUNDE MODEL 2.ifc

May 20, 2023 5:20 PM • jaco@agile.co.za

View



Three Pillars of 360 Jobsite Capture



Simple

Tap Start
Walk like Normal
Tap Stop



Fast

30 minutes or less from
upload to view



Powerful

If you can use Google
Street View you can use
OpenSpace



Tell Kevin we need to redo this wall!



- Material recall, okie dokey.



- Redesign the hall?



We need to install-



- We have to demo it all!



- Fire in the wrecking ball!

LEAVE NO ROOM FOR INTERPRETATION

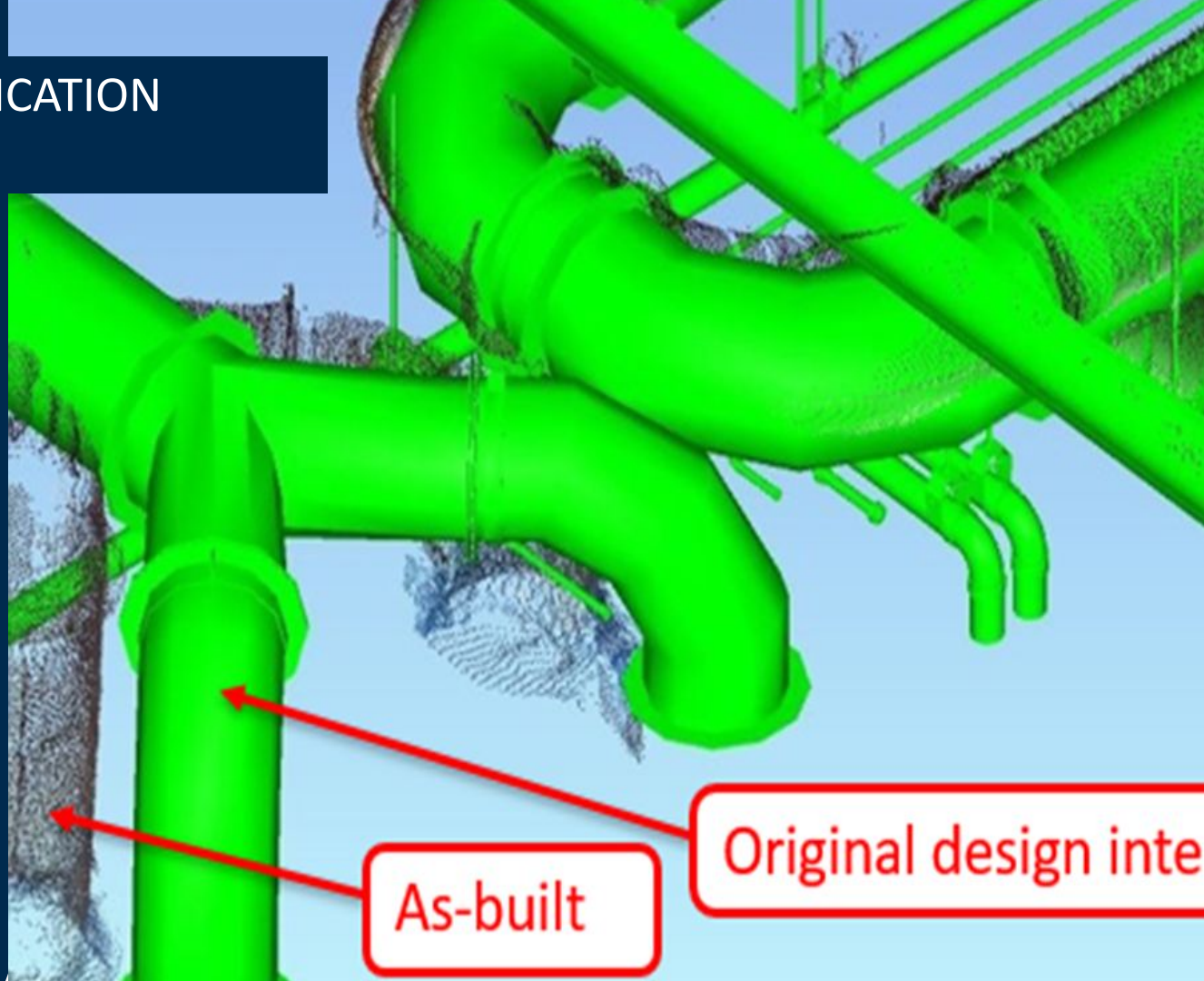
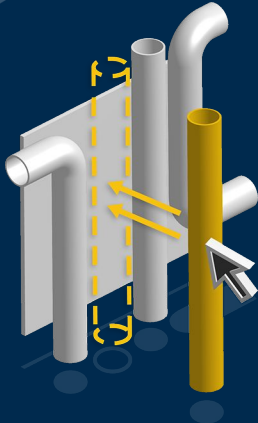
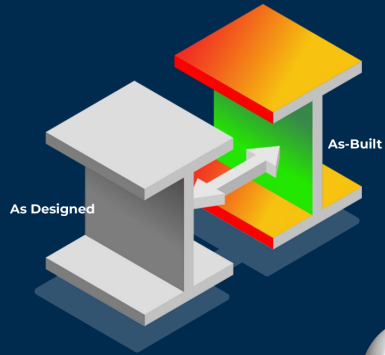


REALITY CAPTURE Construction Monitoring



CONSTRUCTION VERIFICATION

Quality Control



QUALITY INSPECTIONS

CONSTRUCTION MANAGEMENT

MANAGE AND TRACK CONSTRUCTION ISSUES & CHANGES

3 0-1 - Concrete Pre Pour Checklist

1. Pre Pour Information

1.1 Location of pour

1. Forms and Accessories

2.1 Verify location, dimensions and grades are as required.

☐ Pass ☐ Fail ☐ NA

2.2 Verify formwork materials are as specified.

☐ Pass ☐ Fail ☐ NA

RFIs

Create RFI

RFI #6

In Review

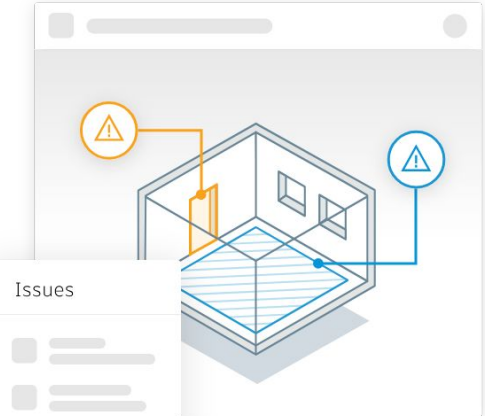
Submit

Details

Attachments

Activity

Issues





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Harambee
.Africa

BIM Work Stages

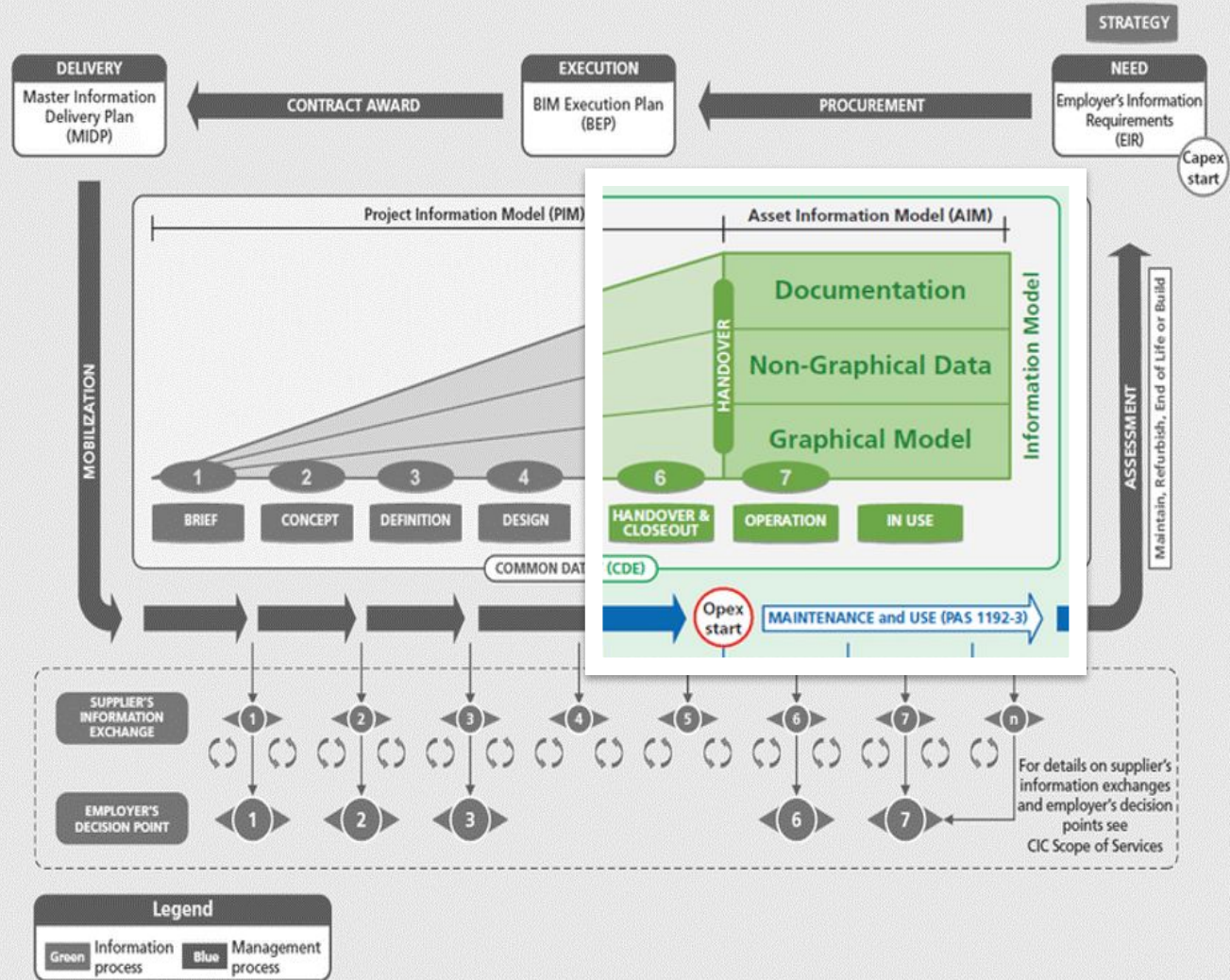
Stage 6

Close-out & Handover

BAKER BAYNES

BIM

From PIM - AIM



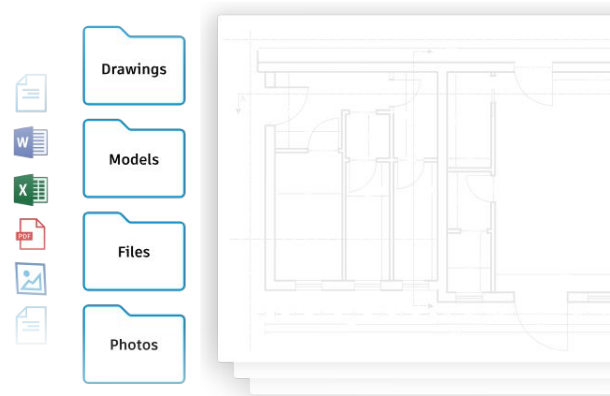
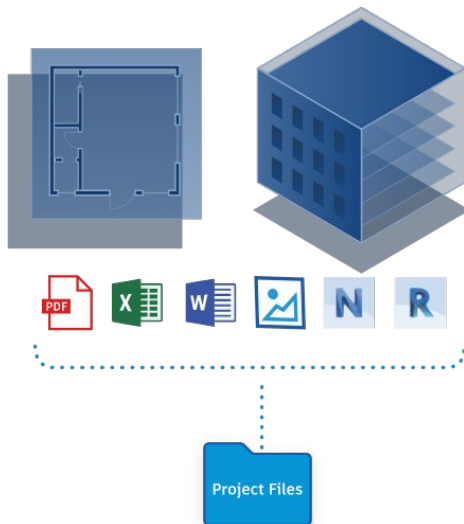
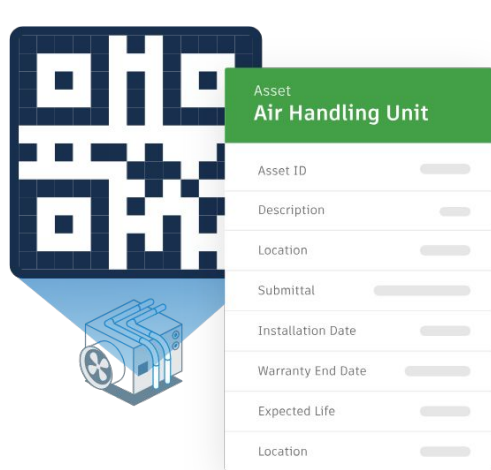
COMMISSIONING

- Access asset data and resolve defects

GENERATE TURNOVER DOCUMENTATION

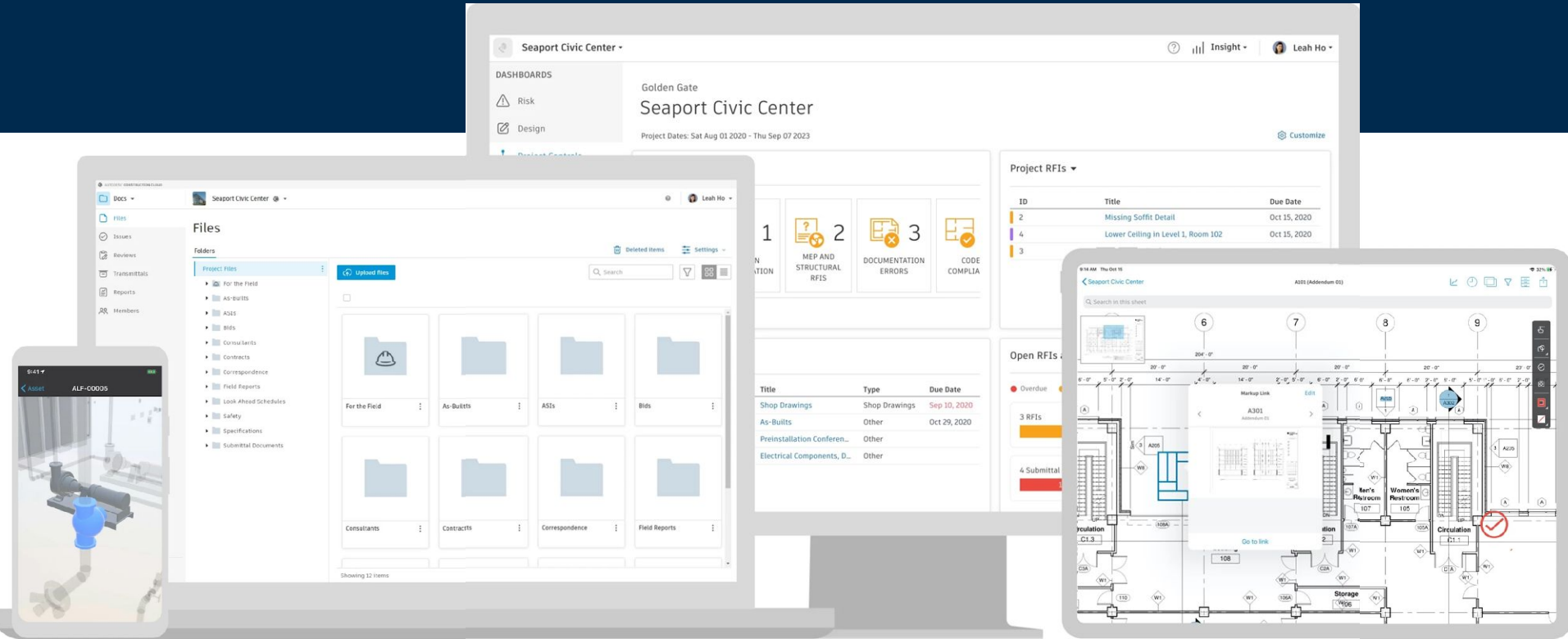
- That meets Information Requirements

DELIVER ACCURATE AS-BUILTS



COMMON DATA ENVIRONMENT

- Structured information, that someone can find (and use) 10 years down the line





BIM Work Stages

Stage 7

Operations & Use

ESRI, YORK BROTHERS CONSTRUCTION



ArcGIS GeoBIM

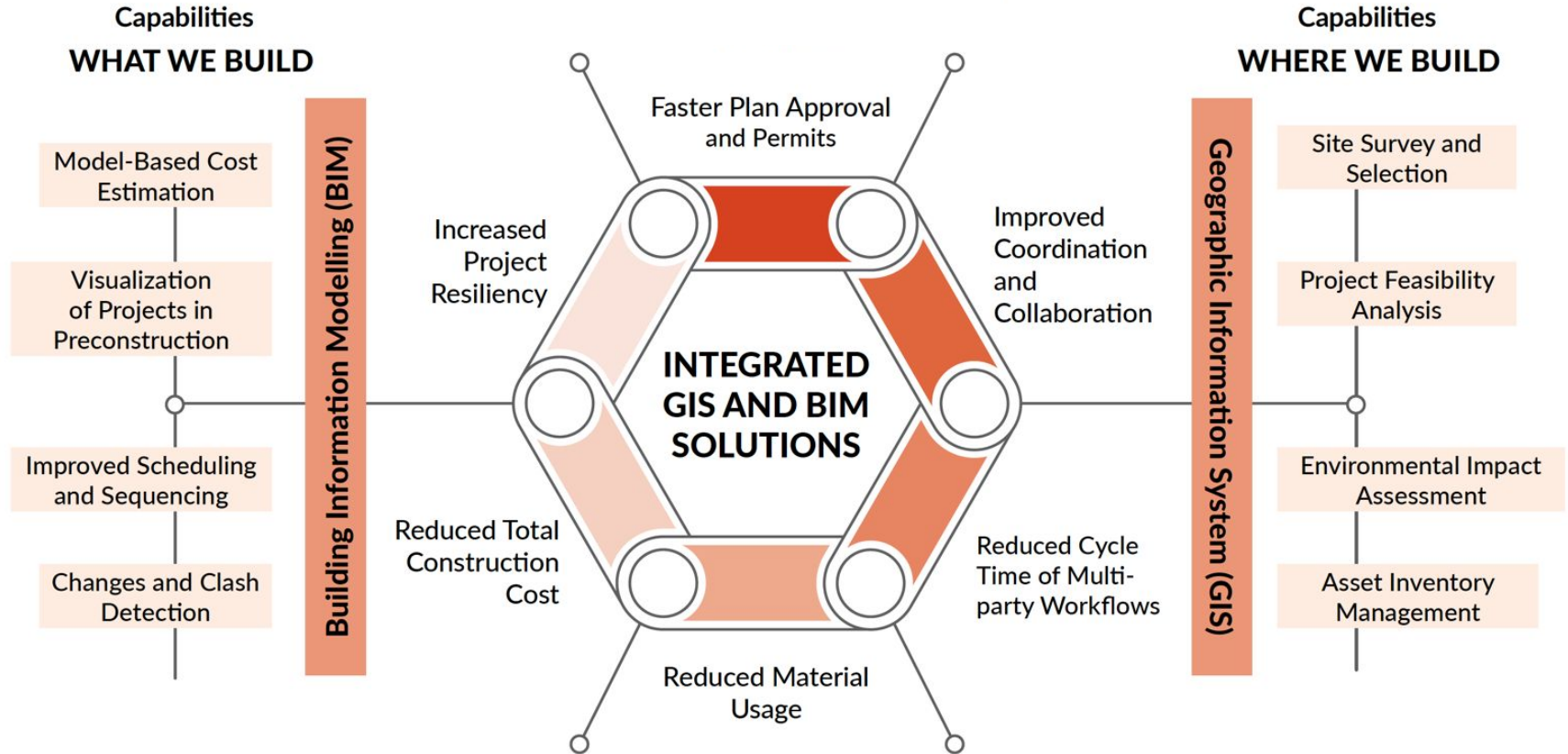
Connecting projects and assets in context



Improving project coordination and delivery

ArcGIS GeoBIM delivers an innovative, easy-to-use web-based experience for teams to explore and collaborate on building information modeling (BIM) projects and issues, using data from multiple systems in a geospatial context. Architecture, engineering, construction (AEC) and operations teams can easily work with linked data and documentation in configurable web apps to simplify communication and collaboration.

GIS and BIM benefits



ArcGIS GeoBIM



Campus Operational Management



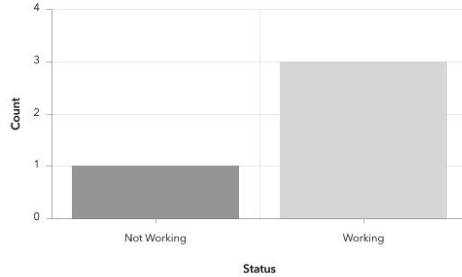
Utilities Maintenance Assignments Dashboard

Work Order ID
None

Assignment Type
None



Working Status



Number of Assignments

22
In the Last 90 days

Completed Assignments



In the Last 90 days

◀ 19 of 22 ▶

Assignment Type: Electricity-Daily and Planned Maintenance

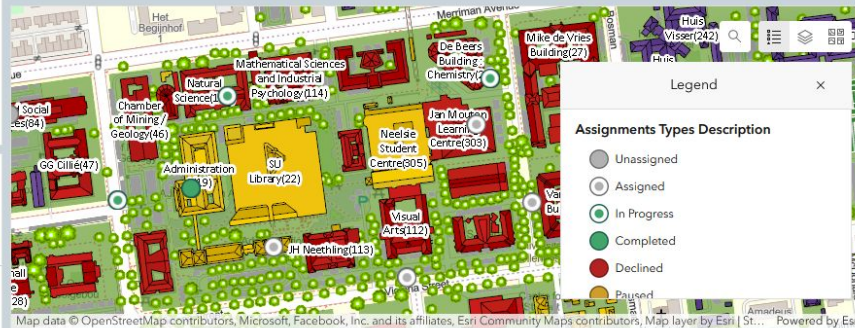
Description	IT Fibre Nodes due for quarterly maintenance check
Priority	Low
WorkOrder ID	US-019
Due Date	21/10/2022, 09:00

List of Assignments

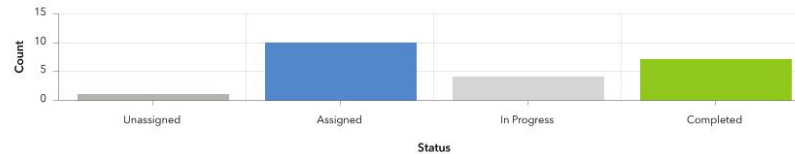
- Work Order ID: US-015
Assignment Type: Fibre-Unplanned Maintenance
Status: Assigned
Priority: Critical
- Work Order ID: US-017
Assignment Type: Fibre-Unplanned Maintenance
Status: Completed
Priority: Critical
- Work Order ID: US-020
Assignment Type: Fibre-Condition-Based Maintenance
Status: Assigned
Priority: Critical

Workers

- Technician
Viewer User
Working
- Technician
Odwa Dandala
Working
- Lead Technician
Skhumbuzo Simelane
Not Working
- Technician
Rudolf de Munnik
Working



Assignment Status



Campus Operational Management

Maintenance Condition Assessment Dashboard

Work Order ID
None

Condition
None

Verification Status
None

Total Surveys
16
Submitted

2

Bad

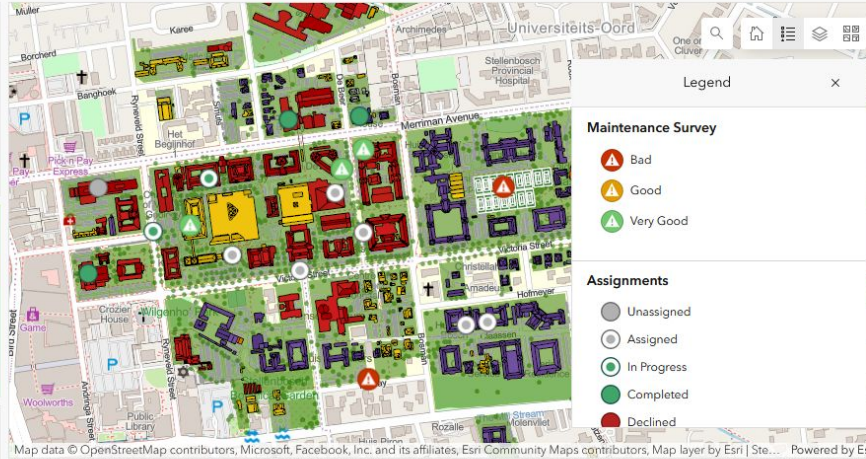
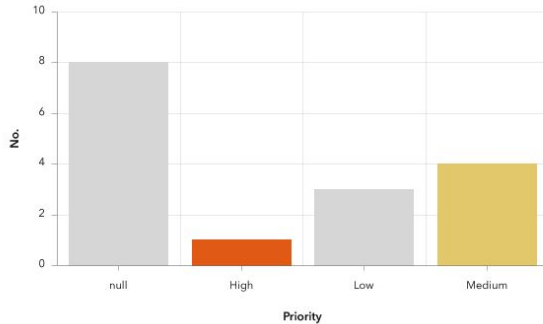
9

Good

5

Very Good

Received Priority Status



Survey Details

Mobile Worker Maintenance Form

Work Order ID	US-011
Completion Date	13/10/2022, 12:49
Status	Completed
Priority	Medium
Assignment Type	Condition-Based Maintenance
Assignment Description	De Beers Building - Construction along the parking lot cut the entry IT fibre cable. Construction to be alerted about underground fibre entry points. Costs unknown. To assess affected floors.

Survey Details Attachments



Work Progress Status



Work Order ID: US-011

Assignment Type: Condition-Based Maintenance
Completion Date: 13/10/2022, 12:49
Manager to approve costs.

Work Order ID: US-011

Assignment Type: Condition-Based Maintenance
Completion Date: 13/10/2022, 12:49
Manager to approve costs.

Work Order ID: US-013

Assignment Type: Condition-Based Maintenance
Completion Date: 13/10/2022, 13:59
The status is still good for another 3 months

Work Order ID: US-011

Assignment Type: Condition-Based Maintenance
Completion Date: 13/10/2022, 12:49
Manager to approve costs.

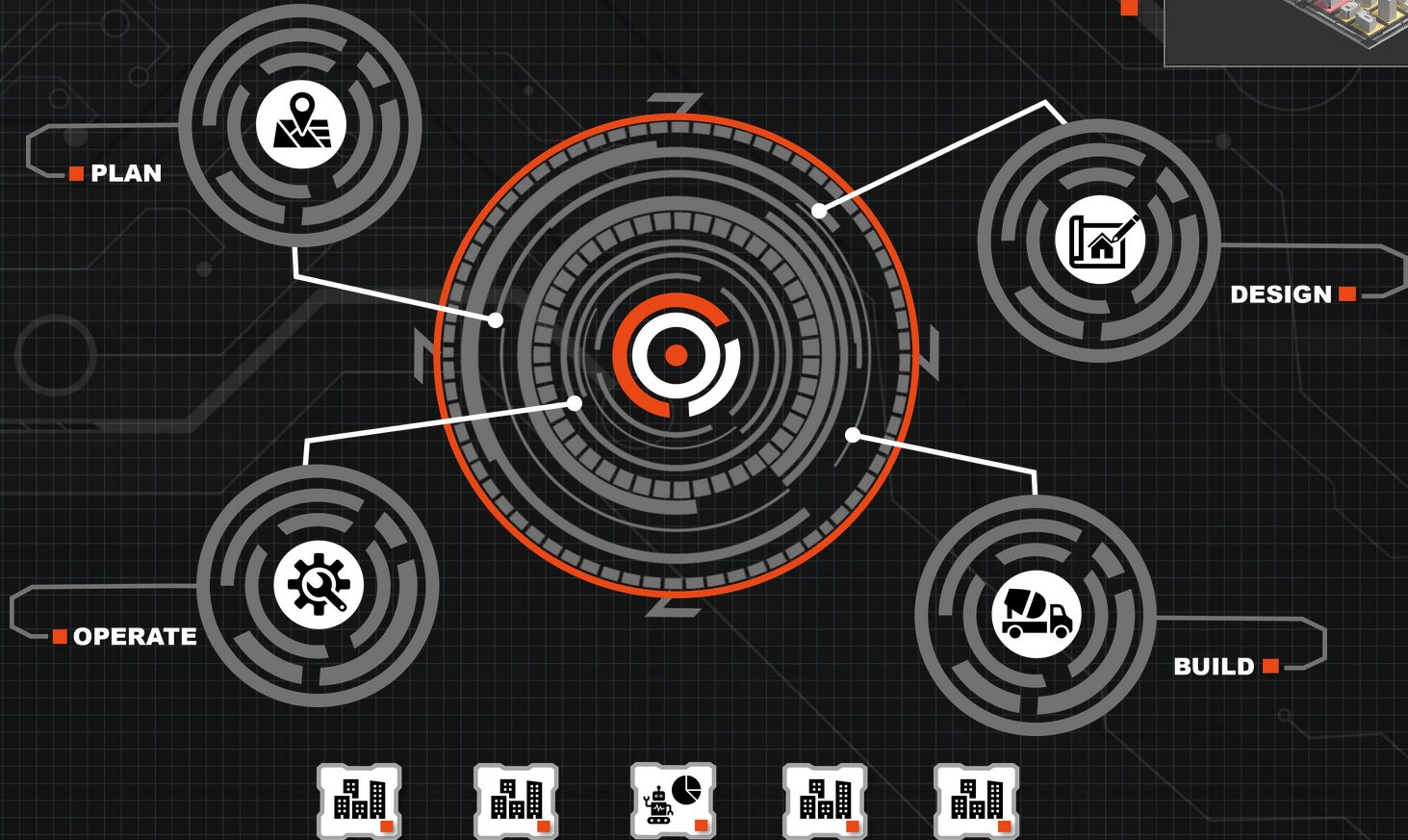
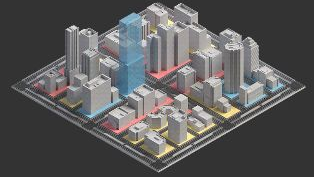
Work Order ID: US-016

Assignment Type: Condition-Based Maintenance
Completion Date: 14/10/2022, 07:23
Assessed, in good condition

Work Order ID: US-019

Assignment Type: 489071a8-d594-4650-96d4-259cb145750f
Completion Date: 21/10/2022, 09:00

CAMPUS DIGITAL TWIN



CAMPUS PLANNING



forward together
samen is meer
saam is voordeel



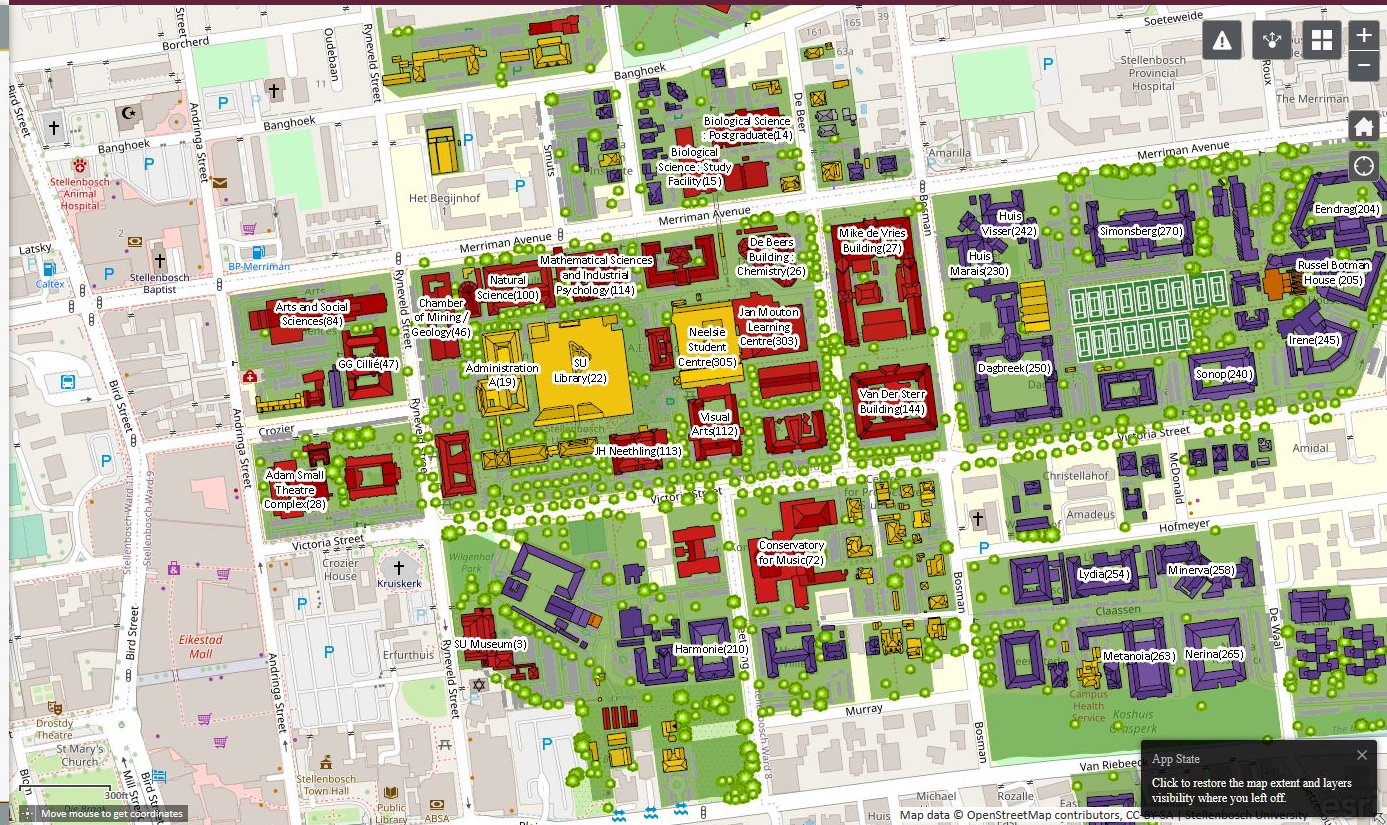
Search

- > Campus
- > Parking Area
- > Campus Destinations
- > Libraries
- > Faculties
- > Building

Clear

Stellenbosch University Campus Map

Feedback | Help



App State
Click to restore the map extent and layers visibility where you left off.

Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox

CAMPUS NEW BUILDING DESIGN



Home ▾ BIM Proposed Building 🏠

New Scene ▾ Rudolf ▾



Layers

Legend

- ☐ Visibility Analysis
- ☒ Campus Trees
- ☒ Proposed Building
- ☒ Proposed Building Site
- ☒ Campus 3D Buildings





Mobile Worker Maintenance Form

Work Order ID

US-013

location

Verify that the location is turned on in your device

33°56'S 18°52'E

Name & Surname

Odwa Dandala

Staff email

odandala@esri-southafrica.com

Worker ID *

OD

Completion Date

Thursday, 13 October 2022

13:59

Mobile Worker Maintenance Form

Completion Date

Thursday, 13 October 2022

17:08

Status *

☐ In Progress

☐ Declined

☒ Completed

☐ On Hold

Priority

Medium

Assignment Type *

Condition-Based Maintenance

Assignment Description

Assess condition of fibre

On Site Notes

Please provide any additional notes

Everything is good

4982

Mobile Worker Maintenance Form

Condition *

☐ Bad

☐ Good

☒ Very Good

Pictorial Evidence

Signature *

Compliance *

☒ I agree that the assignment is completed





Maintenance Condition Assessment Dashboard

Work Order ID

None

Condition

None

Verification Status

None



Total Surveys

16

Submitted

2

Bad

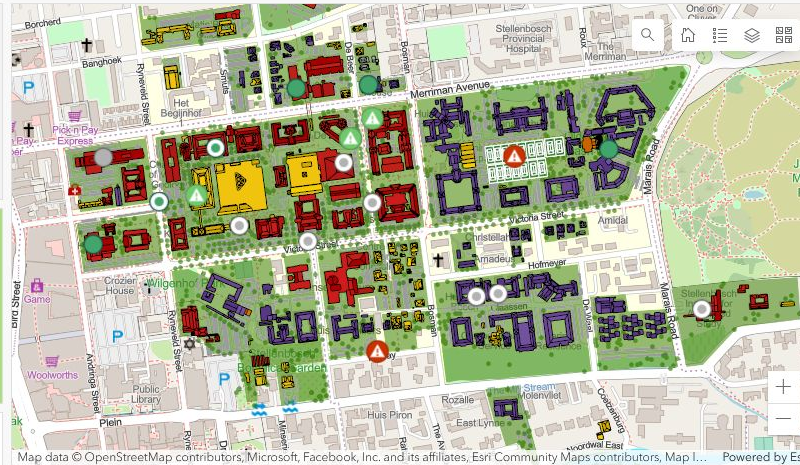
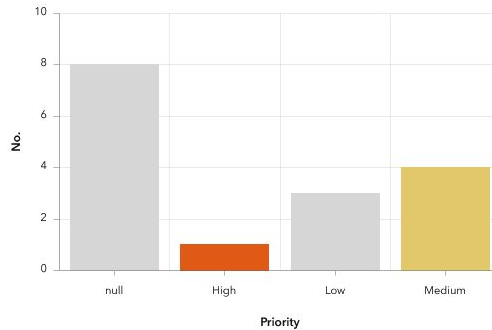
9

Good

5

Very Good

Received Priority Status



Survey Details

Mobile Worker Maintenance Form

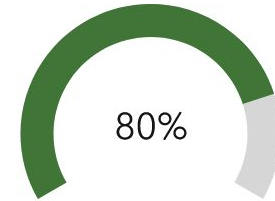
Work Order ID	US-011
Completion Date	13/10/2022, 12:49
Status	Completed
Priority	Medium
Assignment Type	Condition-Based Maintenance

Assignment Description
De Beers Building - Construction along the parking lot cut the entry IT fibre cable. Construction to be alerted about

Survey Details Attachments



Work Progress Status



Work Order ID: US-011

Assignment Type: Condition-Based



Maintenance

Completion Date: 13/10/2022, 12:49
Manager to approve costs.

Work Order ID: US-011

Assignment Type: Condition-Based



Maintenance

Completion Date: 13/10/2022, 12:49
Manager to approve costs.

Work Order ID: US-013

Assignment Type: Condition-Based



Maintenance

Completion Date: 13/10/2022, 13:59
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Maintenance

Completion Date: 13/10/2022, 12:49
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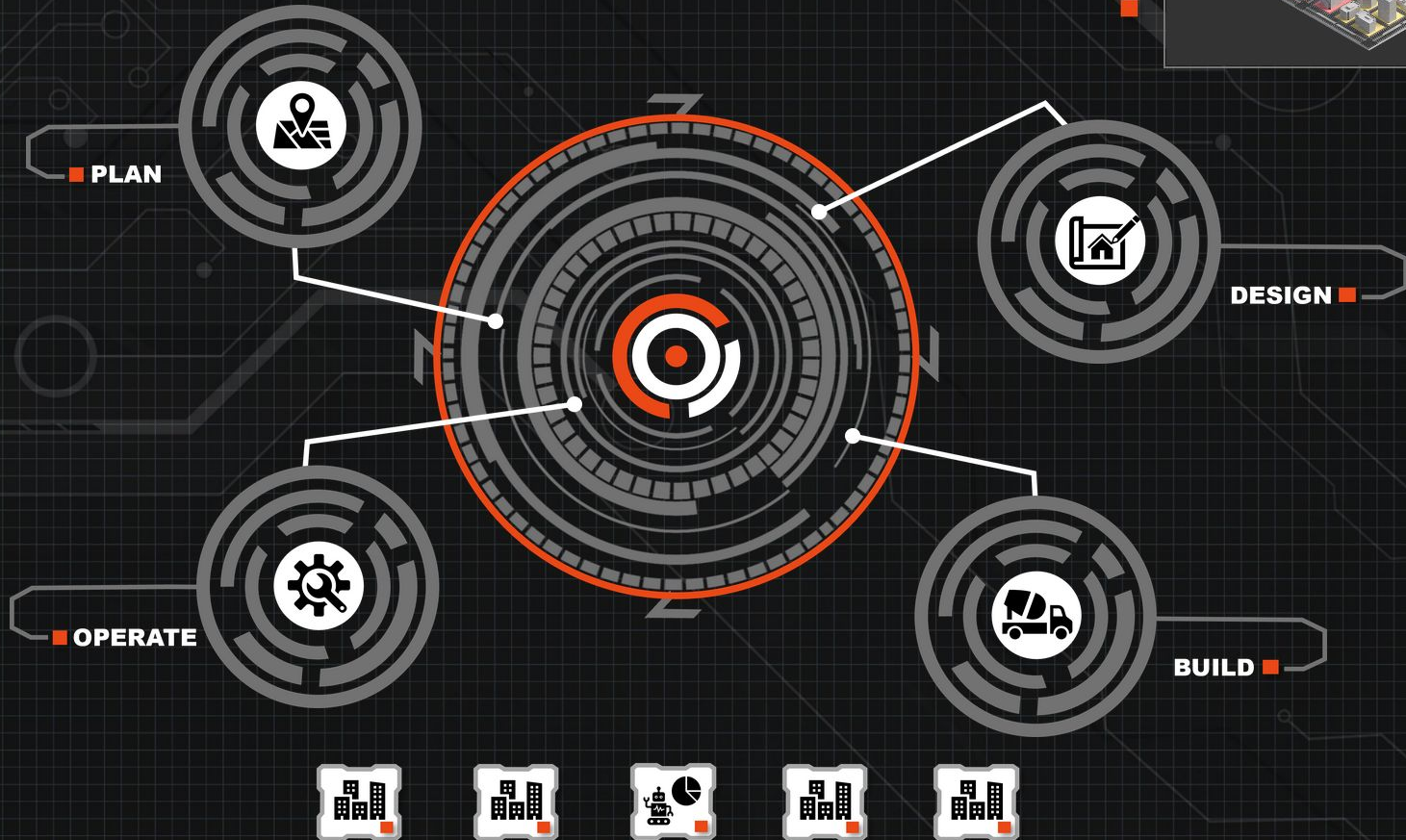
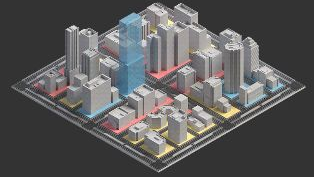
Assignment Type: Condition-Based



Maintenance

Completion Date: 14/10/2022, 07:23
Assessed in good condition

CAMPUS DIGITAL TWIN





To Play - Download ArcGIS Field Maps



..... more detail @ venue





BIM Work Stages

Stage 8

Heritage or Decommissioning

UNIVERSITY OF PRETORIA

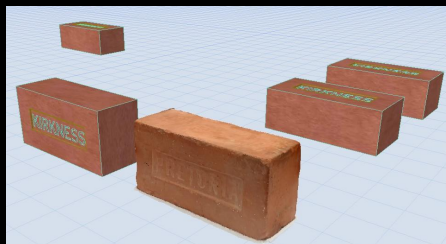
RESULTS from an Industry Perspective: (b) Unpack the value / learnings

IPAD Pro 12.9- inch
6th Generation



Learnings:

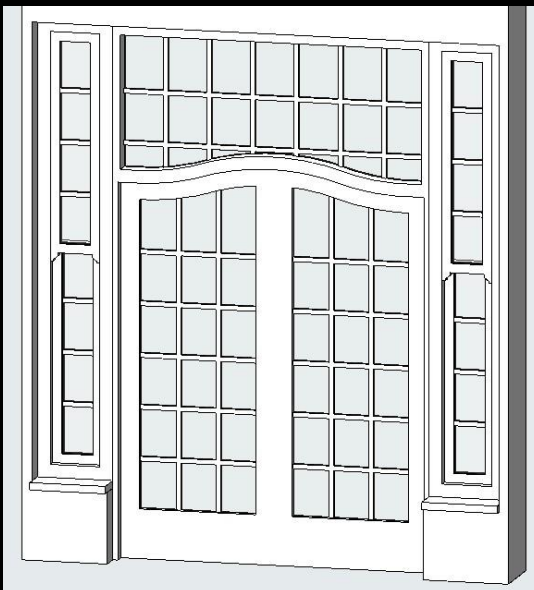
2. Scanning as a sole means of recording is not sufficient to produce the level of accuracy & detail required.
2. Point Cloud Data cannot be 100% accurately translated into any CAD model.
3. Accuracy required to capture complex historic fabric require accuracy to the millimetre. *** (5mm discrepancy over 100m = 500mm)
4. HPA also in the process to compile a 3D library of historic fabric



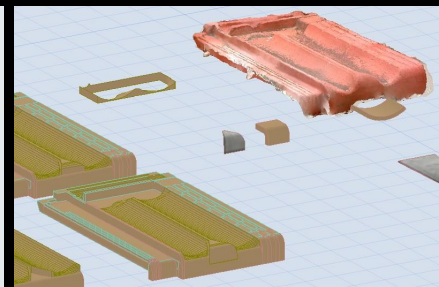
Kirkness historic clay brick PRETORIA
(est 1888) - quarry @ UP Groenkloof
Campus)



Coronation historic clay bricks DURBAN
(est 1902 @ coronation of Edward VII)



UP Vergeet-My-Nie female residence –
door to archive



Marseille historic clay roof tile
(various models)



Pta City Hall
Historic Kirkness
clay roof tile

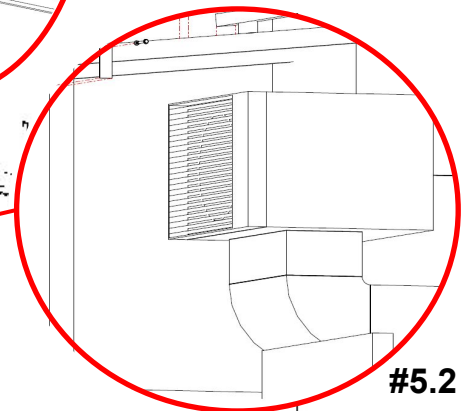
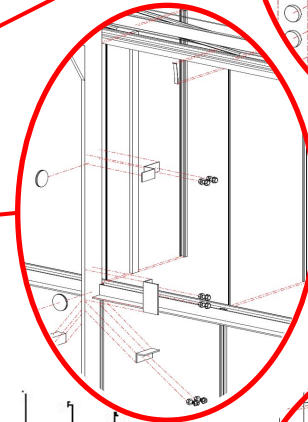
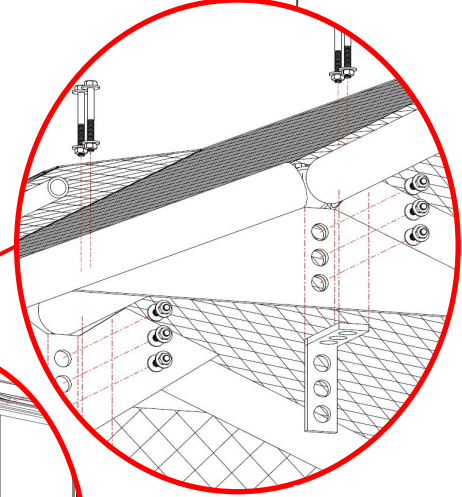
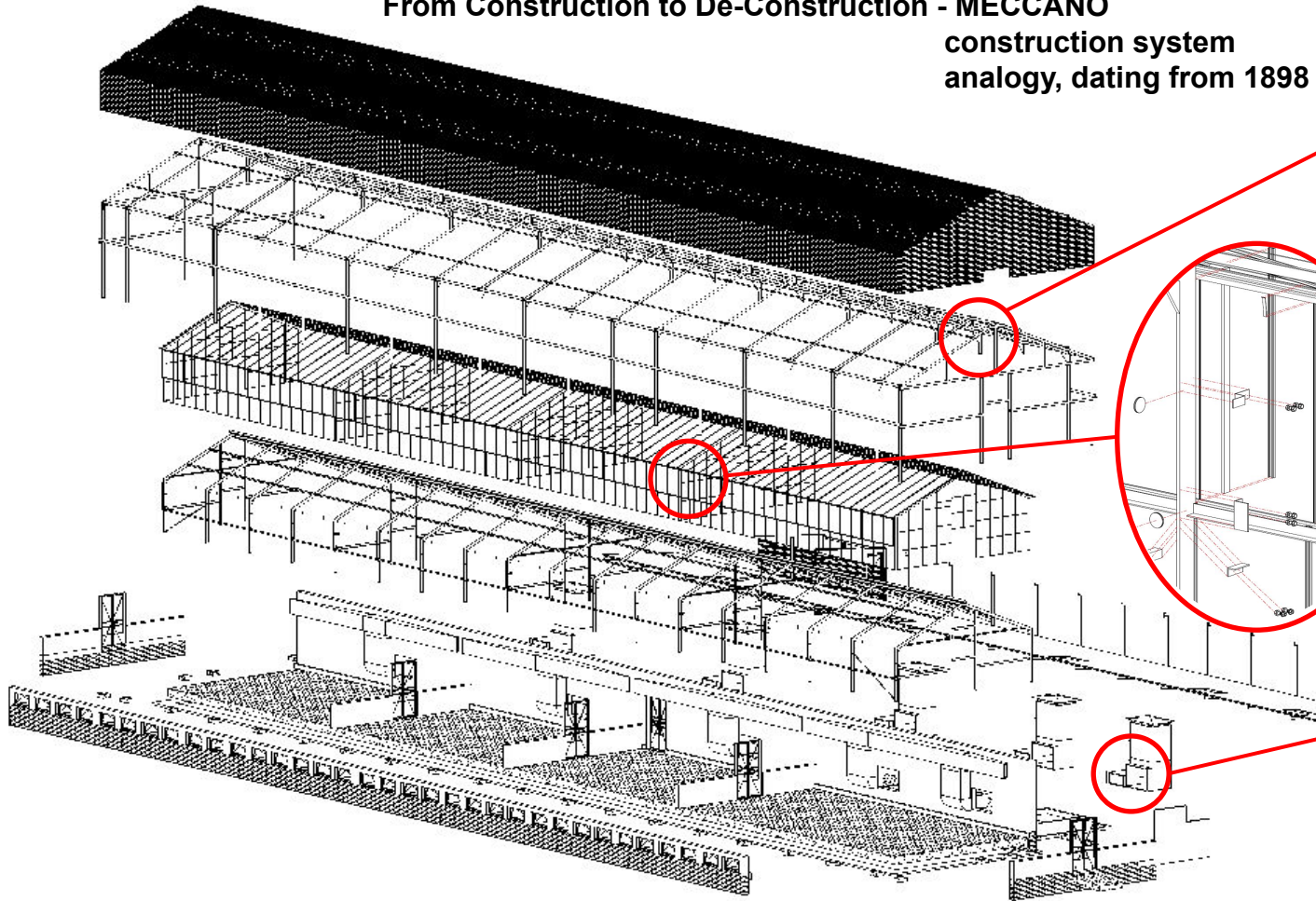
#5.3

Application (APP)



polycam

**Greenhouse 1 exploded CAD model – with 100% accuracy down to each nut & bolt.
From Construction to De-Construction - MECCANO
construction system
analogy, dating from 1898**





BIM Work Stages

Stage 9

Circularity & Re-Use

UNIVERSITY OF PRETORIA

192.9M³



CONCRETE

50.9M³



BRICK

50.1M³



SAND

40.3M³



TIMBER

23.4M³



METAL

2.4M³



PLASTIC

1.5M³



STONE

0.6M³

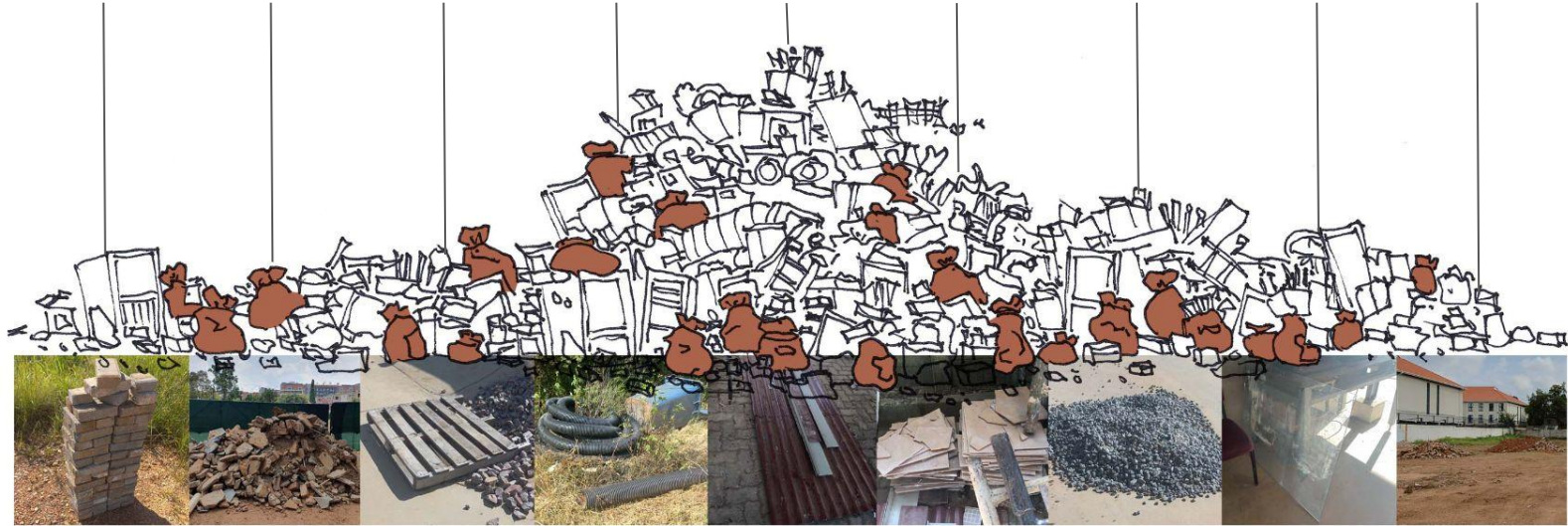


GLASS

0.3M³



CERAMIC



“WASTE, EXCLUDING HAZARDOUS WASTE, PRODUCED DURING THE CONSTRUCTION, ALTERATION, REPAIR OR DEMOLITION OF ANY STRUCTURE, AND INCLUDES RUBBLE, EARTH, ROCK AND WOOD DISPLACED DURING THAT CONSTRUCTION, ALTERATION, REPAIR OR DEMOLITION.”
(DEPARTMENT OF ENVIRONMENTAL AFFAIRS, 2012)

Reframe Real-World Problems
Heritage & Circularity Opportunities



Wait a minute,

BIM and Digital Twins are simply the vehicles to create a

Circular Built Environment

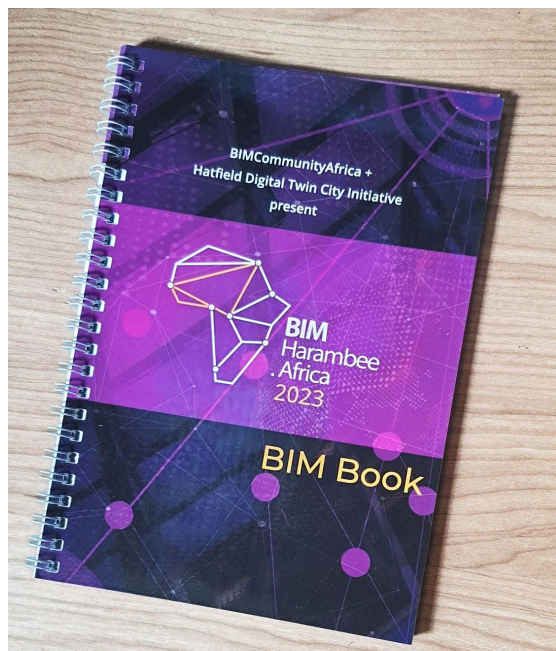


27 July 2023

Welcome to

The Future of Work

Afternoon Activities



Thurs 27 July | How it works





IMPORTANT INFORMATION

After the presentations on Thursday morning, you will get the chance to explore Boukonde and see what exciting tech is available. And also take part in the Scavenger Hunt that some of our partners are hosting. Check out their stand for more info.

Floor by Floor

You will see on your nametag that you have a coloured dot. Each dot represents the group you belong to. Red dots in the red group etc.

Starting at 11h45, you will go to the floor as assigned below. Every hour you will move to the next floor as allocated.

	11h45	12h45	13h45	14h45
	Basement	Ground Floor	Floor 1	Floor 2
	Ground Floor	Floor 1	Floor 2	Basement
	Floor 1	Floor 2	Basement	Ground Floor
	Floor 2	Basement	Ground Floor	Floor 1

Make sure you ask questions, listen to the presentations and exhaust your curiosity!

Refreshments are available for sale from the Vida-e Caff  in the basement, and The Artisan pop-up (both in Boukonde). For more substantial meals, you can find 'The Artisan restaurant' next to Rautenbach Hall.