

# We Changed Dirt to Opportunity



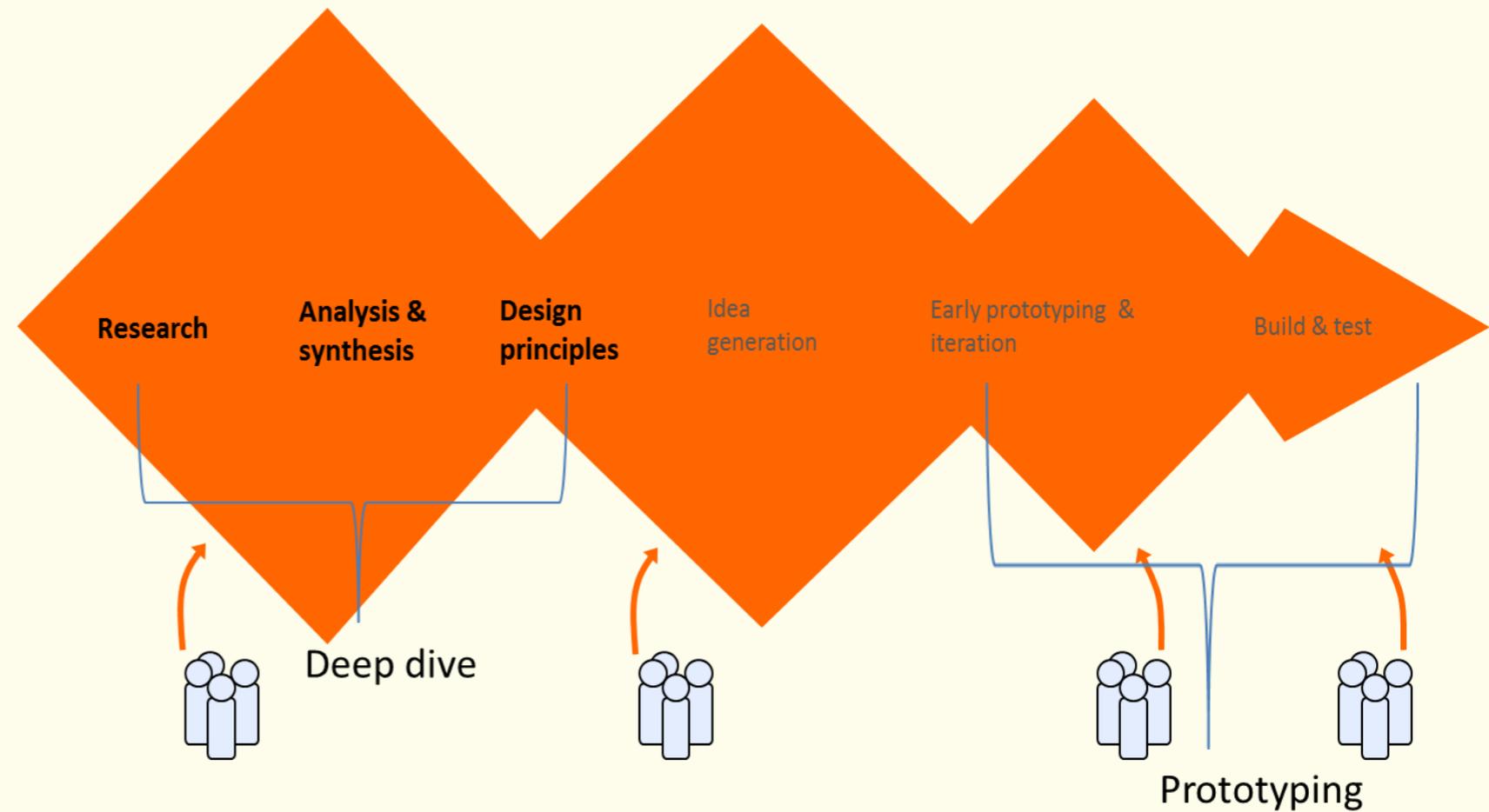
# Statement of problem

In some of our intervention villages pits generally last 8 months of each year until the onset of rainy season (June-September), which sees the highest incidence of pit collapse. Health Extension Workers (HEWs) monitor pit statuses and urge households to build as soon as possible. A few may choose to construct small, temporary pits, which generally collapse again during the rainy season. The majority choose to wait until dry season before rebuilding their latrine, and defecating open in the interim.

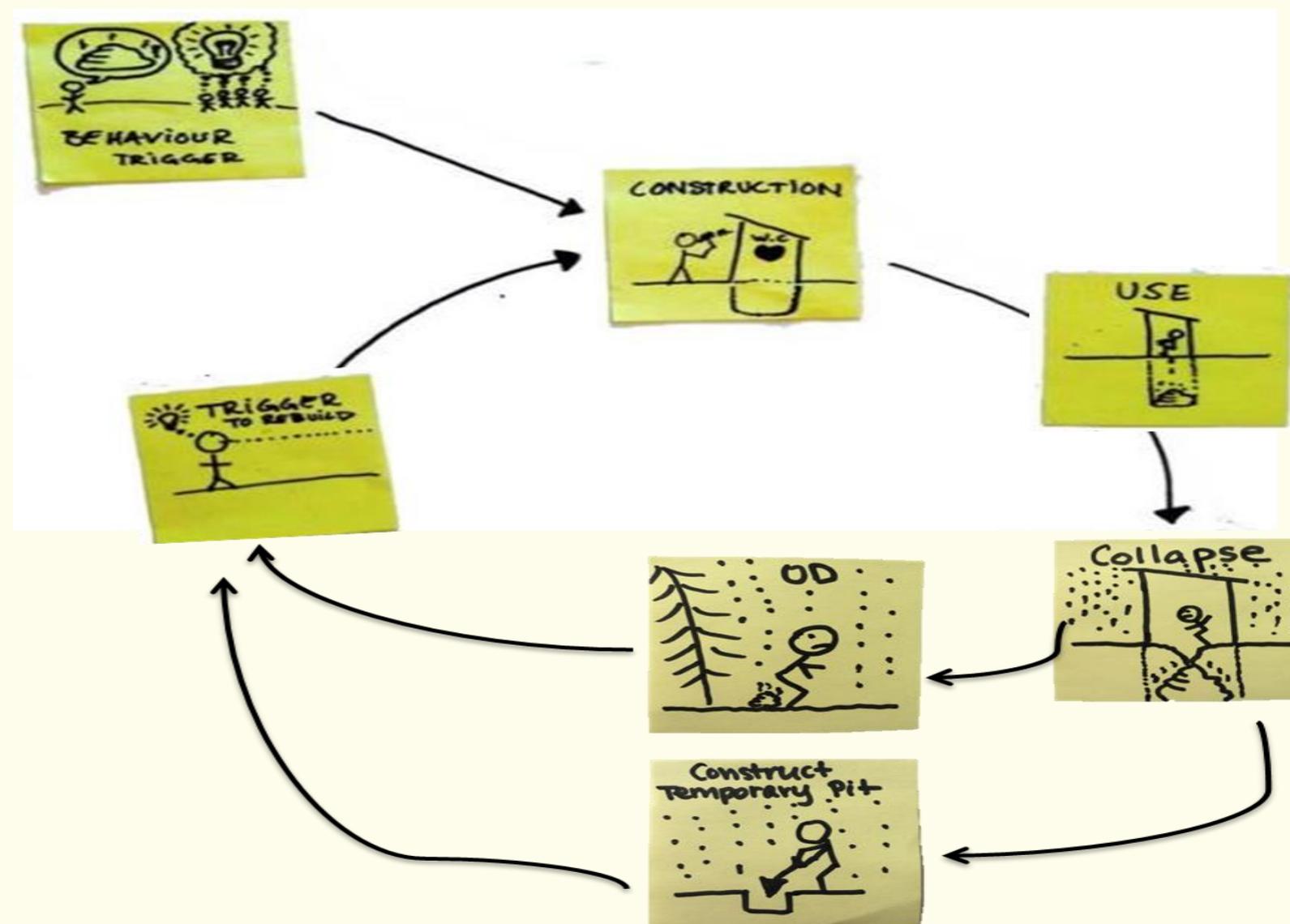
Although rare, there are instances of people having fallen into their pit when households have not noticed the early signs of collapse. The signs of pit collapse that households notice are expanding pit holes, displaced superstructure (wooden logs), and change in diameter of the top part. However, when collapse happens from inside the pit, then it suddenly happens. And during rainy season the ground water rises up and people could see the feces and right then they abandon that pit. Although households accept that they must rebuild every year, it is with a sense of resignation and almost dread and discourage household to use latrine.



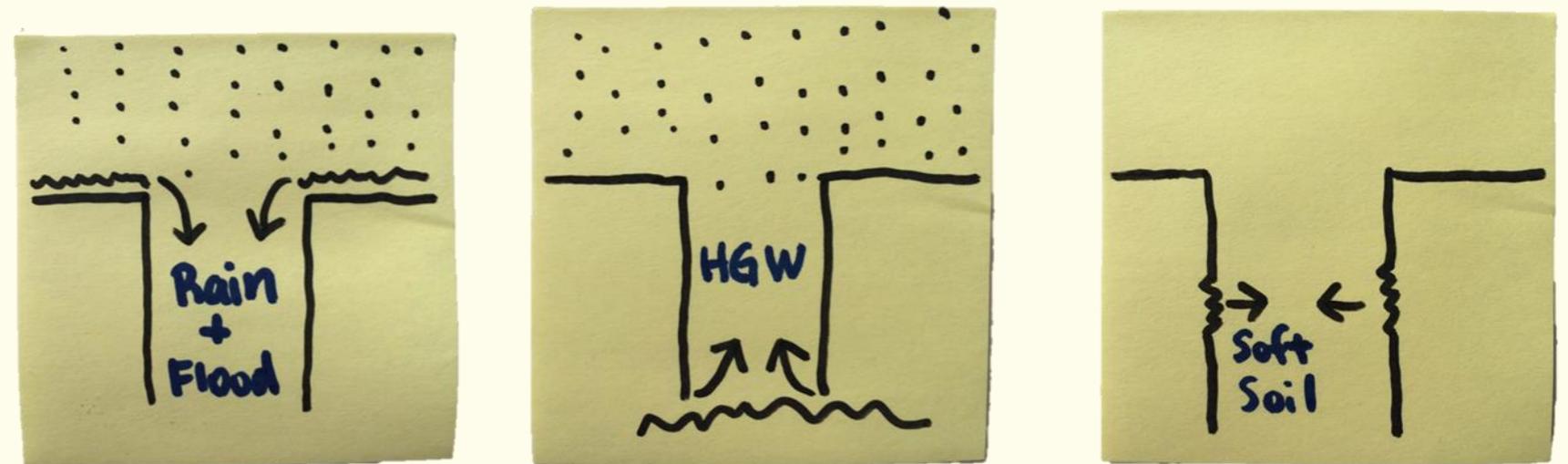
# Process: Human Centered Design



# Household pit collapse experience: user journey



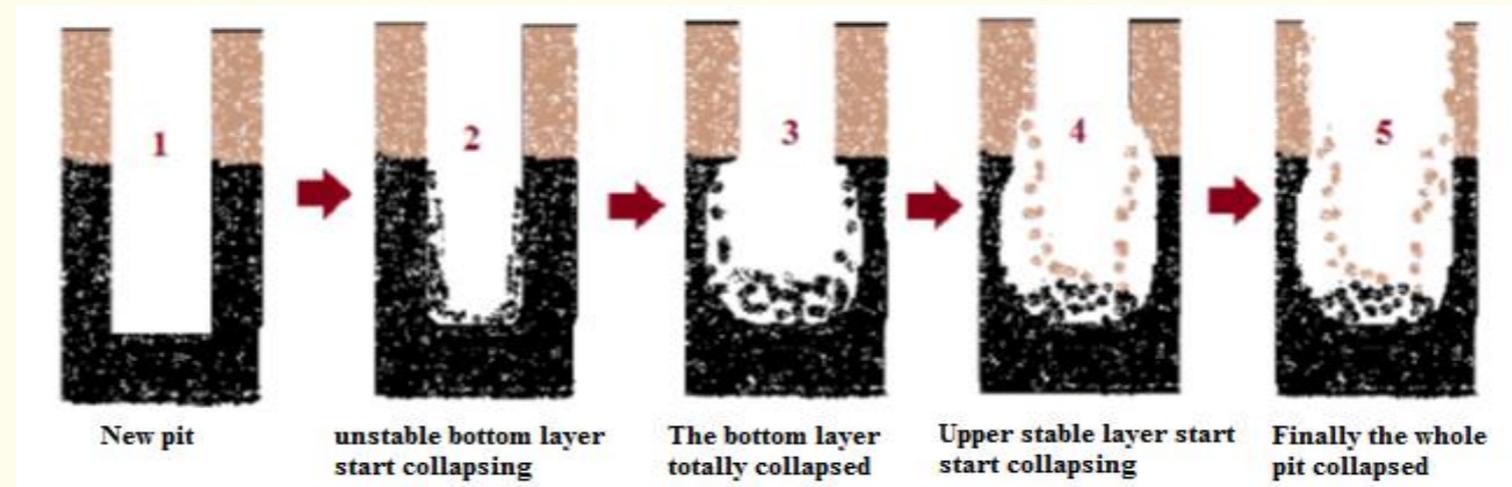
# Understanding how pit collapse happens



Three main theories emerged from all the interviews. Some believe pit collapse is a result of rain and flooding, which causes the pit to collapse from top to bottom. Some believe pit collapse happens because ground water reaches a high level when it rains, causing pit collapse to happen bottom up. Some believe that because the soil profile is loose in the middle of a pit, pit collapse happens from the middle. Others say it depends on pit type. A straight pit collapses top to bottom; a V-pit collapses bottom up. No definitive conclusion can be made at this point without better data.



# Understanding how pit collapse happens



The team learned Whether rain and flood comes in or high ground water it is the bottom soil that softens and results in collapsing the pit. The fact that the collapse is happening from the bottom makes the problem complicated. It is uncommon for collapse to happen from bottom than from the top.



# Design principles: Product

- Offer a solution that is durable.
- Be affordable but stay aspirational.
- Design to overcome transportation challenges.
- Offer value that households cannot produce themselves.
- Design for ease of manufacturing and installation
- Design for integration with slab.



# Product prototyping and development



**Build**



**Test**



**Learn**



# Product prototyping and development

- Pits with different sizes (diameter and depth) tested
- Different pit lining materials tested including using wood, used oil drum, used tires and soil sand mixture.



# Final product

Continuing from the deep dive assessment on pit collapse issue, our team worked on further investigations to address this problem, which occurs in some areas of the project regions. Factors contributing to pit collapse include the landscape, soil texture and climate, e.g. heavy rains (high water tables), which can all affect the durability of latrine pits and discourage households to build a new toilet.

After continuous testing of different option of pit lining; easy to build and affordable pit lining solution is developed. The pit lining is build from a mixture of soil and cement in 1:10 ratio by compacting it using circular ring mold. The cost is 5.6 USD/meter (including raw materials and service fee)



# How to build

- Dig a pit having 1.2 m diameter
- Mix soil from the pit and cement in 1:10 ratio (medium wet)
- Put the mold at the center of pit and make sure the wall thickness is equal in all sides.
- Fill the space between the pit wall and ring (mold) with mixture made of soil and cement and compact it properly
- After 10 minutes, pull the mold gently upwards
- Repeat the same process until you reach surface or stable layer of soil (sometimes we don't have to line the whole pit and it is possible to line only the unstable portion of soil profile)



# Special features

- Quick to dry (only three days)
- Quick to build (only two hours for three meter depth)
- No watering required
- Exactly fits with our slab
- Possible to reuse the pit after composting
- No special skill required to build



# Analysis: the costs of rebuilding a pit 2x a year Vs pit lining

## Assumptions:

- Pit digging costs 33br -85br (\$1.65 – 4.25) per meter, depending on the total depth of pit and expertise of digger.
- Pit depth ranges from 1m-6m. 3m deep pits are common, meaning the total cost of pit digging ranges from 100-255br (\$ 5-11.25).
- Households with frequent pit collapse dig twice a year.
- Wooden slab costs 200-300br/slab [\$10-15/slab] (10 small pcs\*5br/pc [\$0.25] + 2logs\*100/pc [\$5/pc] + transport 50br [\$2.5]).
- Total cost of each pit = [\$ 15-28].

**If a household digs two pits a year, the total cost of the two pits would range from [\$ 30 – 55.5] but for our pit lining for same depth the total cost will be \$16.8 only**



# Business model

People providing pit digging service are found in both kebeles and Woreda towns. Diggers with technical skills and experience are found in towns whereas in the kebeles, the diggers are less experienced and dig sporadically based on demand. Diggers from the town are usually more capable of digging more technically complicated and deeper pits.

We tested a business model which is training this diggers on how to make the pit lining and provide them with molds to start the business with. House holds purchase raw material (cement) for lining and the diggers will charge house holds for additional service they are providing.



Thank you

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