

Technology Selection Tools for Urban Sanitation in Benin using Portable Toilets

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Background

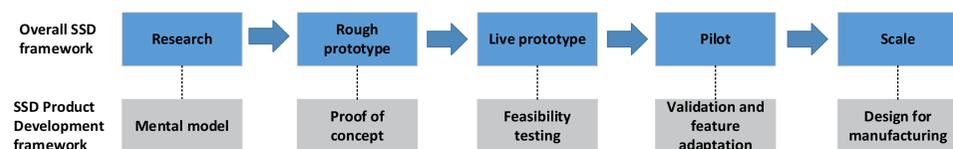
The Sanitation Service Delivery (SSD) project is a United States Agency for International Development/West Africa regional urban sanitation agreement project being implemented in Benin, Côte d'Ivoire, and Ghana by Population Services International (PSI) in collaboration with PATH and Water and Sanitation for the Urban Poor. The goal of the SSD project is to improve urban sanitation outcomes through developing and testing scalable, market-based models that contribute to structural change within the region's sanitation sector with an initial focus on the cities of Cotonou (Benin), Abidjan (Côte d'Ivoire), Accra (Ghana), and Kumasi (Ghana).



PATH/Howard Lakounga

SSD framework

The SSD project adapted key concepts from three product development resources: The Lean Startup,¹ PATH's product development approach, and IDEO.org² to create a modified six-stage framework for advancing and refining sanitation products and business models.



SSD product development framework

As a complement to the overall SSD framework and to successfully identify and advance to support business models, PATH incorporated several of its pre-existing, product development-specific steps into the broader approach for the SSD project. Each step includes an iterative build, measure, learn cycle and focuses on generating key user and stakeholder feedback and provides project teams with evidence to make informed decisions.

Product development tools

PATH used its product development expertise to develop a set of three core tools that support the SSD team in identifying and investigating appropriate, affordable, and hygienic sanitation products: (1) the product development canvas; (2) a product requirements form; and (3) a technology/product stoplight diagram. These tools were revisited and revised at each stage to incorporate learnings and from end users and project activities, evaluate results against goals and targets, and drive data-led decision-making.

Product development canvas

Focusing on the end user in Benin

Purpose: Summary document of use cases, value proposition, sanitation gaps addressed, and success metrics for a proposed technology.

Tool in practice: Based on the SSD market landscape and product scan in Benin, a key gap identified was the lack of affordable and appropriate sanitation products. Two use cases—tenants without improved sanitation and whose landlords are not providing improved latrines or tenants without sanitation facilities—were identified and prioritized by the project teams.

SSD Product Development Pilot engagement plan	Technology/Product: Portable toilets for households living in shared compounds without latrines or looking to improve current latrines	User interface: Collection/Storage, Transport, Centralized (semi) treatment, Reuse/Elimination												
Use case(s) Primary use cases: <ul style="list-style-type: none"> Tenants living in compounds without latrines or looking to improve their latrines. Tenants living in shared compounds looking to buy a private latrine. Secondary use cases: <ul style="list-style-type: none"> Employers who want to provide toilets for day laborers. Private house in areas with a high water table or frequent floods. 	Value proposition <ul style="list-style-type: none"> No odors or pests. Safe access, privacy, comfortable to use. Pride, increased social standing by guests. Health impact (safe separation of feces from human contact). Storage options adapted to space and geological conditions (e.g., slugging and capacity). Toilet can be easily moved. 	Gaps <ul style="list-style-type: none"> Proper disposal of used dry cleaning materials as per MDH guidelines. Minimal awareness and acceptance of safe containment, handling, and treatment / low acceptability of simple pit latrines associated with a lack of understanding on the dangers of open defecation and other safe storage and treatment options. Minimal safe onsite containment and treatment options (especially for flood-prone/high water table areas) (Step 3 – More storage and treatment options available on the market). Adequate (or any) toilet facilities for renters. <p>Definition of a portable toilet: toilets that are purchased and owned outright by an individual household, no part of the system or service contract shared with other households in the compound.</p>												
Success metrics: <ul style="list-style-type: none"> Tenants that can afford to and decide to buy, rent or improve existing toilets to satisfy their needs. People that are proud/satisfied with their toilets and use them. Toilet facilities are maintained in hygienic conditions with servicing happening at appropriate intervals. Prevention and reduction of diarrheal diseases and reduction of open defecation. Entrepreneurs engaged in the sale or rental of toilets. 	Sample Learning Objectives (Y2 & Y3) <table border="1"> <thead> <tr> <th>Mental model stage</th> <th>Proof of Concept Rough Prototype (4-6 months)</th> <th>Feasibility Live Prototype (6-9 months)</th> </tr> </thead> <tbody> <tr> <td> BUILD <ul style="list-style-type: none"> Identify prototypes/testing technologies. Define product requirements. </td> <td> <ul style="list-style-type: none"> Select technologies to test. Develop protocol and evaluation. Government support/buy in. Ranking of design features. </td> <td> <ul style="list-style-type: none"> Identify pilot households. Train artisans and users. Number of prototypes installed. Feedback from key stakeholders. </td> </tr> <tr> <td> MEASURE <ul style="list-style-type: none"> Average # of HH/people living in compounds. Estimated space available for latrines. </td> <td> <ul style="list-style-type: none"> List of available technologies. Updated product requirements document(s). </td> <td> <ul style="list-style-type: none"> Recommended prototypes. User acceptability report. </td> </tr> <tr> <td> LEARN </td> <td> </td> <td> </td> </tr> </tbody> </table>		Mental model stage	Proof of Concept Rough Prototype (4-6 months)	Feasibility Live Prototype (6-9 months)	BUILD <ul style="list-style-type: none"> Identify prototypes/testing technologies. Define product requirements. 	<ul style="list-style-type: none"> Select technologies to test. Develop protocol and evaluation. Government support/buy in. Ranking of design features. 	<ul style="list-style-type: none"> Identify pilot households. Train artisans and users. Number of prototypes installed. Feedback from key stakeholders. 	MEASURE <ul style="list-style-type: none"> Average # of HH/people living in compounds. Estimated space available for latrines. 	<ul style="list-style-type: none"> List of available technologies. Updated product requirements document(s). 	<ul style="list-style-type: none"> Recommended prototypes. User acceptability report. 	LEARN		
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Potential Collaborators Ministry of Health, Artisans, Landlords, Vacuum truck operators, Entrepreneurs	Key dependencies Product availability and acceptability, Cost and feasibility of service model													

Product requirements form

Prioritizing design factors for the portable tenant toilet

Purpose: Describes the desirable functionality of a technology and provides a benchmark to evaluate similar technologies. Highlights priority design factors.

Tool in practice: Portable toilets were identified as a technology of interest. The project teams defined design factors to evaluate the technology options, including: cost targets and affordability, number of users, containment capacity, space, acceptability, access (input materials), technology readiness level, and portability (own or rent).

Product stoplight diagram

Comparing portable tenant toilet options

Purpose: Highlights potential benefits and risk factors for selected technologies using stoplight colors of green, yellow, and red. This tool helps decision makers identify the most appropriate technology for the prioritized use cases.

Tool in practice: Container-based sanitation (CBS) solutions were prioritized based on the refined use case. CBS includes an indoor, portable toilet plus emptying service. CBS options were included in a stoplight diagram, which provided the project teams with a high-level visual analysis and in-depth technical review of the technologies.

Rough prototype study in Benin—May 2016

Portable toilets for compound tenants

In May 2016, PATH and PSI/Association Béninoise pour le Marketing Social et la Communication pour la Santé Benin conducted a qualitative study to understand the appropriateness and desirability of different portable toilet models. PATH led the development of the study design, methodology, and research tools, provided support during the data collection; and led analysis of the field data.

Sample

- Tenants (n=12): interviews collected feedback from potential end users on container-based systems, including materials, key features, costs, payment options, and service models.
- Landlords (n=4): interviews gathered perspectives on CBS and support and consent requirements for a tenant-purchased sanitation facility.

Results

- Tenants like the design and service model.
- Space is available in compound households, specifically in the “bathroom” (i.e., wash/shower) area.
- Tenants preferred ceramic or laminated wood toilets and a two-week to biweekly service model.
- Cost remains a clear limitation to sustainable service models.

Stoplight diagram of small household toilet plus service model

					
Pilot location	Ghana	Kenya	Haiti	Peru	Kenya
Cost targets for toilet rental and service per month	\$8 US/month.	\$7 US/month.	\$5 US/month, includes flush material.	\$18 US upfront or \$14 US/month.	\$2 US/month.
Interval service	Twice weekly	Twice weekly	Weekly	TBD	Daily
Toilet design	Plastic container, molded ABS & HDPE plastic portable toilet. UDDT.	The Blue Box (UDDT) plastic container.	Compact, portable toilet unit designed for home use.	Separett's Villa model, portable dry toilet, made out of fiberglass. UDDT.	Portable toilet unit designed for in home use, easily stored, urine collected in separate tank.

Conclusion

The findings from the initial proof of concept (rough prototype) study were used to update and refine the product development canvas and identify additional questions around technical feasibility, commercial viability, and user acceptability. The results from this work were also entered into a Stage Gate process for decision-makers to evaluate and prioritize the most promising business models for the project. While the user and landlord feedback on the idea of a CBS toilet plus service model was positive and suggested a CBS model would be acceptable among end users in Cotonou, several questions remain, in particular, around the commercial viability of the service model and market size remain. Following a review and prioritization by the Benin team, the next iteration of this work is scheduled for late 2017.

¹ Reis E. The Lean Startup. Crown Publishing Group; USA. 2011. ² IDEO.org