



BUILD UP

The European portal for energy efficiency
and renewable energy in buildings

WEBINAR

Online Webinar

Digital Tools for Workflow Management



25 May 2023
11:00 AM – 12:00 AM



BUILD UP

The European portal for energy efficiency
and renewable energy in buildings



cogito-project.eu

Agenda

11:00 - 11:05: Welcome, BUILD UP

11:05 - 11:20: Project overview and Q&A – *Dr. Frédéric Bosché (UEDIN)*

11:20 - 11.50: Digital tools for Workflow Management and Q&A

PMS - *Damiano Falcioni (BOC)*

WODM – *Martin Straka (Novitech)*

SLAM & BCSC - *Dr. Panagiotis Moraitis (QUE)*

WOEA - *Martin Straka (Novitech)*

11:50 – 11:55: Poll via slido, BUILD UP

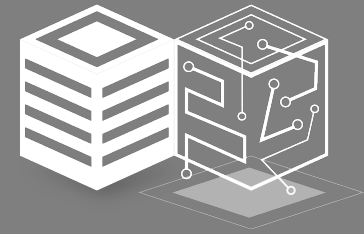
11:55 – 12:00: Wrap up & conclusions, BUILD UP

Digital Tools for Workflow Management

Introduction

Dr. Frédéric Bosché

UEDIN



COGITO

CONSTRUCTION PHASE
DIGITAL TWIN MODEL

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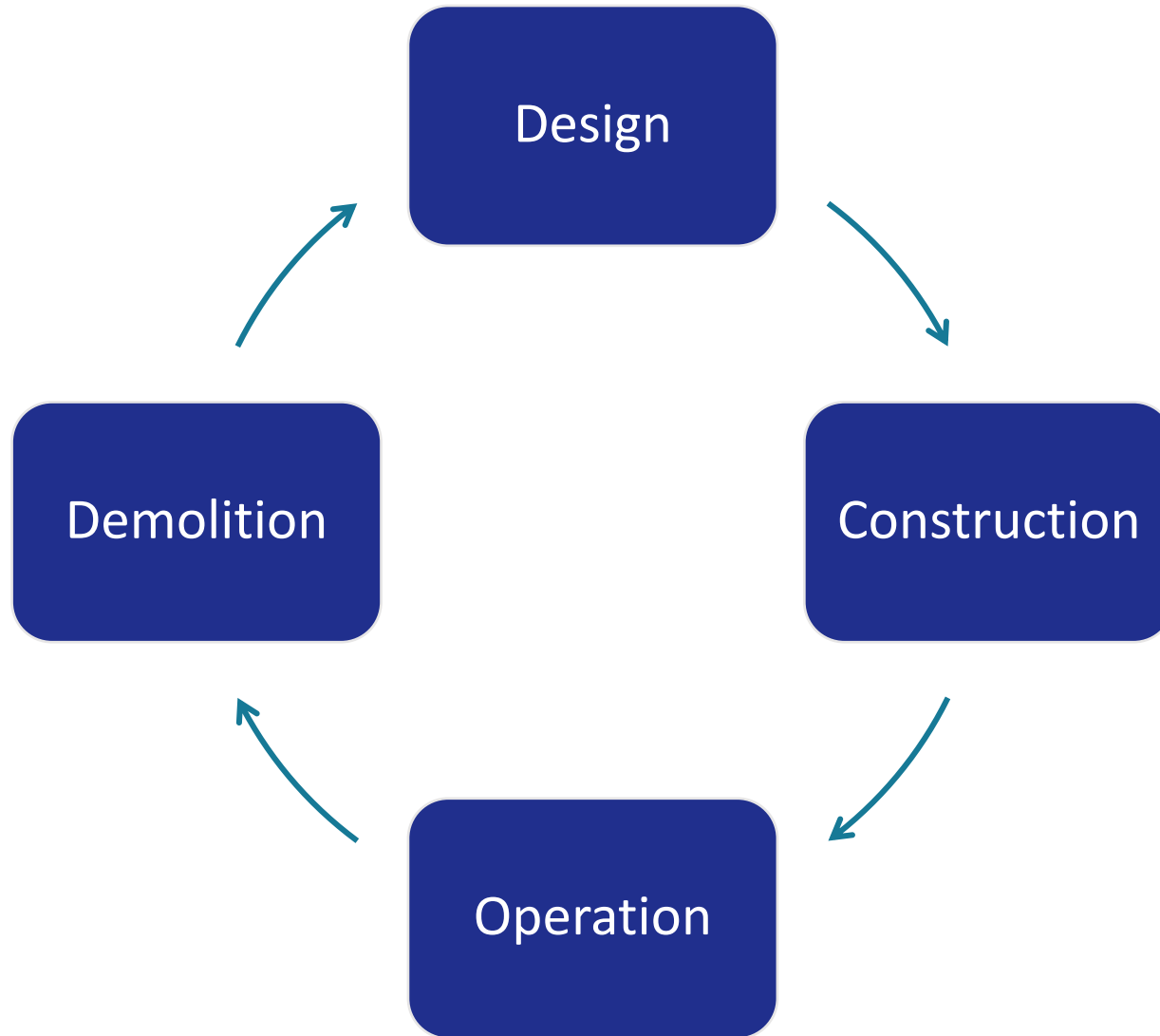
This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 958310

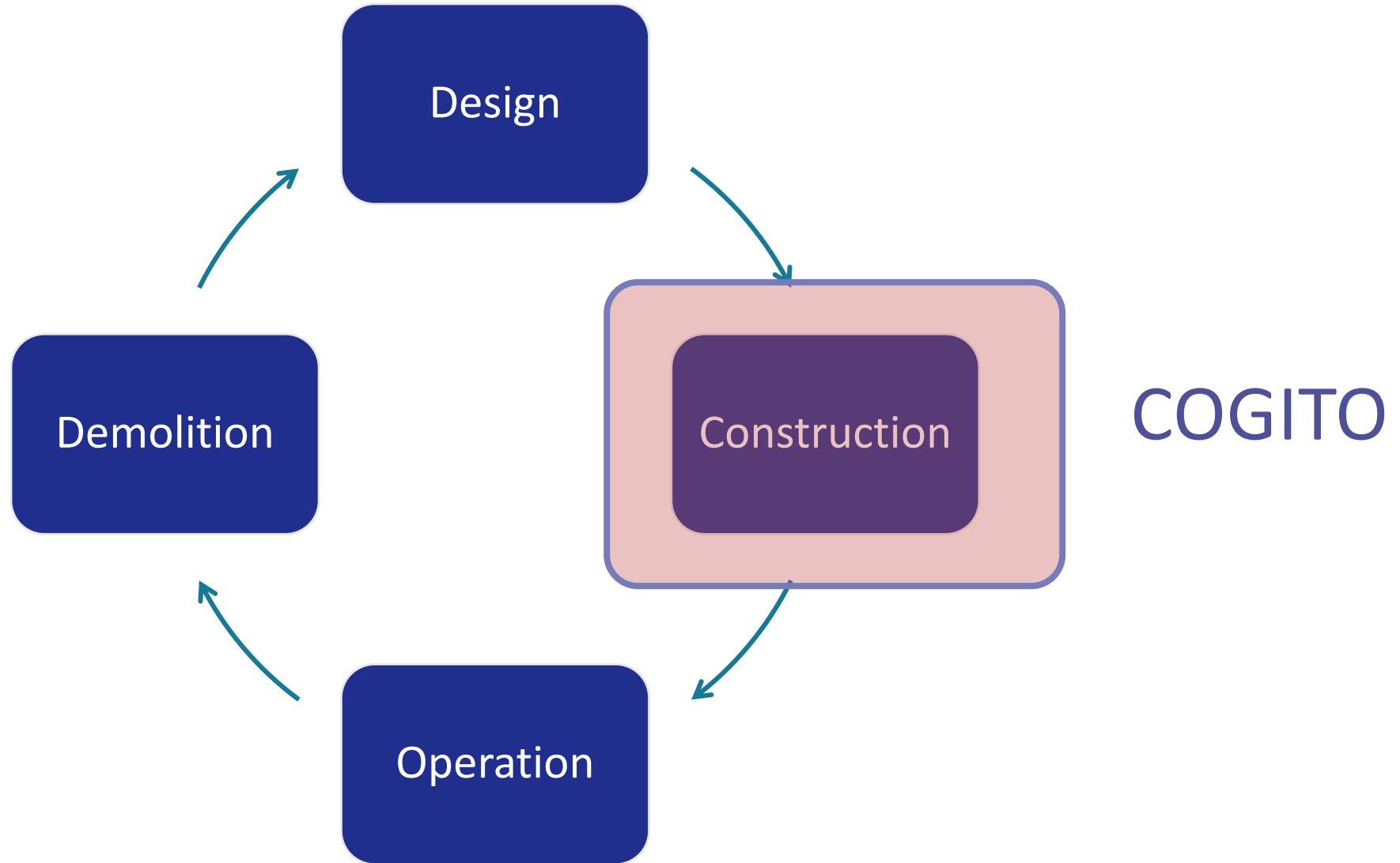


COGITO Project Partners



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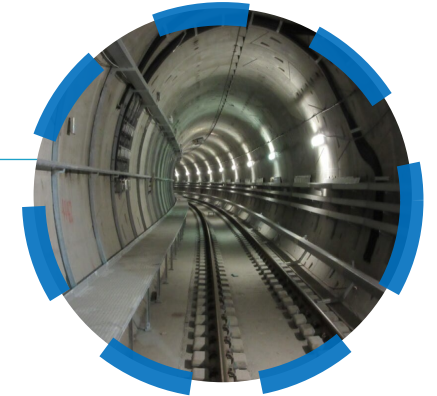


COGITO: Construction 4.0

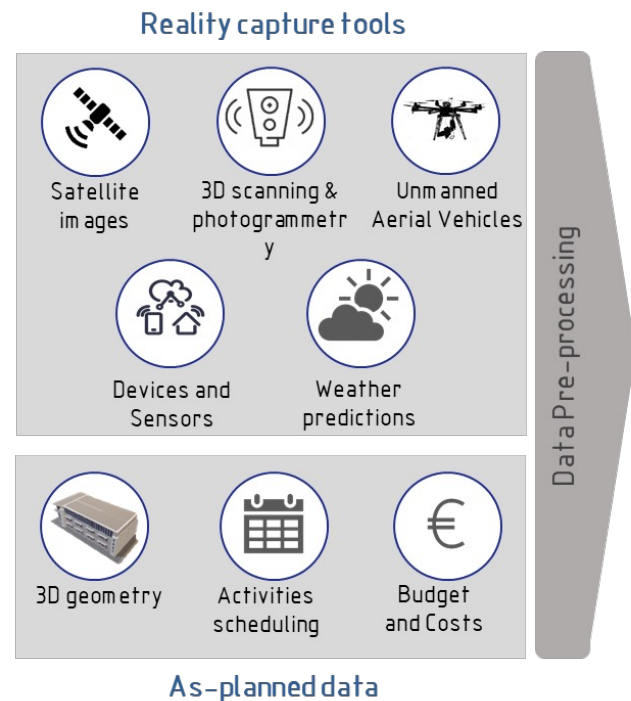
- **Digital 4.0 methodology** encompassing:



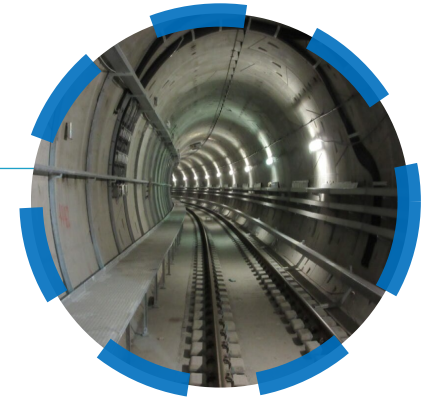
COGITO: Construction 4.0



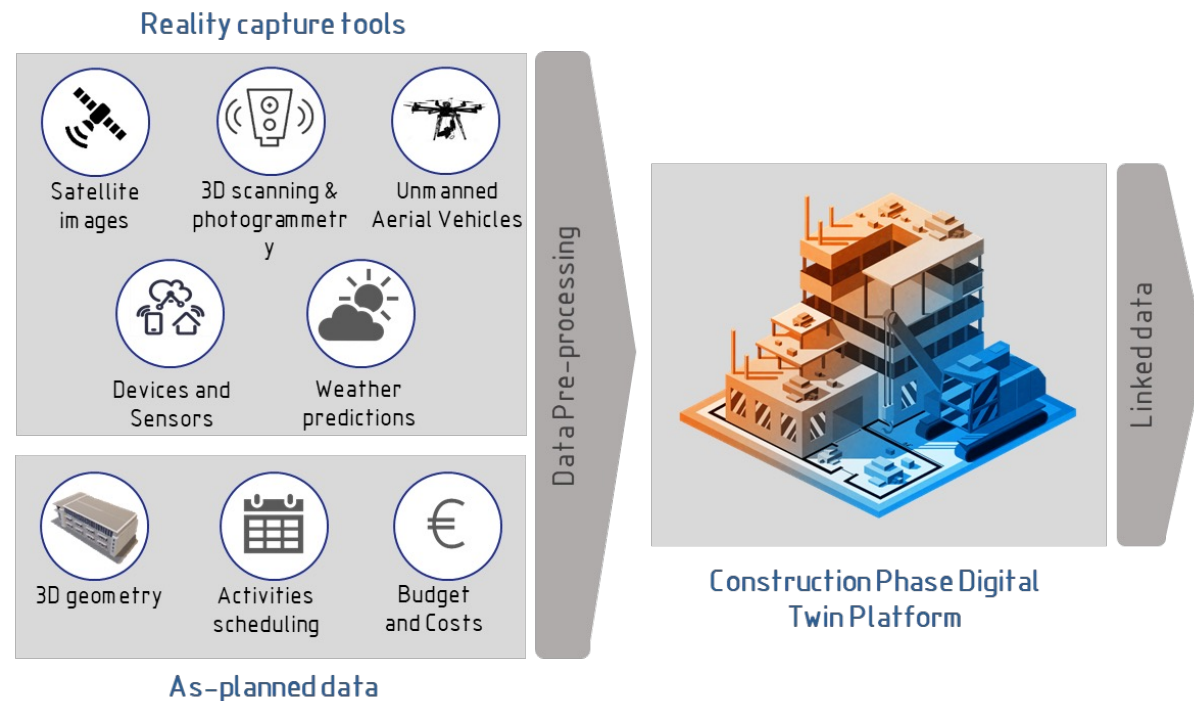
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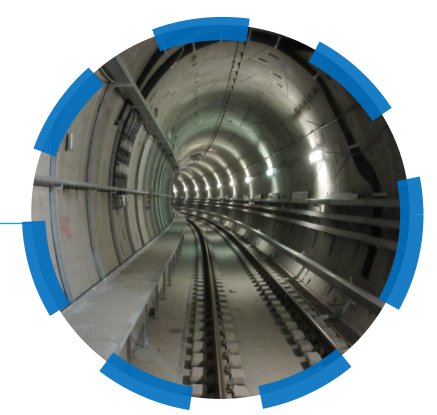
COGITO: Construction 4.0



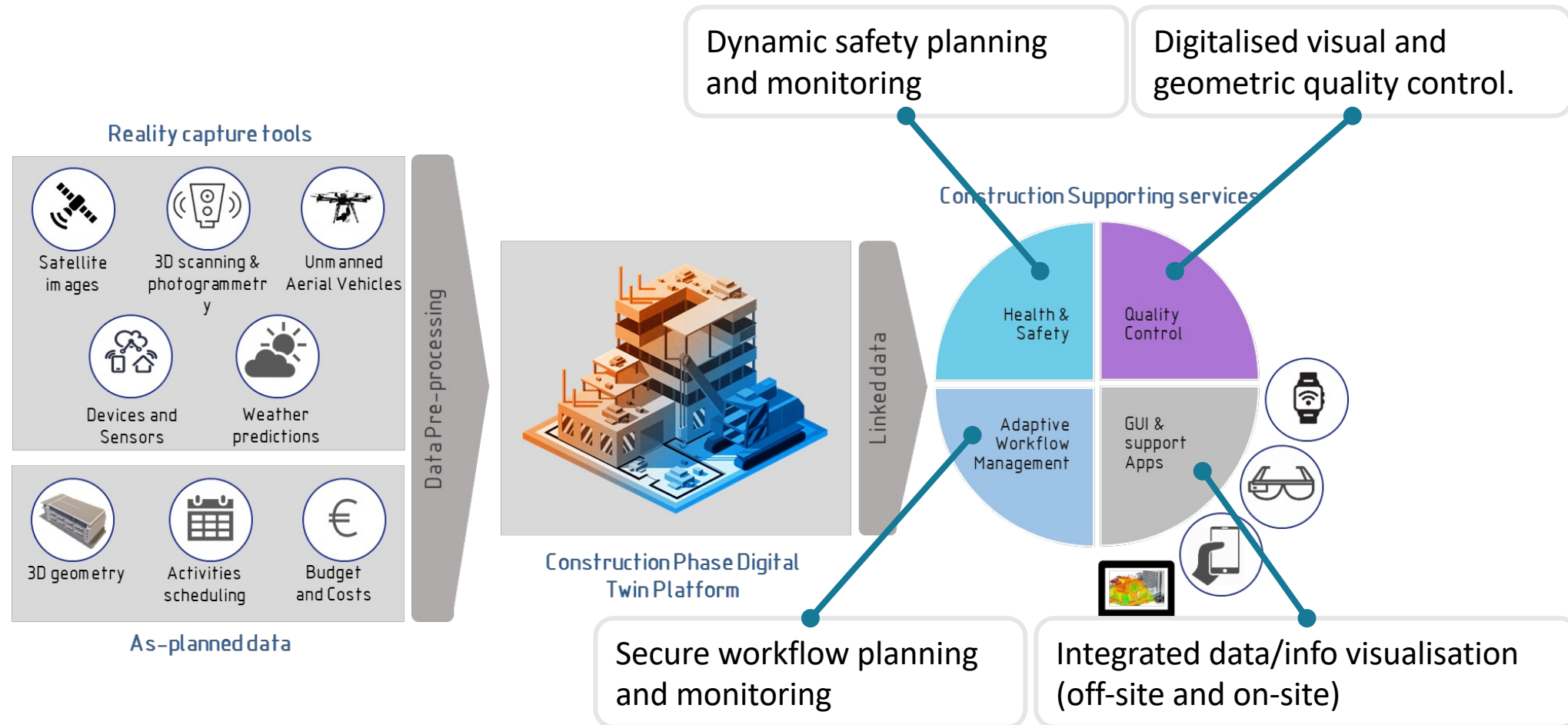
- **Digital 4.0 methodology** encompassing:



COGITO: Construction 4.0



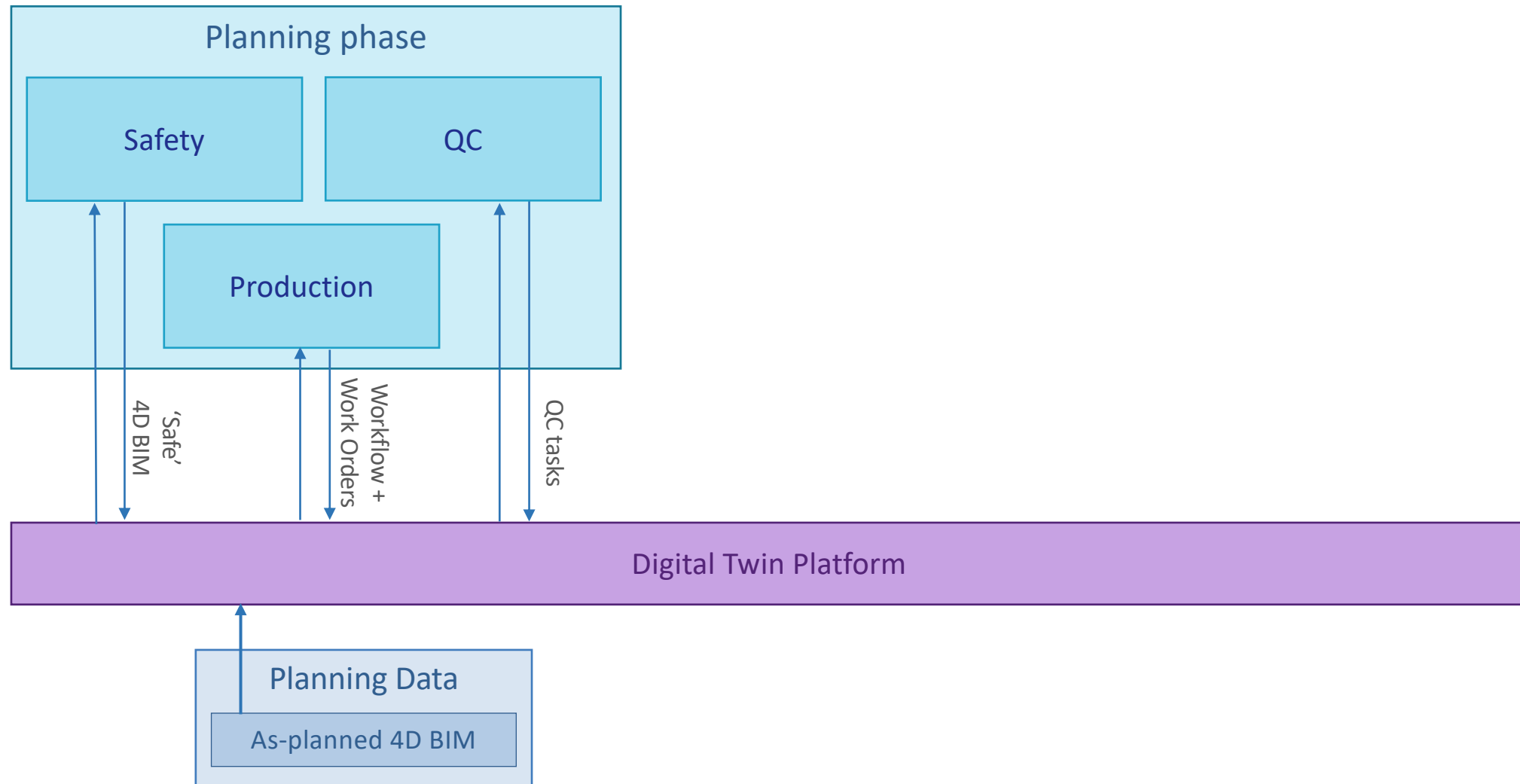
- **Digital 4.0 methodology** encompassing:



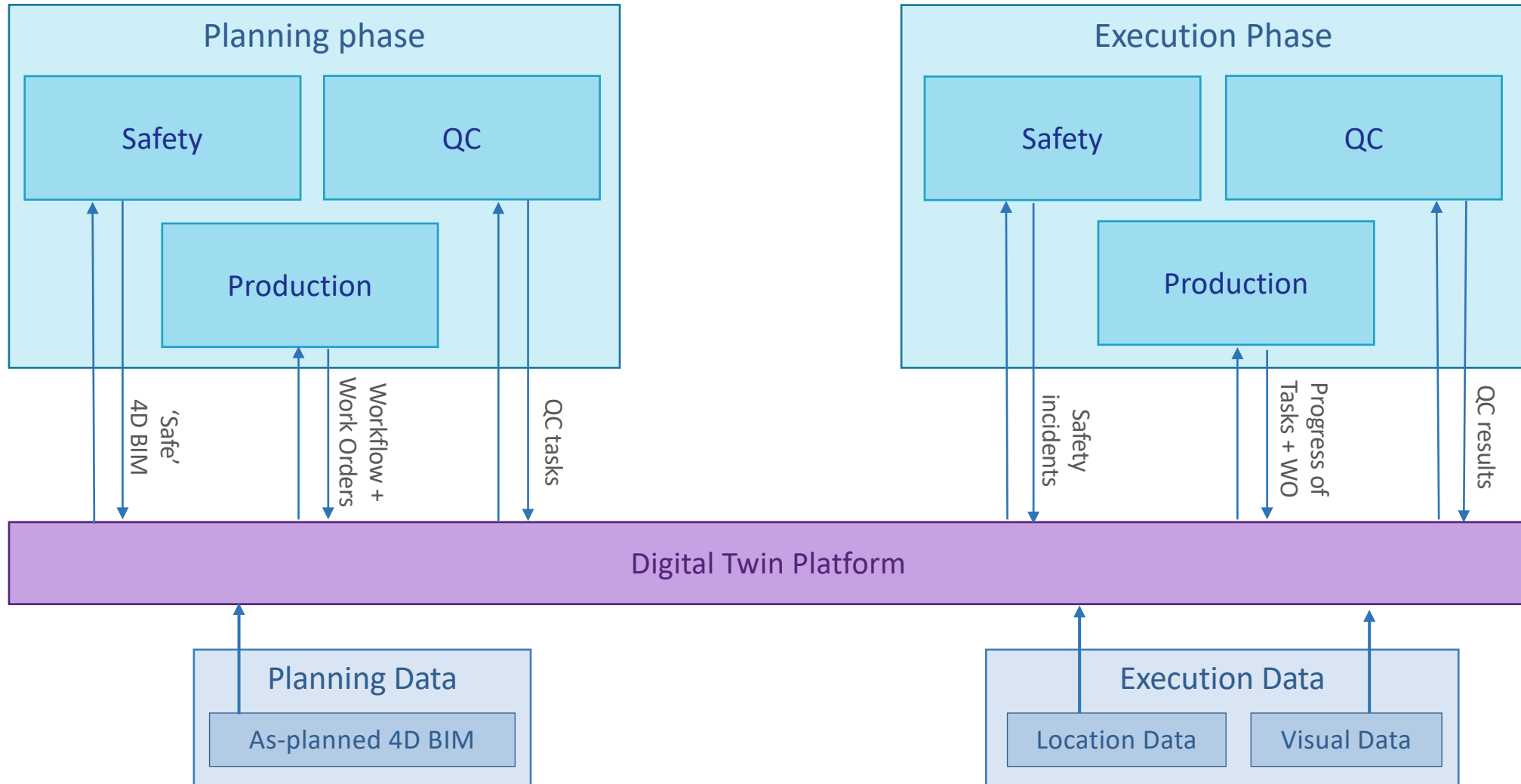
COGITO Solution in a Nutshell

Digital Twin Platform

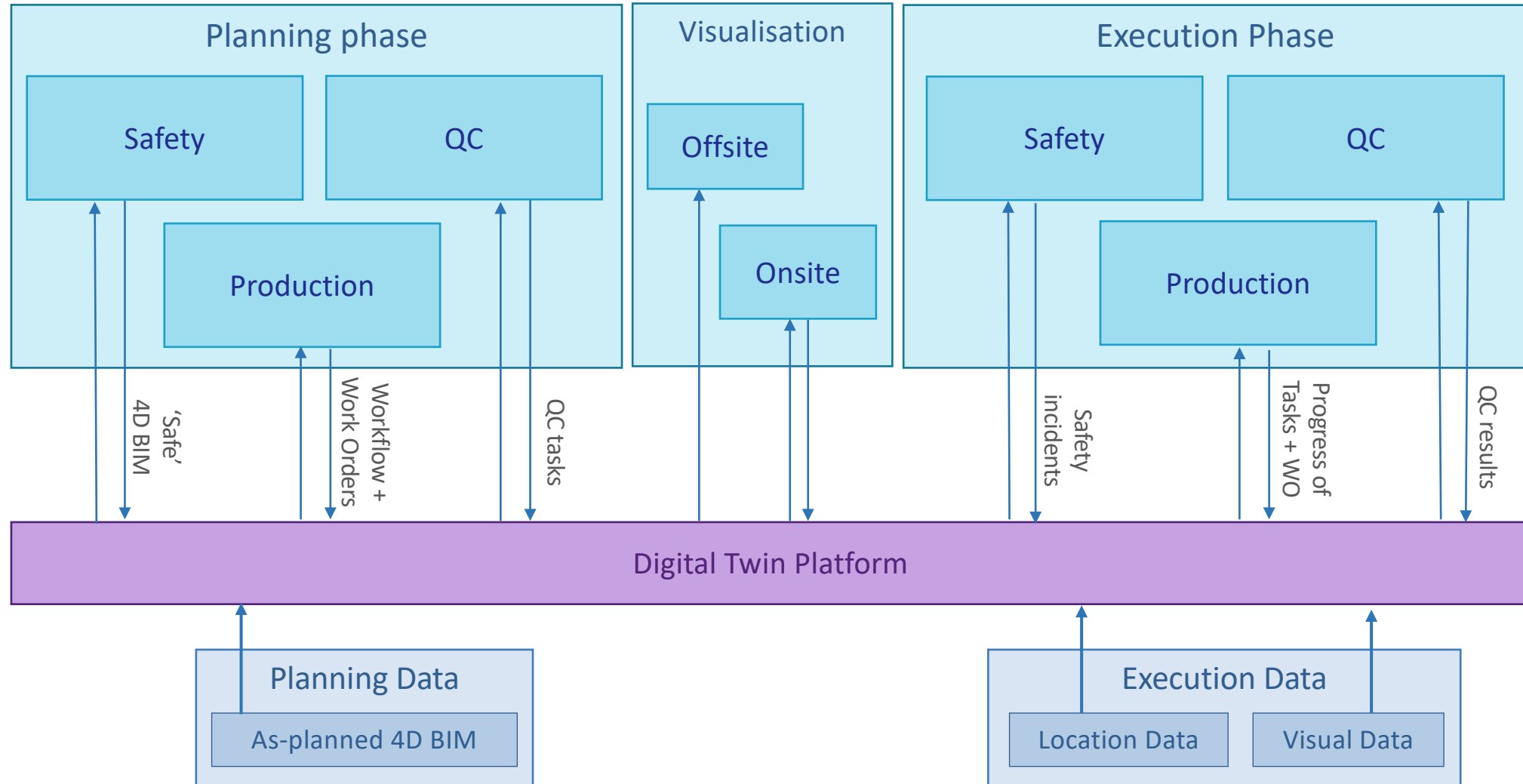
COGITO Solution in a Nutshell



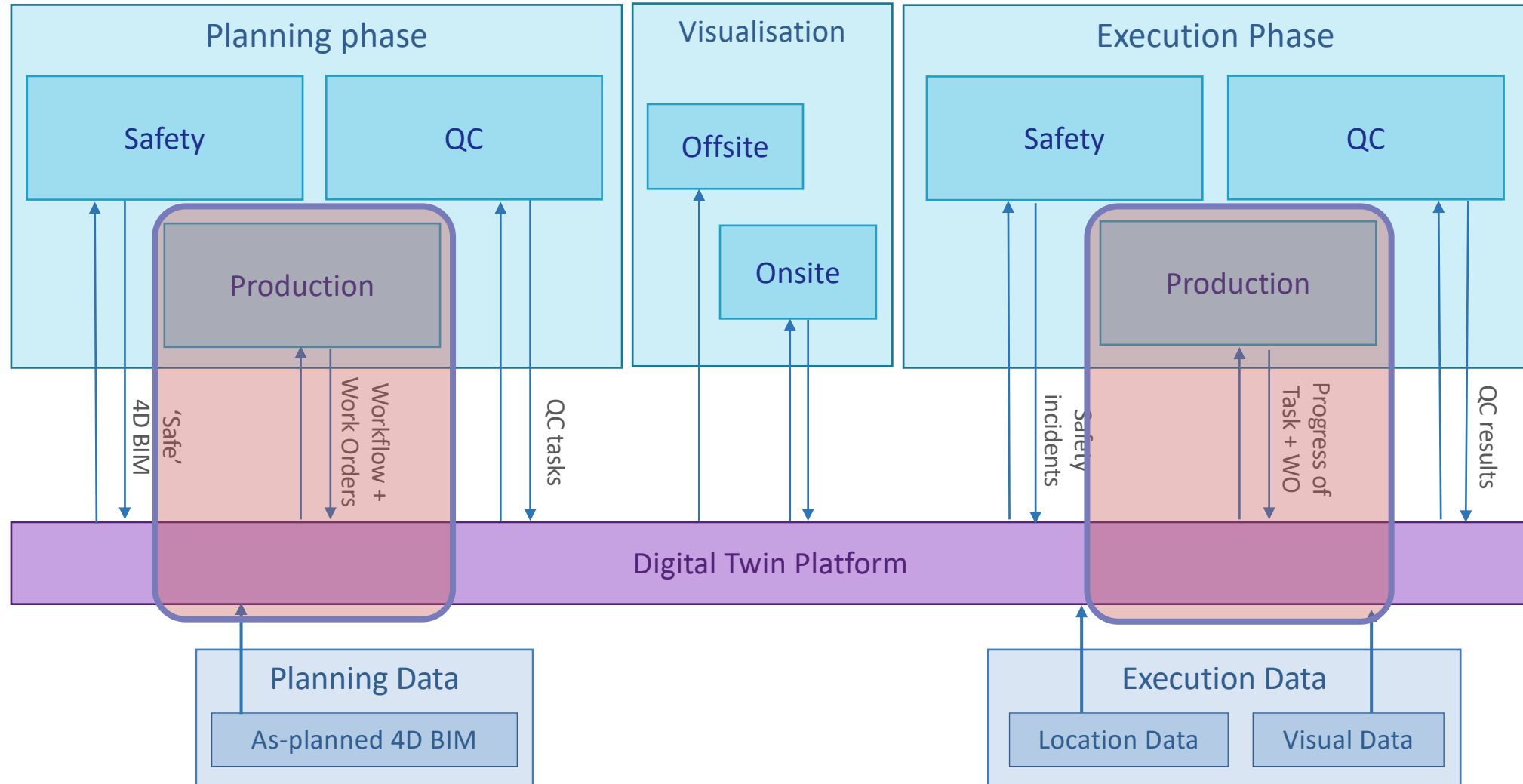
COGITO Solution in a Nutshell



COGITO Solution in a Nutshell



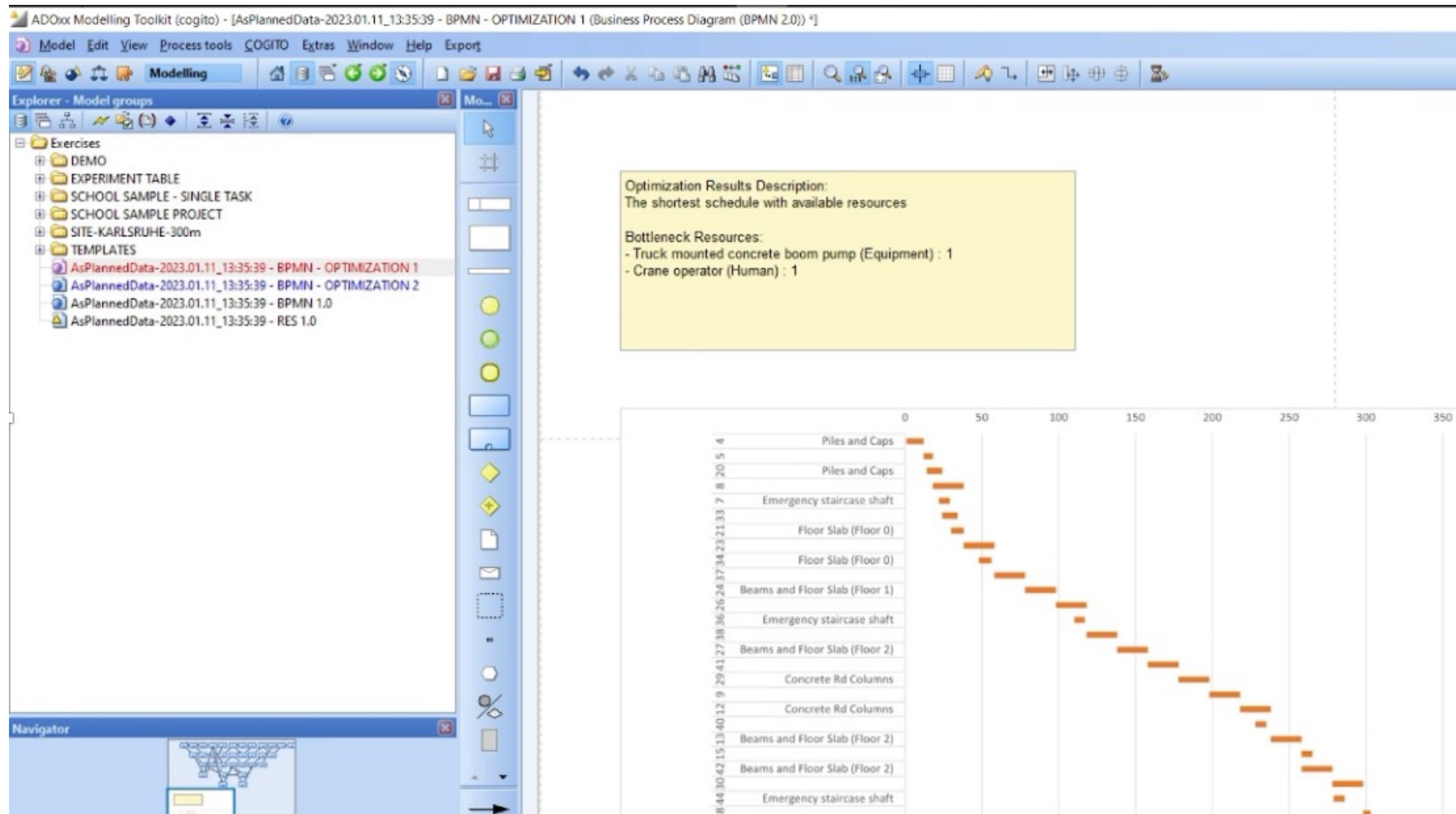
COGITO Solution in a Nutshell



COGITO Solution in a Nutshell



Modelling and Simulation tool (PMS)



COGITO Solution in a Nutshell



Work Order Definition and Monitoring tool (WODM)

I3D Industrial Services Project: School straka@novitechgroup.sk Logout

GENERAL

- Dashboard

WORKFLOW MANAGEMENT

- Project Workflow
- Tasks
- Resources
- Task Groups

WORK ORDER MANAGEMENT

- Work Order
- WDEA Results
- Smart Contracts
- KPIs

SETTINGS

- Users & Providers
- User Roles
- Reports Management

Task List Type to search

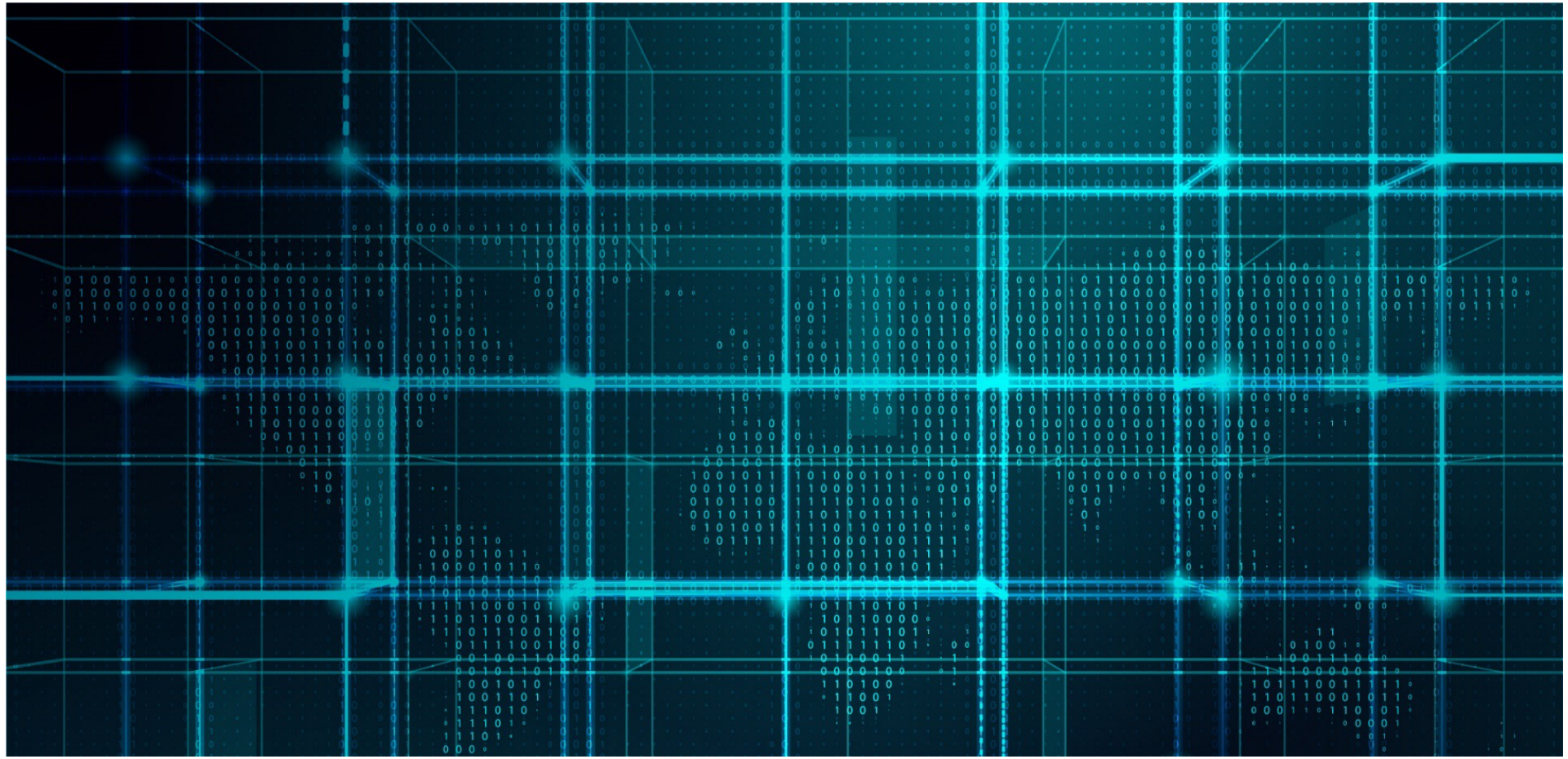
Status: Workflow: Clear

ID	Status	Name	Description	Seq Num	Resources	Planned Time	Step
1	Draft	Concrete Rd Columns - GQC			3 5		
2	Draft	Beams and roof slab - GQC			2 5		
3	Draft	Concrete Rd Columns - VQC			0 3		
4	Draft	Concrete Rd Columns - VQC			2 1		
5	Draft	Pile and Caps - GQC			5 5		
6	Draft	Beams and roof slab - GQC			7 2		
7	Draft	Emergency staircase shaft			2 5		
8	Draft	Concrete Rd Columns			1 2		
9	Draft	Emergency staircase shaft - VQC			0 2		
10	Draft	Beams and Floor Slab (Floor 2)			4 5		
11	Draft	Emergency staircase shaft			5 3		
12	Draft	Concrete Rd Columns			2 5		
13	Draft	Beams and Roof Slab			2 5		
14	Draft	Emergency staircase shaft - VQC			6		

COGITO Solution in a Nutshell



SLA Manager & Blockchain Smart Contract



COGITO Solution in a Nutshell



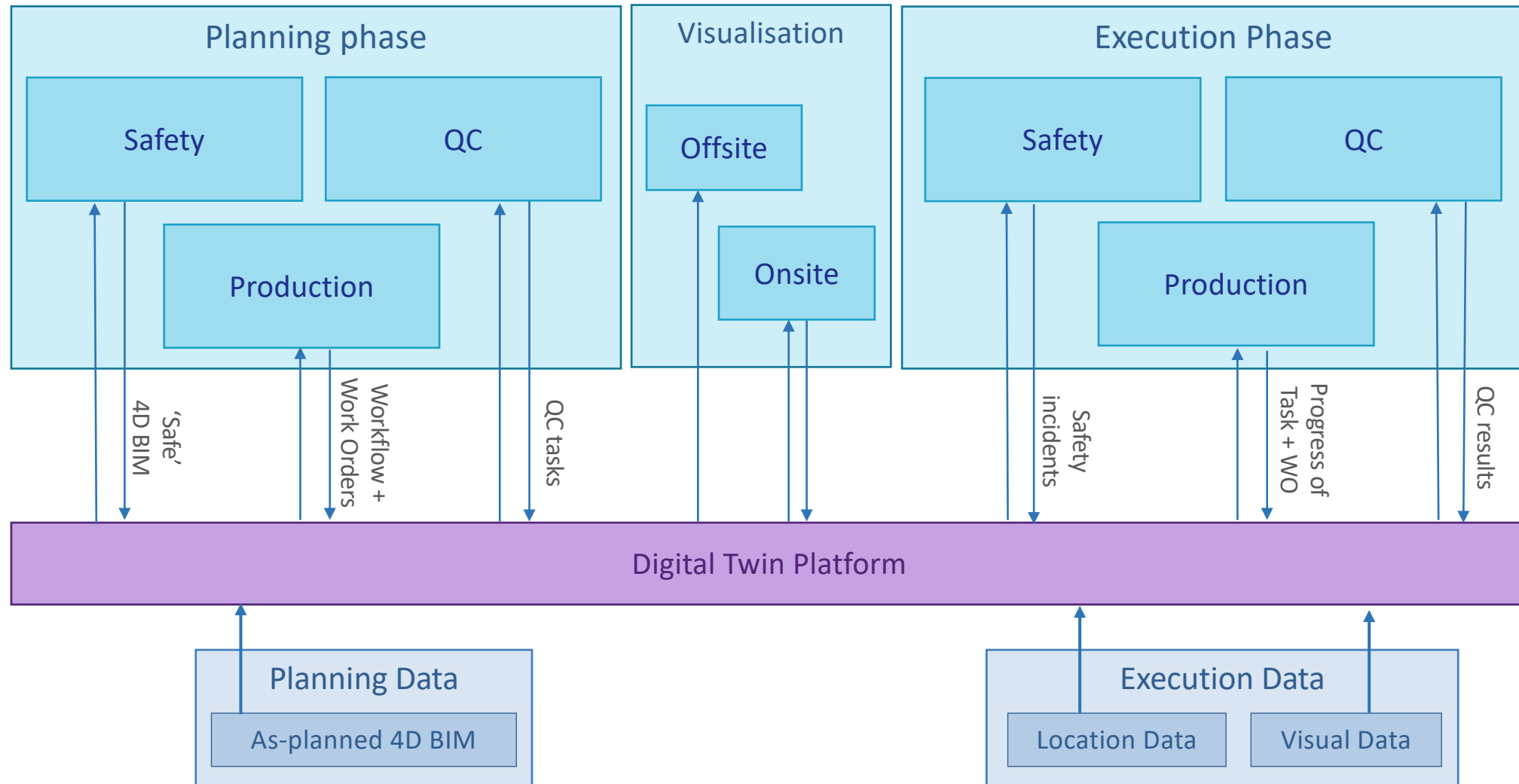
Work Order Execution Assistance tool (WOEa)



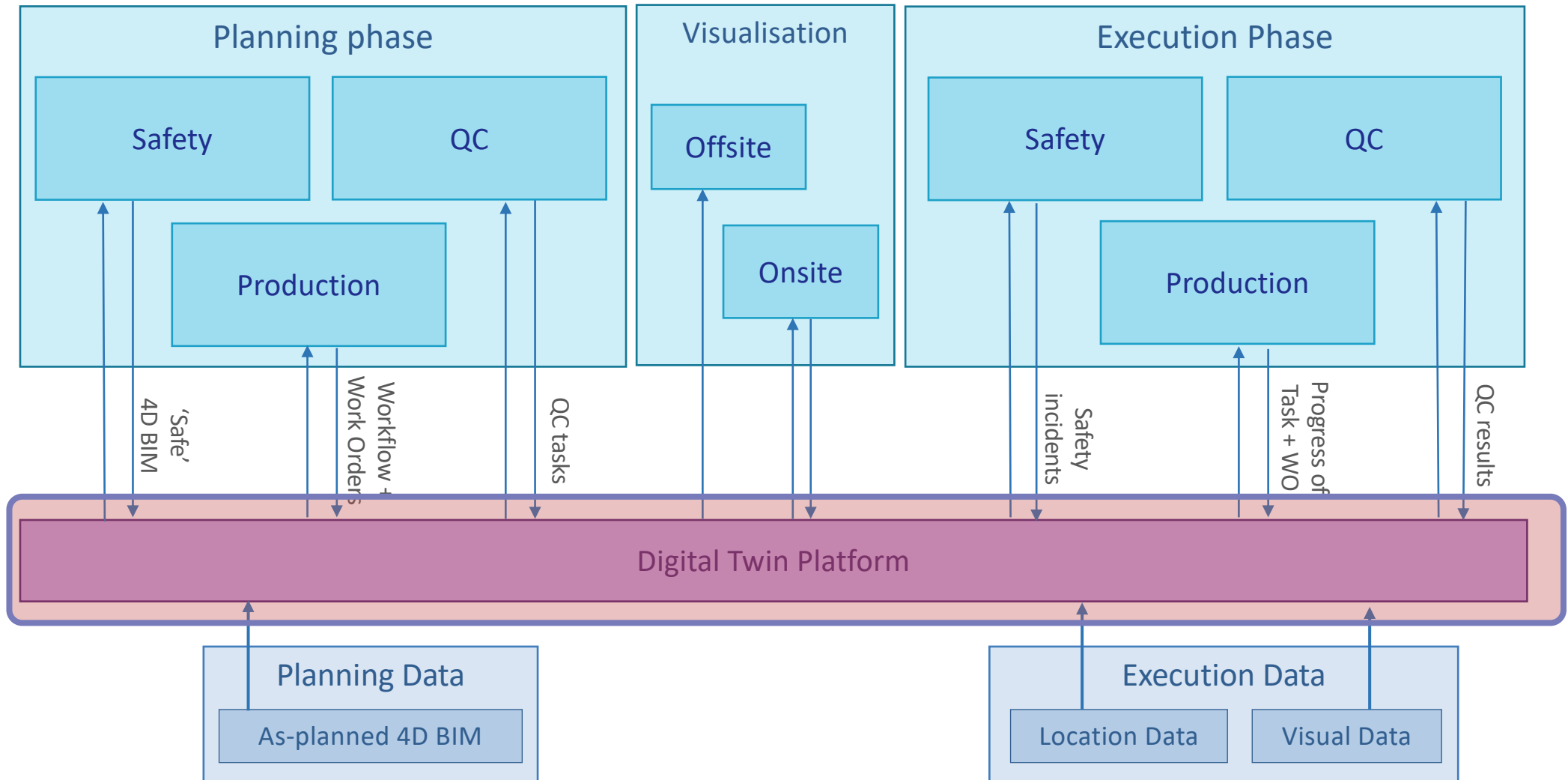
Execution Menu ☁ 🔔 Options ☰

 Back	 Notifications	 Pause Action	 Stop Action	 Previous Step	 Previous Action
 Action Details	 Next Action	 Next Step	 Action Selection	 Take Photo	 Record Video
 Record Voice	 Call	 Gallery	 Settings	 Help	 Exit Work Order

COGITO Solution in a Nutshell



COGITO Solution in a Nutshell



Ontology Network



- Relevant information domains:



Product

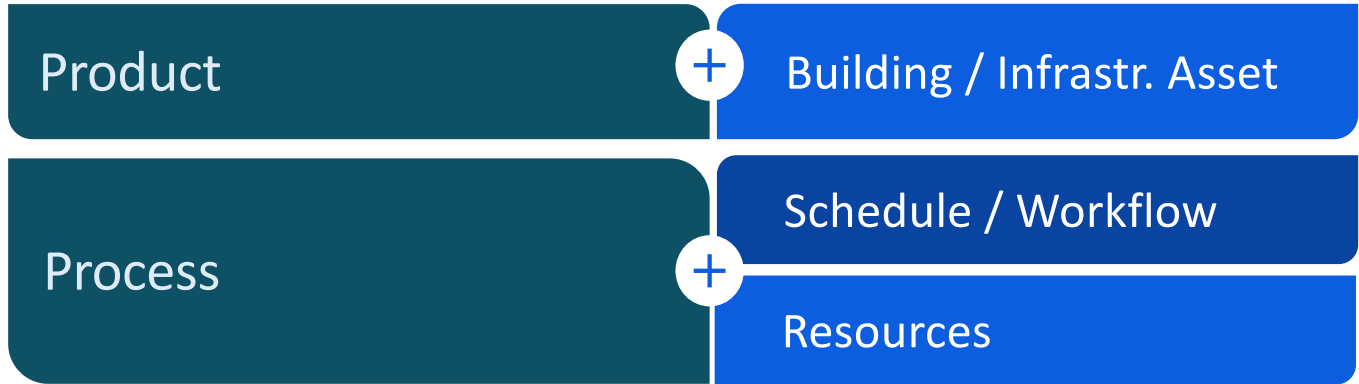


Building / Infrastr. Asset

Ontology Network



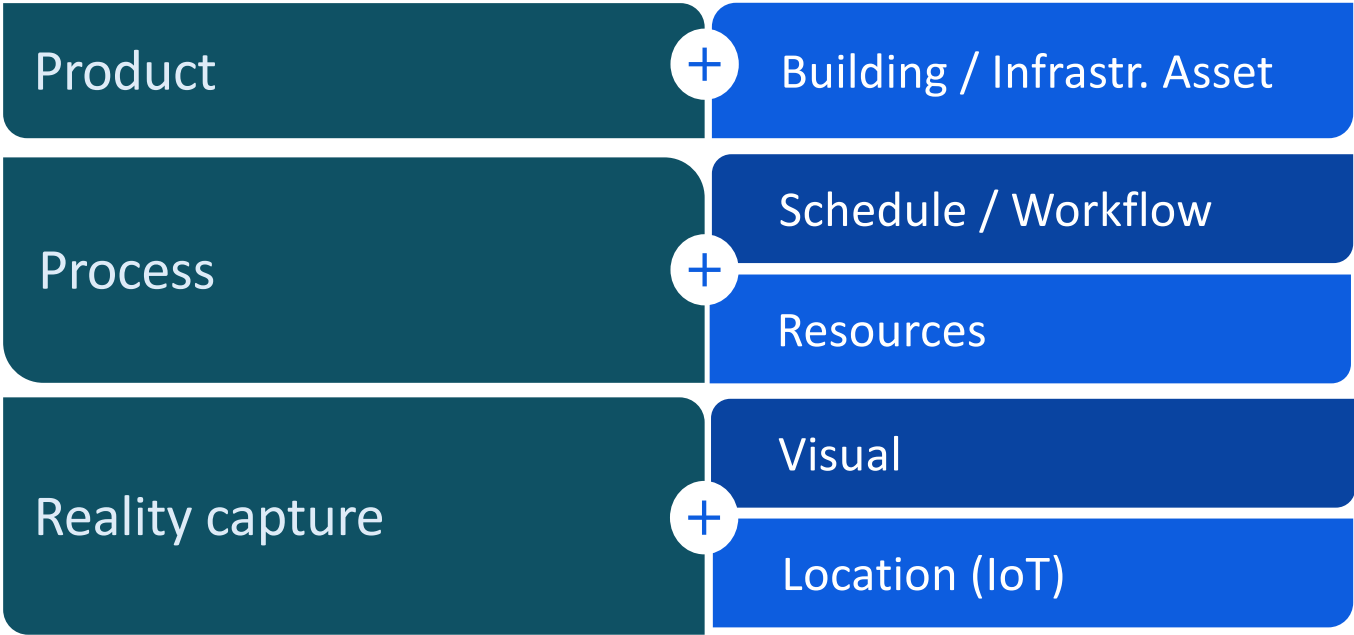
- Relevant information domains:



Ontology Network



- Relevant information domains:



Ontology Network



- Relevant information domains:



Product



Building / Infrastr. Asset

Process



Schedule / Workflow

Resources

Reality capture



Visual

Location (IoT)

Applications
(Use Cases)



Workflow

Health & Safety

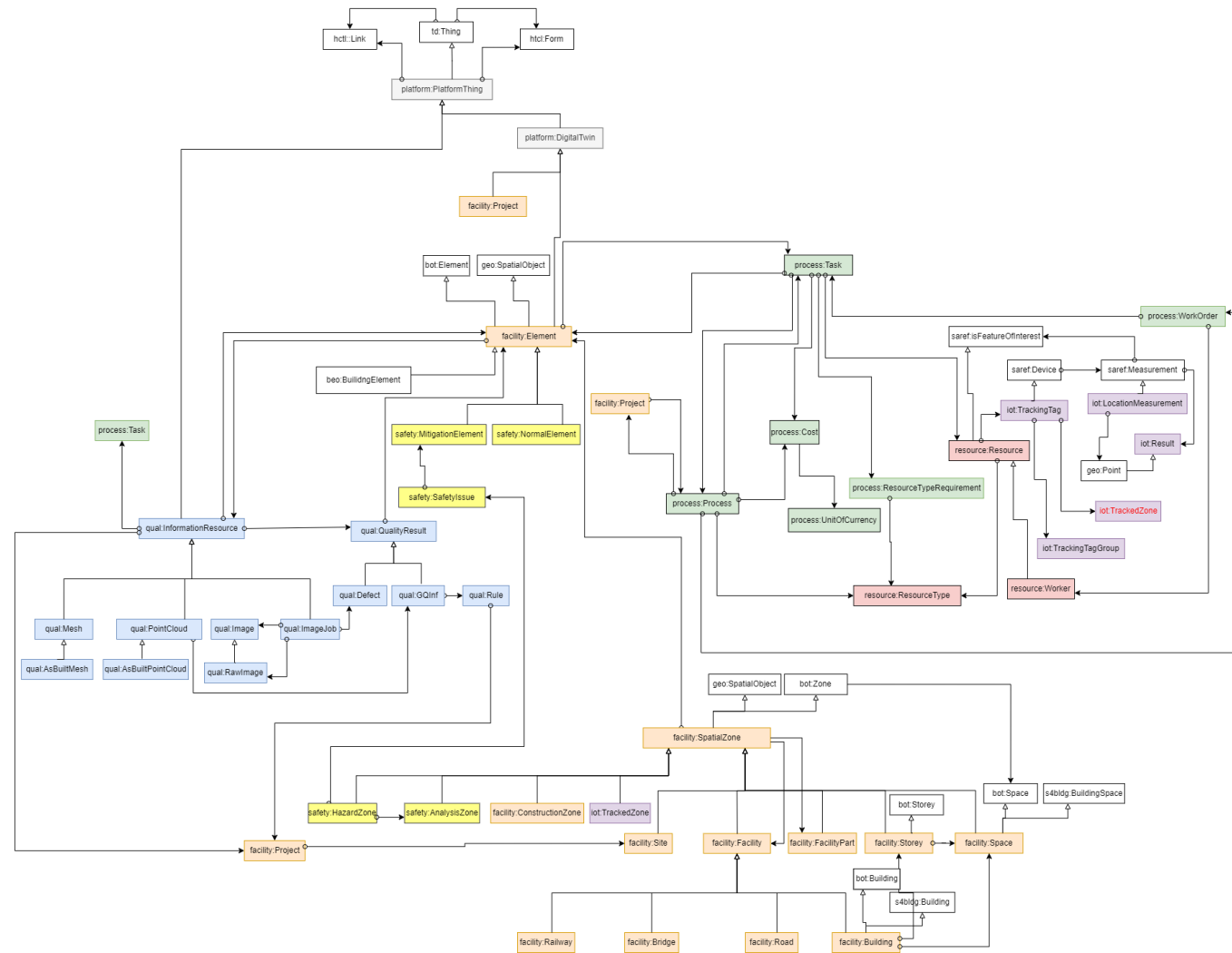
Quality Control

Ontology Network (as of April 23)



• 7 Ontology Modules:

- Product:
 - Facility (orange)
- Process:
 - Workflow (green)
 - Resources (pink)
- Sensing:
 - IoT (purple)
- Applications:
 - Quality (blue)
 - Safety (yellow)



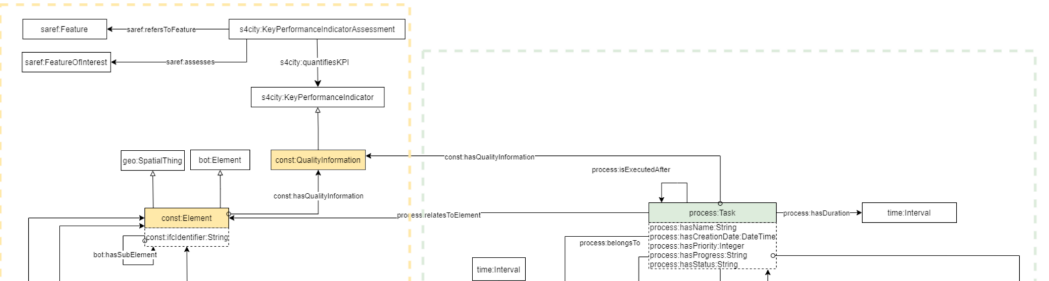
Ontology Network (as of April 23)

Ontologies Ontology testing

COGITO

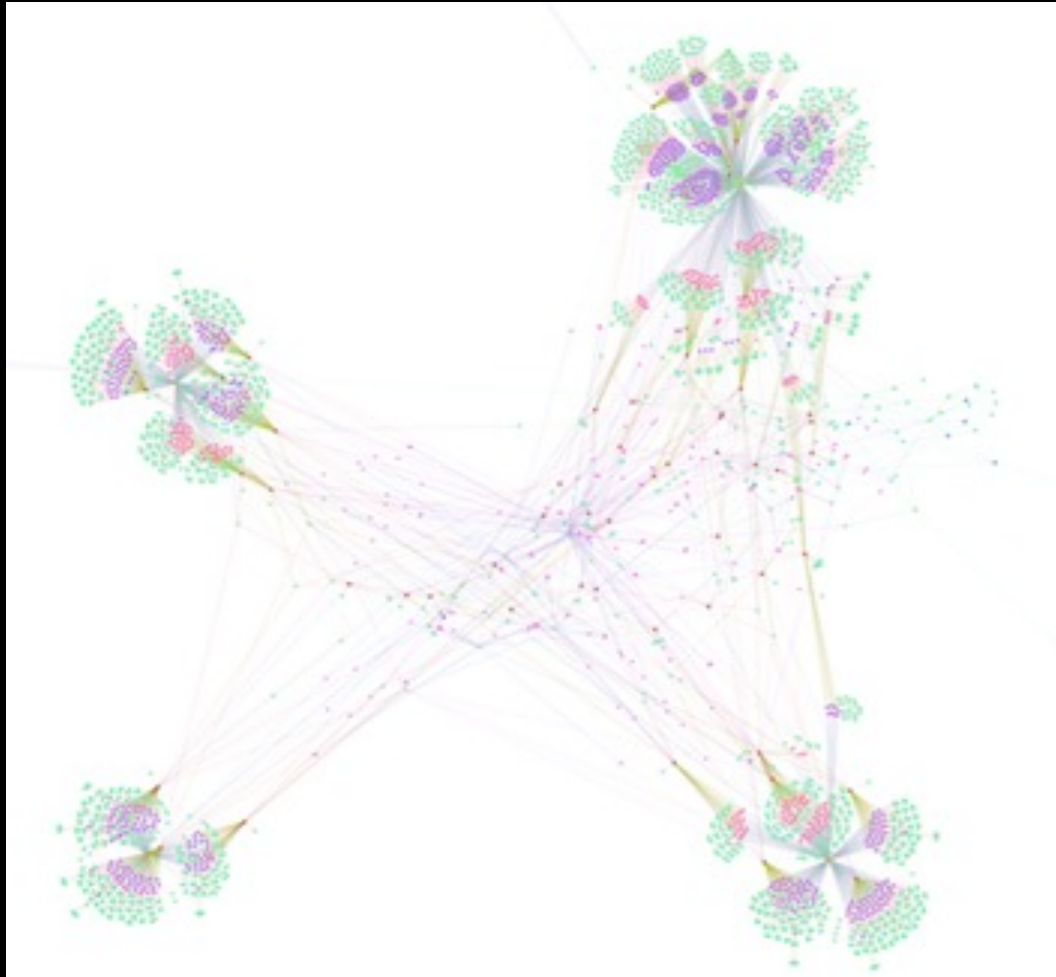
Here you can find the list of ontologies developed for COGITO project
If you want to contribute developing ontologies please follow the [guidelines](#) we provide

Ontology	Description	Requirements	Repository	Issue tracker	Releases
COGITO Process ontology	This ontology aims to model the construction process in the COGITO ontology	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Facility ontology	This ontology aims to model the construction data exchanges in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Resources ontology	This ontology aims to model the resources in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases
COGITO Quality ontology	This ontology aims to model the construction quality domain in the COGITO project	Ontology Requirements	Ontology Repository	Ontology Issue Tracker	Ontology Releases

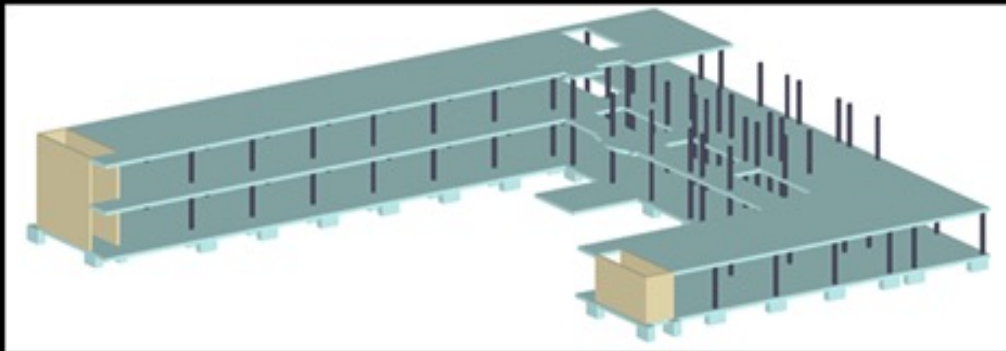
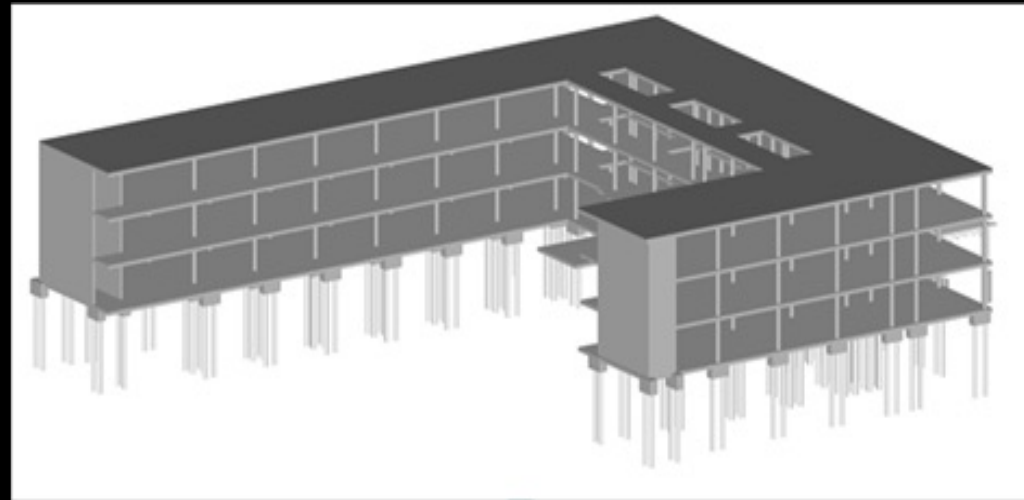


<https://cogito.iot.linkeddata.es/>

Knowledge Graph

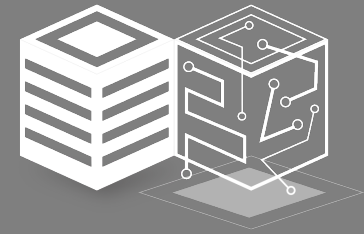


Visual representation of the knowledge graph generated by the DT Platform



BIM model generated by DTP's "4Dsnap" BIM query module during runtime

Questions & Answers



COGITO

CONSTRUCTION PHASE
DIGITAL TWIN MODEL

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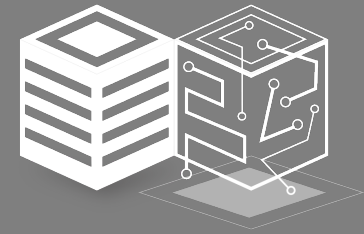
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Digital Tools for Workflow Management PMS Toolkit

Damiano Falcioni

BOC-AG



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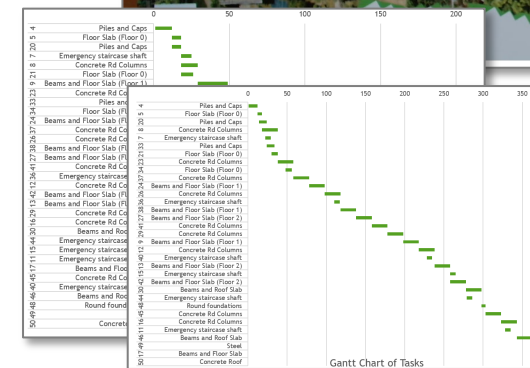
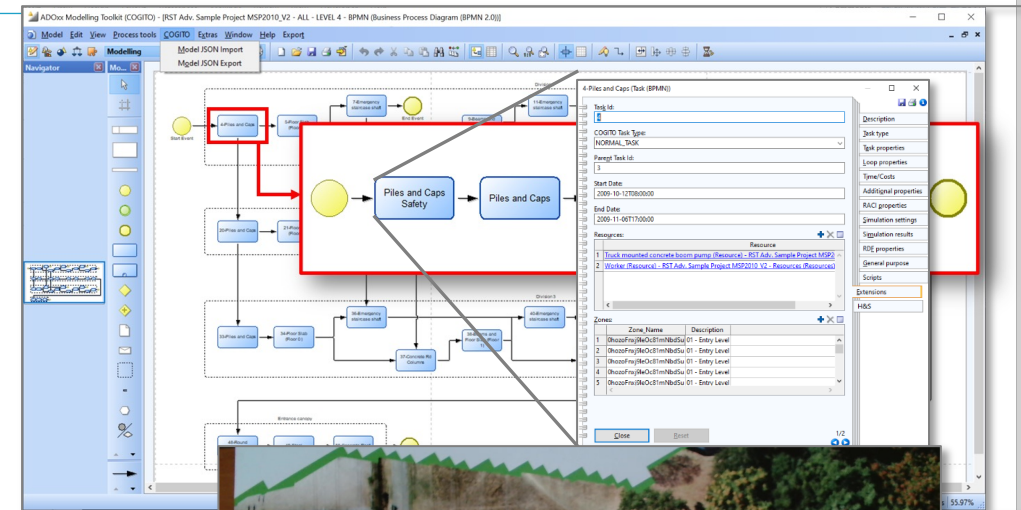


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PMS in a nutshell

- PMS – Process Modelling and Simulation
- Collaborative reasoning on use case and requirements
- Refinement of scheduled activities with:
 - Resources needed/available
 - BIM Element
 - Quality control and safety activities
- Identification of optimal schedule where:
 - Tasks can be carried out in parallel
 - Optimal number or resources are allocated
 - Alternative schedules based on user preference are proposed
 - Bottleneck resources are identified
 - Flexibility of each task schedule is calculated
- Validation of the final schedule before execution



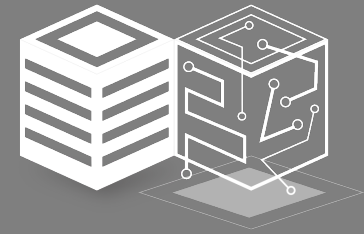
A	B	C	D	E	F
Task ID	Task Name	Start Time	End Time	Duration	
1	4 Piles and Caps	11	11	11	
2	3 Floor Slab (Floor 0)	12	18	6	
3	20 Piles and Caps	12	18	6	
4	7 Emergency staircase shaft	18	23	7	
5	8 Concrete Rd Columns	18	29	11	
6	21 Floor Slab (Floor 0)	18	29	11	
7	9 Beams and Floor Slab (Floor 1)	29	49	20	
8	23 Concrete Rd Columns	29	49	20	
9	38 Piles and Caps	31	41	10	
10	24 Floor Slab (Floor 0)	41	49	8	
11	24 Beams and Floor Slab (Floor 1)	49	69	20	
12	27 Concrete Rd Columns	49	69	20	
13	28 Concrete Rd Columns	69	89	20	
14	28 Beams and Floor Slab (Floor 1)	69	89	20	
15	27 Beams and Floor Slab (Floor 2)	89	109	20	
16	42 Concrete Rd Columns	89	109	20	
17	39 Emergency staircase shaft	99	106	7	
18	22 Concrete Rd Columns	109	129	20	
19	39 Emergency staircase shaft	109	129	20	
20	42 Beams and Floor Slab (Floor 2)	109	129	20	
21	22 Beams and Floor Slab (Floor 2)	129	149	20	
22	29 Concrete Rd Columns	129	149	20	
23	24 Concrete Rd Columns	149	169	20	
24	30 Beams and Roof Slab	149	169	20	
25	44 Emergency staircase shaft	157	164	7	
26	15 Emergency staircase shaft	158	165	7	
27	22 Emergency staircase shaft	159	166	7	
28	17 Beams and Floor Slab	169	189	20	
29	40 Concrete Rd Columns	169	189	20	
30	40 Emergency staircase shaft	186	193	7	
31	46 Beams and Roof Slab	189	209	20	
32	48 Round Foundations	189	194	5	
33	48 Round Foundations	194	195	1	
34	50 Concrete Roof	195	200	5	

Digital Tools for Workflow Management

WODM

Martin Straka

NT



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CONSTRUCTION PHASE
DIGITAL TWIN MODEL

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WODM in a nutshell

Work Order Definition and Monitoring tool

- WODM is a tool providing:
 - service to create executable work processes based on PMS-generated workflows imported from DTP
 - service to assign resources to tasks
 - service to create SLAs with assigned KPIs and tasks
 - service to execute workorders and follow changes provided by PMS
- WODM has a UI providing:
 - Assigning of resources to tasks
 - Definition of SLAs and KPIs for tasks
 - Overview of the task and work order progress
 - Reporting of workorder results and captured multimedia



Work Order Definition and Monitoring tool

Name or Email

Password

[Developer Access](#)

Human Resources List

Type to search human

ID	Name	Tag
1	Worker	c87541be-e1b8-4122-be14-1ba44807d3e5
2	Finisher	108cd97a-3028-4cde-b0e0-a5e30ba6078b
3	Surveyor	
4	Welder	
5	Foreman	

1/1

[Previous](#) [Next page](#)

Equipment Resources List

Type to search equipment

ID	Name	Tag
1	Dump truck	
2	Excavator	
3	Truck mounted crane	
4	Concrete vibrator machine	ab1163a2-2f70-436f-a366-61d4b010a798
5	Concrete mixer truck	ec774843-17e6-48e9-a05f-53a947dd1b81

30

Workorder [Details](#) [Related Task List](#) [Flow Diagram](#) [Result Multimedia](#) [Saved Reports](#)

[Print workorder report](#) [Full](#) [Export JSON](#) [To running](#) [Back](#)

Workflow
 WFL Adv. Sample Project MSP2010_V2 Workflow ID: 9
 RST Adv. Sample Project MSP2010_V2 - ALL - LEVEL 4 - extended

Workorder code **Workorder name** **State** **Workorder ID**
 WO_CGT_02 Test:WOL_Cogito_School Project_02 Completed 13

Description
 Test:Cogito School Project WO_02

Workorder owner **Main provider** **Main device**
 CogitoUser: CogitoUser CogitoUser: CogitoUser RW HMT-1

Planned start **Planned end** **Actual start** **Actual end**
 2022-07-07 01:37 2022-07-08 01:37 2022-07-07 01:42:43 2022-11-17 09:52:55

Notify relevant users after creation?

Task List [?](#)

Status: no filter **Workflow:** W-9 WFL Adv. Sample Project MSP2010_V2 [Clear](#)

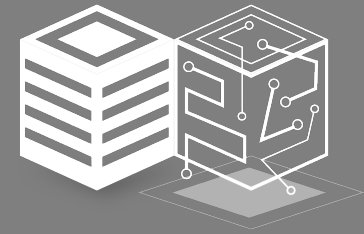
ID	Status	Name	Description
48	Draft	Piles and Caps	Prepare area for installation and check distance
49	Draft	Floor Slab (Floor 0)	Install floor slab No.15
50	Draft	Emergency staircase shaft	
51	Draft	Concrete Rd Columns	
52	Draft	Beams and Floor Slab (Floor 1)	



Digital Tools for Workflow Management

BCSC

Dr. Panagiotis Moraitis
QUE



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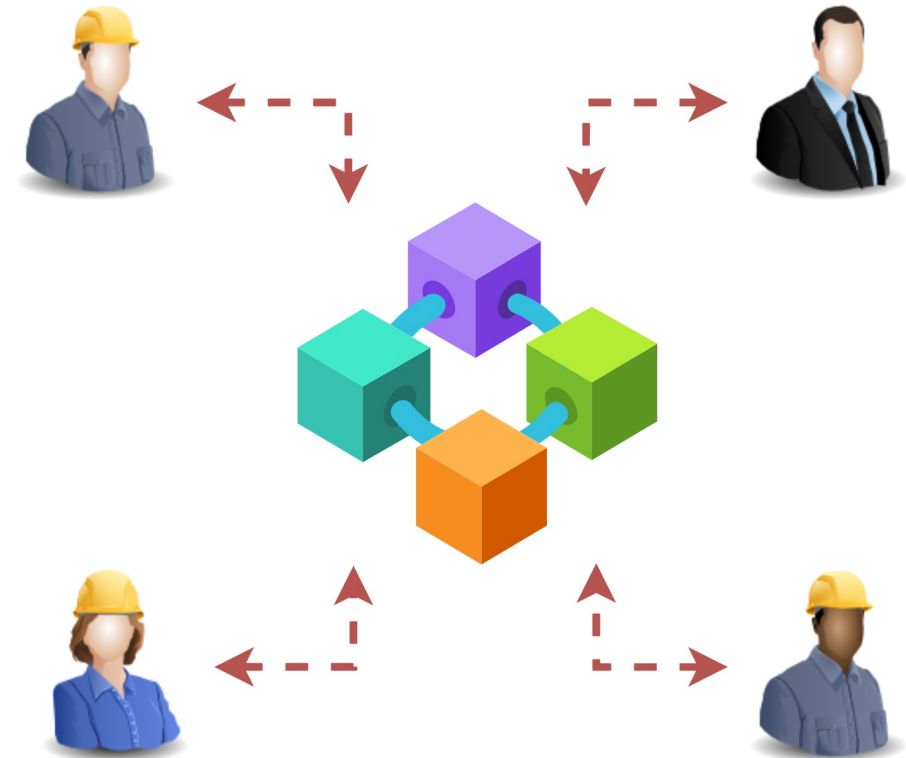


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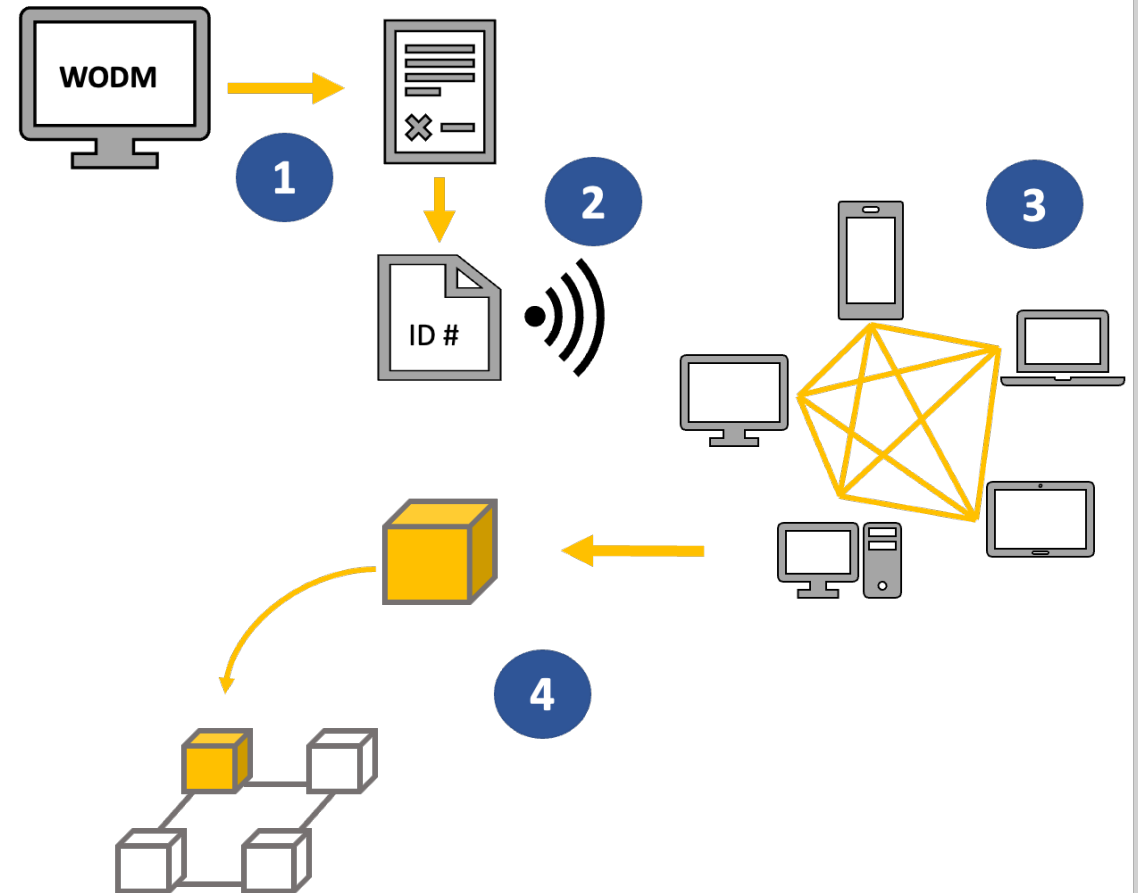
Blockchain Platform in COGITO

- Blockchain and Smart Contracts can be utilized to **enhance transparency** and provide the **trusted means** to verify the completion of construction tasks.
- It will communicate progress information securely and reliably and it will act as a **single source of truth** in order **to reduce the trust gap** between the involved stakeholders.
- From a **technical point of view**, this approach offers an outstanding advantage in terms of **security**.
- It will **simplify** and **speed up** timely procedures reducing delays and potential conflicts.



Smart Contracts in a nutshell

- SLAM – Service Level Agreement Manager
- BCSC – Blockchain – Smart Contracts
- A tool that provides measurable and quantifiable KPIs to the WODM.
- Translates Work Orders to Smart Contract ready SLAs and deploys them on a Blockchain Network.
- Receives updated KPI values that monitor the progress of each task registered with the specific Work Order.
- Stores these values on the Blockchain and calculates the overall SLA performance.



Achieved so far

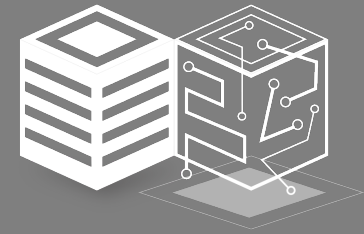
- A set of **predefined, measurable** and **quantifiable** KPIs to enhance transparency and provide the **trusted means** to verify the completion of the construction tasks.
- A Data Model that bundles together **stakeholders, tasks** and **KPIs** into machine readable and smart contract ready SLAs.
- The **SLA Manager**, the component responsible for organizing and providing the **SLAs** and **KPIs** to the WODM tool.
- **Blockchain and Smart Contract (BC-SC)** platform, the component responsible for running the Blockchain offering a highly secure and tamper proof system to store data.
- **BC-SC** platform provides also Smart Contract functionality to securely and reliably calculate task progress **eliminating the trust gap** between the involved parties.

Digital Tools for Workflow Management

WODM & WOEA

Martin Straka

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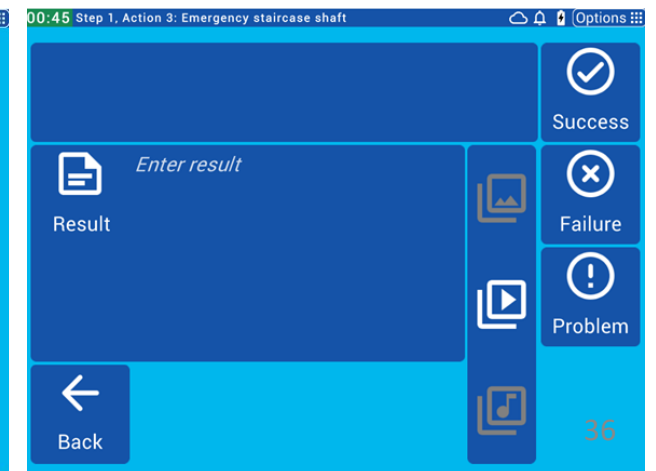
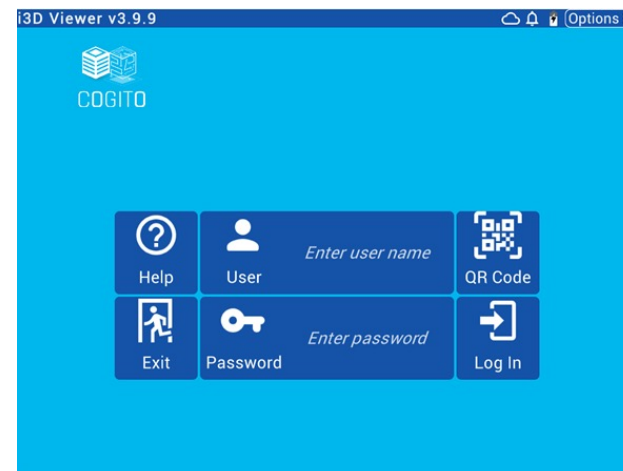
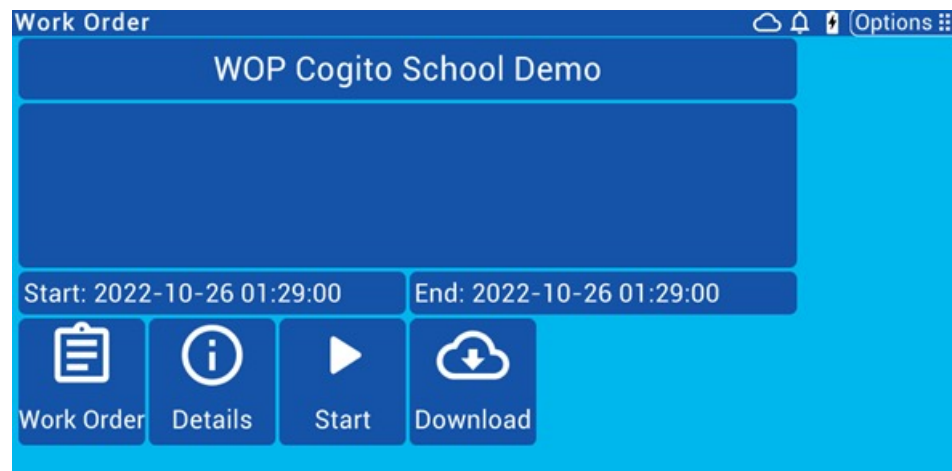
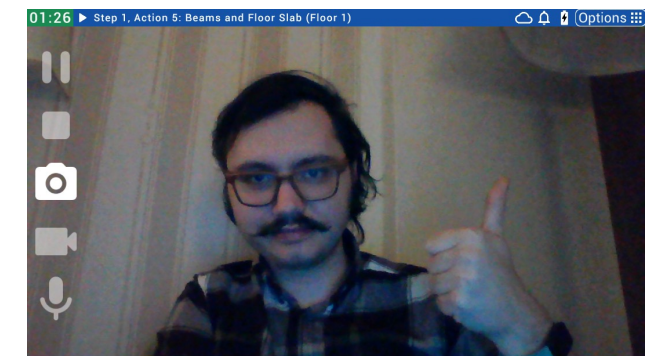
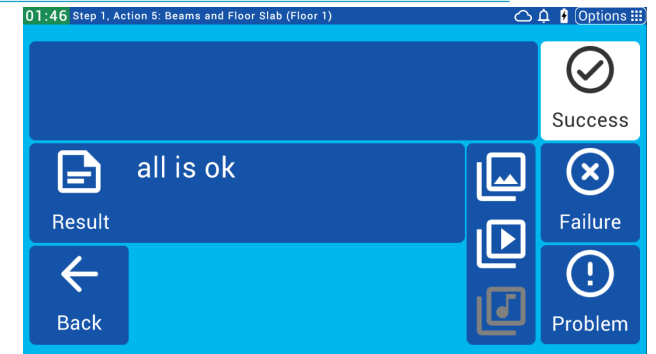
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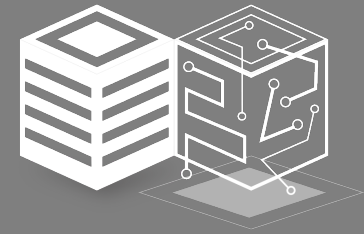
WOEA in a nutshell

Work Order Execution Assistance tool

- WOE is an on-site application for execution of work orders.
- The main users of WOE are workers, Surveyors, and Foremen
- The application is available for android devices, for best results smart glasses like Realwear HMT-1 are preferred.
- Application guides users to execute and report tasks in work orders and provides these results to WODM including any captured pictures, voice records and videos.



Questions & Answers



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Poll



Join at slido.com
Code: 3751094

Project website: cogito-project.eu



LinkedIn: [Cogito-project](https://www.linkedin.com/company/cogito-project)



Twitter: [@cogito_project](https://twitter.com/cogito_project)



Facebook: [Cogito](https://www.facebook.com/Cogito)



YouTube: [@COGITO_project](https://www.youtube.com/@COGITO_project)

Thank you!

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