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international symposium

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Using the Cognition Platform for the SE of a Local Health Care System in Cameroon

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- Project context
- Mahola system (concept models)
- Data model (using the Cockpit Platform)
- Configuring Cockpit for Mahola
- Activities in Cockpit
- Example data (needs, requirements, architecture, V&V and ROM)
- Mahola system (design models)
- Design documents (signed off and published)
- Conclusions
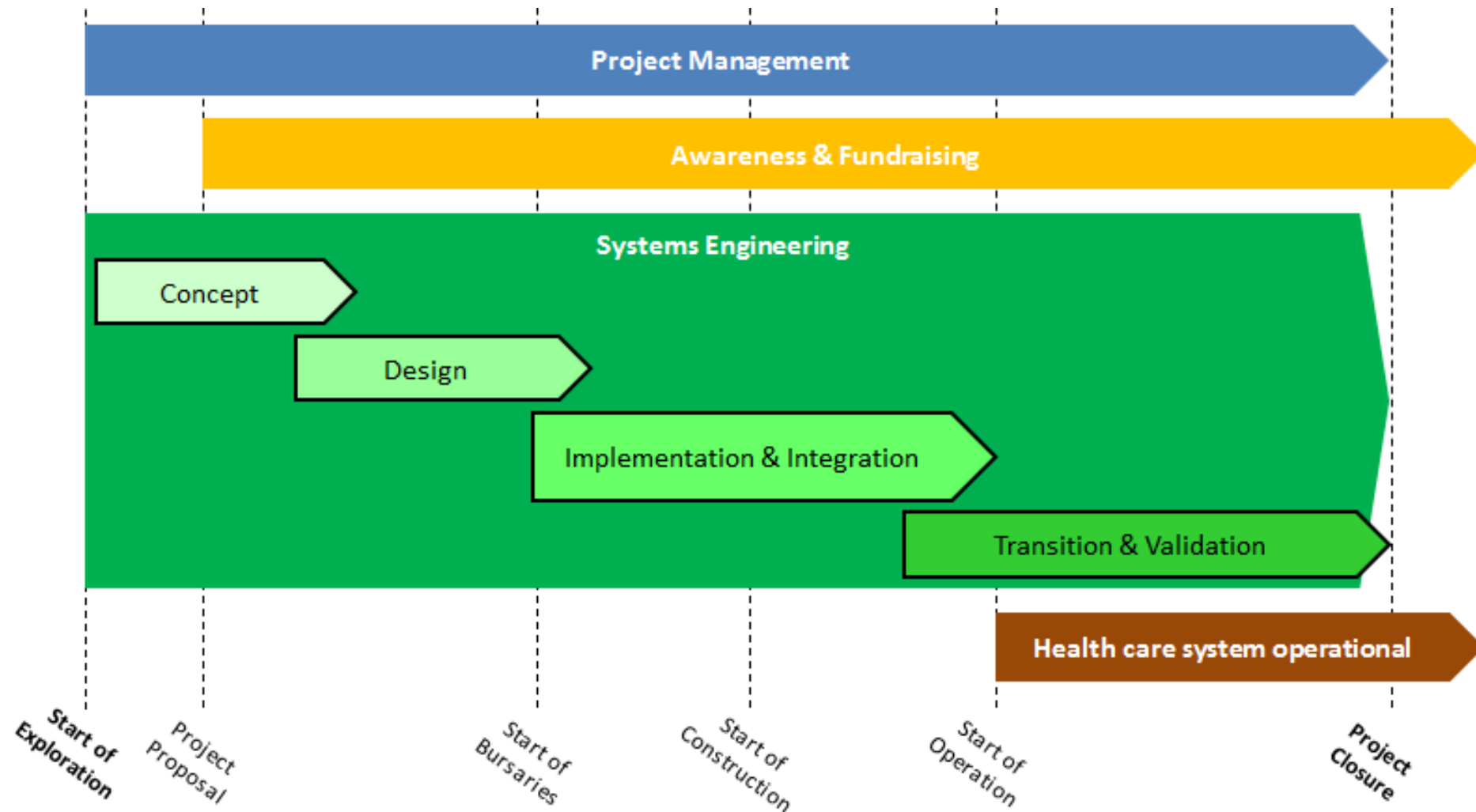
Context of the Mahola Project
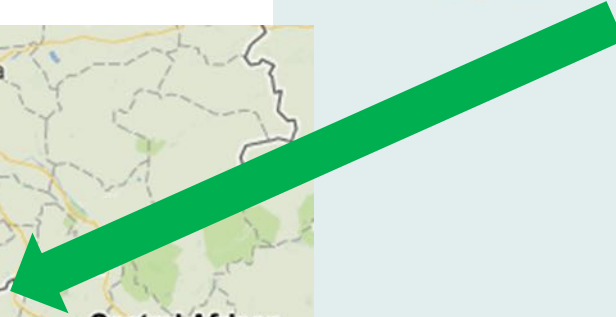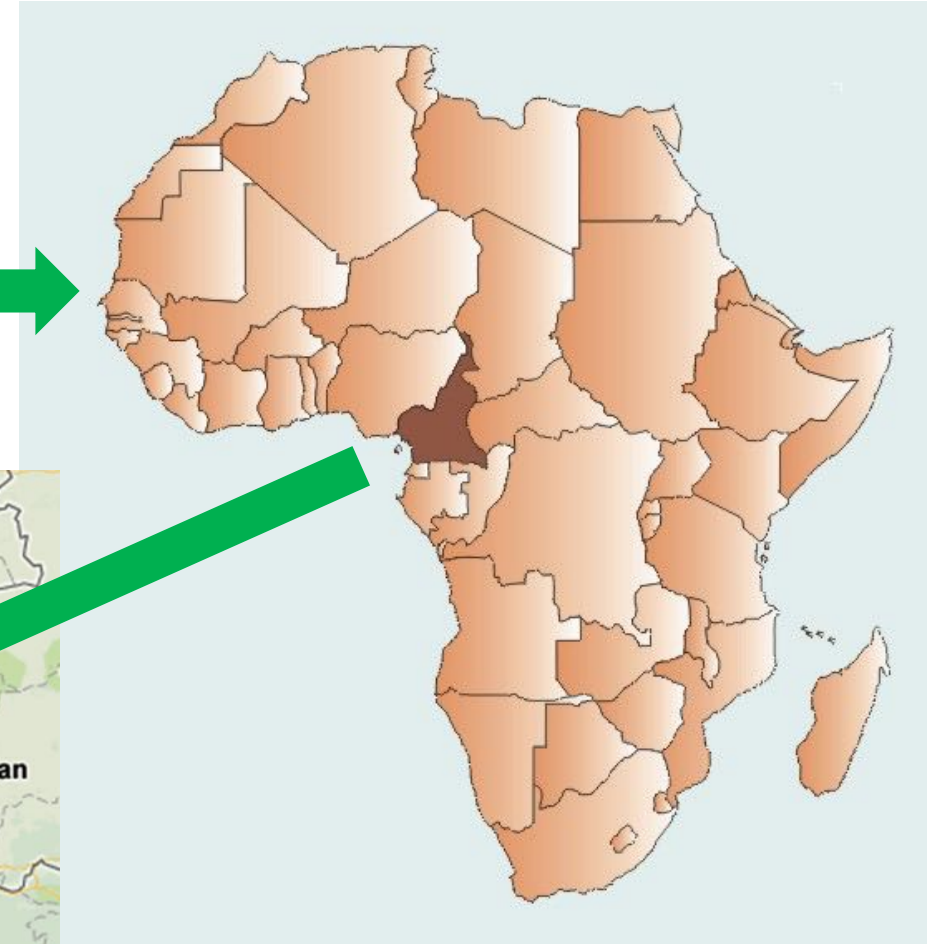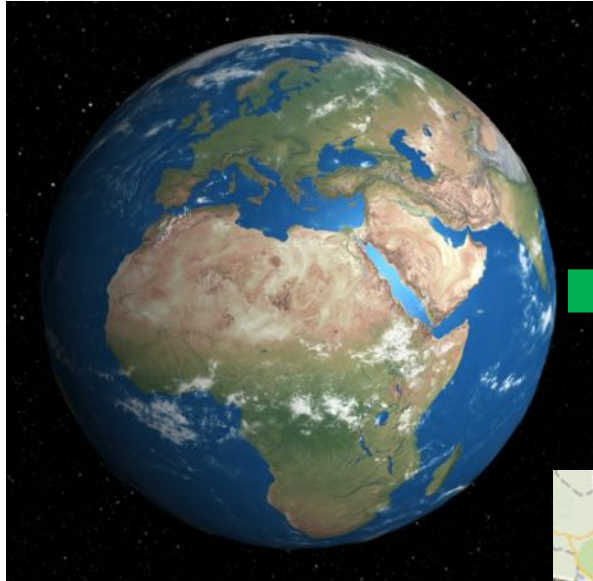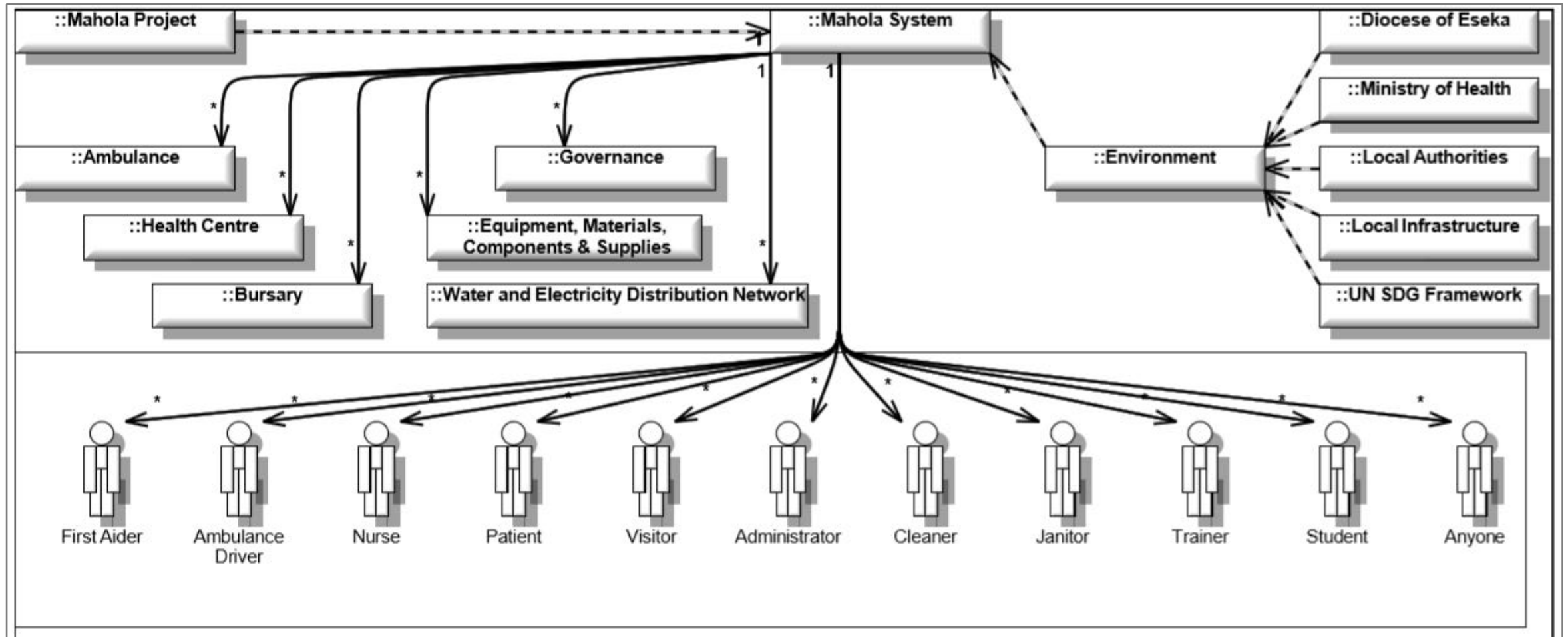
Exploration trip 2013

Mahola Project - Overview

Mahola System – Context Diagram

Mahola System – Class Diagram

Mahola System – Use Case Diagram
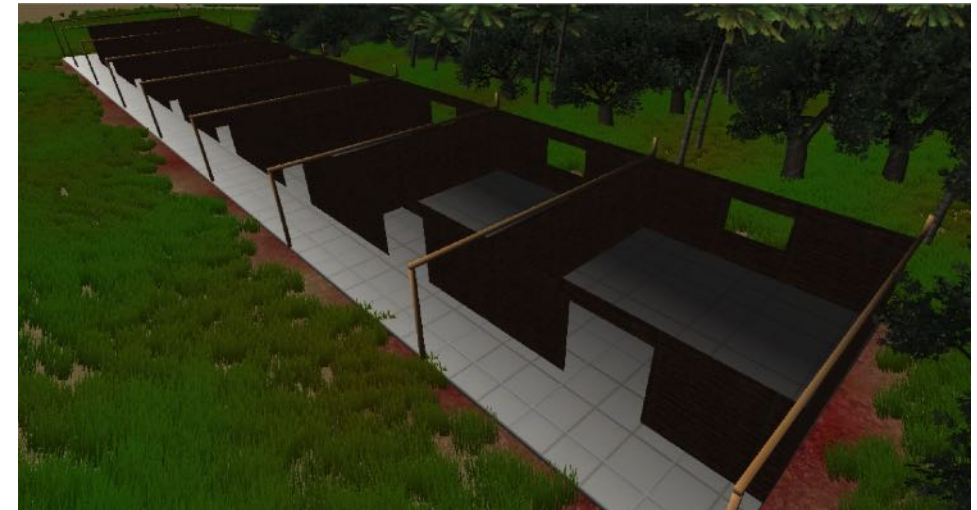

Generic **roles**
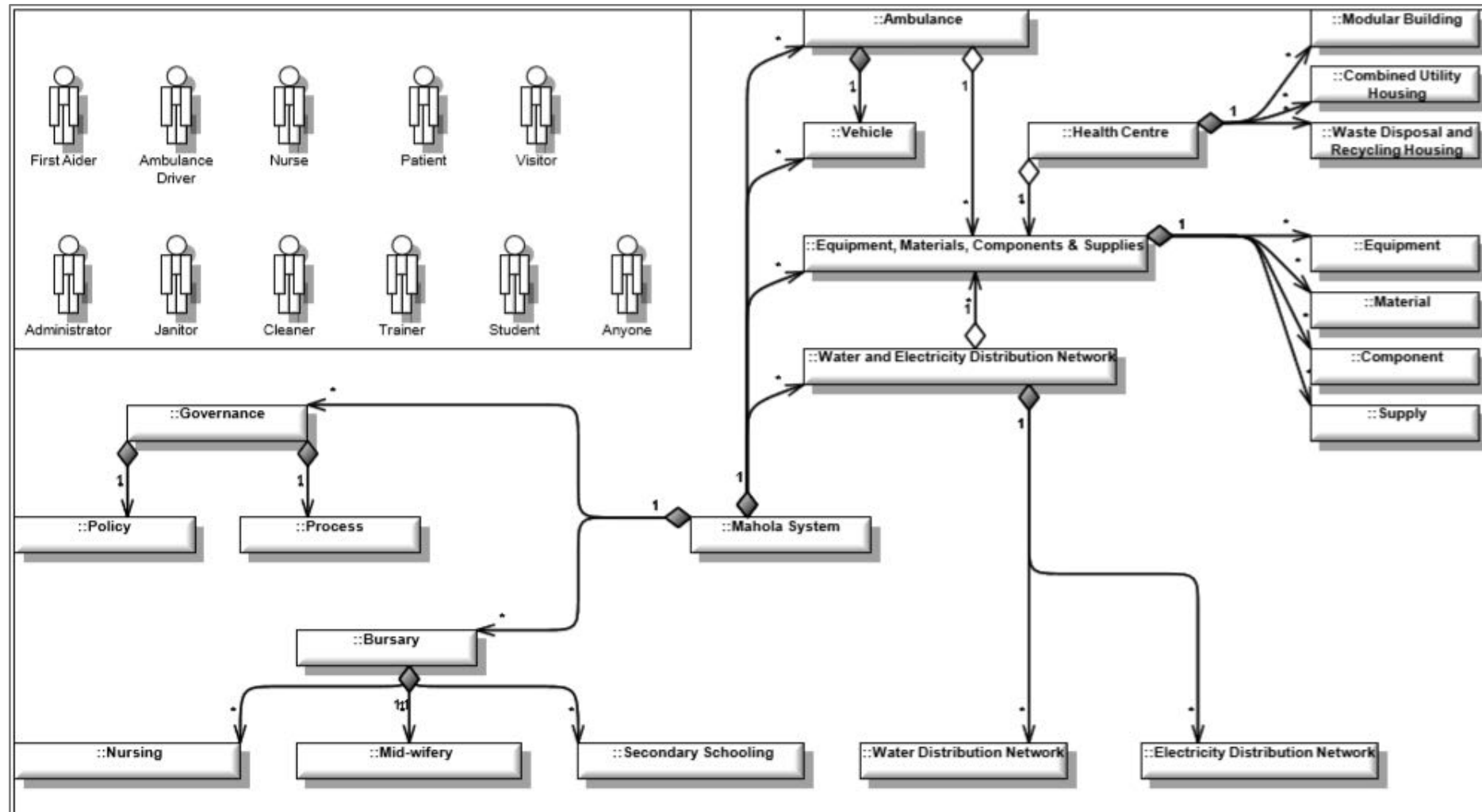
Use cases with *Inclusions* and *Dependencies*

Sequence and/or **Activity** diagrams may be used to further detail use cases

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Concept models
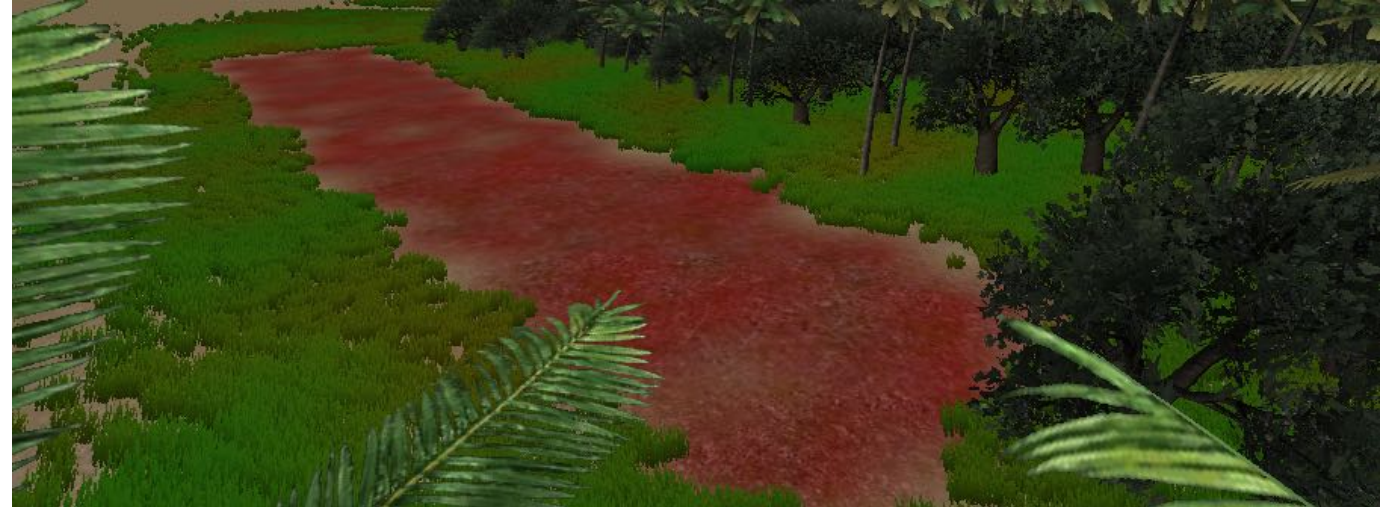
Mahola data model

Using Cockpit for Mahola
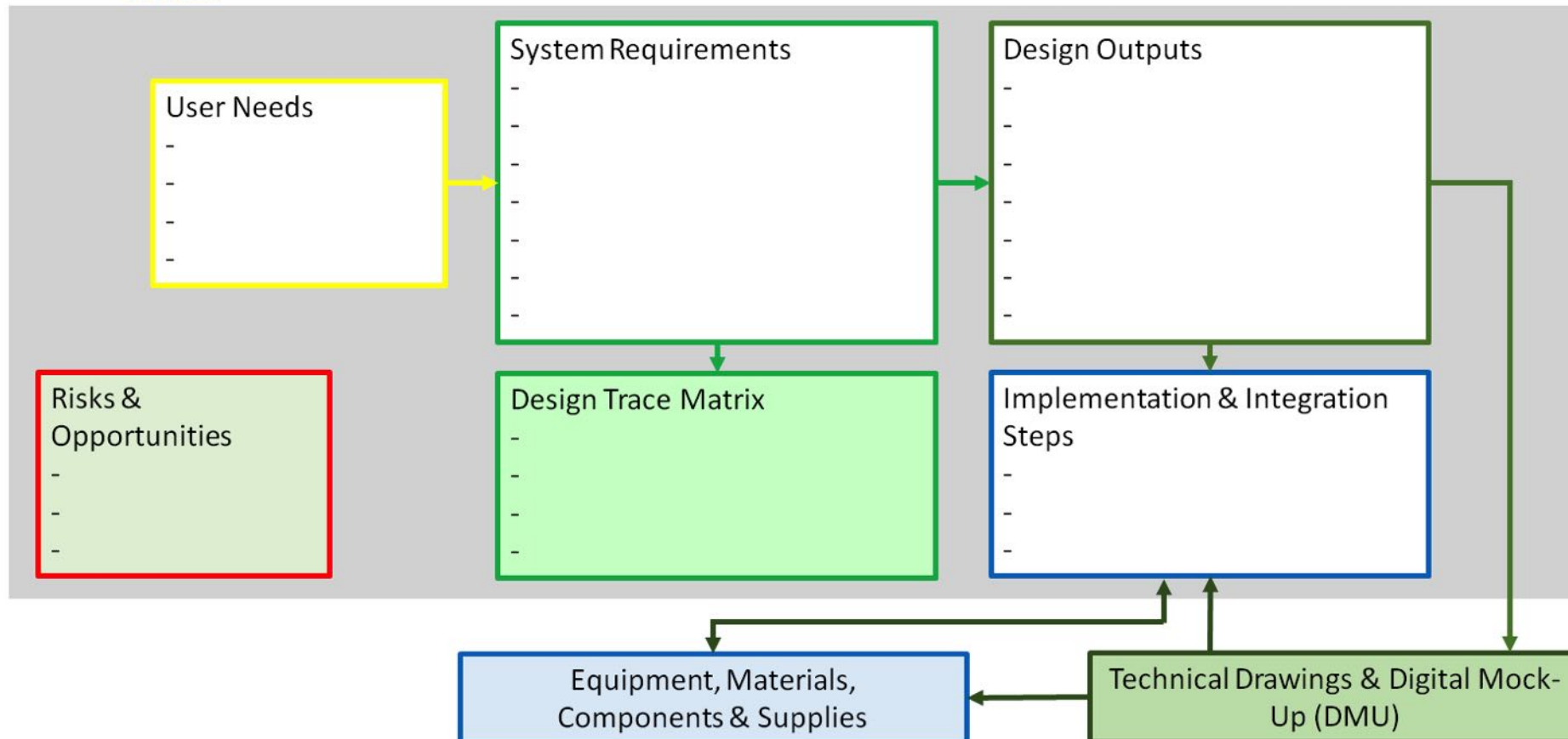
- **User Needs**
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  -
  -
  -

- **Risks & Opportunities**
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  -

- **System Requirements**
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  -
  -

- **Design Trace Matrix**
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  -
  -
  -

- **Design Outputs**
  -
  -
  -
  -
  -

- **Implementation & Integration Steps**
  -
  -
  -

- **Equipment, Materials, Components & Supplies**

- **Technical Drawings & Digital Mock-Up (DMU)**

Configuring Cockpit
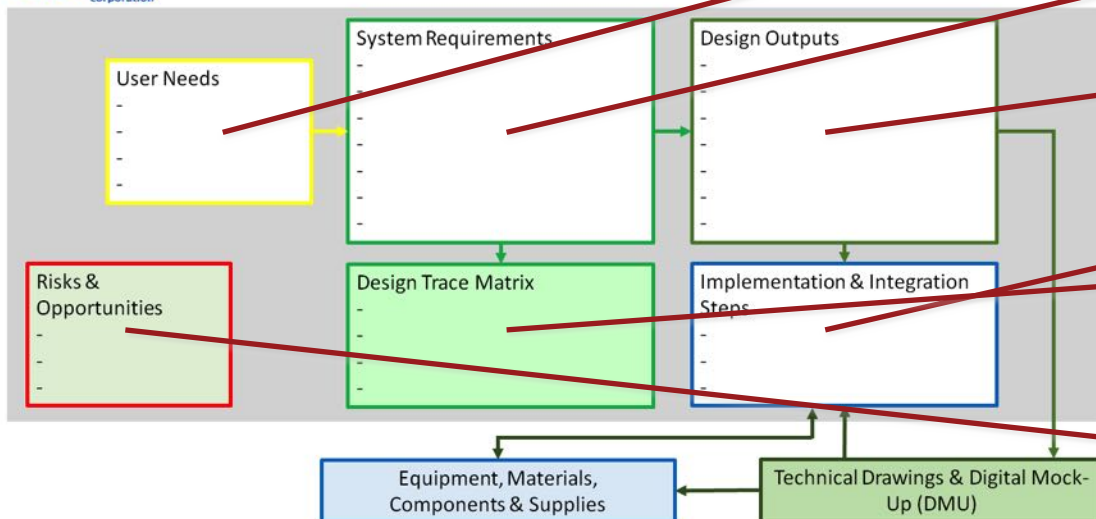
Activities in Cockpit

User Needs

Requirement	Acceptance Criteria	Critical	Importance	▶
U UN0105: The Mahola system needs to provide health care to the local population. - User Needs ✕	Inspection: Review of existing patient files and related statistics of the health care services provided to the local population.	YES ▾	1 ▾	▶
U UN0106: The Mahola system needs to provide improved access to education. - User Needs ✕	Inspection: Review of the training plan and the contracts for the existing bursaries.	YES ▾	2 ▾	▶
U UN0107: The Mahola system needs to enhance employment opportunities for the local population. - User Needs ✕	Inspection: Review of evidence of whereabouts and use of equipment and materials that was no longer needed after the construction and given to the local population. Inspection: Review of the work contracts of the employees of the Mahola system.	YES ▾	2 ▾	▶
U UN0108: The Mahola system needs to contribute to the protection of the environment. - User Needs ✕	Inspection: Review of the implementation of the Mahola Environmental Protection Policy.	YES ▾	1 ▾	▶
U UN0109: The Mahola system needs to protect the traditional way of life of the local population. - User Needs ✕	Inspection: Review of the evidence of the validation of the detailed design and the customer acceptance of the integrated Mahola system by the elected local Steering Committee.	NO ▾	3 ▾	▶
U UN0110: The Mahola system needs to		NO ▾	2 ▾	▶

Design Outputs Document

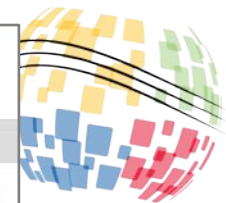| Design Outputs Sections	Section Description	⇕
5.1 Ambulance - Design Outputs Document	The ambulance has to specify the relevant system requirements and consists of the vehicle itself, as well as necessary certification, insurance, warranty and related documentation.	
5.2 Health Centre - Design Outputs Document	The health centre consists of a modular building, two cess pools, a combined utility housing, a waste disposal and recycling housing, all fitted installations, drives, pedestrian paths and water evacuation drenches.	
5.3 Mahola Governance Plan - Design Outputs Document	The Mahola Governance Plan describes how the Mahola system is governed and operated over time. In particular it describes the Processes and Roles of the system. The processes describe how the Mahola system is operated by generic roles; whereas the generic roles, for each of which responsibilities and necessary skills and experience are defined, are needed to operate the defined processes of the Mahola system. Each generic role can be performed by one or several real people or, alternatively, one real person can perform several generic roles. A set of policies is attached to the Mahola Governance Plan as appendices (see 5.5); and the Processes and Roles are supported by an ICT solution (see 5.8).	
5.4 Equipment, Materials, Components & Supplies - Design Outputs Document	The Mahola Equipment, Materials, Components & Supplies list is the master collection of all physical and software items that are needed to implement, integrate and operate the Mahola system. Its purpose is to coordinate and optimise all procurement activities.	
5.5 Policies - Design Outputs Document	The policies of the Mahola system give the strategic direction for one given key topic, both during the development and during the operation of the system. For each such topic, a real person will be nominated to drive the topic, ensure the implementation of the policy and keep the policy maintained, reviewed and updated over time.	

Implementation & Integration Steps	System Elements	Activities	E	M	C	S	Drawings	Comments
SS0222: Implement the brick walls.	HC	- Measure and mark* the positions of the brick walls of the modular building and both housings i.a.w. with the design. - Place the bricks corresponding to the walls of each room into the centre of each room. - Produce the cement mix**. - Build the walls i.a.w. the design**. - Conduct Product Verification.	x	x	x	x	TD4	Produce the brick walls of the WDRH first for practice. * Using chalk. ** These activities are carried out in parallel.

| Implementation & Integration Steps	System Elements	Activities	E	M	C	S	Drawings	Comments
SS0240: Conduct integrated exercises (for the Mahola system).	All	- Prepare a series of integrated exercises across the entire Mahola system (by a dedicated separate team supported by a group of First Aiders who will play victims during the exercises or serve as observers). - Conduct exercises (preparation, briefing, exercise, feedback and analysis). - Restore operational condition of the Mahola system.	x	-	-	x	n/a	These exercises have to be documented by observers, including feedback from all participants, as well as photos and videos. For each exercise, a report is to be produced.

Risk and Opportunity Management

Risk Item	Probability	Criticality	Root Causes	Action Taken
RISK0049: Local authorities hinder the project	3	1	Envy, greed, pride, and/or lack of understanding of the benefits for the authorities by individual civil servants in responsibility.	Currently none.
RISK0050: There are insufficient funds to implement the project	3	1	International Fundraising Campaign unsuccessful.	Currently none.
RISK0051: There are insufficient funds to operate the system	3	1	International Fundraising Campaign unsuccessful.	Currently none.
RISK0052: The elected Steering Committee falls apart	3	1	Self-interest of several individuals or negative unresolved conflict between several individuals (members of the steering committee).	Currently none.
RISK0053: The land provided is retaken by the previous owner	5	1	Self-interest of several individuals or negative unresolved conflict between several individuals (members of the steering committee).	Currently none.
RISK0054: The bricks are not produced at the required quality	2	1	Lack of experience, low quality of the production process or supporting tools.	Technical evaluation of the risk and mitigation strategies with construction/structural engineering domain expert.
RISK0055: The bricks are not produced as scheduled	2	2	Lack of experience, low quality of the production process or supporting tools; theft; lack of availability of necessary resources.	Currently none.

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Design models
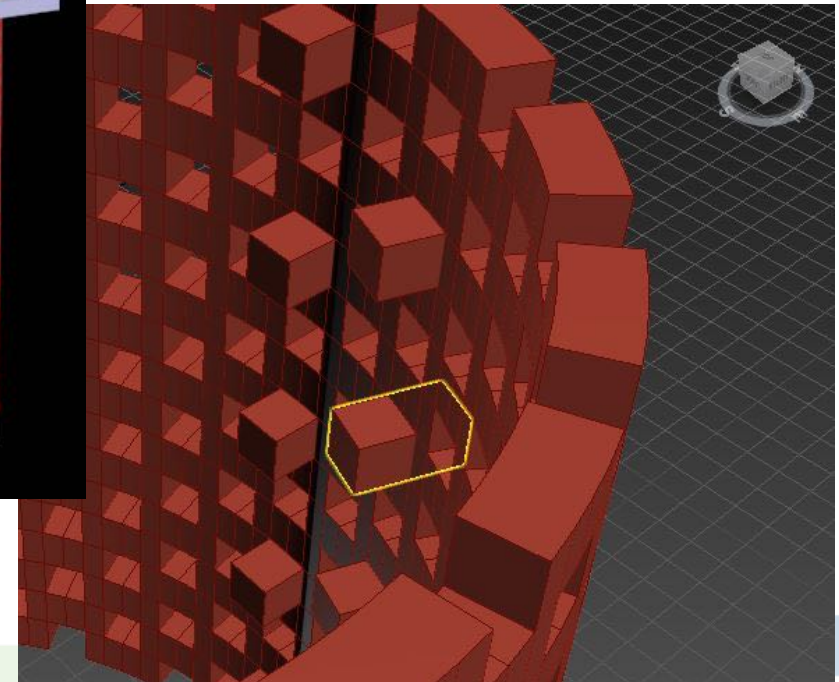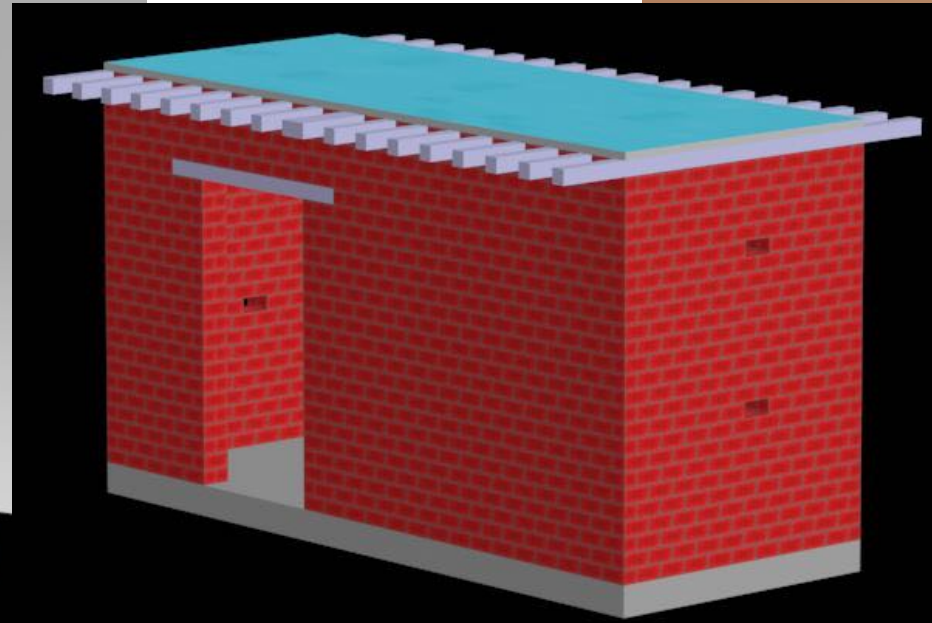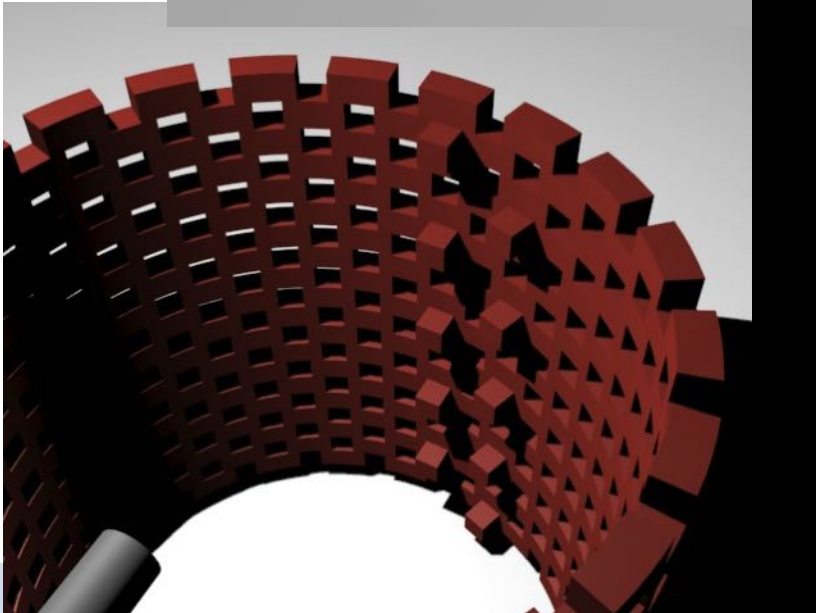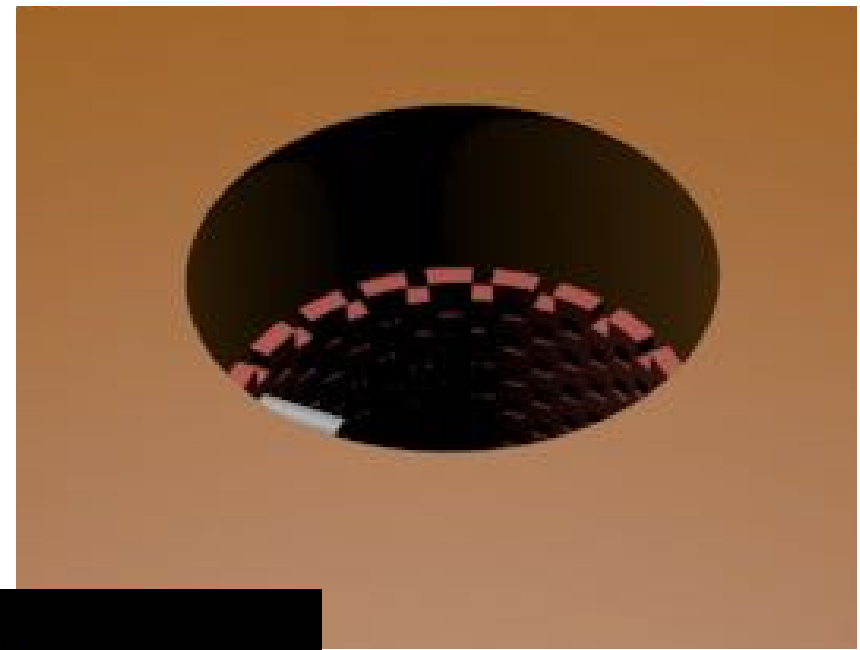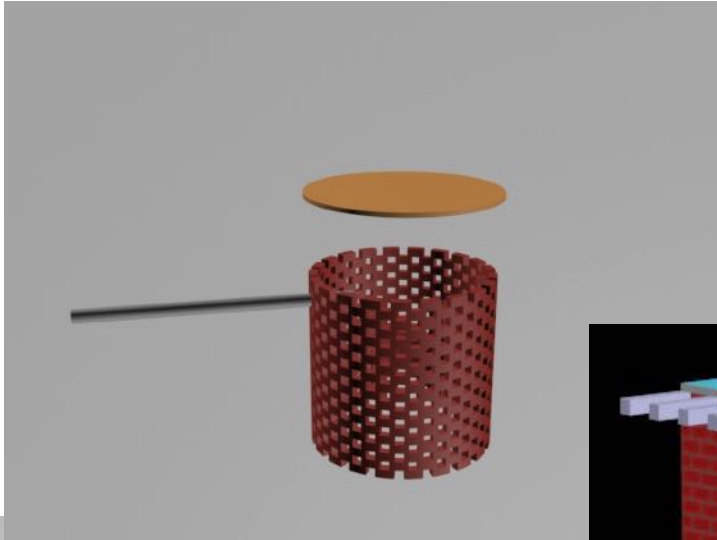
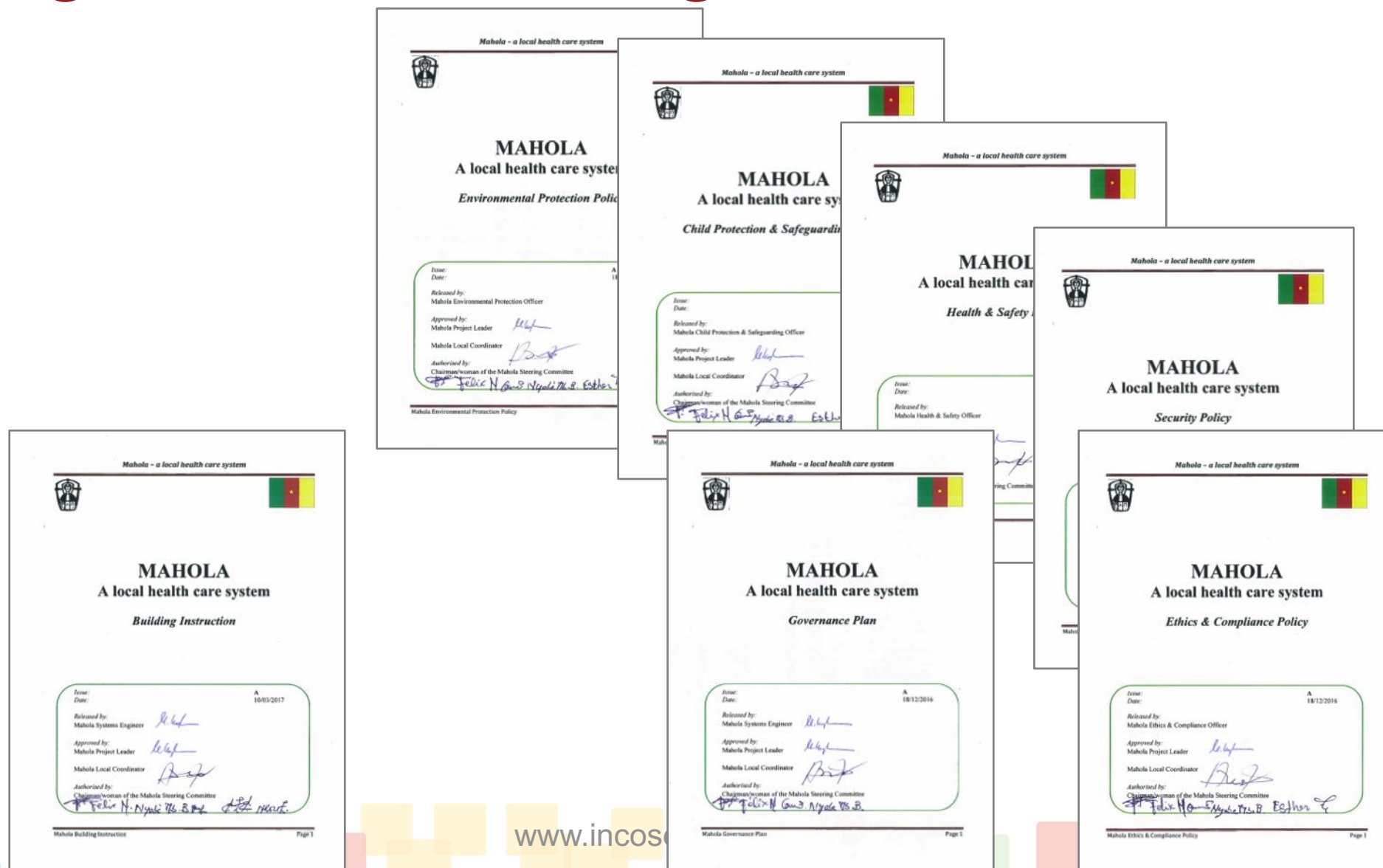# Layout of the Health Centre
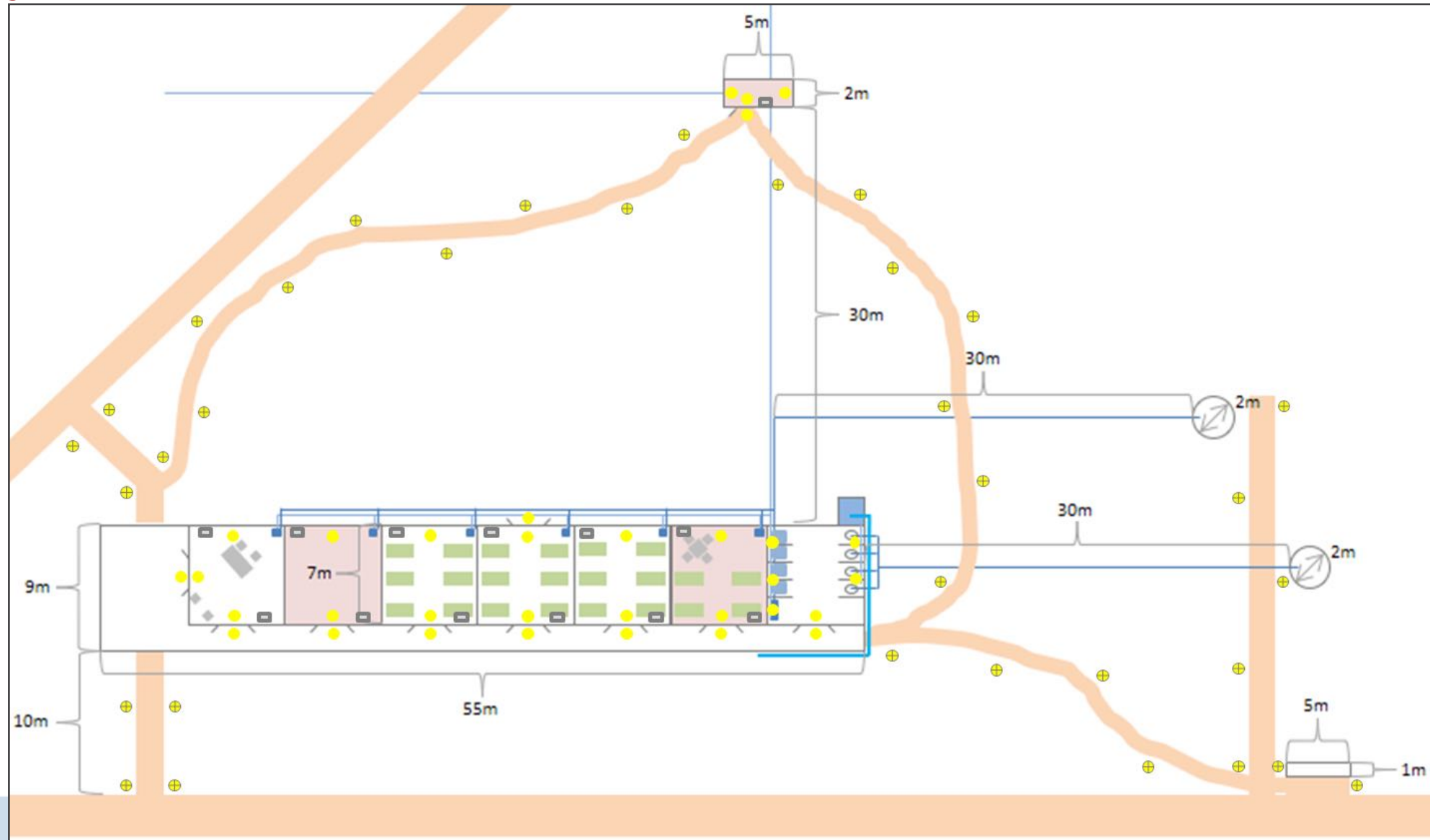
Design review 2017

Design review 2017

Design documents signed off

Design documents published on website

Mahola Governance Plan (MGP) Issue A 181216

MGP Appendix 1 Mahola Environmental Protection Policy Issue A 181216

MGP Appendix 2 Mahola Child Protection & Safeguarding Policy Issue A 181216

MGP Appendix 3 Mahola Health & Safety Policy Issue A 181216

MGP Appendix 4 Mahola Security Policy Issue A 181216

MGP Appendix 5 Mahola Ethics & Compliance Policy Issue A 181216

Mahola Building Instruction (MBI) Issue A 100317

MBI Appendix 1 Mahola Equipment, Materials, Components & Supplies Issue A 100317

MBI Appendix 2 Mahola Progress Status Issue A 100317

MBI Appendix 3 Mahola Verification & Validation Matrix Issue A 100317

Conclusions

- **Typical <u>difficulties of not-for-profit projects</u> and their SE:**
  - **High turnover** and **low availability** of project team members;
  - **Budget uncertainty**;
  - **Language** and **other cultural boundaries**;
  - **Lack of infrastructure** (e.g. roads, electricity, internet, health care);
  - **Corruption**.
- **The <u>Cockpit platform from the US based Cognition Corporation</u> was used as a candidate SE tool for such projects** (not to critically evaluate and compare it with other SE tool solutions, but to use it to do the actual work):
  - The Cockpit platform and related technical support has **been provided free of charge**;
  - It was found that Cockpit is a **robust, secure, globally accessible platform solution** that has a **sound SE approach implemented** in its default version, including data export into multiple formats and action management against sets of data;
  - Whenever needed, the **user support was very swift and responsive**, and obviously staffed with **highly qualified personnel**;
  - The way Cockpit was configured was sometimes a compromise and partially deviated from the default version, in order to be aligned with the existing data structure of the Mahola project and **allowing for some data to be generated and managed outside Cockpit**;
  - However, the **default version of Cockpit could have been used 'as is',** including the capability to generate project documents from the technical data; although it is rather geared towards the development of medical devices and uses corresponding terminology.
- **What are the <u>next steps</u>?**
  - On-going use of **V&V management and change management**, linked to **risk and opportunity management** and **action management** by multiple users throughout the integration and operational life cycle of the Mahola system;
  - Future investigation of Cockpit in **synchronization with other MBSE tools regarding artefacts such as SysML models and their elements**;
  - Future investigation of using **multiple languages on the Cockpit platform**; this is important for international not-for-profit projects, since many volunteers who participate in these projects, including members of the local population, may not be able to speak or read English.

Thank you

www.incose.org/symp2018