Research Report

PBL Project - 06.02.2018

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Mission & Vision

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Mission

1. To **better the lives of Kenyans regarding food safety** (and especially aflatoxins) by developing e.g. tools/campaign/platform/service model to tackle the issue.

2. To **learn from one anothe**r and create a lasting collaboration **partnership** between the Aalto University and University of Nairobi.

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Vision

To **collaboratively work** with the team in Nairobi University and together **create deliverables/solutions** that take the **conversation and development** around **aflatoxins and food safety** further.

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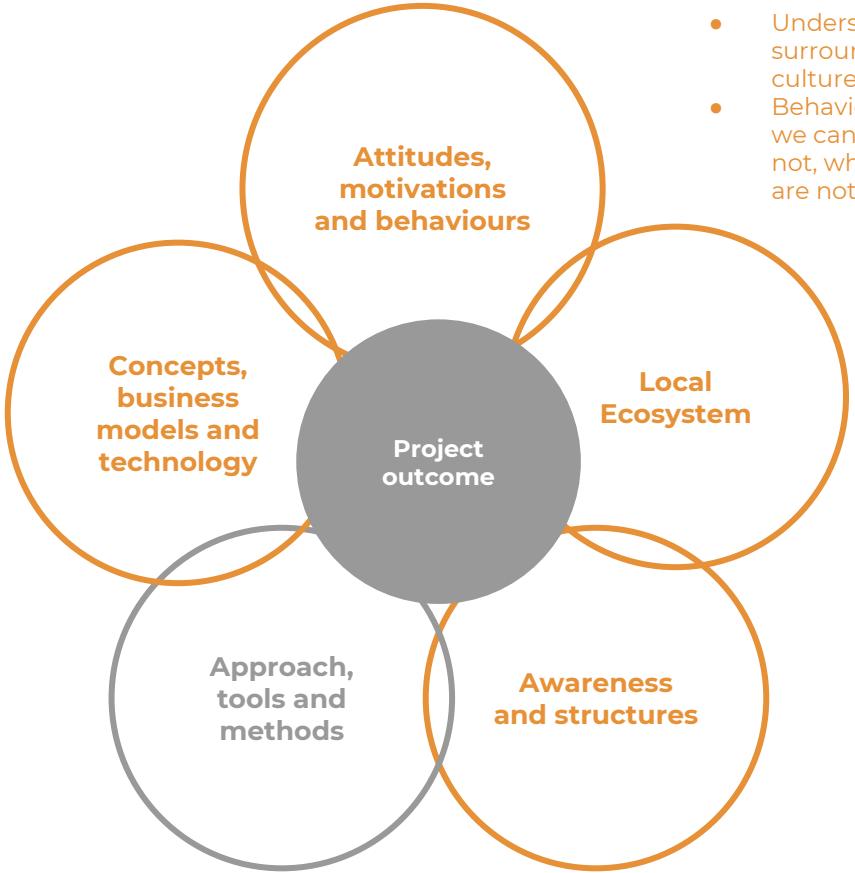
Mission & Vision | themes of focus



- Understanding the attitudes and motivations of Kenyans surrounding food safety, aflatoxins, food, health, family, culture etc.
- Behaviours in contrast to attitudes around these topics. So we can understand if and how they are interested and if not, why not? Or if they are interested but behave like they are not

- Benchmarking
- Theory and options
- Limitations and possibilities of technology

- Mapping the stakeholders in and around the issue
- Other entities, technologies, resources are involved in the ecosystem

- Wicked problems
- Design thinking
- Systems thinking

- The awareness of the stakeholders around the topic
- The structures involved in the issue

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Introduction & Challenges

leading to the problem statement

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Introduction | research questions

1. **Why is food safety in developing countries such as Kenya still such a big problem?**

2. **Where can we find the right *leverage points* so we can improve food safety in such areas?**

I. What social impact can we have with our project?
II. How can we improve lives?

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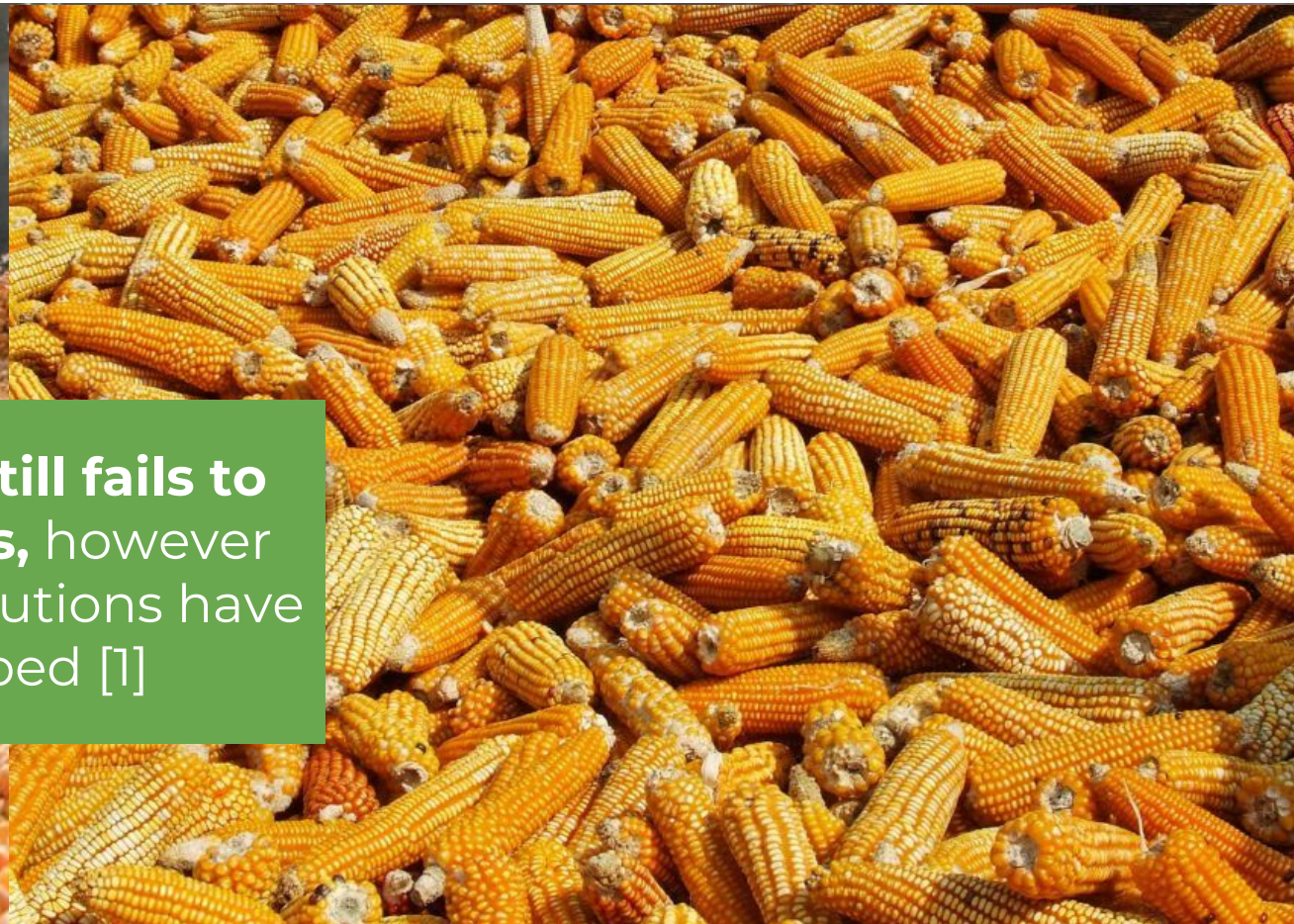
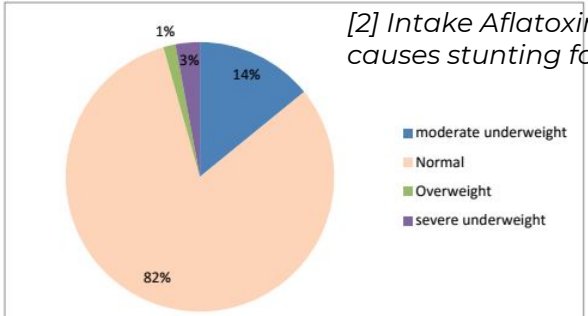
#1 Challenge | drying



Drying process still fails to control aflatoxins, however effective drying solutions have been developed [1]

#2 Challenge | cheap

People are forced to buy the cheapest food available, although being exposed the high risk of contamination [2][3][4]

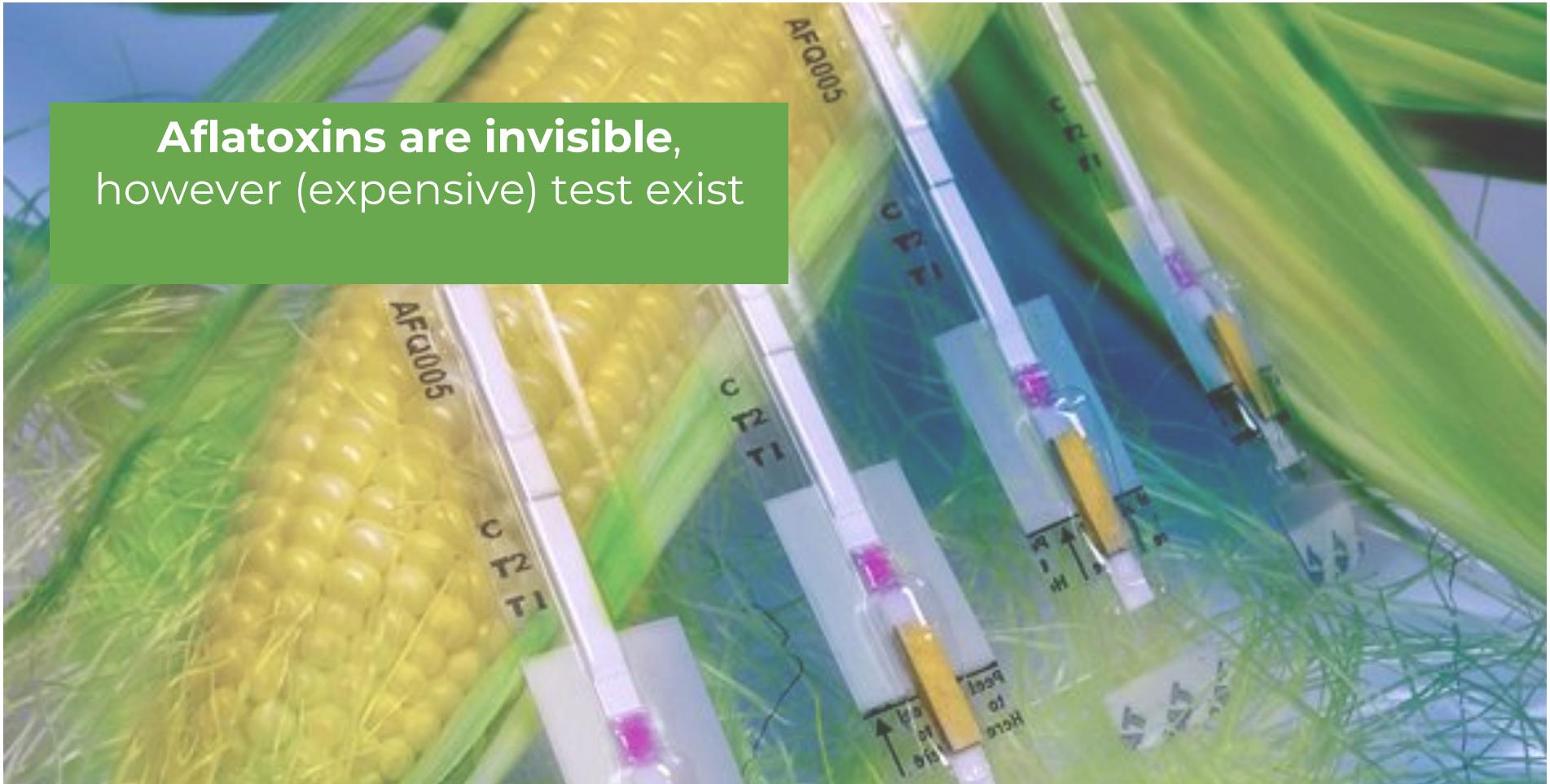


[2] Intake Aflatoxins causes stunting for kids

#3 Challenge | testing

Farmers have no incentive to test for contamination (and risk decrease value of produce)
since there is no support for harvest loss when infected

#4 Challenge | testing



Aflatoxins are invisible,
however (expensive) test exist

#5 Challenge | testing infection into dairy chain

Contaminated food needs to be sold and is fed into the dairy chain, infecting milk and eggs [5]

Introduction | problem statement

Kenyans, especially in **rural areas suffer from low food quality** e.g. aflatoxin infected foods.

While food safety solutions have been developed, they seem not to function/being adopted in the current system flow of safe food production. [1]

Why is that so? *Food safety is less regulated in low-income countries, where the BoP (bottom of pyramid) suffers mostly. In the case of aflatoxin infected foods it causes health problems one of which is stunting in the growth of children. [2][3]*

Introduction | solution area

Local companies/networks may contribute in development by engaging in **inclusive business model innovation** with the potential for long-term sustainability and broad, multi-stakeholder collaboration to remove systemic barriers to scale and impact. [6]

How can we do this? Through:

- **project** based alliances with e.g. on-the-ground networks, NGO's, donors, development banks
- **platforms**: formal networks of potentially large numbers of players, established for the common purpose to organize collective action to overcome the weakest links in the value chain.

Scoping

Scoping | finding customer segment [1]

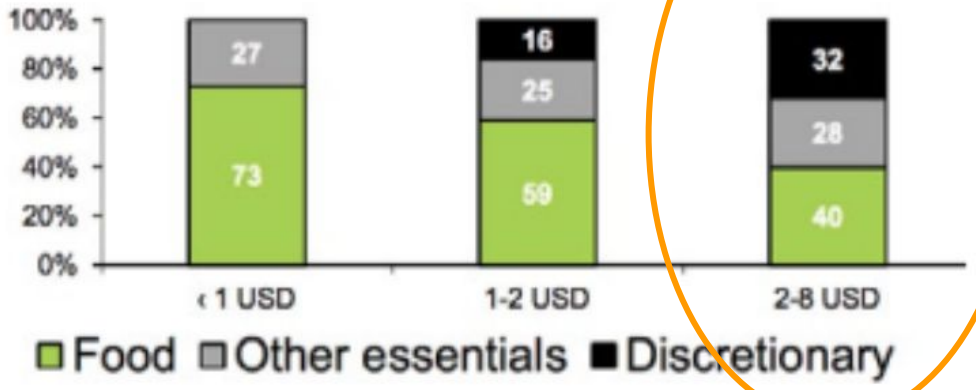


Figure 2. Total household expenditure of BoP consumers by PPP adjusted income.

BoP = bottom of pyramid
PPP = purchasing power parity

Customer segmentation [1]

- 2-8 USD daily income
- semi-rural

We will narrow down and agree on the specific scope with the Nairobi team.

Scoping | BOP challenges [1]

The challenges of BoP consumers have caused them to be excluded from most of the conventional business models

1. **Low and fluctuating incomes**, and **limited access to credit or insurance**, drive the BoP to be smart shoppers and risk-averse investors.
2. **Domestic constraints**, **difficult living conditions**, and **high prices** for **products or services** are among the daily challenges at the BoP.
3. **BoP consumers lack information on many commercial products**, and therefore rely on trusted sources or demonstrations to make purchase decisions.
4. BoP consumers and workers conduct their lives with dignity and **demand both respect and quality from service providers and employers.**

Challenges BoP [1]

It is common to see people making extra or living by selling small products

Outdoor marketing

The marketing channels for a Bottom of the Pyramid consumer in remote areas that cannot access TV or internet cannot rely on channels that are used by foreign companies in their home markets. One of the most visible advertising is **painted houses**, restaurants and small stores in the colours and the logo of the product in exchange for free paints and extra fee.

Roadside houses are often painted in the colours and brands of consumer goods

Budget constraints

It is unusual for lower income Kenyans to save money for future (health) expenditures. In case of unexpected health costs it is common turn to the family and friends to organise a **fundraiser** and to get help. The family and community centred approach also works in saving for bigger purchases – there are savings clubs, where the members make payments and get paid in bulk on rotational bases. This helps people save, where banks are not available and the income is unstable.

The poorest consumers also desire self-esteem and social recognition and buy items that not only fulfil their needs but look nice and make them feel better

A healthcare products provider who targets the urban slum dwellers as the purchase decision makers might consider street ads and painting of buildings with simple slogans and foreign look

Fast growth in the spread of technology

The technology innovation in Kenya has clustered mainly around mobile services. Most people can access websites through **mobile phone** and mobile money transfer services also started in Kenya.

Paying for various services by simple mobile applications is common

Kenya as Mobile Success Story

With high mobile penetration and literacy rate, popular mobile applications are very efficient way to reach the Bottom of the Pyramid consumers with services from various fields. For example, MedAfrica allows the users to find info about the nearest relevant clinics based on signs and symptoms, M-Farm on the other hand helps farmers collect information about market prices of products and buy and sell them. Their data is also quoted daily in the TV.

The mobile developers got a huge boost in 2007. One year before the Let's Do It campaign helped Estonians map the garbage nationwide; Ushahidi application let Kenyans map post-election violence incidents. The group of enthusiasts continued meeting and another workgroups were established:

- Hub (www.ihub.co.ke), which allows 7000 Kenyan youth interested in technology exchange their ideas and work and which gives workspace for 50 start-ups and 250 people;
- m-Lab (www.mlab.co.ke), an incubator for mobile businesses, which is one of five worldwide set up in partnership with mobile giants Nokia and Samsung, both of who also have their research labs in Nairobi.

Aflatoxins & Mycotoxins

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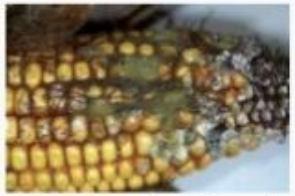
Aflatoxins | key insights

What are Aflatoxins?

- **Invisible** – poisons in fungi that infect many crops – maize, groundnuts, sorghum, rice
- **Complex**
  - Preharvest: Aflatoxin contamination increases with crop stress – drought, pests
  - Postharvest: Increases further with poor drying and storage conditions
- **Persistent** - Very difficult to destroy or remove through normal food processing



www.ipm.iastate.edu

PACA

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Aflatoxins | key insights

Aflatoxins are **mycotoxins** produced by two species of Aspergillus, a fungus which is especially found in areas with hot and humid climates. Aflatoxin is the most researched mycotoxin. **[1]**

A person's **age**, **gender**, **level of exposure**, **duration of exposure**, **health**, **strength of their immune system**, **diet** and **environmental factors** are things that count when talking about the affections of aflatoxin. **[2]**

Aflatoxin affects almost **one quarter of global food** and feed output. **[3]**

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Aflatoxins | key insights & overview

Since aflatoxins are known to be **genotoxic** (the ability of chemicals to damage the genetic information within a cell resulting in mutations, which may lead to malignancies) and **carcinogenic** (having the potential to cause cancer), exposure through food should be kept as low as possible. **[1]**

There are two main ways people are usually exposed to aflatoxins.

1) someone takes in a **high amount** of aflatoxins in a very **short time**.
This can cause: Liver damage, Liver cancer, Mental impairment, Abdominal Pain, Vomiting, Convulsions, Edema, Pulmonary Edema, Haemorrhaging, Disruption of food digestion, absorption or metabolism, Coma, Death **[2]**

2) taking in **small amounts** of aflatoxins **over a long period**.
This can cause: Growth and development impairment, Liver cancer due to DNA mutation caused by aflatoxins **[2]**

Aflatoxins | key insights

*“Each year over **4.5 billion people** are at risk of chronic exposure to mycotoxins. These people mainly live in developing countries where the exposure to mycotoxins is not sufficiently controlled. Sub-Saharan Africa is especially vulnerable to mycotoxins because of the climate conditions and climate change may further aggravate the situation.”*

- Luke

(Luke.fi, 2013)

Aflatoxins | key insights

As a result of **fungal contamination** before and after harvest, aflatoxins occur in **foods**, such as:

groundnuts, treenuts, maize, rice, figs, other dried foods, spices, crude vegetable oils and cocoa beans

(Efsa.europa.eu, 2009)

Aflatoxins | key insights

Mycotoxins are a threat to **human health** and a substantial contributor to **post harvest losses**, thus affecting both **food security** and **food safety** negatively => **Significant problem**.

Many technologies have been published, but **never scaled out**.

Aflatoxin contamination in stored maize increases rapidly after harvest in Kenya, due to **poor handling and storage practices.**

Understanding **willingness to pay** is critical to scaling up aflatoxin control in Africa.

There **exists little incentive** for farmers to invest time or material resources in aflatoxin control when producing for the market.

The poor are more exposed to aflatoxins.

Women were more involved in agricultural decisions were more likely to adopt **recommended practices that did not require a cash outlay.**

In April 2004, one of the largest aflatoxicosis outbreaks occurred in rural Kenya, resulting in 317 cases and 125 deaths.

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Aflatoxins | key insights

The selected post-harvest technologies (**plastic tarps, a mobile drying service and hermetic storage bags**)

Only one of the technologies is currently available for use: **a locally-manufactured flatbed dryer made by Kenya Stove**.

Just under 70% of farmers to whom the drying service was **offered free** of charged made arrangements to **take advantage of the offer**.

Using of lactic acid bacteria in controlling mycotoxins in **feeds and foods**.

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Aflatoxins | key insights

	Seeding	Production	Harvest	Post-harvest	Retailing	Consumption
Source of contamination	weather	weather	dry	Storage	Storage	Storage
Level of risk	NA	NA	High	High	NA	NA
Mycotoxin control solutions	NA	LAB/Bio control	Dryer service	Storage bag	NA	LAB
Study/Intervention	Yes	Yes	Yes	Yes	No	No

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Food Safety issues

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Food safety | key themes

Horticultural produce gets contaminated on and off farm and therefore **food safety interventions are required along the entire value chain**. Poor production and handling practices have resulted in contamination by harmful bacteria and fungi.

On the farm, micro-organisms enter the value chain through the use of **contaminated surface water** used for irrigation and application of incorrectly composted animal manure. The rise in urban population has driven up peri-urban production and **use of waste water in farming** due to the rising scarcity in irrigation water which has further elevated the **risk of microbial contamination.** Weak implementation of good agricultural practice in production also provides a loophole for indiscriminate use of pesticides by some farmers.

(East-africa.org, 2017)

Food safety | key themes

Other **food safety hazards** and mostly microbial, **originate during storage**, **transportation and retailing**, as a **result of poor hygiene and handling** practices. The use of tables or platforms is limited, and it is not uncommon to find produce in informal markets placed on the ground and on walkways, **in contact with dirt**.

It is not unusual in some markets to find **garbage bins or waste piles next to traders selling fruits and vegetables.** Furthermore, unscrupulous suppliers and traders also use **chemicals** to hasten the ripening of fruits like mangoes and bananas. **Actors in informal markets rarely have formal training in food safety**, and few are aware of food safety risks related to the produce that they sell, and regulations that apply to their activities.

While formal markets such as supermarkets and greengrocers are more organized, **most sourcing teams and food handlers at the points of sale lack the requisite food safety knowledge.**

(East-africa.org, 2017)

Supply Chain

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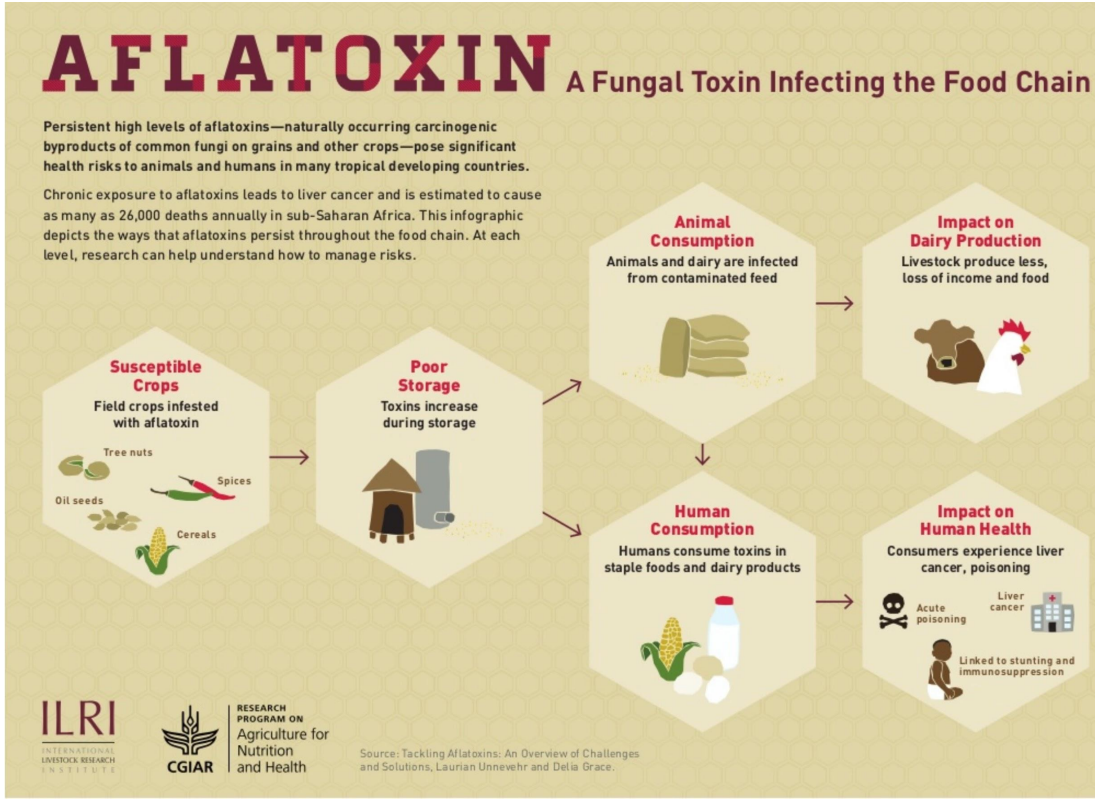
Supply chain | Food Safety Hazard

Brief Description:

Solving the market failure in food safety requires improvements in **identifying food safety hazards and providing incentives for improved management.**

Given the nature of many hazards, which may **originate at the farm level or first handler**, and may multiply or spread as products are mingled and moved downstream towards the consumer, **improved supply chain coordination** is also frequently required.



Supply chain | General Steps

Production
- Farms & orchards
- Fisheries
- Gardens (home, school, community)
- Land

Processing
- Community kitchens
- Commercial processing facilities
- Value-added businesses (jams, prepared foods, etc.)

Farm inputs
- Suppliers
- Composting
- Biodigesters
- Policy supporting input usage
- Seed banks & cos.
- Farm equipment
- Fuel supply

Support Systems
- Emergency food providers & other food assistance programs
- Food system organizations, land trusts
- City, economic councils, business development agencies
- Media, schools, institutions, transportation system
- Supportive policy & programs

Distribution: Wholesale
- Independent businesses
- Community root cellars
- Farmer co-ops to increase wholesale supply

Waste management: Retail
- Composting companies
- Community composting
- Biodigesters
- Wastewater Management
- Composting in institutions

Distribution: Retail
- Farmers markets, CSAs
- Food co-ops, local stores, restaurants
- Schools/senior meal sites
- Matchmaking of farmers with processors & retailers

General Food Chain for urban citizen, AFDB, 2003

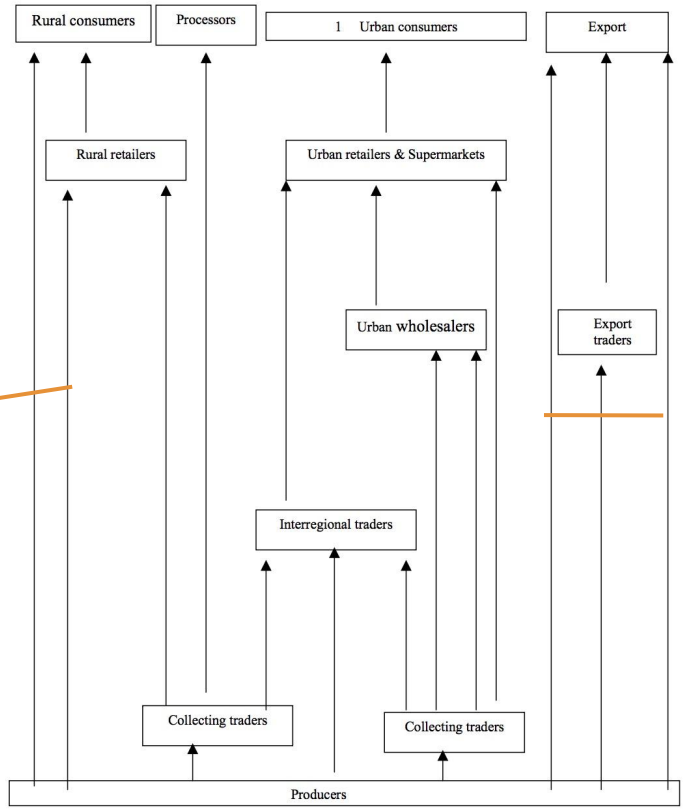
Source: AfDB, 2013

Supply chain | Previous research for Kenyan context

No-controlled Food Safety

High-controlled Food Safety

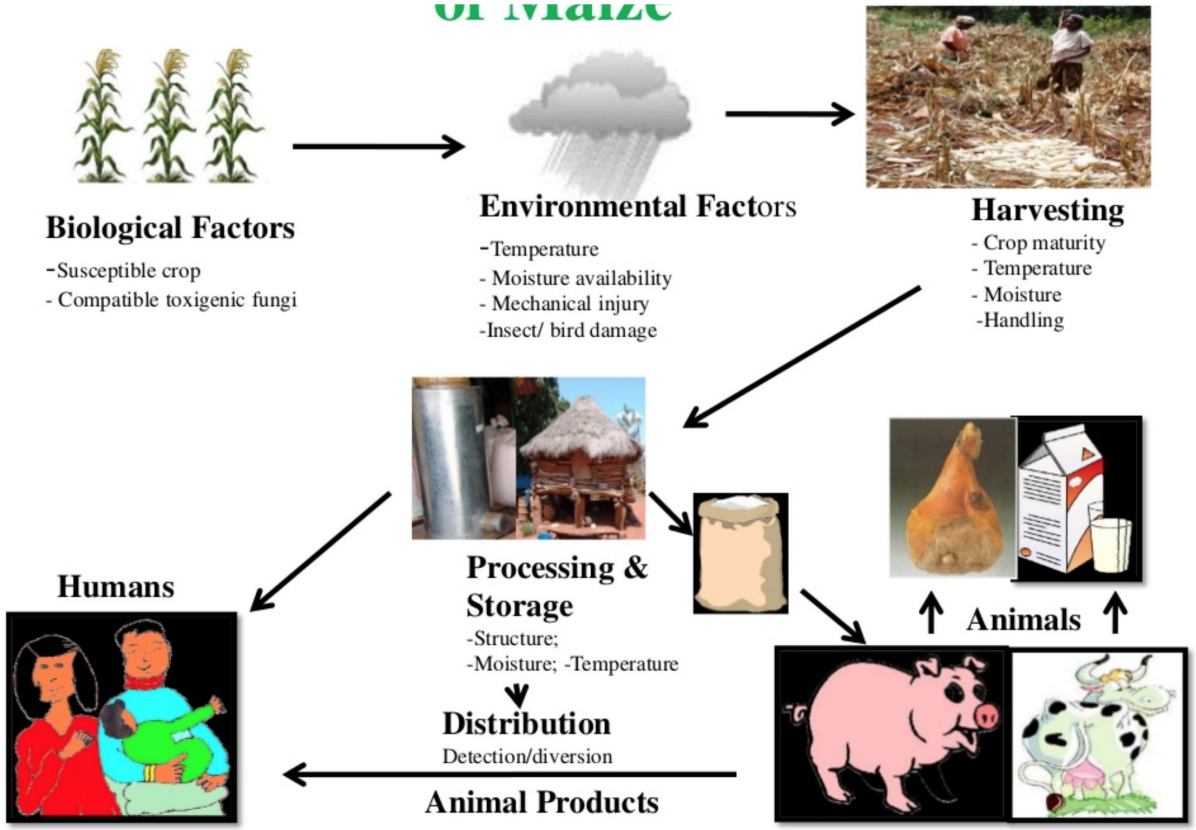
Figure 3 A typical flow of produce and the traders involved



Source: Adapted from Okado (200)

Typical Flow of Produce and Traders Involved (Okado, 2003)

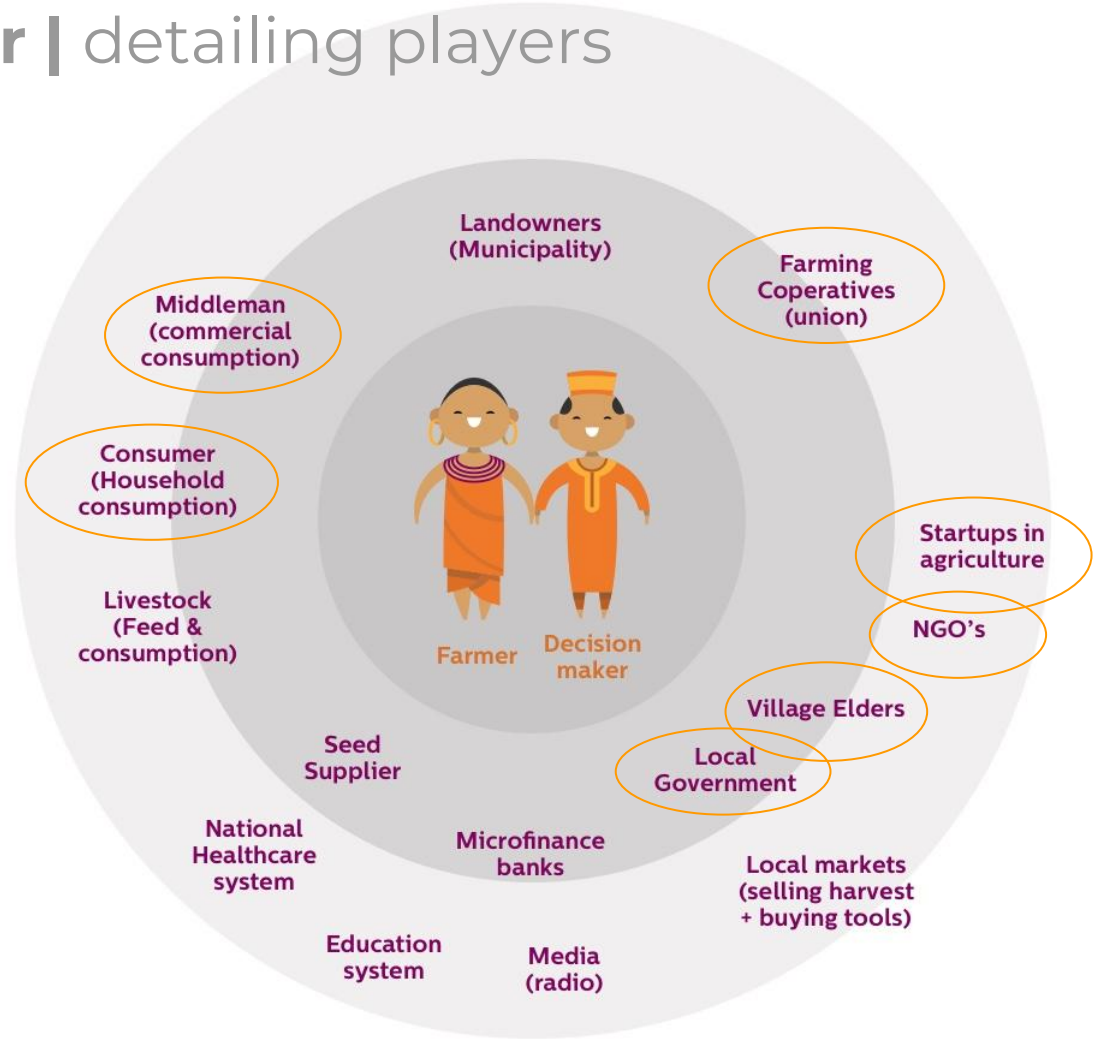
Supply chain | Cause of Aflatoxin in supply chain



Stakeholders

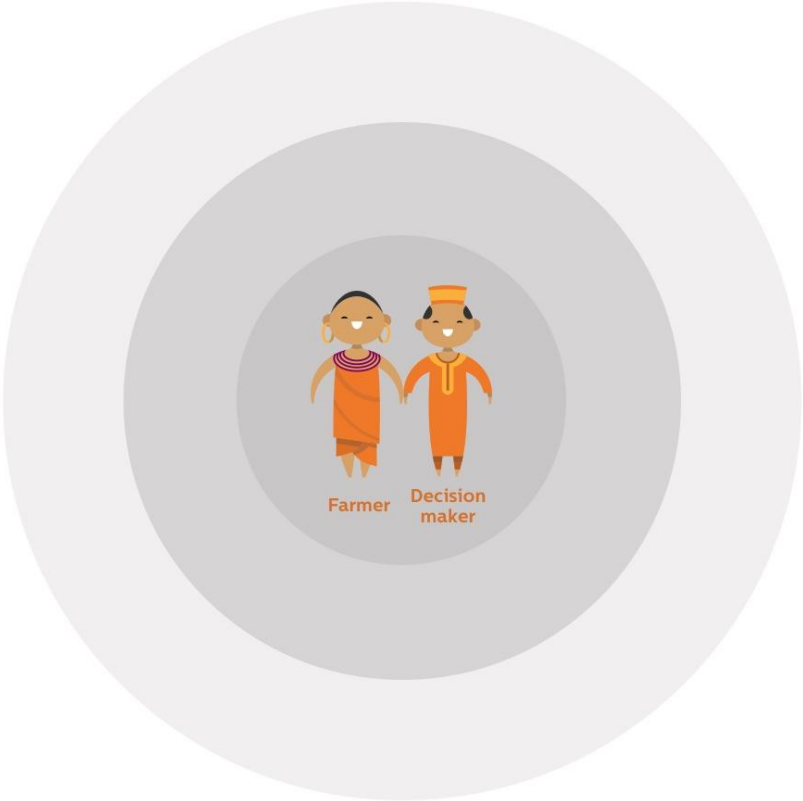
Stakeholder | detailing players

who we'd like to talk to



The outcome of a stakeholder workshop with the Aalto Team to decide who we would like to talk to during the field trip

Stakeholder | empty map



The Stakeholder map can be used during workshops. The centre can be with another stakeholder as well. Its purpose is to understand the key players which can later be used to map out the value they could / are currently giving to each other

Local Ecosystem

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Ecosystem | preliminary research

Kenyan food Startups

Twiga foods

A B2B mobile-based supply platform for Africa's retail outlets, kiosks, and market stalls. A vendor orders stock from Twiga, and we reliably show up the next day at their shop with a low-cost, better quality, product than informal markets can provide.

M-Farm connecting farmers

Step by step guide on how to plant your crop and reach optimum production.
Engage thousands of buyers directly when your produce is ready.
Know when to plant using our price trends.

JUMIA FOOD

Order delicious food online!

Discover local restaurants that deliver to your doorstep

yum deliciousness. delivered.

Yum Kenya is an online food ordering service based in Kenya.

GRADUATE FARMER

An online platforms that empowers the youth with information, tools and financial opportunities that will guide them from being job seekers to Creators through Agribusiness.

agruppa

Agruppa leverages mobile phone technology to empower small food vendors in low income neighborhoods by providing them with fruits and vegetables at wholesale prices.

Agri tours

Let farmers and aspiring farmers learn from other farmers through tours to those already practicing what they want to learn. We hold monthly trips to farms with themed lessons all year round and document them so that other farmers can learn as well.

Established companies

TECHNOSERVE
50 YEARS OF BUSINESS SOLUTIONS TO POVERTY

TechnoServe is partnering with a group of food companies on an effort to strengthen the food processing industry in several African nations. Today, General Mills announced the launch of Partners in Food Solutions, a hunger-fighting nonprofit.

Cargill Helping the world thrive

Cargill Kenya Limited has 159 employees based in Nairobi, Nakuru and Mombasa. Activities in the country include grain origination, trading in wheat, maize, barley, soybean meal, tea sourcing, handling and related services.

APTECA facilitates adoption of a quality systems approach to measure and manage aflatoxin risk to increase global food safety.
third-party labeling for aflatoxin-tested maize.New labeling system may bring safe, affordable maize flour to Kenyan consumers

Public Organizations

NFSCC

The National Food Safety Coordination Committee (NFSCC) is a multi-sectoral committee which was initiated by various government agencies/institutions who are players in the food chain. The NFSCC is responsible for coordinating all food safety activities in the country

Department of Public Health

National Public Health Laboratories

Department of Crop production

Government Chemists Department

Department of Veterinary Services

Agricultural Research Institute

Plant Health Inspectorate Services

Dairy Board

The National Biosafety Authority

General info & food culture

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General info | key insights

Location: Eastern Africa, bordering the Indian Ocean, between Somalia and Tanzania.

Capital: Nairobi.

Climate: varies from tropical along coast to arid in interior.

Population: 45,010,056 (estimated - 2014.)

Ethnic Make-up: Kikuyu 22%, Luhya 14%, Luo 13%, Kalenjin 12%, Kamba 11%, Kisii 6%, Meru 6%, other African 15%, non-African (Asian, European, and Arab) 1%.

Religions: Protestant 45%, Roman Catholic 33%, Muslim 10%, indigenous beliefs 10%, other 2%.

Government: republic

The most common greeting is “Jambo?” (“How are you?”)

Food | cultural dishes

Most Kenyan dishes are **filling and inexpensive** to make. Staple foods consist mainly of c**orn, maize, potatoes, and beans.** ***Ugali*** (a porridge made of maize) and **meat** are typically eaten inland, while the coastal peoples eat a more varied diet.[1]

Traditional dish 'Nyama Choma': roast meat (any meat) traditional dish eating for any gathering [2]

Insects : For the global demand of meat growing, insects are a very important source of protein in Sub Sahara Africa. [3]

Perhaps the Nairobi team can enlighten us with more cultural behaviour insights on food topics + statistics

More in-depth research can be done on:

1. What **levels of food safety** (in the value chain) are present?
2. What is the **private contribution** in the food sector?
3. What is the **formal / informal market** size?
4. **International trade relations**? (import & export products)
5. Who are the local and foreign (future) **investors**?

Approach, Tools & Methods

for wicked problems

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Wicked Problems

What | What is a wicked problem?

10 characteristics of Wicked Problems by Horst Rittel

1. There is **no definitive formula** for a wicked problem.
2. Wicked problems have no stopping rule, as in there's **no way to know your solution is final**.
3. Solutions to wicked problems are **not true-or-false, they can only be good-or-bad**.
4. There is **no immediate test of a solution** to a wicked problem.
5. Every solution to a wicked problem is a "one-shot operation"; because there is **no opportunity to learn by trial-and-error**, every attempt counts significantly.
6. Wicked problems do **not have a set number of potential solutions**.
7. Every wicked problem is **essentially unique**.
8. **Every wicked problem can be considered to be a symptom of another problem**.
9. There is always **more than one explanation** for a wicked problem because *the explanations vary greatly depending on the individual perspective.*
10. The planner/designer has no right to be wrong and must be **fully responsible for their actions**.

(https://www.interaction-design.org, 2018)

Why | Why is food safety in Kenya a wicked problem?

On the right is a picture that is used to characterize wicked problems. When our issue "Food Safety in Kenya" is placed in the middle of the map, it becomes clear that all the mentioned characteristics are relevant in our project.

1. The issue is difficult to define.
2. Aspects of the issue are interlinked with other wicked problems (e.g. access to education, poverty, regulation etc.) and they affect each other.
3. The food and agriculture system is so complex that changes and interventions in the system made by us would cause unforeseen consequences somewhere else in the system.
4. The solution is not clear.
5. Social complexity surrounds the issue.
6. People's, organisations and systems behaviours would have to change in order to tackle the root cause of the issue.
7. The food safety system involves multiple stakeholders who have various roles in the system. The responsibilities of those individuals and their roles are not clear..
8. Policy and governmental agencies regulate and are integral in solving the problem. However the issue stands.

(Mediafactory.org.au, 2018)

1. **Design Thinking**
2. Systems thinking

Design Thinking

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Why | Why design thinking for the project?

“Design thinking helps democratize innovation by providing a common language and a problem solving methodology that everyone can use to create better value for the stakeholders they serve.“

...

“One discovery we made in our research here at Darden as we listen to the stories successful social innovators told us was the way the design thinking was creating more than just better outcomes. It was providing the tools and the process to foster a better conversation across differences. Now sometimes, those differences were within organizations across functional silos or different levels. Other times, they were across very different types of organisations like government regulators and businesses or they were about different stakeholder needs and trade-offs. “

“Across them all, design thinking's greatest gift we came away believing was providing **a new social technology**. One that channeled conversations into more productive areas and provided guardrails that made it feel safe for the individuals involved to talk about and to work across their differences when things got uncomfortable. That helped them find higher order solutions that were better than what any one individual brought into the room in the first place, solutions that made a difference in their stakeholder's life.

This is what design thinking can bring.”

– Jeanne M. Liedtka, Professor of Business Administration, Darden School of Business

(Coursera.org, 2018)

Why | Why design thinking for the project?

Why are we using Design thinking methodology for this project?

As Professor Liedtka said in her great quote in the previous page, Design Thinking offers a great starting point and “social technology” for approaching problems in multidisciplinary teams.

Design thinking is based on people from different backgrounds working together and the tools are made to support that. The tools themselves are easy to grasp and utilize and the value in the process comes from having a variety of views present and then iterating on the solutions to see what works.

Design Thinking tools as much about retrieving information as they are about fostering collaboration and communication between people who don’t speak the “same language”.

Design thinking also emphasizes creativity, exploration and curiosity in solving problems, which leads to different kinds of results when compared to strictly rational and logic oriented methods. As we have learned in the IDP sessions, having fun and feeling safe to be goofy in teamwork produces the best kinds of results and Design Thinking fosters that.

The double diamond process where the researcher is vulnerable and open for all kinds of information (whether it be people’s emotions, experiences or structural information) during the research process brings in rich data and a variety of perspectives. From the rich data set the researchers then starts analyzing and synthesising the data to find unforeseen connections and possibilities as well as ideating with the people to find better solutions for their problems.

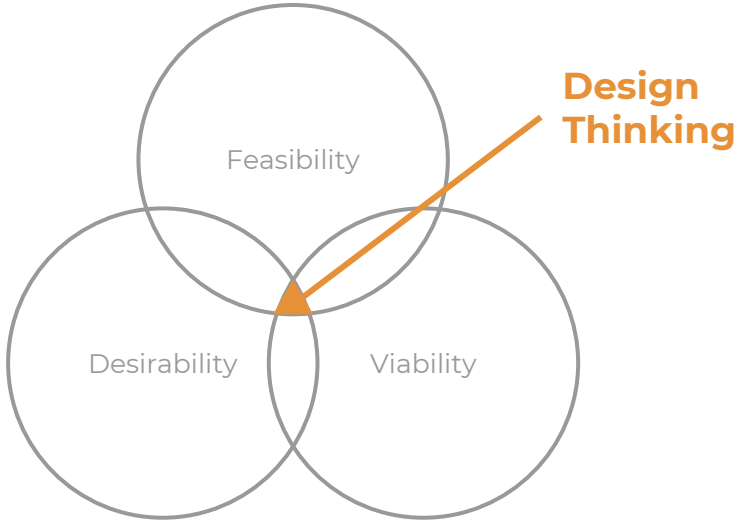
Design thinking offers a rich array of **methods and tools for including the human experience in the design process.** Engaging various stakeholders in the process makes sure that the end results are something the users actually need and want to commit to.

What | What is Design Thinking?

There are various definitions for Design Thinking and the first example is by IDEO.

At IDEO Design thinking is tightly connected to a **process** that is divided to four steps that all have a **variety of methods and tools** to choose from.

The goal in IDEO's Design thinking process is that anyone and everyone can be a "Design Thinker" and IDEO has created the tools for doing that.
The process is aimed at creating better products, services and experiences.



Phases of Design Thinking

Inspire new thinking by discovering what people really need

Push past obvious solutions to get to breakthrough ideas

Build rough prototypes to learn how to make ideas better

Craft a human story to inspire others toward action

"This approach, which IDEO calls design thinking, brings together what is desirable from a human point of view with what is technologically feasible and economically viable. It also allows people who aren't trained as designers to use creative tools to address a vast range of challenges."

(IDEOU.com, 2018)

What | What is Design Thinking?

Another approach to Design Thinking is by a company called Humantific. Humantific focuses on **sensemaking** as a foundation for changemaking and their approach is more philosophical than IDEO's, even though they also are a consultancy that works with and for clients.

Their approach is in many ways similar to IDEO's but the main difference is that it openly critiques **"strange making"** (as they call creating something new and different just for the sake of creating it) as they advocate for more critical and holistic way of designing.

Humantific has published their views for definitions of two different kinds of design thinking. (see next page) and the first kind of Design Thinking fits the settings of our complex project. This "Meta Design Thinking" as it's also called, mixes Design Thinking and Systems Thinking, just as we are aiming to do in this project.

(Humantific.com, 2018)

Design Thinking
(“Meta Design Thinking” or “Strategic Design Thinking”)

1. Is a meta, iterative, nonlinear, holistic, human-centered innovation process.
2. **Oriented towards multiple participant, cross-disciplinary co-creation.**
3. Begins with no preconceived assumptions regarding what the challenges, and opportunities are.
4. Begins upstream in Opportunity Challenge Definition Phase.
5. **Begins with a fuzzy situation to be defuzzed.**
6. **Contains empathetic research insight creation that informs challenge framing and opportunities for changemaking.**
7. **Recognizes that a constellation of diverse challenges likely exist simultaneously that can be visually mapped.**
8. **Contains a high degree of empathetic visual sensemaking that shapes insights for accelerated digestion by all participants.**
9. Contains the surfacing and orchestration of participant innovation behaviors.
10. Contains the surfacing and orchestration of participant cognitive thinking style preferences.
11. Like a Swiss army knife, is adaptive to various challenge types found in organizational and societal contexts.
12. **Serves as human-centered, adaptive toolkit/skill-set in the pursuit of organizational adaptive capacity building.**

Design Thinking
(“Product/service/Experience Design Thinking”)

1. Is a situational, iterative, nonlinear, holistic product/service/experience creation process.
2. Oriented towards a project team, or teams creating products/services/experiences.
3. Begins with preconceived assumptions that the challenges or opportunities are product/service/experience related and will be outcomes.
4. Begins downstream in product/service/experience Opportunity Challenge Definition Phase.
5. Most often begins with a predefined product/service/experience brief.
6. Contains empathetic research focused on insight creation that informs the creation of products/services/experiences.
7. Recognizes product/service/experience challenges.
8. Might contain a high degree of empathetic visual sensemaking that shapes insights for accelerated digestion by all participants.
9. Most often contains no surfacing or orchestration of innovation behaviors.
10. Most often contains no surfacing and orchestration of cognitive thinking style preferences.
11. Like a hammer, screwdriver and wrench. Each applicable situationally to product, service or experience challenges.
12. Can serve as a useful toolkit/skill-set in the pursuit of product/service/experience creation capacity building.

(Humantific.com, 2018)

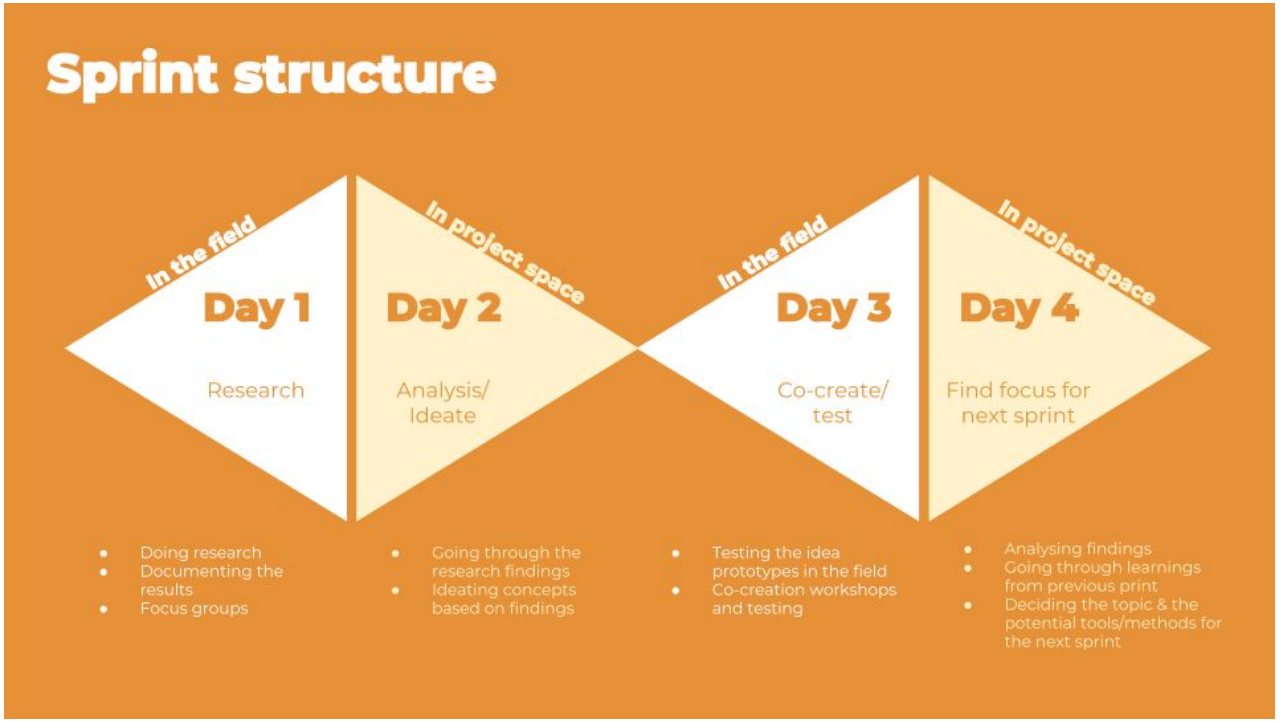
How | How to apply Design Thinking?

The sprint model

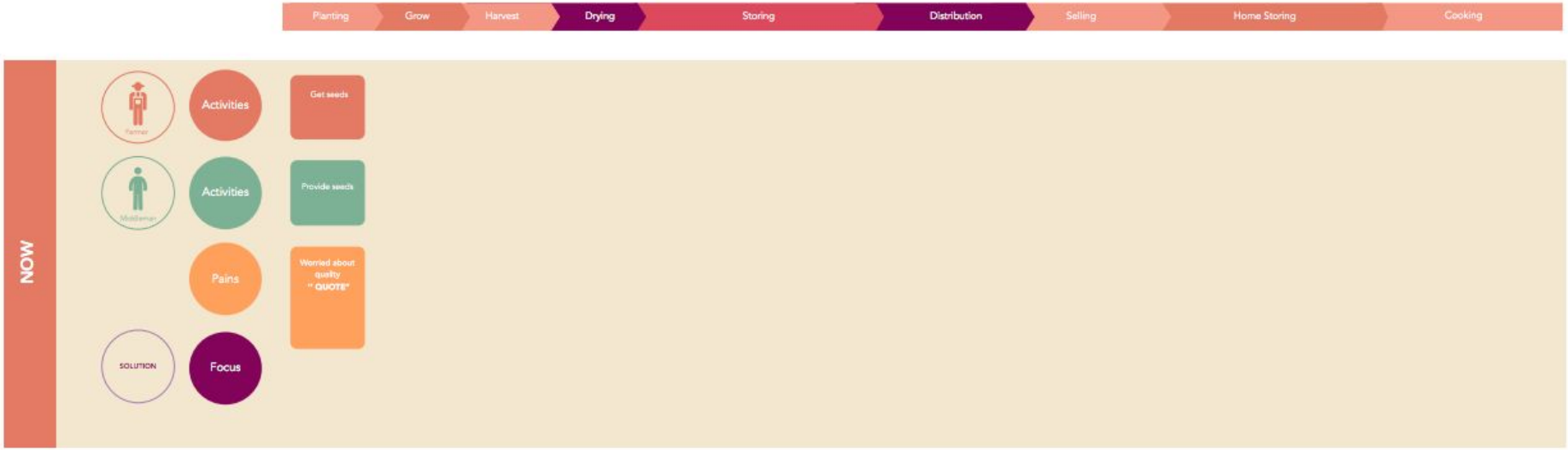
We created a specific sprint model for our field trip using the knowledge and experience of the designers in the team.

The model is based on the double diamond and this iterated version takes into account the tips we got from Annie Njenga who works as a Concept Business Architect at Philips in Nairobi, Kenya.

Annie Njenga for example suggested that we use focus groups instead of individual interviews and do simple co-creation sessions in the field.



Tools & methods | The Journey Map



The journey maps/Experience flows are used for:

- Making intangible experiences or systems visible
- Facilitating a common understanding between different stakeholders
- Finding painpoints / opportunities
- Visualising the present and the future vision

(Service blueprint is similar, but it includes the "backstage" of the service, where as the customer journey only shows the experience the user sees)

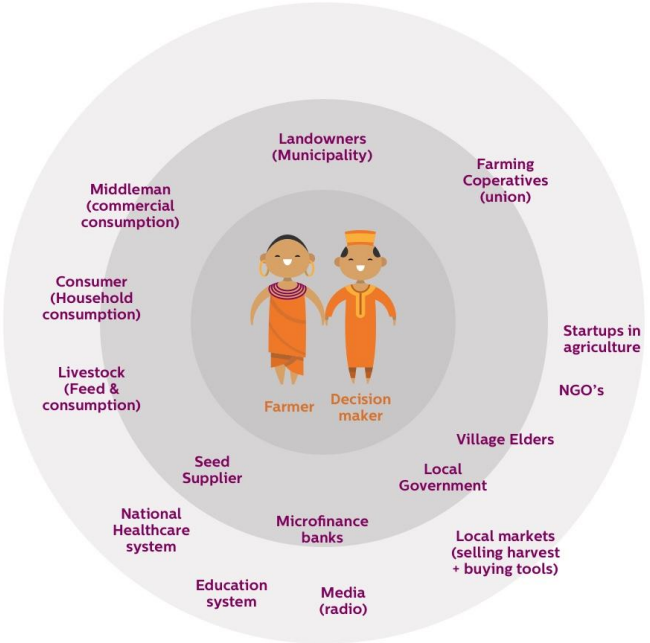
(Stickdorn, et al. This is Service Design Doing, 2017)

Tools & methods | Systems map e.g. Stakeholder Map

Stakeholder map is one kind of systems map that
- Illustrates the various stakeholders involved in the system
- used to create a common understanding of who is involved in the process and how

Value network map
- extension of stakeholder map to illustrate value exchange between participants
- used to understand flows of money, respect goods etc.

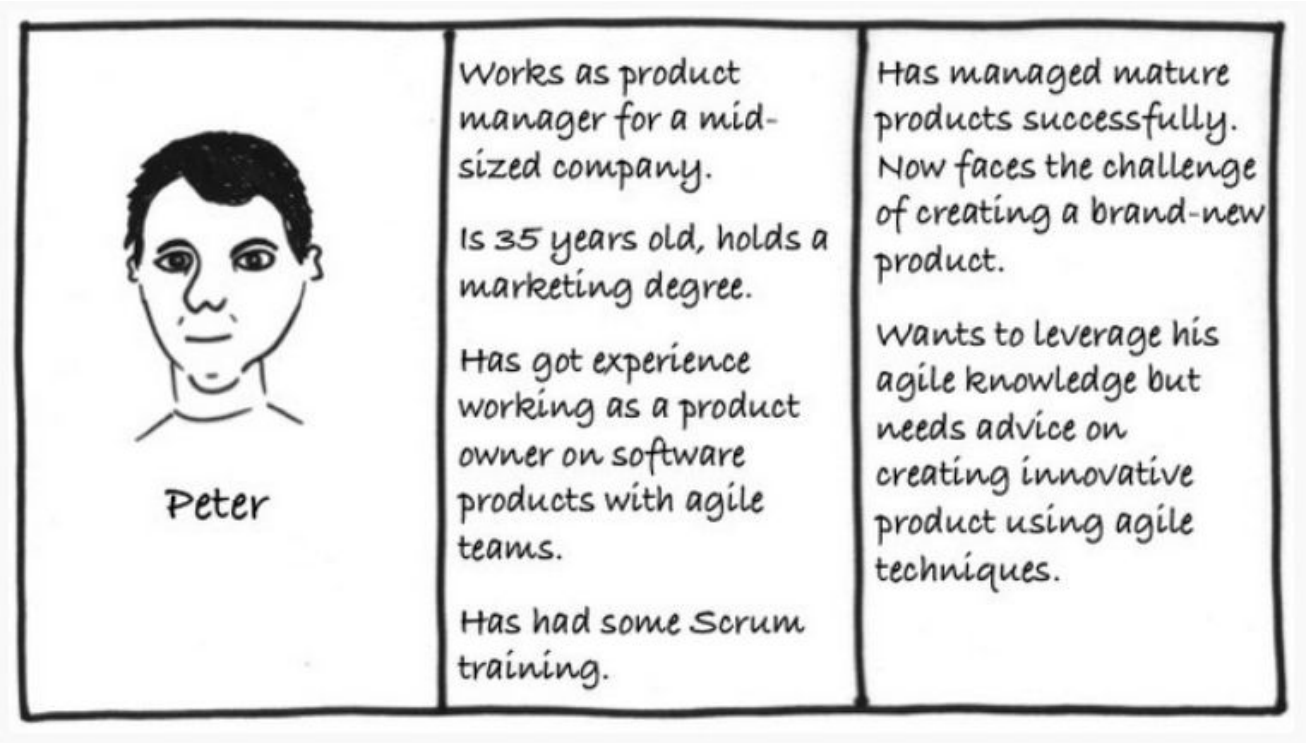
Ecosystem map
- used to visualise complex systems with humans, machines, interfaces, platforms, systems etc.
- visualise the relationships and interdependencies between the system stakeholders



Stakeholder map

(Stickdorn, et al. This is Service Design Doing, 2017)

Tools & methods | Personas [1]



Personas are used for
- Personas are fictional characters, which you create based upon your research in order to represent the different user types that might use the service / platform / network.

Helps in
understanding the users' needs, experiences, behaviours and goals.

(Interaction-design.org, 2018)

Systems Thinking

Aalto University

Why | Why systems thinking for the project?

1. “Systems thinking **motivates people to change** because **they discover their role in exacerbating the problems they want to solve.**”

2. “Systems thinking catalyzes collaboration because **people learn how they collectively create the unsatisfying results they experience.**”

3. “Systems thinking **focuses people to work on a few key coordinated changes over time** to achieve system wide impacts that are significant and sustainable.”

4. “Systems thinking **stimulates continuous learning**, which is an essential characteristic of any meaningful change in complex systems.”

(David P. Stroh, Systems thinking for Social Change, 2015)

Why | Why systems thinking for the project?

1. Systems thinking **expands the choices available for solving complex problems** by offering us methods and tools for broadening our thinking and tackling complex problems with concrete steps.

2. It helps us **articulate and frame problems in new and different ways** and from various standpoints.

3. Systems thinking offers ways to reach the core of the issue and **visualise the various levels and parts in the system that contribute to the problem**.

4. **Systems thinking perfectly supports and adds to design thinkin**g by fostering collaboration and common understanding among stakeholders in complex settings.

5. Systems thinking helps us in seeking for better solutions in the parts of the system where we can make a change, which then again will have an impact on other parts of the system.

6. So we can facilitate a process where the relevant stakeholders in Kenya can see their responsibility of the current state of things as well as **pinpoint the best opportunities for change and reaching the desired outcome.**

What | What are systems?

What is a system?

*“A system is a set of things – people, cells, molecules , or whatever –
interconnected in such a way that they produce their own pattern of behaviour over time.”*

– D. Meadows, Thinking in Systems, a Primer (2008)

“...A complex whole the functioning of which depends on its parts and the interactions of those parts. Stated like this, it is clear that we can identify systems of very different types:

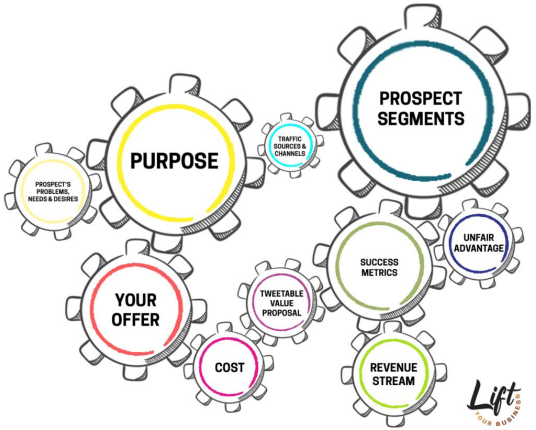
- *physical, such as river systems;*
- *biological, such as living organisms;*
- *designed, such as automobiles;*
- *abstract, such as philosophical systems;*
- *social, such as families;*
- *human activity, such as systems to ensure the quality of products”*

– Michael C. Jackson, Systems thinking, Creative Holism for Managers (2003)

What | Examples of Systems

Business model

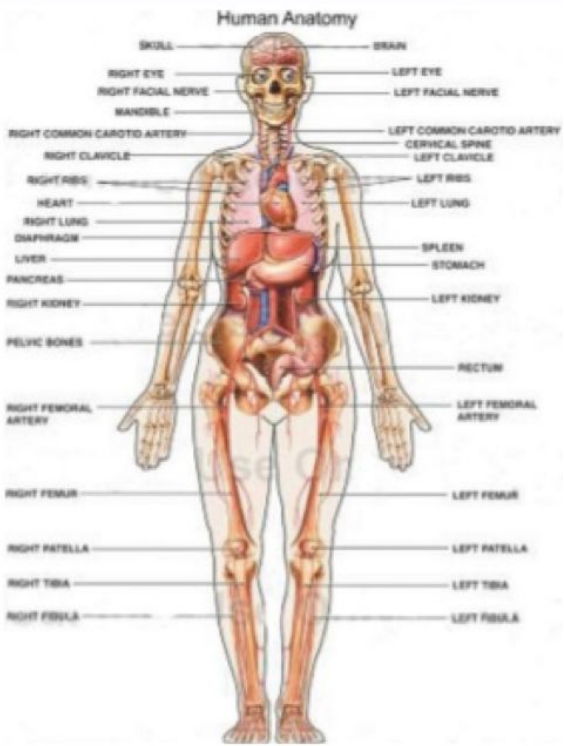
INPUT



OUTPUT

Business model is a system consisted of various elements including cost structure, customer value proposition etc affecting each other.

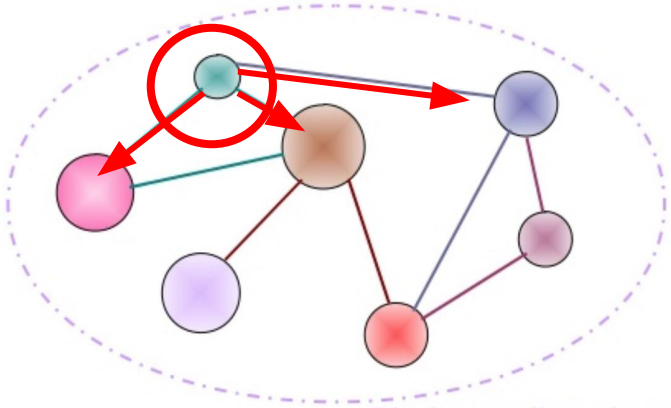
Human body



The human body is a complete system comprised of a number of key subsystems

(See references for pictures in the end)

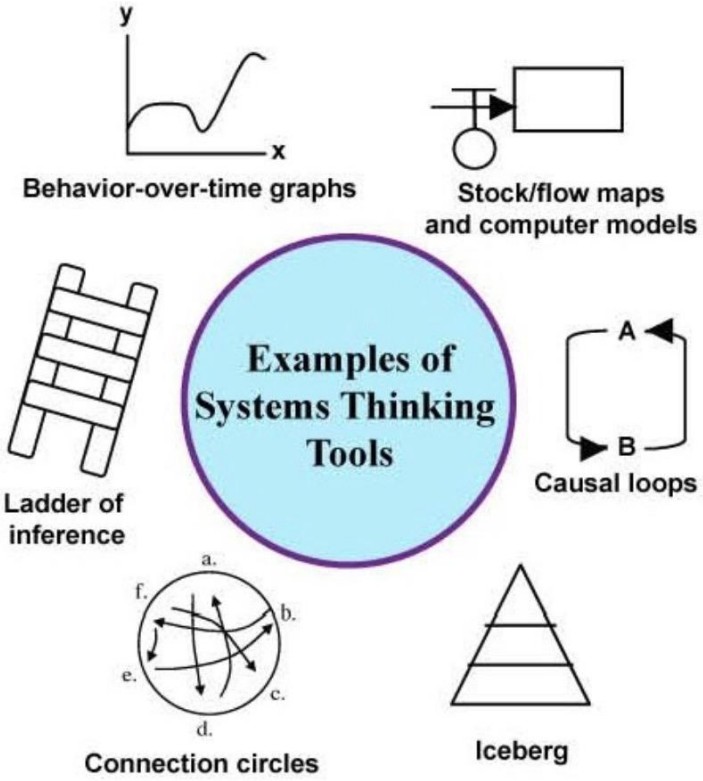
What | Systems Thinking principle and habits

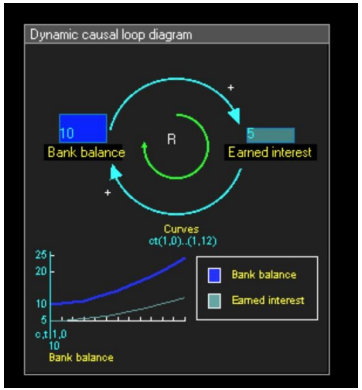


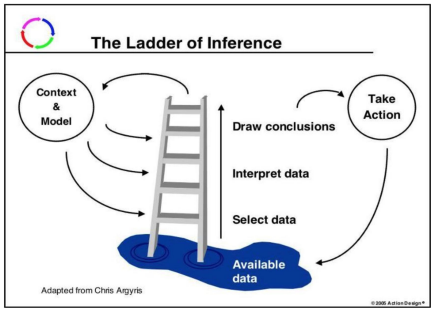
“Leverage” - setting where actions and changes in structure can lead to significant, enduring improvements in complex systems.

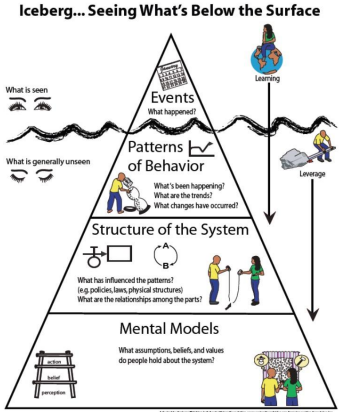
(See references for pictures in the end)

What | Systems Thinking tools



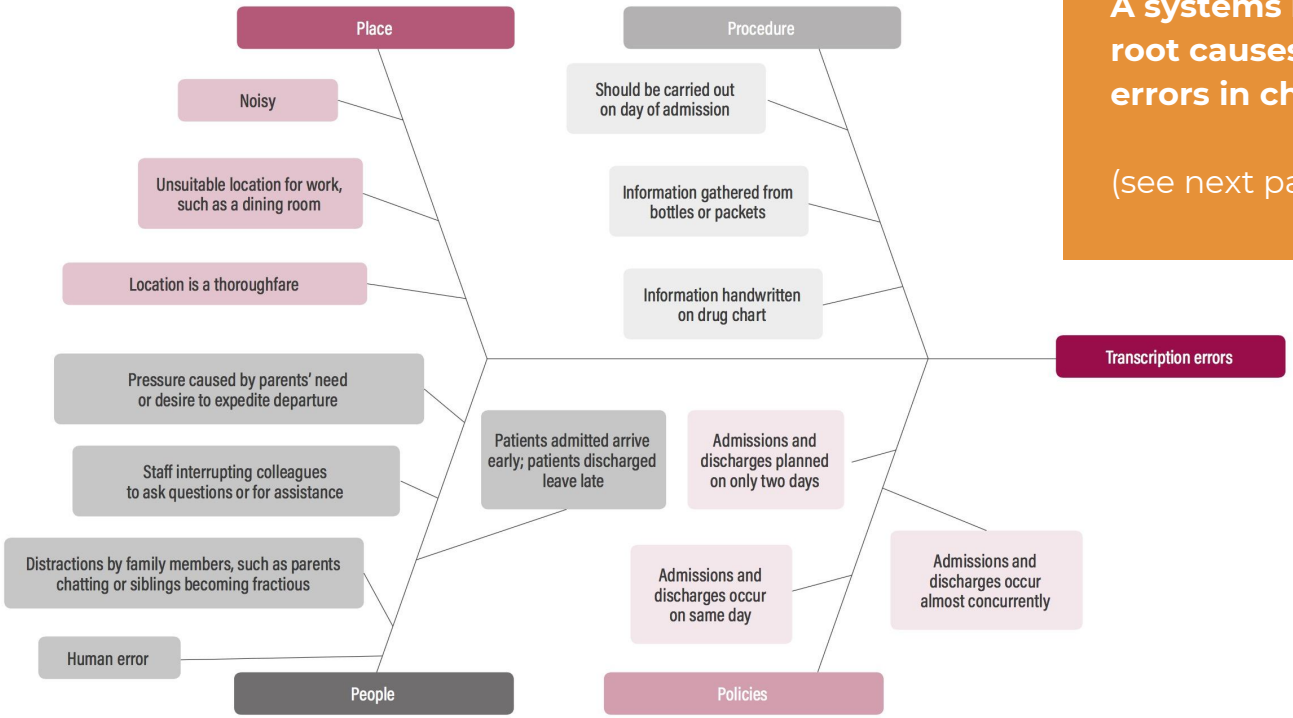






(See references for pictures in the end)

What | Example case of applying Systems Thinking 1/2



A systems map for possible root causes for transcription errors in children's hospice

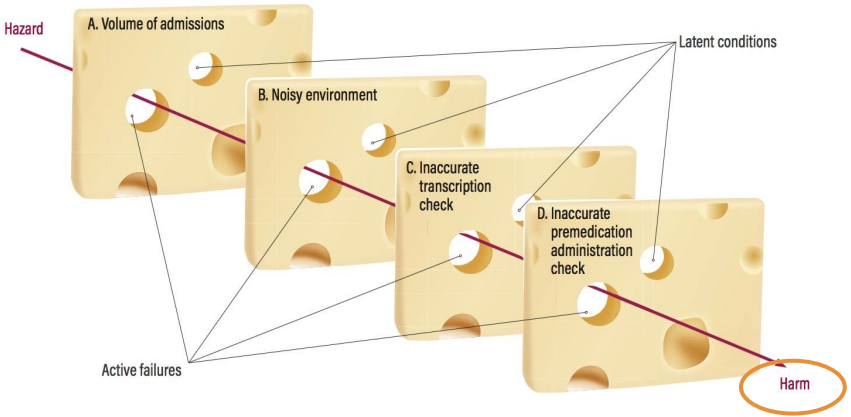
(see next page for the rest)

(ncbi.nlm.nih.gov, 2018)

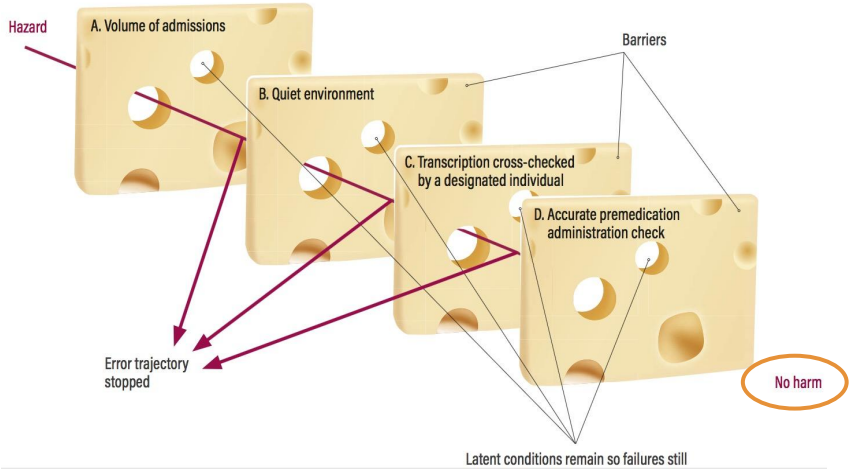
What | Example case of applying Systems Thinking 2/2

Visualisation of how transcription errors led to medicine management errors both in the old and in the new system.

Old System



New System



(ncbi.nlm.nih.gov, 2018)

What | Other case examples

- A Waste Reduction Case Story through a Systems Thinking Lens

https://www.sabre.com/images/uploads/A_Tale_of_Three_Bins_Sabre_Holdings_Case_Story.pdf

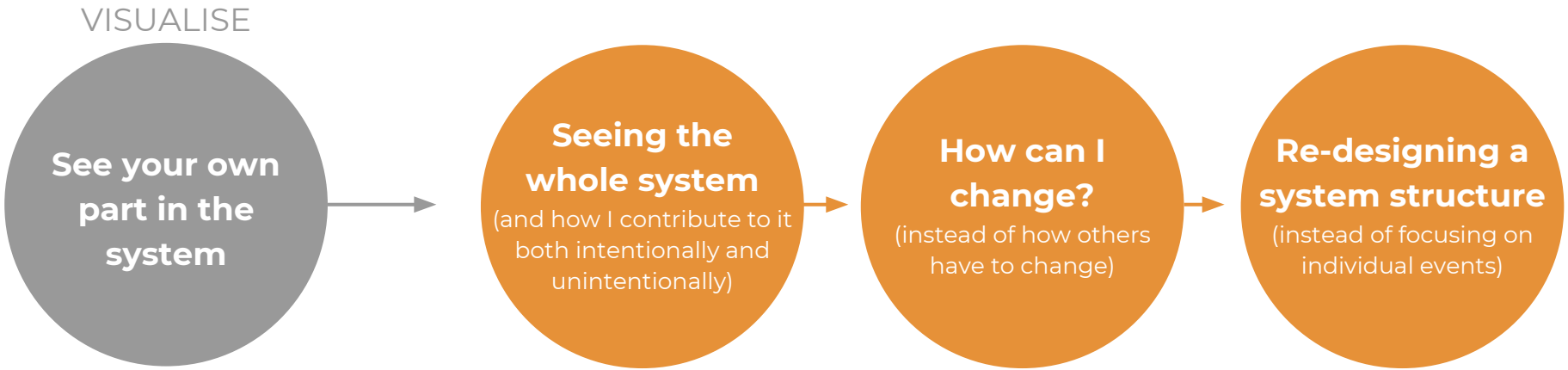
- “Leveraging Change: The Power of Systems Thinking In Action”

http://www.appliedsystemsthinking.com/supporting_documents/Leveraging_Power.pdf

- Case Studies in Teaching Systems Thinking

https://www.sciencedirect.com/science/article/pii/S2405896316303974

How | Shaping a systems story



Answer questions such as:

- Why even with your best intentions your efforts still fall short?
- What could I do differently?
- How could me only focusing on my part of the system limit the effectiveness of the whole system?
-How am I connected to the others in the system?
- What are the unintended impacts of my actions?

"The best way to optimize the system is to improve the relationships among its parts, not optimize each part separately."

(Quote and map created with information from David P. Stroh, Systems thinking for Social Change, 2015)

Tools & methods | The Iceberg

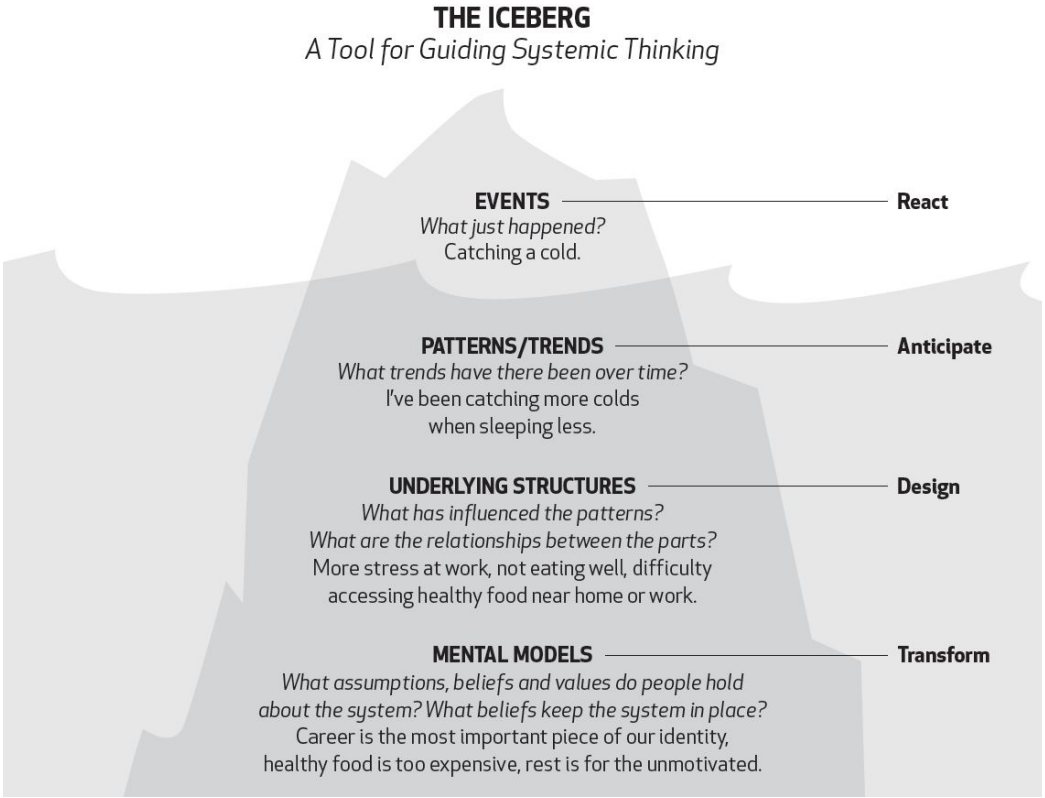
The Iceberg model

The iceberg model starts from the top and **the deeper the level of insight is, the greater the opportunity to change the systems behaviour.**

1. Thinking about the most obvious events in the problem or **what happened?**

2. **What has been happening over a period of time?**

3. **Why has it been happening?** E.g. pressures, policies and power dynamics as well as beliefs and purposes.



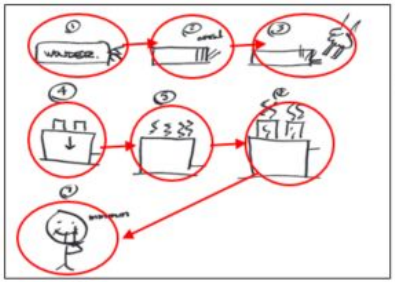
(nwei.org, 2018)

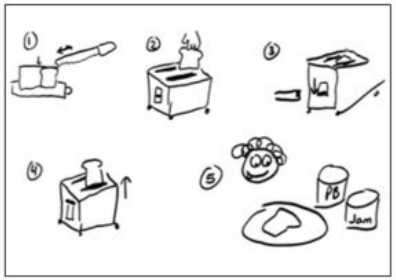
Tools & methods | Systems model

Nodes + links = Systems model

The systems model at its very basic level consists of nodes and links.

1. **Nodes** are chunks of information (e.g. objects, people, concepts)
2. **Links** are relationships and connections between the nodes
3. **Systems model** visualises a narrative or a story of how a certain system works





A collaborative process for creating better systems models:

1. Everyone drawing their own systems model on one piece of paper. **(Figuring out the links and nodes)**
2. Drawing a new version of the systems model on individual pieces of paper. **(Iteration)**
3. Drawing and organising (one node per paper) a systems model in a group. **(Synthesis)**

// Tip: the last phase is more efficient if it's done without talking.

(Interaction-design.org, 2018)

How | How to address the challenges of change making?

SYSTEMS APPROACH

MOTIVATION

Why should we change?

- Show responsibility for current situation.

COLLABORATION

Why should we work together?

- Demonstrate how people's current ways of interacting undermine both their individual and their collective performance.

FOCUS

What should we do?

- Use leverage to change the few things that change everything else.

LEARNING

Why bother?

- Recognise that our actions matter, and that we need to learn from the consequences of our actions.

(Map created based on information from David P. Stroh, Systems thinking for Social Change, 2015)

Why | Current understanding of steps in previous slide

1. **Why should we change?**
   - The issue is recognised, tackle in many different ways but it still persists.

2. **Why should we work together?**
   - We can not go and solve the problem on our own, or even just with the team from University of Nairobi. There are so many stakeholder who contribute to the current system and make it what it is now. If we change something, the rest of the system may just adjust itself to balance out the change we are making.

3. **What should we do?**
   - We have to pinpoint and find the relevant stakeholders in the field and who either directly or indirectly contribute to the problem and get them to work together on the solution. We have to figure out a common goal for all the different stakeholders in the system and see how they may currently be undermining each-others efforts to reach their goal.

4. **Why bother?**
   - We can facilitate the change in bringing together different stakeholders and sparking a light in the community to approach the system in a different way.

What | What next?

- Figuring out the field trip plan and selecting an array of tools both from design thinking and systems thinking. The selection of tools depends on who we will meet (if something has been decided in Kenya and or by Aalto Global Impact et al.) and what kind of time we have to spend with each stakeholder.

- At the moment the iceberg, systems models and systems stories seem like probable tools from systems thinking and the stakeholder map, personas and journey map from design thinking. We will most likely create personas to represent our data gathered from the field and to represent the different stakeholders when designing the concept.

- We will use the maps and personas as well as other co-created materials from the stakeholder workshops and observations to find the most fruitful leverage points that we can create our solution around.

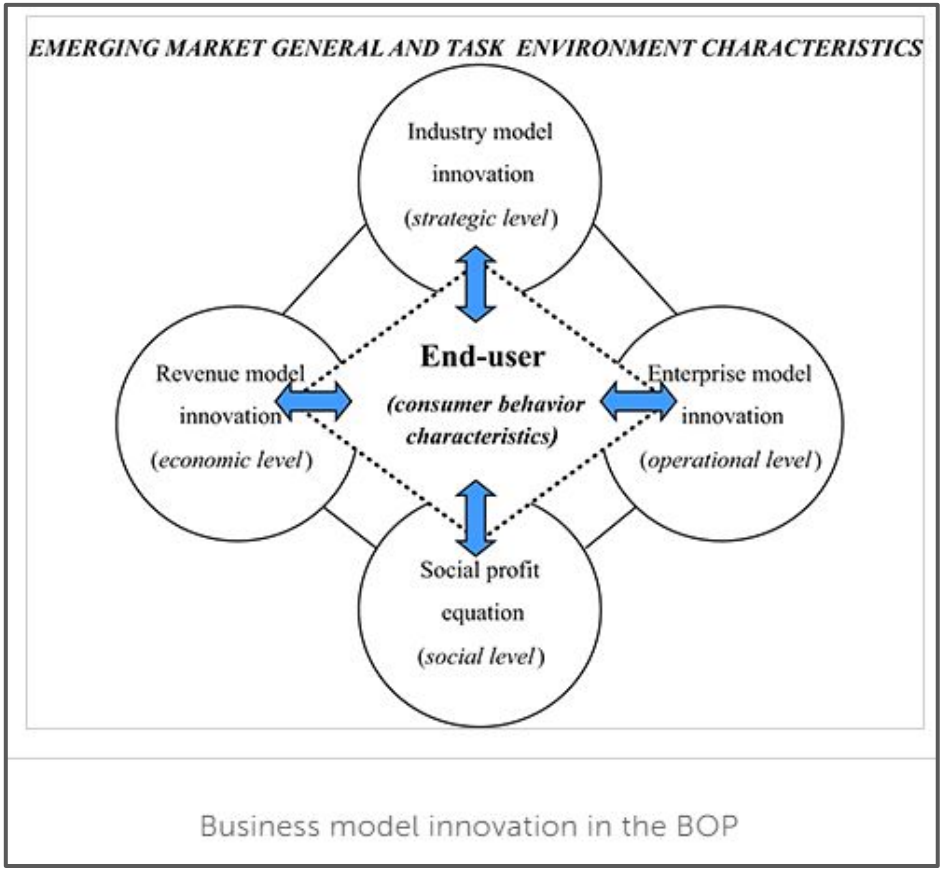
- We have to think about different ways of motivating the various stakeholders in seeing the whole process as well as understanding their exact roles in the system. With a 3-week project (where one week will go into preparing the presentation) this is a big task and therefore we will most likely have to go with the sprint model and not use the most in-depth systems thinking tools in our kit.

- Most of the information regarding the dynamics, experiences and practicalities or the food safety issue in Kenya are best observed and tackled in Kenya. The methods from design and systems thinking will help us in creating a holistic picture of the system with human sized details.

Business Models

Aalto University

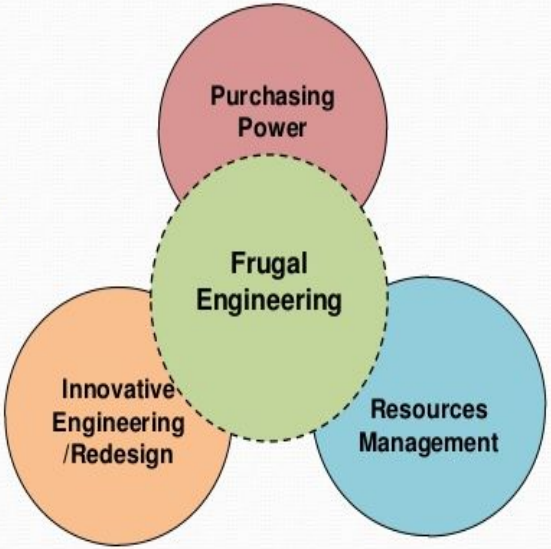
Business Model Innovation in the BOP



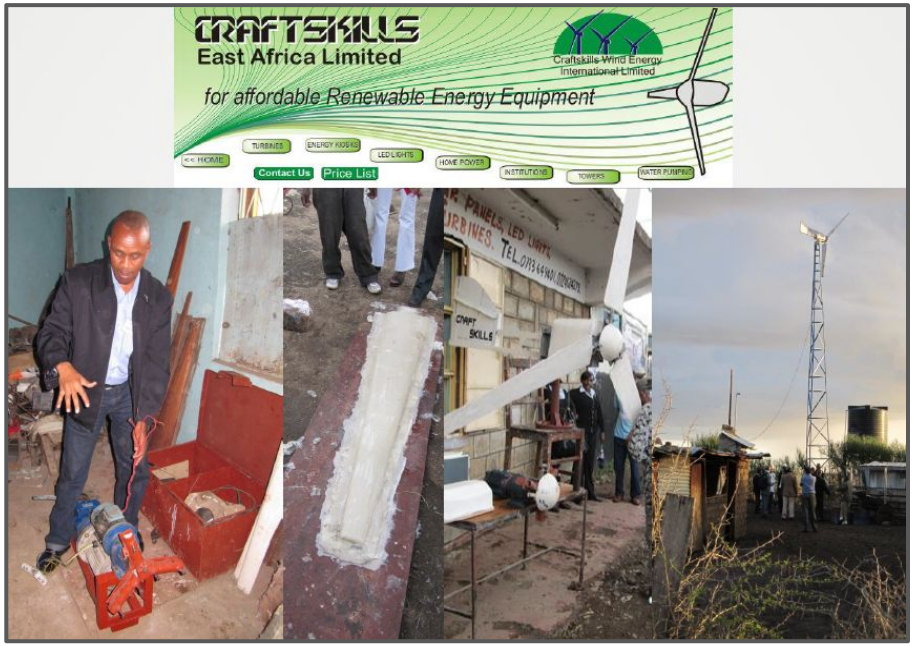
Business model innovation in the BOP

Business Model | Frugal Innovation

- Low-cost design.
- Product development efficiency
- Capital efficiency
- Manufacturing simplicity
- Optimizing customer Interface features
- Eliminating non-value adding features

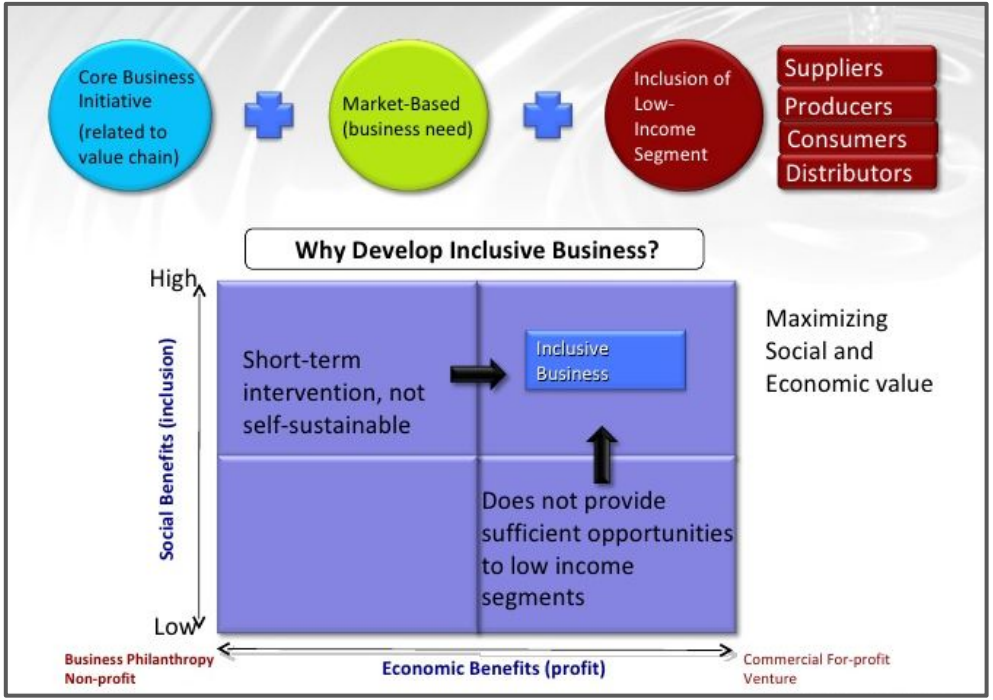


Model



Example

Business Model | Inclusive Business Model



Model

Example

Business model canvas for low-income markets

Building block	Bop-business model	Bottom / base approach
Customer segments	Broad customer segments. The level of local integration depends on base or bottom approach	Consumers / producers and local entrepreneurs
Value proposition	The "poverties" of low income markets How these poverties are reached depends on base or bottom approach	3 As - increase consumption / mutual value and open-ended – increase capacity
Channels	Use of partnerships. The level of localization depends on base or bottom approach	NGOs and public institutions / local value chains
Customer relationships	Depending on base or bottom approach	Direct sales / co-creation and mutual dependency
Revenue streams	At point sales	
Key Resources	Generally external through partnerships The key resource depends on base or bottom approach	Technology / local knowledge
Key activities	Depending on base or bottom approach	Scaling / local capability development
Key partnerships	Cross sector and NGOs for finance, distribution and as mediators	
Cost structures	Low fixed investment	
Business model: Main points	The business model depends on base or bottom approach. In both cases, partnerships extend into several building blocks and could therefore be key for business model generation at the Bop	

Benchmarking

Benchmarking | key insights

There are many ways of approaching food safety issues around the world, all the way from **drying the produce with portable dryers** to **switching to hydroponic gardening methods** or using sensors and satellites via apps to help in analysing the soil, watering and other aspects of farming. The solution to the problem aflatoxins is even searched for with an online game.

In the following slides there are some examples of solutions proposed all over the world.

Examples such as: Gardening walls in urban communities, co-ops and home deliveries, small scale and large scale hydroponic gardens, utilising sensors and satellites, membership business models for e.g. buying seeds and fertiliser, using great branding as a tool for marketing the safe products and offering loans and savings possibilities to farmers.

Benchmarking | Summary 1 / 3

Benchmarking Research					How to Benefit from		Resource
Name	Problem Tackled with	Where	Offering	Business Model	Applicability for our project	Tips for our project	Website
FarmDrive	Farmers have No Access To Credit	Kenya	FarmDrive to assess risk and develop loans that fit the needs of smallholder farmers through mobile App.	- Interest occured on lending money. - Advertisement on App	Indirectly applicable in terms of Farmer's investment in new products or services improving Food safety.	Good case for indirectly supporting the lives for farmers though it's question mark on the possibility of long-term return from farmer	https://farmdrive.co.ke/
myAGRO	Majority live in poverty with no access to financing through traditional banks or microfinance.	Mali	myAGRO offers mobile Platform where farmers get Field assistance, Tips for agriculture, System to save extra cash and buy high quality seeds, fertilizer.	Starting from Philanthropy then increasing earned revenue (Maybe by advertising and asset management)	Good platform solution model as demonstrated by the figure 34,000 farmers using myAGRO (2017).	Annual report is also good sample focusing on actual impact and long-term strategy.	https://www.myagro.org/
RML AgTech	Low productivity production and selling	India	AgTech provides information platform app. offering customer information, crop selection etc for farmers and traders.	No Info about profit model but, maybe advertisement and fee from farmers and/or the traders.	NA. This model is designed for middle-income level farmers who could purchase farming machine and aim at exporting crops.	High-Tech driven solution is applicable most likely for farmers who have adequate financial income.	http://rmlagtech.com/
CITYFARM	Food demand increase but many lands are unused	Malaysia	inspire more city farmers with the ability to grow locally from anywhere for a more sustainable future of food production	Launched July 2017. Maybe no profit yet.	Concept is good: Inspire and Educate more people to take action toward problem solution.	This type of raising awareness solution is challenging to make it profitable.	https://cityfarm.my/

Benchmarking | Summary 2 / 3

Benchmarking Research					How to Benefit from		Resource
Name	Problem Tackled with	Where	Offering	Business Model	Applicability for our project	Tips for our project	Website
PACKET GREEN	Many Pesticides used for farming	Singapore	Providing honest pesticide free quality produce that benefits not only our health but also the health of our planet.	Selling products to customers	NA. This model works for customers who have adequate purchase power and already have high-awareness of healthy.		http://www.packetgreens.com/
iGrow	Underemployed skilled farmers and underused arable land	Indonesia	Crowdfunding platform connecting farmers, landowners and investors	20% of project profits	Good model to connect the local and other world, also raising the awareness of the issues.	Interesting incentives for investors allowing them to see how crop grows.	https://igrow.asia/v1/
MilkLane	No services for farming in rural areas	India, rural areas	All-inclusive services for farmers so they don't have to own all equipment	Selling and charging for products and services offered to farmers	Very good, rural areas are being offered all necessary services to take care of their milk production	A model for offering service to rural areas.	http://milklane.in/
The Living Greens	Carbon credits and emissions in Indian cities	India, Jaipur	Green walls, rooftop farming product of all kinds, training and education initiatives	Selling green walls and urban gardening tools and services	This could be adapted in the city and surrounding areas if the roofs are suitable for farming	How to use the roofs and other non-typical land for farming?	ttp://thelivinggreens.com/index.html
Indigo Agriculture	Uncertain profits	the US	A model for receiving modified seeds, training and AI help in farming + guaranteed price from the harvest	Membership model as far as can be said from the website	Membership models with guaranteed profits make sense, since now there's no guarantee and therefore no incentive to use safer and better seeds/methods	Could we create a system where the initial investment by the farmer would guarantee a certain profit?	https://www.indigoag.com/

Benchmarking | Summary 3 / 3

Benchmarking Research					How to Benefit from		Resource
Name	**Problem Tackled with**	**Where**	**Offering**	**Business Model**	**Applicability for our project**	**Tips for our project**	**Website**
Mr. Ekpa	Aflatoxins in food	Nigeria	Clean and high-quality nuts	Selling premier nuts	Not best, since the higher price point will make it impossible for BOP -customers to buy (also these wouldn't be sold in unofficial markets)	"Classic" solutions such as branding something in an interesting way instead of making it all about poor food safety is a fresh approach	http://www.mrekpa.com/
Hydroponics Kenya	Farming with hydroponics methods to save water	Kenya, Nairobi	Hydroponic systems, seeds, piglets, training, consultation	Traditional selling of products and services	Very applicable, in Nairobi Kenya and saves water plus offers a new way of farming	A new way of farming all together for Kenya?	http://hydroponicskenya.com/
Purdue Foundry	Growing vegetables while using less water and at home	the US	Hyrdoponic system and seeds	Selling the equipment at first and then offering a membership model for the seeds	Good and bad. The initial investment is large but since growing vegetables using hydroponics uses 95% less water, it would be good for areas with drought	Do people want to grow their own veg? By not having open outside gardens can we limit aflatoxins because of the lack of soil involved?	https://purduefoundry.com/default/startup-single/hydro-grow-llc
JUA Technologies	Crop post-harvest losses and low value of the crops	the US	Farmholders and processors with efficient dehydration technologies powered by clean renewable energy.	Selling the product and provide the after service how to use.	Not realistic in terms of initial investment and the subject technology really solves the problem in Kenyan context?	After service selling product is important for farming business since the productibity also depends on farmers skill	http://www.dehymeleon.com

Solution | Credit scoring small farmers

Solution | Saving and training services for small farmers

Smallholder farmers are feeding the world, but the vast majority live in poverty. Only 7% have access to financing through traditional banks and microfinance.

At myAgro, we think that farmers can finance themselves.

WHAT WE DO

myAgro's mission is to move smallholder farmers out of poverty.

myAgro farmers use their mobile phones to pay for quality seeds, fertilizer, and training.

MOBILE LAYAWAY

myAgro's unique mobile layaway platform allows farmers to save money for seed and fertilizer using their mobile phones.

LOCAL STORES

We partner with local stores—the centers of village life—to create a sales network that is convenient, trustworthy and safe.

SEEDS AND FERTILIZER

myAgro delivers high-quality seeds and fertilizer to farmers at the start of each planting season.

TRAINING

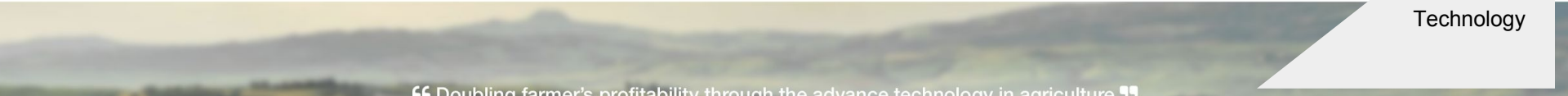
Our field agents provide training in modern farming methods contextualized for the West African farm.

Education,
Financial support

Solution | Offering smart technology to farmers

Holding Hands of Indian Farmers

RML is award winning technology company providing Agri Decision Support Solutions for farmers. RML strives to play at the cutting edge of the agri technology space with focus on creating services, tools and products to help farmers significantly improve their productivity and profitability. RML'S key legacy products include RMLdirect which deliver agri information through timely SMS as well as the myRML app.With better technology adoption among farmers RML is introducing new and path breaking product such as FarmNutri,DigiMandi and the flagship RML farmer Max which can profitably transform the farmer's business through world class technology.



Solution | Services for urban home hydroponics farming

HOME ABOUT US PRODUCTS COURSES PROJECT PRESS CAREER BLOG

Hydroponics Farming Course

Book Your Spot Today

Best Seller

VIEW ALL

Beginner Essentials

VIEW ALL

Kits & Systems

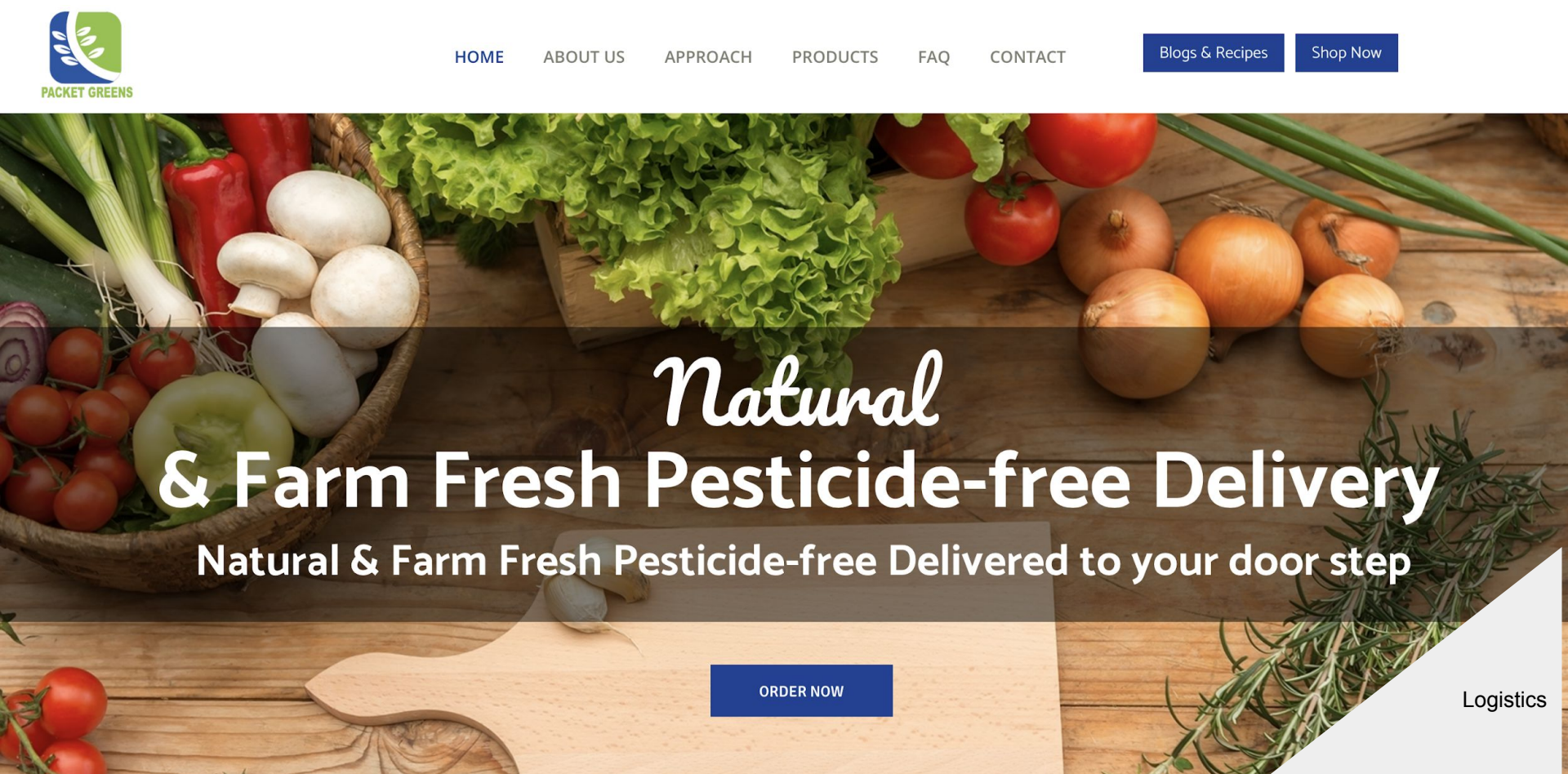
VIEW ALL

New Arrival

VIEW ALL

Technology

Solution | Branding local food delivery service



Logistics

Solution | Opportunity to invest in small farming

iGrow MY OWN FOOD Terdaftar dan diawasi oleh OJK OTORITAS JASA KEUANGAN

Sign in Sign up

Buy Seed

Browse all of our seeds. Choose the right seed in accordance with the budget and expected return of the most interest to you

See the progress

Get updates such as photos, height, and the latest comments in real time from our surveyor in the field as an iGrow Plant Monitoring feature. You can also monitor your plants directly in the field

Sell the Harvest

All the crops will be sold to a partner who has worked with iGrow

Get Profit Sharing

All sales results will we summarized in complete financial statements, so be ready to enjoy your impactful investment

Why Join Us?

Promising Investment

Investors could benefit from revenue sharing between 13-24% of the investments per year

Empowering Farmer

Farmers can have a job and optimizing land thereby increasing revenue

Environmentally Friendly

Communities feel the impact of greening and increased food production

Strengthening Our Food Security

The investors participate in planting to increase domestic food production

Financial investment

Solution | “All-included” services for small farm owners

MilkLane | Incubated by Pioneering Ventures

Services for farming

Solution | Urban gardening products

The Living Greens

Home | About Us | Products | Portfolio | Pages | TLG Blog | Contact | Login

LGO client with Organic Vegetables

Rooftop Farming Units Placed on Client's rooftop.

Living Green wall at Hotel Hilton

Products for farming

Solution | Service for farmers to buy, farm and sell crops

Indigo Corn™

Subject to terms of the Indigo Grower Agreement

Indigo is currently offering U.S. corn growers a 47¢ premium to grow Indigo Corn™

- ✔ Up to a $.47/bushel premium guaranteed at harvest
- ✔ Potential to raise yields through new technology without additional input costs
- ✔ Microbial treated seed financed at 0% through season
- ✔ The benefits above apply to all bushels produced on contracted acres

Premium Pricing + Higher Yields = Increased Profitability

Membership for
seeds and profits

Solution | Branding to make safe food attractive

Mr. Ekpa

Home About Health and Wellness Our Impact In The News Products

Mr. Ekpa Frosted Groundnuts

Being the first product ever launched by our humble company, Mr. Ekpa Frosted Groundnuts are very dear to our hearts. It is the product of countless trials, which lead to a unique and perfect taste. As all our nuts are, it is roasted to perfection and made from only the best groundnuts.

Mr. Ekpa Salted Groundnuts

Mr. Ekpa Salted Groundnuts are a product of the best nuts sourced from Nigeria's premiere growing region. We roast them to perfection then add the right amount of salt to give you the perfect snacking experience.

Branding
Aflatoxin free

Solution | Hydroponics farming in Kenya

HYDROPONICS KENYA
Cheap & sustainable farming without soil

HOME / ABOUT US / SERVICES / PRODUCTS / GROWING FODDER / VIA WATER / CONTACT US

Products
and services
for farming

Solution | Membership model for seeds and supplies

HELIPONIX™

BLACK AWARD

FOUNDERS

Scott Massey

Founder & CEO

Scott is a senior at Purdue University currently pursuing his bachelors degree in Mechanical Engineering Technology and certificate in entrepreneurship. His passion for hydroponics began as a research engineer at Purdue designing and manufacturing an automated hydroponic plant growth chamber for the NASA Specialized Center of Research and Training Cuvette with the ultimate goal of growing sustainable food in space colonies. He applied his experience and knowledge to develop a patent-pending, automated, hydroponic appliance capable of eliminating a user's dependence on a grocery store for most produce.

PROFILE

Heliponix LLC provides consumers with automated aeroponic appliances capable of eliminating their dependence on grocery stores for most produce by growing organic produce within a user's home two-to-three times faster than conventional farming methods using 95% less water. This accelerated growth rate using advanced A.I. control algorithms to create optimal environmental conditions for various plant varieties equates to at least 2 full heads of leafy green every single day for the consumer.

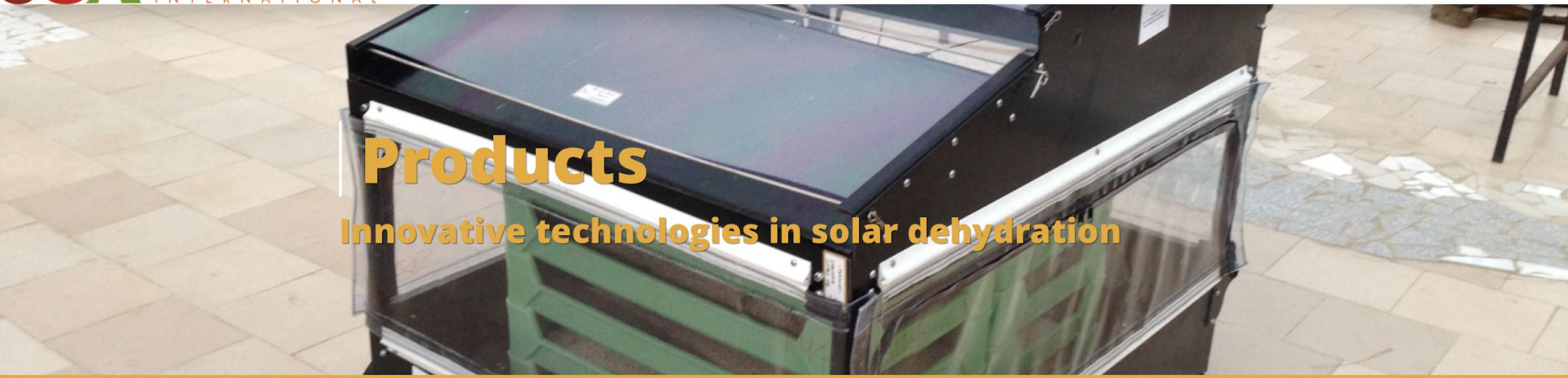
Although the appliance could be sold for a reasonable profit, continuous revenue will be generated by seed cup memberships (similar to a Ke The seed cup membership could be placed on automatic shipme the dollar shave club). These seed cups could have a product and a retail cost of $1, giving Hydro Grow LLC a 1000% pr selling item. Not only would this product usher in an will also establish a new precedence of quality fo

Product and membership model for farming

Solution | Portable solar dehydrator

JUA TECHNOLOGIES INTERNATIONAL

Home | Products | Work with Us | The Company | Contact



Products

Innovative technologies in solar dehydration

Products

We currently only have two products (drying baskets and small solar dehydrators) which are being tested for commercialization, while the third product is being developed, a scale-up of the small unit for small specialty crop growers and processors for the North American market and global customers.

Our technologies are not just dehydrators, but power platforms that can be used to power small electronic and electrical devices and home appliances

Technology

Test Card

summary of research in hypotheses
we can validate

Aalto University

Example Testcard | hypotheses for field trip

	Sprint 01			Sprint 02			Sprint 03			Sprint 04			
5	6	7	8	9	10	11	12	13	14	15	16	17	18

sprint	Hypothesis	#	Experiment
03	B1 Our target group is 18-45, urban, middle-class who feel c problems		
03	P4 People are interested in becoming a trained online coun		
03	P3 End users trust a lay worker trained person to deliver an (InukaHero)		
03	B4 Users are willing to pay for online coaching/counselling.		
03	B5 Heroes are willing to pay a fee to access clients, obtain coaching training and practical tools (scheduler, payment, etc) via Inuka platform.	8	TBD – User interviews at Philips office

This is an example Testcard containing hypothesis <u>statements that we need to confirm / test with the user groups) in order for our solution to work.</u>

e.g. willingness to pay for services, providers willing to participate

→ let's do a workshop in Nairobi to crunch down what hypotheses we will need to check

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