

MAKER MOVEMENT FOR MATERNAL NEWBORN AND CHILD HEALTH Process Documentation Findings

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CONCERN
worldwide u.s.

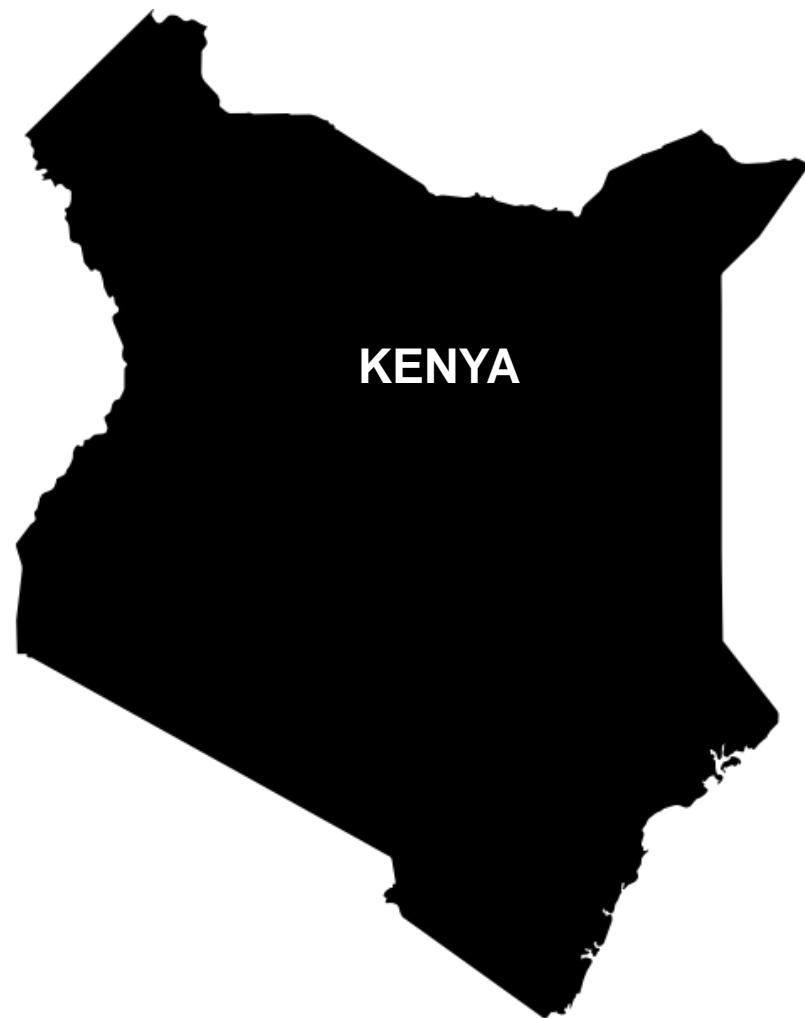
Agenda

Review : Maker
Hypothesis, Objectives
Objectives of Process
Documentation
Review Maker Theory of
Change
Methods and Analysis
Findings
Reflections

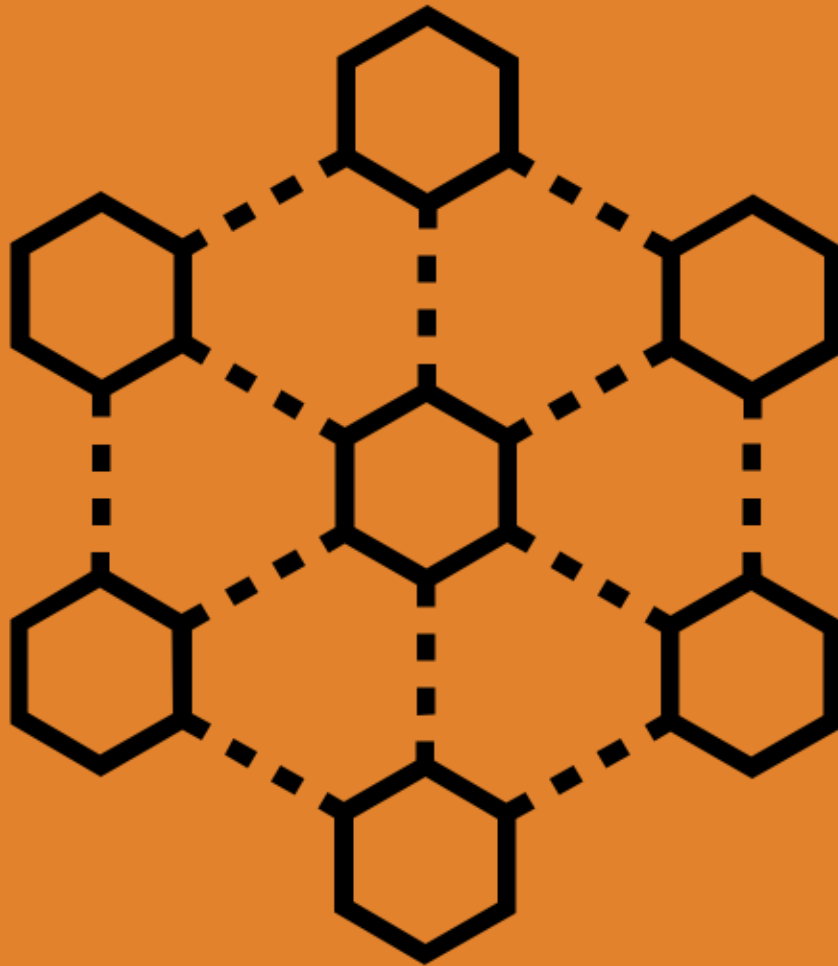
What was Maker about?

locally design low-cost, high-quality, alternatives to essential MNCH equipment and spare parts

unconventional linkages between Makers and MNCH health professionals



Maker Hypotheses



THE HUB



can locally design and build

select equipment and spare parts for labor and delivery
and newborn care

is a **viable model**

Components of viability
as defined by the Maker
team

Establishment of
governance structures

Processes for
management and
decision making

Diversified funding

Business operations



DESIGN THINKING



EMPATHY

FIT

BUY-IN / OWNERSHIP

For Maker, **the case study of DTSl**
is drawn from the process documentation
since all DTSl activities apart from the ideation
pertain to the approach taken to develop
equipment prototypes

Maker Theory of Change

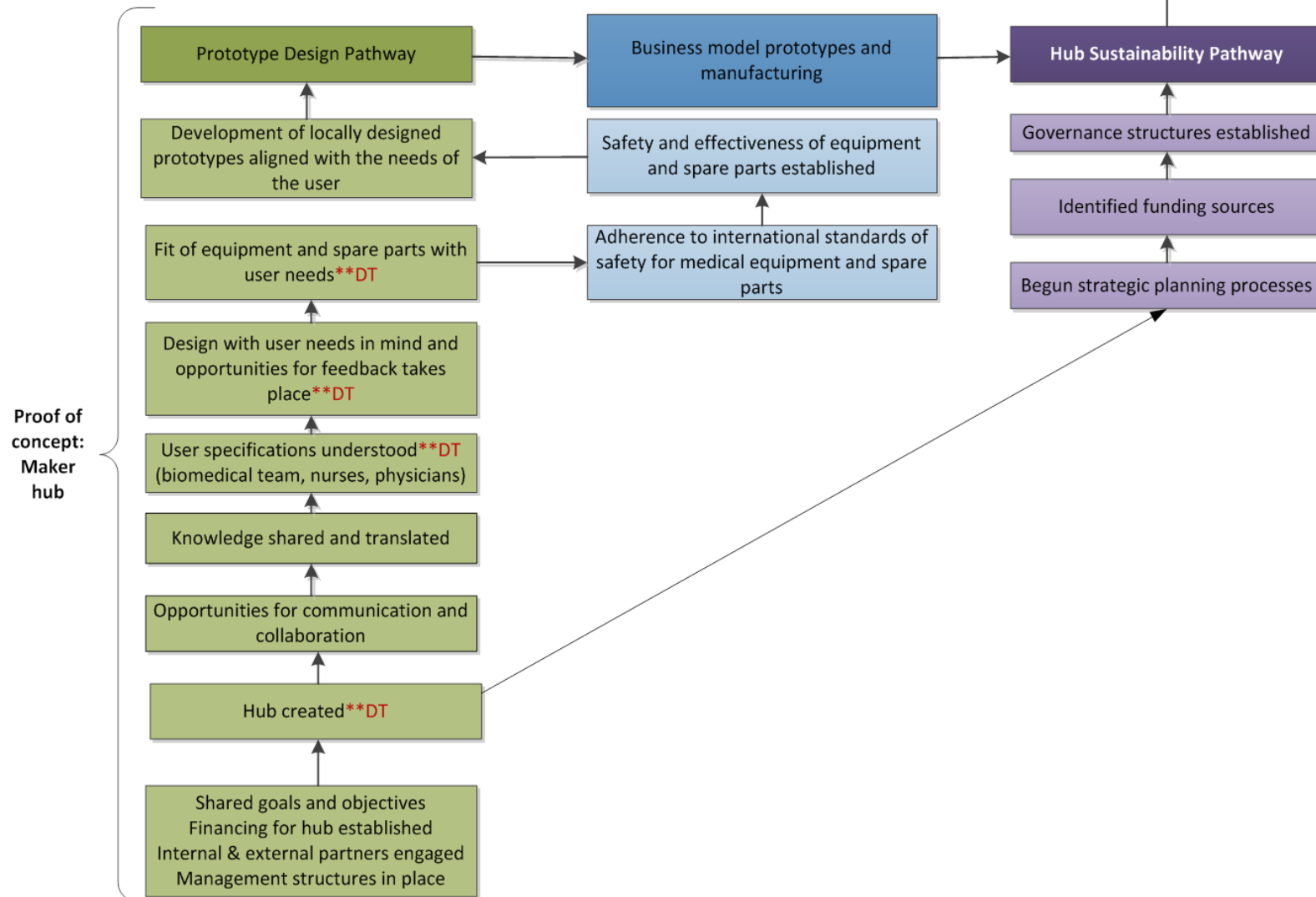
Increased availability of functional MNCH equipment and spare parts

Procurement Systems, Logistics Systems, Budgets & Contracts, Maintenance Systems, Standardization of equipment and spare parts

Manufacturing policies and standards for medical equipment

Viable capacity for local design of equipment and spare parts

Line of accountability

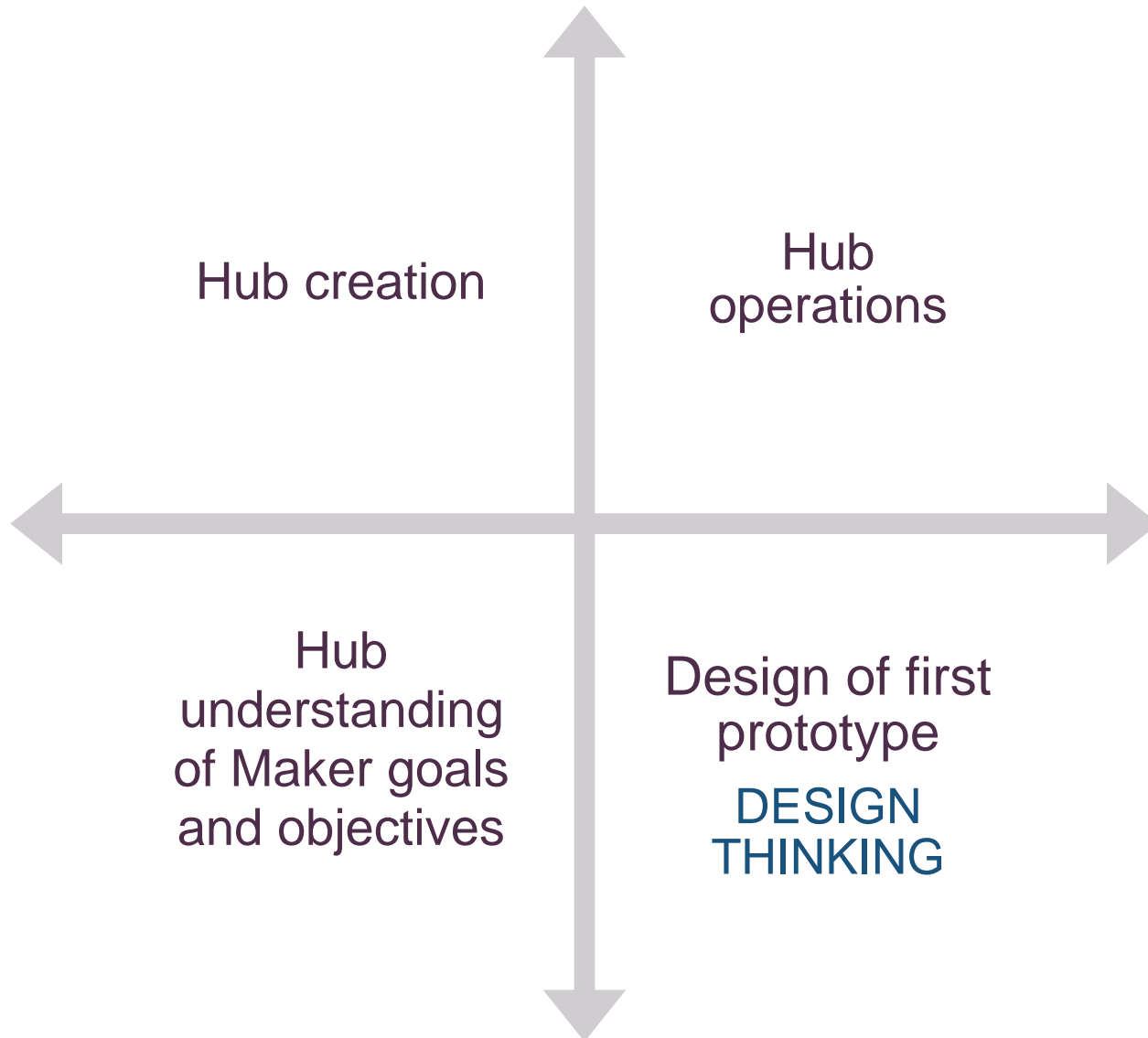


Foundational enabling environment

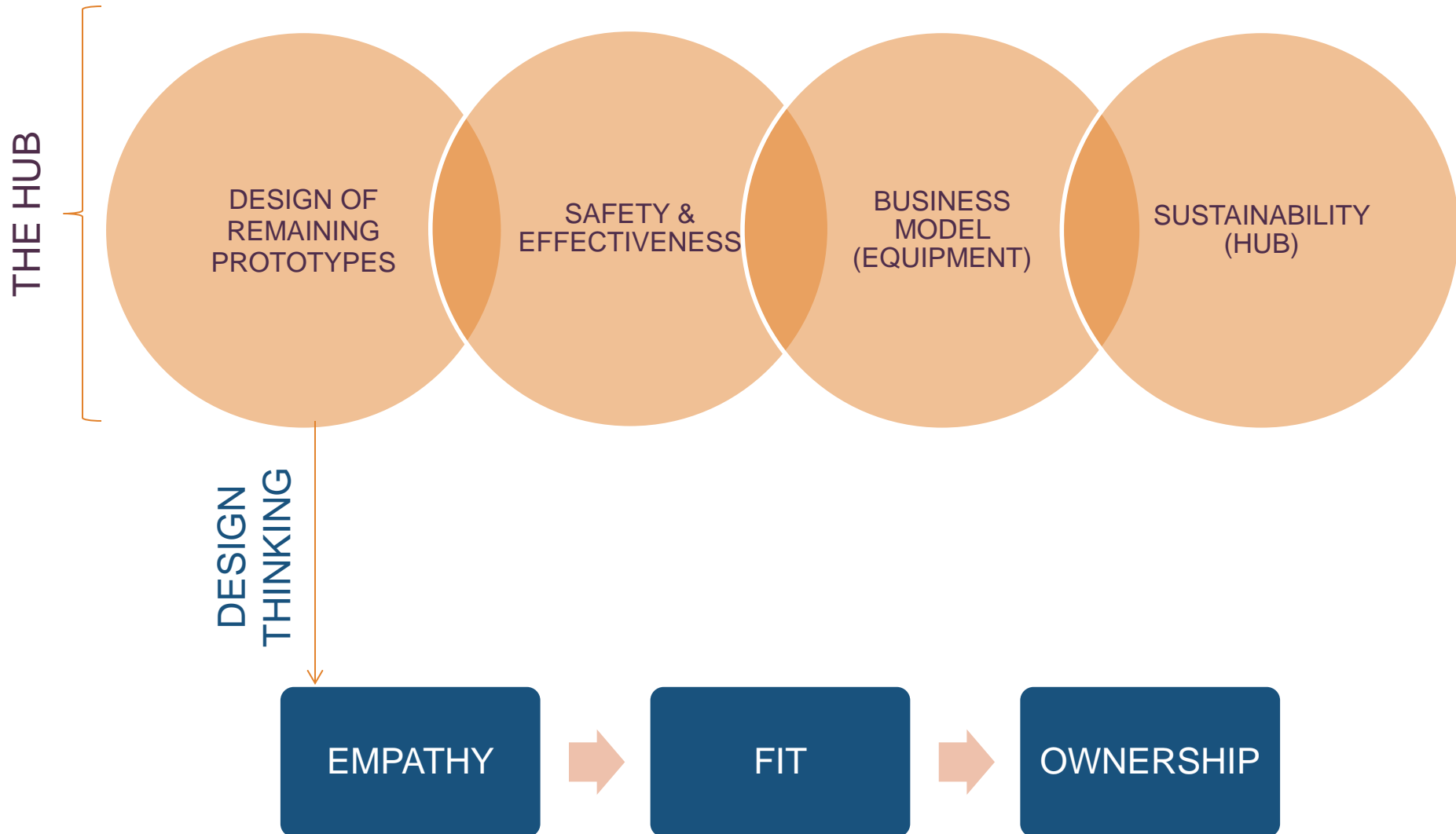
Implementation Strategy · Relevant research undertaken / Health care challenges understood

Objectives

OBJECTIVES OF PD ROUND 1



OBJECTIVES OF PD ROUND 2



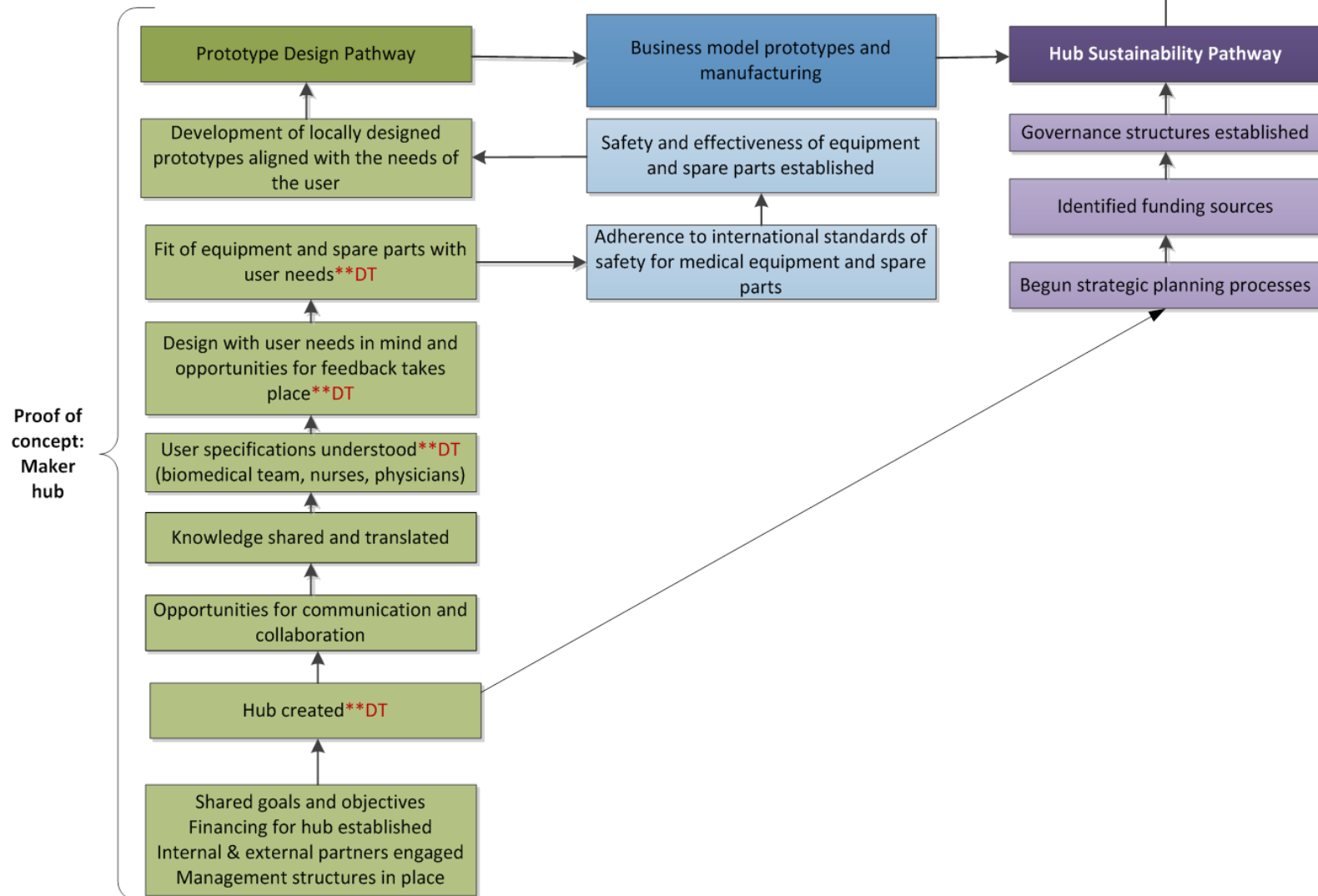
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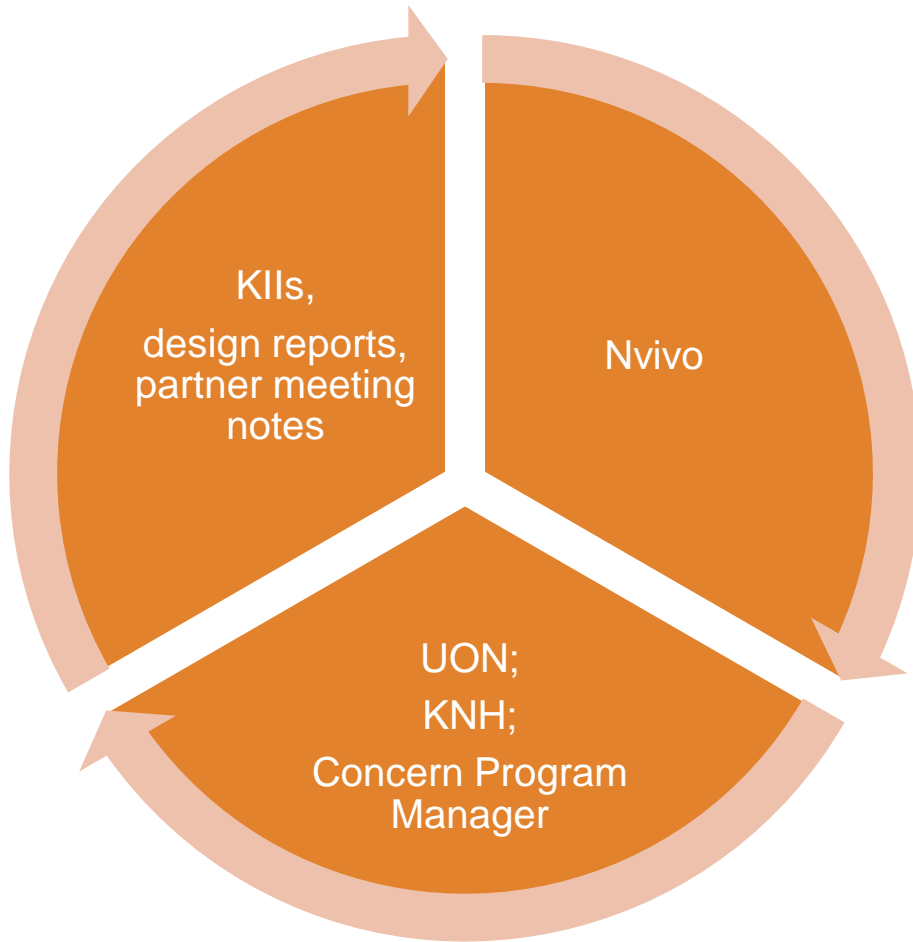


Foundational enabling environment

Implementation Strategy · Relevant research undertaken / Health care challenges understood

Methods & Analysis

METHODS & ANALYSIS



QUALITATIVE
THEMATIC CODING
ITERATIVE REVIEW

Findings

EQUIPMENT DEVELOPMENT TIMELINE

Resuscitaire
Incubator
Patient monitor
Oxygen blender
Delivery Bed

Vacuum Extractor
Phototherapy Unit
Exam Light

Suction Machine

Needs Assessment	9 pieces prioritized	UoN visits to KNH	Prelim designs	4 pieces prioritized	Model finalized	Prototype built & finalized	KEBS review & approval	Clinical Testing
Jan '14	Mar '14	Apr-May '14	May-Aug '14	June '14	Mar '15	Mar-Oct '15	Dec '15 - TBD	TBD
					Exchange visits between KNH clinicians, biomedics & UoN engineers Sept '14 – Dec '15			

Design and fabrication of Prototypes

Mechanisms
for design
and
fabrication

Frequent exchange visits

Monthly partners meetings

Project status and
decisions

Identifying sources of
local material

Identifying equipment
needed to fabricate





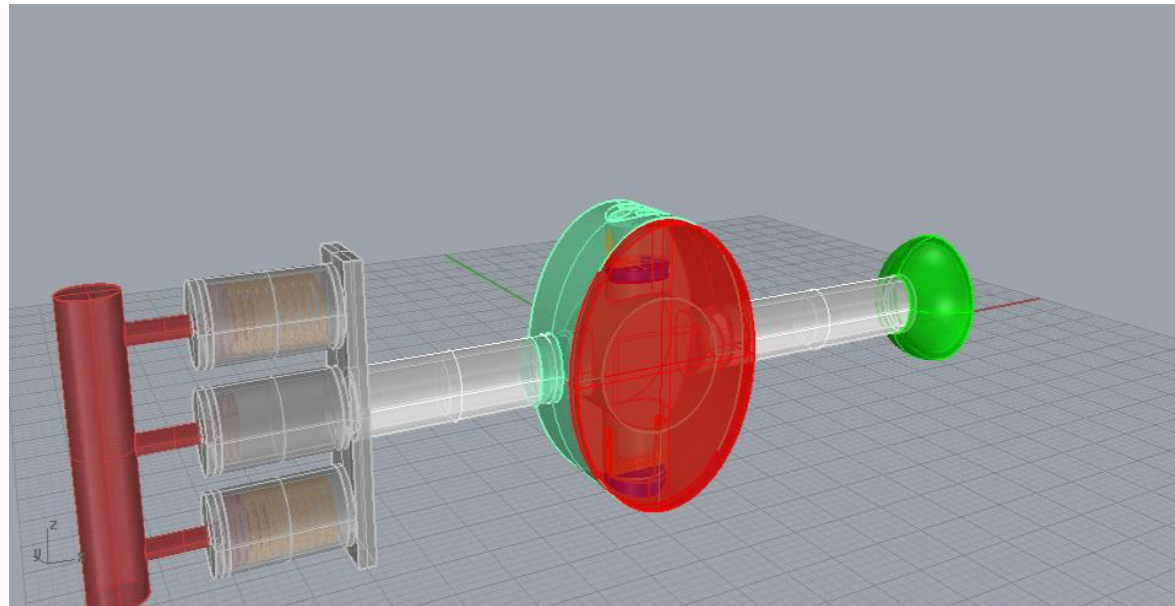
Undergoing KEBS
review

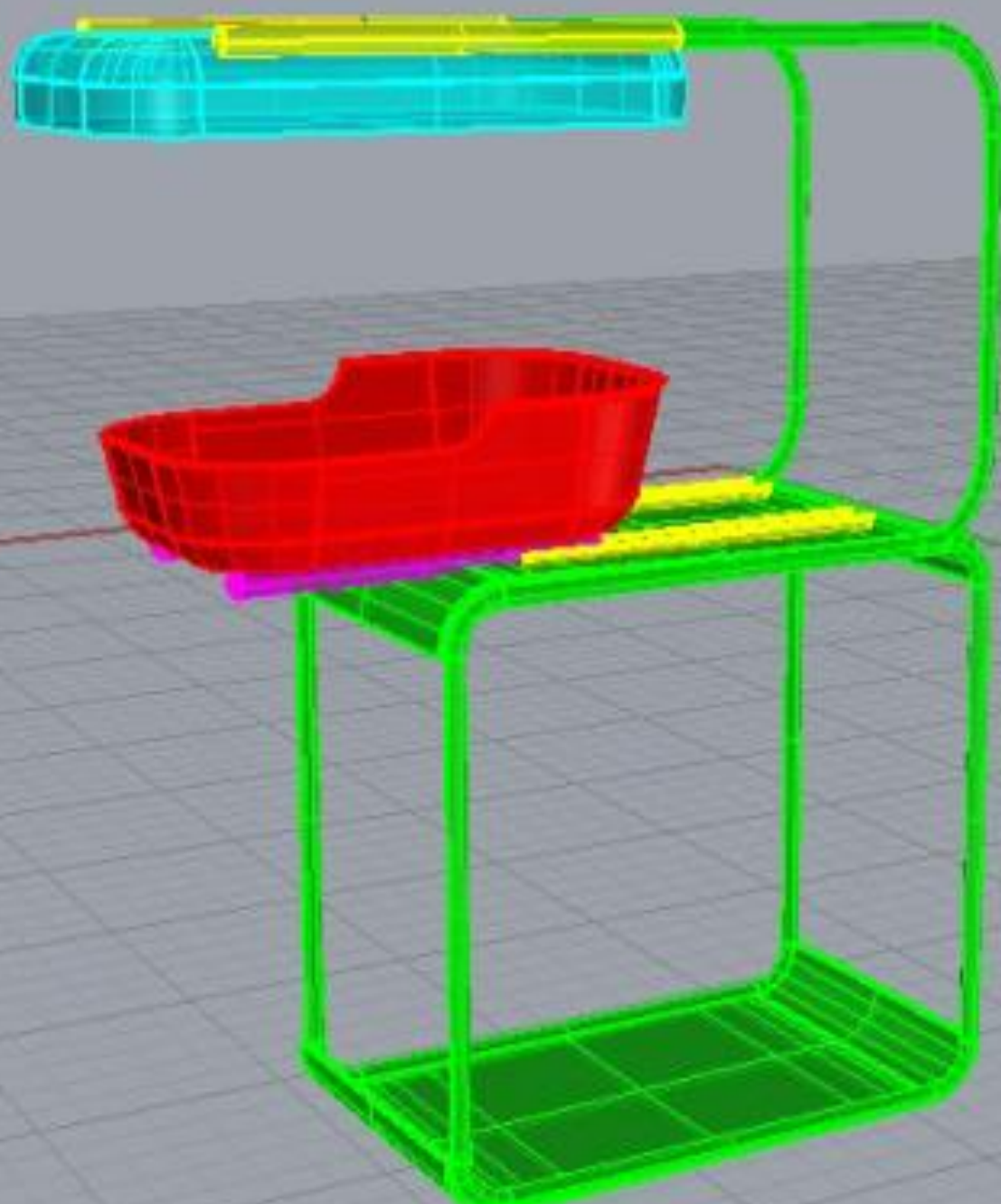
Clinical trial protocol
approved

SUCTION MACHINE

Designs developed for 3 other pieces of equipment w/
clinician input

- Exam light
- Vacuum extractor
- Phototherapy machine





Findings | design thinking

Design Thinking Hypothesis

Application of design thinking methods within Maker will:

Create UON Fab Lab **EMPATHY** for KNH clinicians & biomedical team

Result in **FIT** of equipment prototypes with the desires and needs of KNH clinicians and biomedical team

Result in **BUY-IN/OWNERSHIP** of equipment by KNH clinicians and biomedical team

EMPATHY | FIT | BUY IN/OWNERSHIP

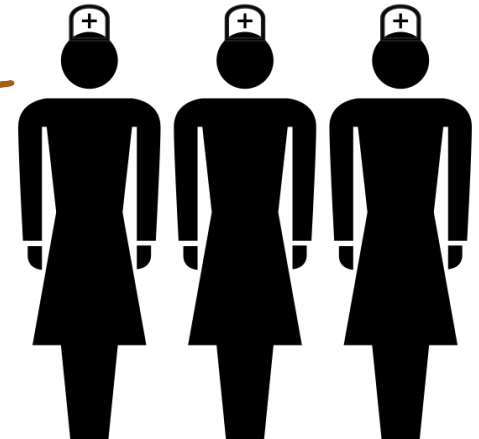
Nurses felt heard

UON Fab Lab reported spending time with nurses in KNH to understand their context

Multiple, frequent meetings

On the examination light:

“There was a lot of cooperation. They would listen and try to modify according to our specifications. They did almost exactly what we anticipated or wanted”



User requirements | on suction machine

- COLOR
- FILTER
- MOVABLE CASTORS
- MATERIAL FOR BOTTLES
- HEIGHT OF THE HANDLE
- BOTTLE HOLDERS
- GAUGE
- SIZE



UON Fab Lab perspective on engaging users (clinicians)

“The nurses have been cooperating. They have looked at our designs, made suggestions to improve.”

“The success of the first equipment we made was the suction machine was highly dependent on their input.”

“When you are making these designs , getting input from the hospital was quite important, because we in engineering don’t use medical stuff, so we could design something that doesn’t work well in a hospital environment.”



EMPATHY | FIT | BUY IN/OWNERSHIP

Challenge to ascertain fit and ownership because the suction machine has not been used at KNH

The RME plan was to do a usability test during clinical testing to ascertain fit.

Ownership was considered an important by product of empathy and fit and therefore could not be tested as well

The other pieces of equipment are in the design stage.

Nurses expressed excitement at the suction machine, as well as some disappointed that more prototypes have not been completed as yet.

Safety & Effectiveness

KEBS engaged

Clinical testing protocol approved

Clinical testing unable to get underway because project ran out of time



Business Model

For Equipment

- **Goal: Get it to market**
- Hired consultant in 2014, gaps in methodology

“But another aspect that has not been considered, is how these pieces of equipment will get to the market.” – UON Fab Lab engineer

For the Hub

- **Goal: understand what it took to run a hub like Maker**
- Concern Fellow brought on in 2015 to work on this model
- Analysis Underway
- ~~No business model analysis on the hub itself as yet.~~

Financial viability analysis is incomplete at this time.

Sustainability

What does sustainability mean for the hub?

What are the core components?

Progress along the sustainability pathway as described in the TOC

Interviewees were not sure about next steps on Maker but expressed interest in remaining engaged going forward

An analysis on sustainability could not be We cannot conclude on the sustainability of the hub at this time

Unintended Effects

Improved working relationship
between clinicians
and biomedical team

“Most of the time we interact with fellow staff and equipment, but here, creating a forum in the hospital where clinicians are talking to bio-meds on developing equipment – it was the first of its kind”.

KNH staff member

UNANTICIPATED ACTIVITIES PER THE TOC

KNH Calibration Center

KNH biomedical team capacity building

UON student capacity building

UON Maker space

UON equipment to create prototypes



Consumed project resources



Quotes from project staff

*“Also I think another achievement was overall capacity building for KNH through Maker which was **able to take our staff to the U.S.** which was also linked to calibration center. It broadened their scope and capacity and thinking to see wider aspects of how things are done out there. But most specifically of course, that was for the calibration center, but that capacity building was huge.”*
- KNH staff

*“We must really be thankful to the Maker project for initiating and supporting Kenyatta to build the **calibration center...***

The calibration center is helping KNH do other things and Maker really contributed to purchasing some of the equipment that made the center running. So that is one thing I can say has been a real benefit to KNH from the Maker project.”
- KNH staff

*“The Maker Space has expanded the ability of the **Science Park** to take ideas to the next level of usability.”*
- UON staff

Context

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Lack of existing policy and systems
at national level

“Another challenge is building medical devices in an environment without national policies and guidelines on research and development of medical devices”.

- Maker hub member

*“...been able to talk, advocate and show an implication to external stakeholders led by the government that **Kenya can build our own medical devices**. This has been done through conferences and meetings. We have been able to share progress with a national task force. We have been able to share through briefings and have briefed **the first lady**. We briefed the **ministry of health** and the **ministry of education, science and technology** on this project and then have been able to talk about work externally. This has attracted a lot of interest..”*

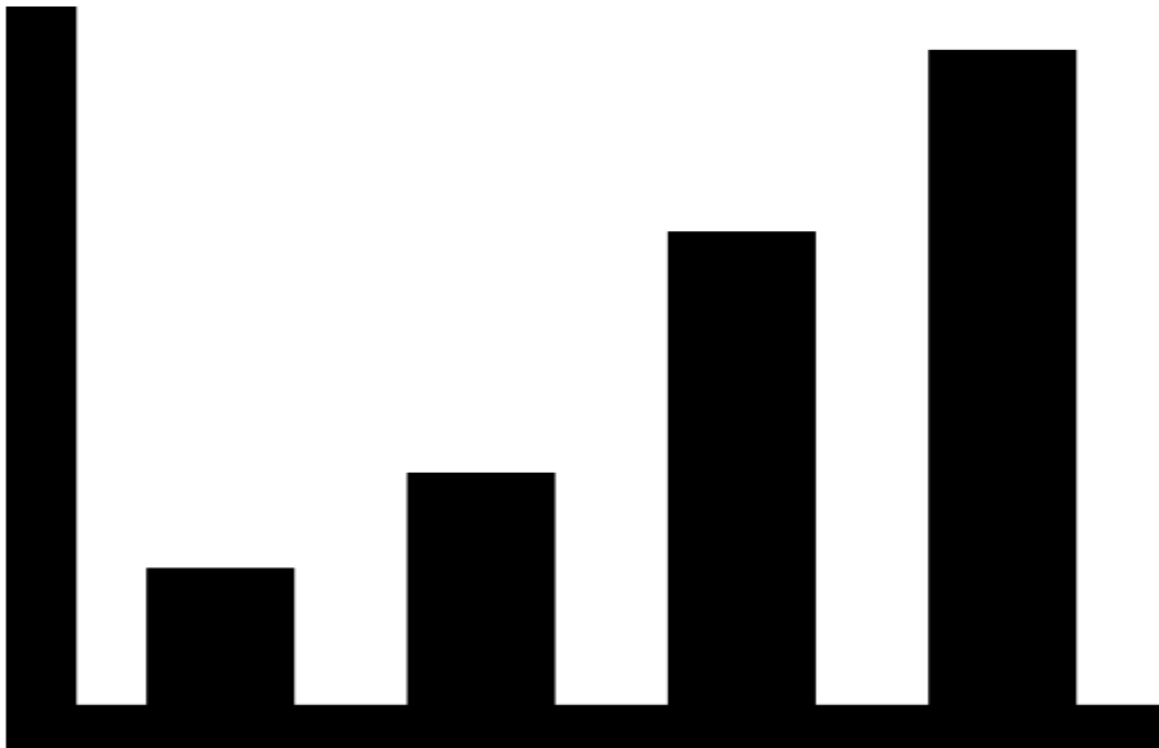
Maker hub member

PD ROUND 1 FINDINGS – OVERLAP AND DIFFERENCES

Overlap between PD round 1 and 2 findings

How do PD findings differ?

How were findings from PD round 1 used?



What worked well | Results reported in round 1:

- Suction machine almost complete
- Concern management recognized
- KNH and UON Leadership recognized
- Strong mechanisms for communication and collaboration during prototype design: partners meetings and exchange visits
- Students and clinicians learning from each other
- Student experience – real world application
- Capacity building of biomedical team

What worked well | Results reported in round 2:

- Working suction machine produced*
- Designs for three pieces complete
- Clinical trial protocol approved
- Concern management recognized*
- KNH and UON leadership recognized*
- Strong mechanisms for communication and collaboration during prototype design: partners meetings and exchange visits*
- Students and clinicians learning from each other*
- Student experience – real world application*
- Capacity building of biomedical team*
- Calibration Center
- Maker space at science park

* Overlap between rounds 1 and 2

Challenges reported in round 1

- Portal use
- Scheduling of partner meetings
- Keeping nurses informed about progress on equipment
- Concern about the end goal
- Different expectations from hub members
- Timelines
- Limited hub engagement on sustainability as defined at the beginning of the project
- Procurement and university bureaucracy
- Student turn over

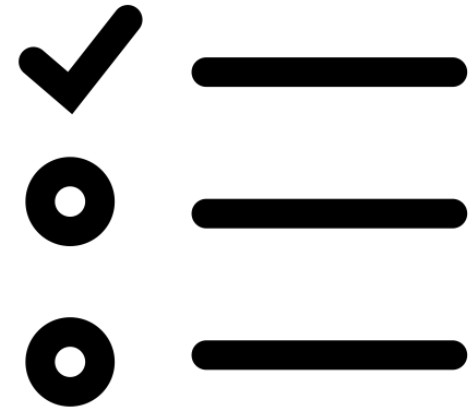
Challenges reported in round 2

- Portal use*
- Scheduling of partner meetings due to multiple schedules*
- Keeping nurses informed about progress on equipment*
- Concern about the end goal*
- Different expectations from hub members*
- Limited hub engagement on sustainability as defined at the beginning of the project*
- Procurement and university bureaucracy*
- Student turn over and junior students*
- Fewer partner meetings and exchange visits in the last quarter

How was data from PD 1 used?

Summary

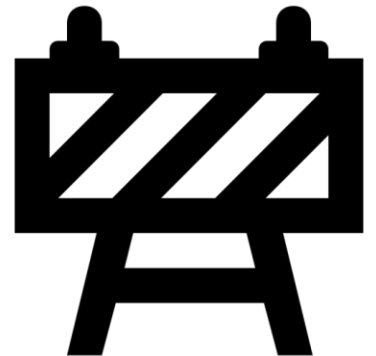
DRIVERS OF MAKER PROGRESS



- Concern Program Management
- Leadership by KNH & UON PIs
- Engaged and motivated teams
- Communication between clinicians and engineers

BARRIERS TO ACHIEVING INTENDED OUTCOMES

- Lack of a consistent, skilled engineering workforce
- Lack of local, high quality material and equipment for fabrication
- Leadership and personnel transitions
- Procurement related challenges
- Finances & Reporting
- Ambitious timelines
- Contextual factors like lack of policies
- Lack of infrastructure
- Management and administrative capacity



HUB REFLECTIONS | If you could do this again what would you change?

Team composition, expertise, skills

Team retention

Procurement and finance

Industrial innovation space

Engage medical device corporations

Expand diversity of users: bring in health care workers from other facilities

Timelines

Take context into account (policies)

“How to engage innovators and leverage their ideas and enthusiasm? Institutional organogram versus ground up innovation”.

RECAP

Revisit the Maker hypotheses: **The Hub**

Kenya based physicians, nurses and biomedical engineers from KNH in collaboration with University of Nairobi Fab Lab engineers (i.e., the Maker Hub) can **design and build** select equipment and spare parts for labor and delivery and newborn care **locally**.

The Maker Hub model is **a viable model** that can address challenges in the social sector through creative collaboration, leadership and governance, processes for management and funding and mechanisms for problem solving to ensure its long term sustainability

RECAP

Design Thinking Hypothesis

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Revisit the TOC

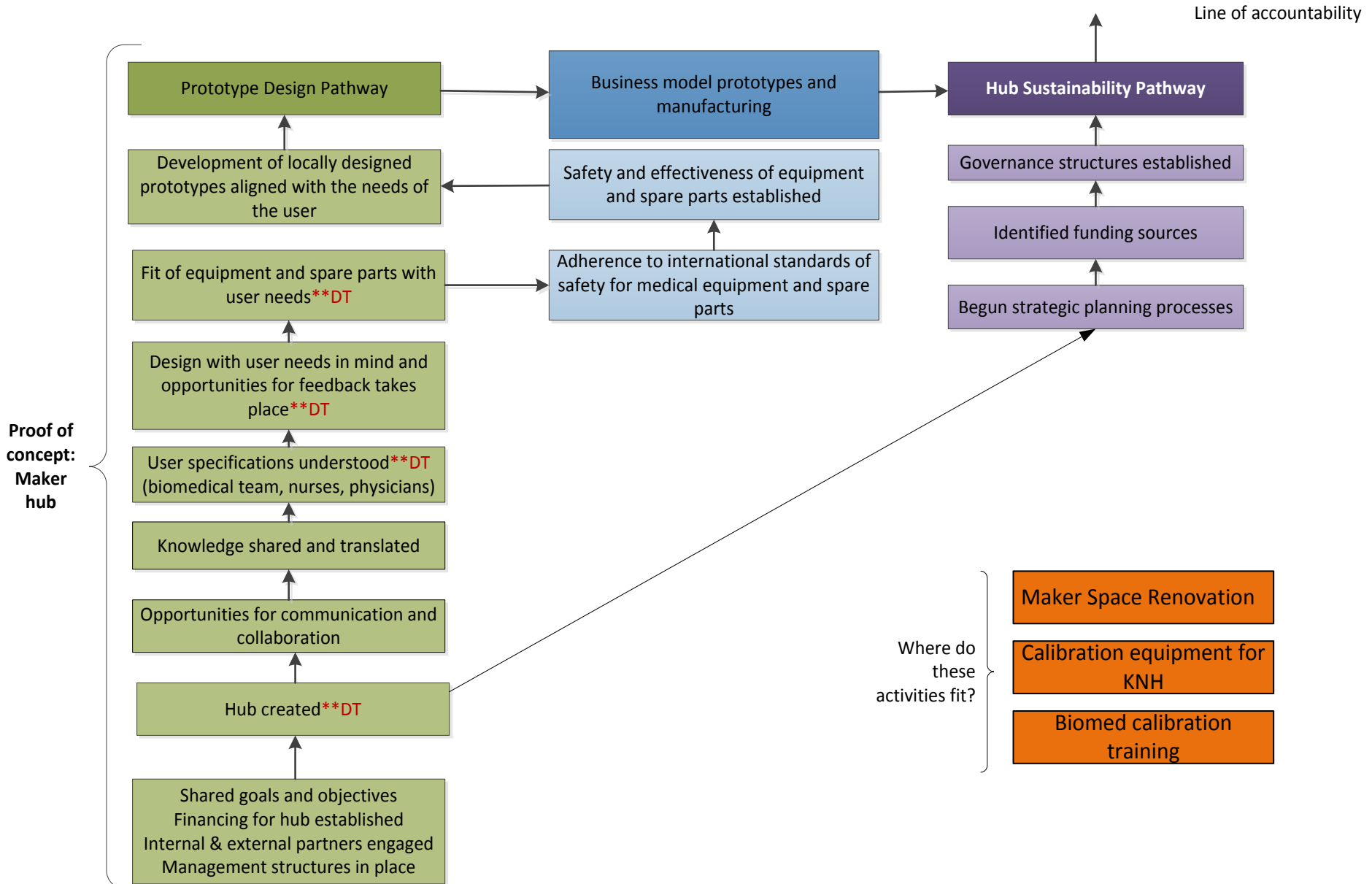
- Did the project achieve what it set out to achieve in this time frame?
- Is this the right pathway for a project like Maker?



Procurement Systems, Logistics Systems, Budgets & Contracts, Maintenance Systems, Standardization of equipment and spare parts

Manufacturing policies and standards for medical equipment

Viable capacity for local design of equipment and spare parts



SUMMARY FINDINGS & DISCUSSION

Hub **created and functioned** as envisioned

The idea of engaging clinicians and engineers to design prototypes has been **successfully demonstrated**

HOWEVER,

Maker designed one prototype | expected 9

None have been clinically tested

Hub viability and sustainability inconclusive at this time

Fit and ownership of equipment by users inconclusive on current timeline

CREDITS

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