Tools and methods to identify, analyse and develop collective solutions for social and environmental challenges within the higher education enterprise curriculum.

Commons Entrepreneurship

Toolbox for Enterprise Education

Created by

Dr Suneel Kunamaneni and Dr Rob Phillips

Masood Entrepreneurship Centre,

Alliance Manchester Business School,

University of Manchester

MANCHESTER 1824
The University of Manchester

Masood Entrepreneurship Centre

Enterprise Educators UK

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Context

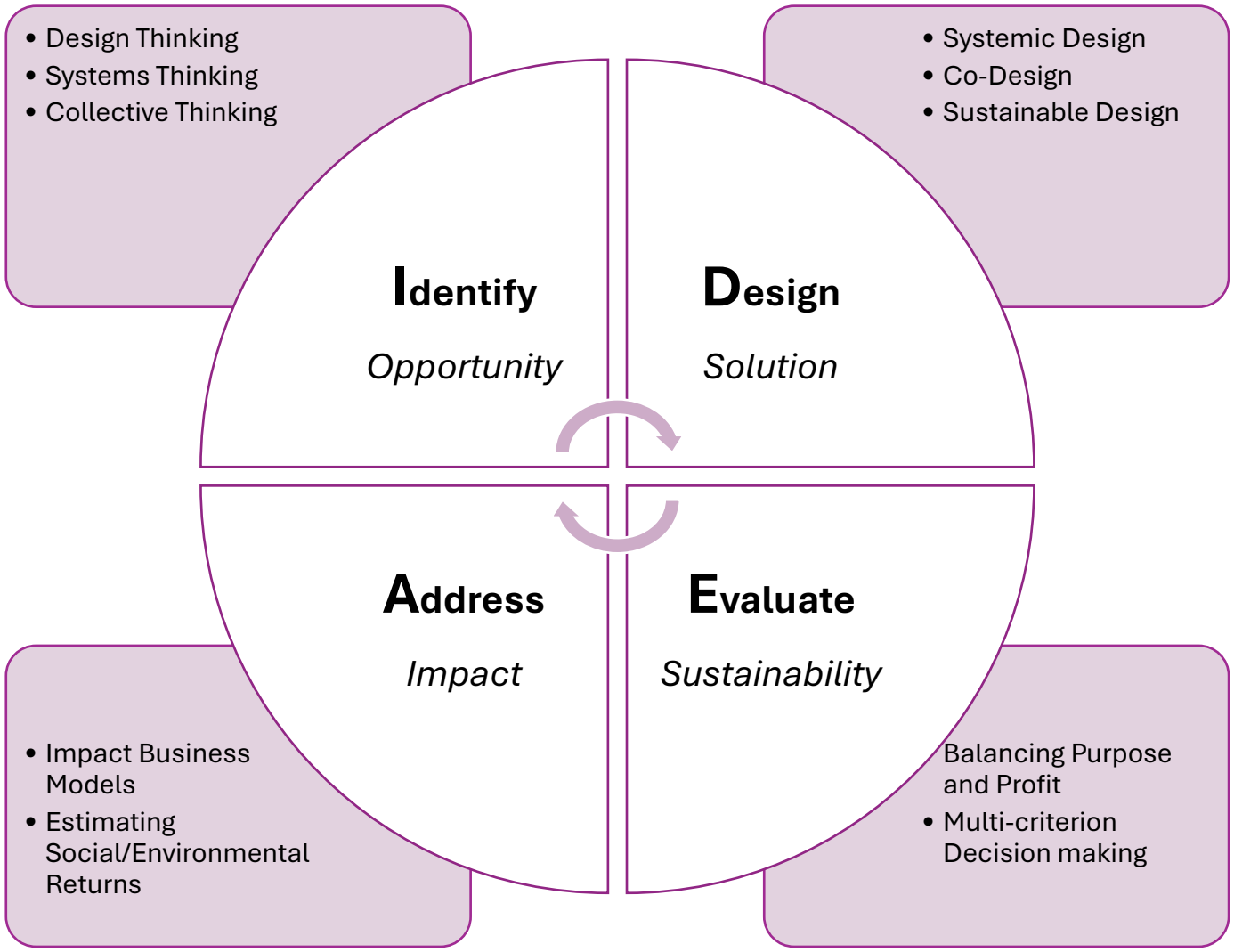
Trans disciplinary education is an appropriate approach in solving complex socio-ecological problems facing the world. Understanding that disciplinary approaches can only offer partial answers or are unable to solve the root problems, collaborative social innovation involving multiple actors can get to the bottom of a broad range of issues that affect planetary well-being. Several core enterprise competencies, for example those that have been identified in Entrecomp framework including ethical and sustainable thinking, mobilising others and working with others etc can be taught to students from different disciplines. However social innovation requires depth, breadth and the ability to collaborate within a diverse range of disciplines across humanities, sciences and engineering, which can be very difficult to design in the curriculum. Divided into four sections, this toolbox provides a high-level overview of the tools and facilitation guides to help students explore problems and design solutions that meet user's needs in an inter-disciplinary setting.

Who and What is it for?

This toolkit was designed by Dr Suneel Kunamaneni and Dr Rob Phillips at the Masood Entrepreneurship Centre (MEC) to help educators design and deliver a collaborative social Innovation education within curriculum or extra-curriculum for supporting students to understand, analyse and solve complex global challenges.

The toolkit is designed to be flexible in helping us get to the root level of issues rather than superficially fixing symptoms. We are curating a toolbox that enables crossing the boundaries between different disciplines. This toolbox provides tools and methods that were employed in the classroom by the creators to meet students voice for more social purpose within curriculum. They can be combined in different ways to design a curriculum, workshop or hackathon. We also refer to additional tools that we did not have the opportunity to use with students but have been used in other professional contexts for co-creation and gathering collective intelligence. We encourage educators to adapt and experiment with the tools in this booklet in the context of higher education.

The I.D.E.A Framework



Tools and Methods

1. Identify Opportunity

1.1 Design Thinking

Student assessments even within enterprise curriculum has heavily focused on individual assessments because of tensions in group work, student complaints and backlash in module evaluation scores. But open and participatory approaches are very important for social innovation in order to achieve SDGs. It is time to move beyond thinking of lone entrepreneurs as singular agents of social change.

This gap can be bridged by designing group work at formative assessment stages. The process follows the design councils double diamond framework for innovation https://www.designcouncil.org.uk/our-resources/framework-for-innovation/. The opportunity diamond represents exploration of the context surrounding the problem, and the solution diamond represents evaluation of viable solutions.

Divergent thinking involves broad ideation, while convergent thinking involves narrowed and focused consideration. As part of the formative assessment, students can focus on a process of first using both divergent and convergent thinking in groups to explore various problems and converge on an opportunity worth pursuing. Each

student in a group can then frame their own independent strategy for exploiting the opportunity towards summative assessment.

Students are encouraged to use convergent thinking to optimise their solution for extra-curricular competitions. This process would not only help define a small set of problems that are worth solving and defined by students themselves, but it also encourages group building towards co or extra-curricular activities whist retaining individual control of assessment performance.

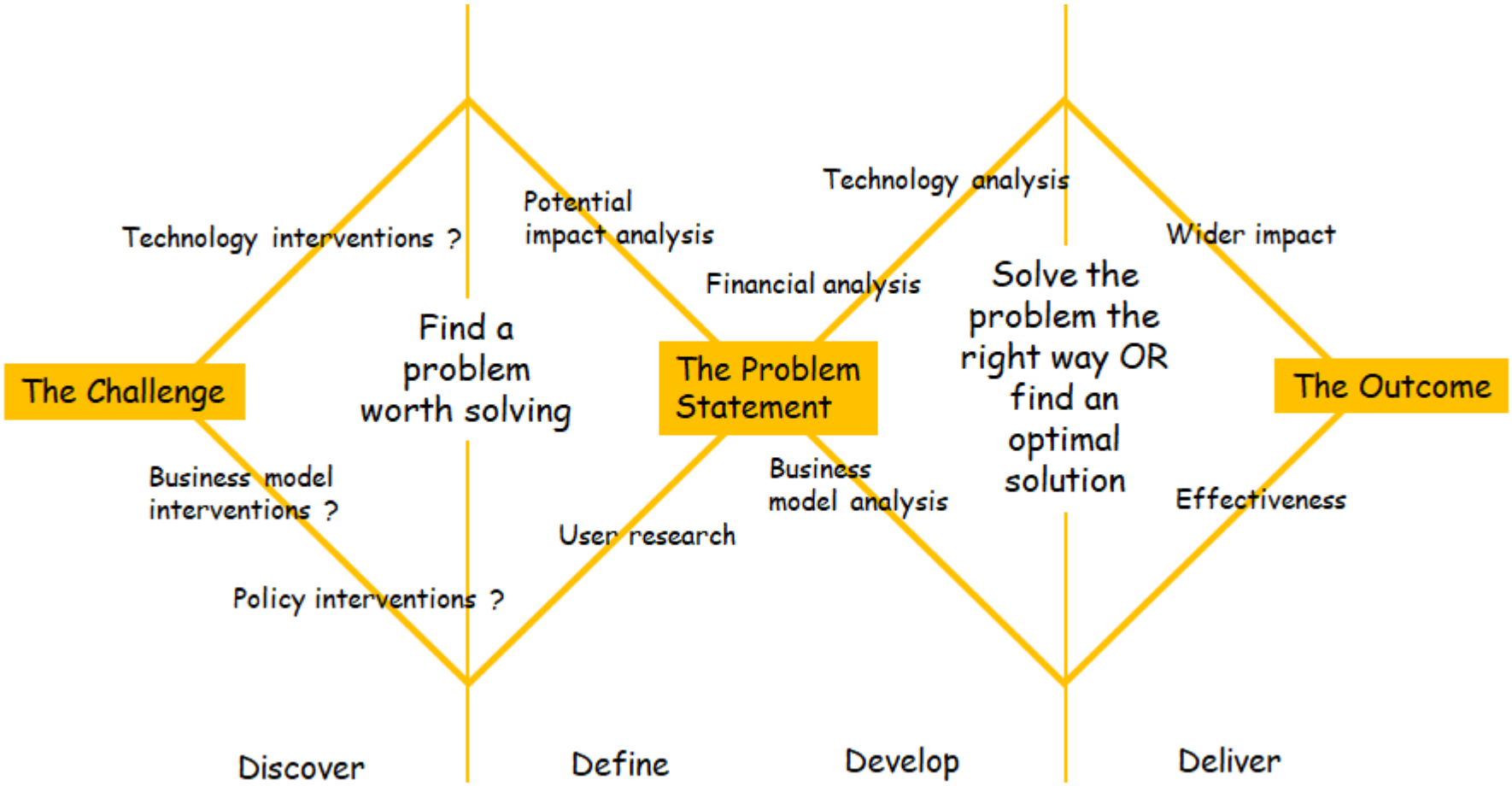


Figure 1: The Design Thinking framework showing a divergent-convergent process for framing problems and solutions.

Facilitation Guide:

Task 1 – Problem Discovery

Each team member lists problem(s). You may suggest more than two problems, but not more than five. As you list a problem:

1. Think about what technological, business model or policy interventions would be needed?

2. What do you know about this area already?

- **Output:** *record your ideas in the following table*

Name	Record your thoughts below:
(team member 1 name)	
(team member 2 name)	
(team member 3 name)	

3. Team Interviews: Team members provide their thoughts on their peers ideas.

Task 2 – Problem Definition

Each team now chooses one good problem based on team discussion.

1. Conduct further secondary research. Why is this problem worth solving?
2. Convert the research into some simple infographics (Use tools such as Piktochart)

Task 3 – Explore Solutions

What are your proposed interventions / solutions. Suggest at least three.

1. What do you know about the technologies and business models.
2. Why these solutions (think of factors such as Cost, Access, Execution etc.)
3. Has anyone tried these before? If so, why did they fail or succeed?

Task 4 – Solution Convergence

1. Are there one or two solutions that appears more compelling than others ? Why ?
2. Do various solutions apply in different contexts ? And is there one context that you would prefer to start with ?

Note that for formative assessment, it is an opportunity to seek feedback from tutors and experts (academic and industry). It is up to the tutor to design how they want to conduct the assessment. In the Enterprise in Healthcare module at University of Manchester, we conducted the formative assessment midway through the term as a poster and pitch presentation event that was designed like an extra-curricular event but without any winners and prizes. If there is more than one compelling solution, it is ok for the group to present the various possibilities and seek feedback. At this stage student research is still preliminary and they may not have fully validated the problem and solution(s). **Figures 2 and 3** show the outcomes and outputs from the event respectively. Despite there being no contribution towards the final individual assessment grade mark, students actively participated in the event as groups and made an effort on their poster and elevator pitch. According to a student:

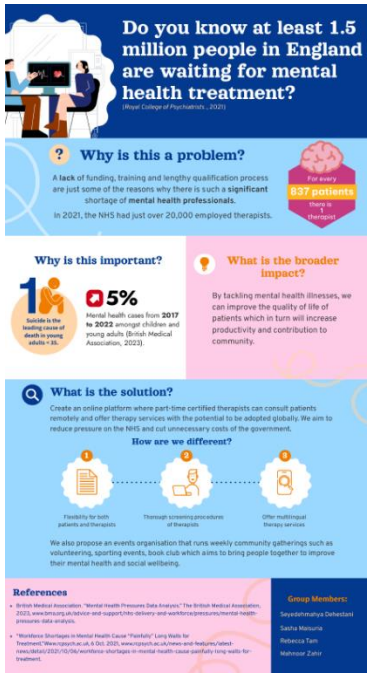
“I liked how many of the sessions were very interactive, giving me the chance to share my ideas with other students and hear theirs too.”

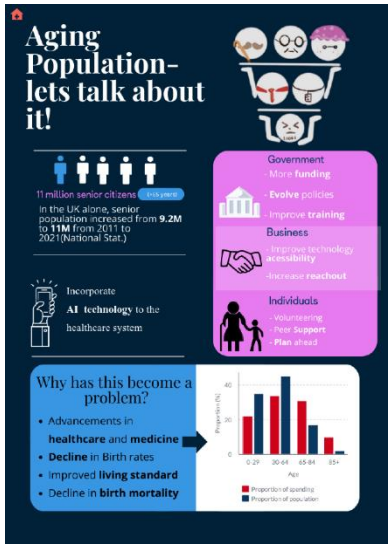
A

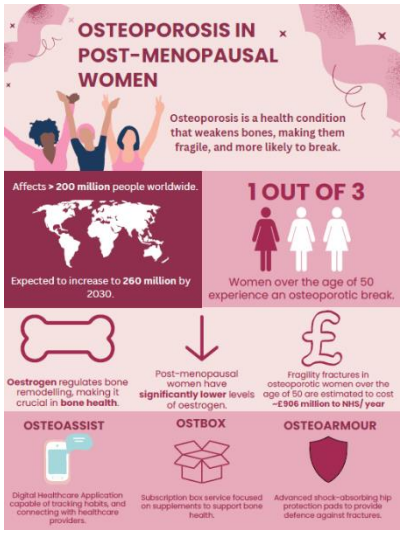
B

C

Figure 2: Formative Group Poster and Pitch Competition within an Enterprise in Healthcare module. A. Talk by a Thought Leader, B. Students Pitching, C. Feedback from an Expert.







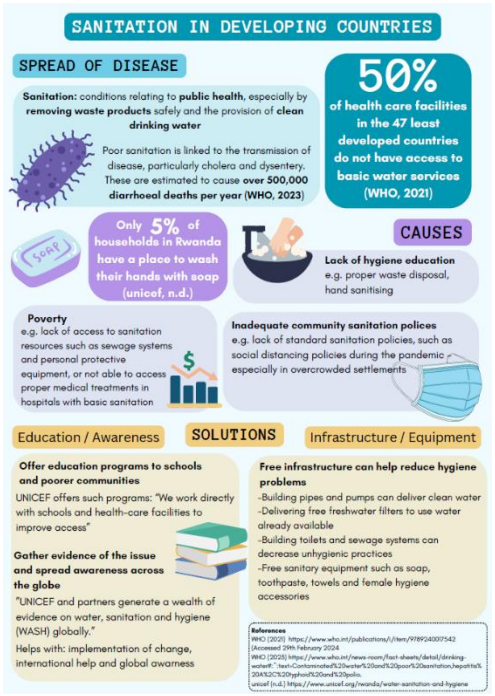
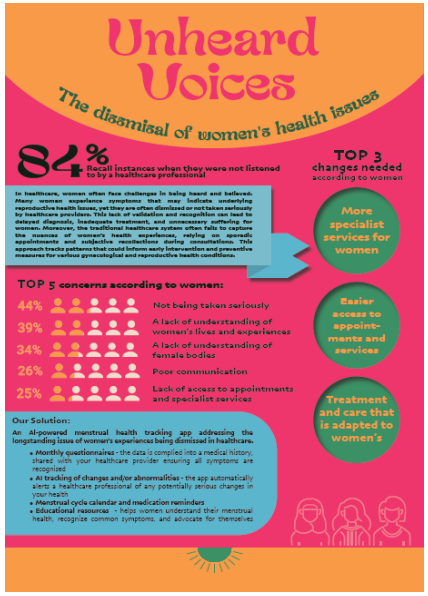
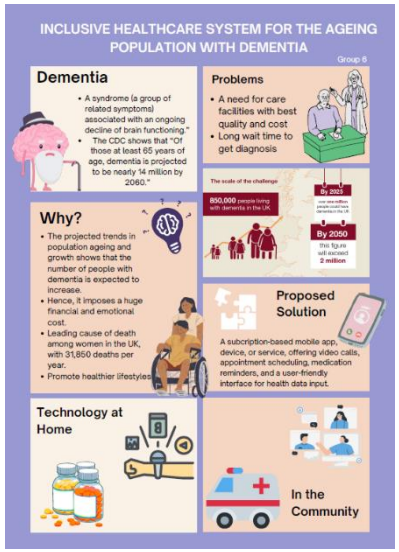
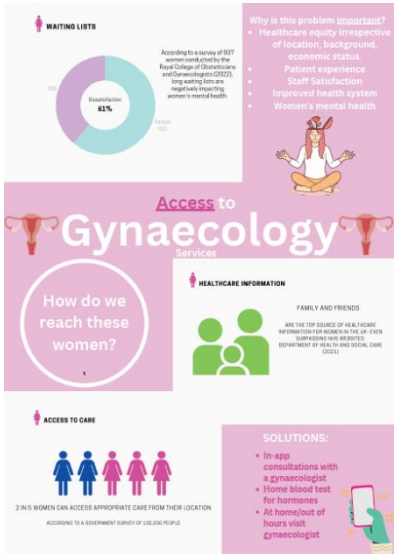


Figure 3: Example Student Posters







1.2 Systems Thinking

Unlike a typical, solutions-driven business pitch competition, students should be encouraged to focus on deeply understanding the context of a social or environmental problem requiring innovative solutions and entrepreneurial interventions. They should be encouraged to analyze and demonstrate understanding of a narrow issue at the root level, map the landscape, and present their findings.

Understanding the Challenge

What is the issue you are looking to understand? What is its history and what are the social, economic, corporate, environmental, cultural and political forces maintaining the status quo? Who is affected by it? What is the size and scope of the issue? What is the relationship of this problem to other areas of concern or opportunity?

Understanding Existing 'Entrepreneurial' Solution Efforts

Who is already trying to solve this problem? (entrepreneurs, innovators, accelerators and incubators, funders, government etc.) What are they doing? What efforts have

been tried or are being tried? What has worked, what hasn't? Are any of these efforts linked to one another? What networks & resources exist? What has happened in the past, and what could happen in the future?

The only tools you will need here are the Iceberg Model and Kumu Systems Mapping tool.

The Iceberg Model is a key tool for systems thinking. It uses the idea of the iceberg to illustrate the various layers of a system. It prompts you to consider the underlying patterns, structures, and mental models. From above the sea, only the tip of the iceberg can be seen. The same is true of systems - we usually only see the symptoms of larger problems below the surface: mental models (that is, values and beliefs) that produce problems at the core, underlying structures that reinforce these mental models, and patterns and trends that emerge over time.

The Iceberg model below (**Figure 4**) was created by a student on the Enterprise in Healthcare module.

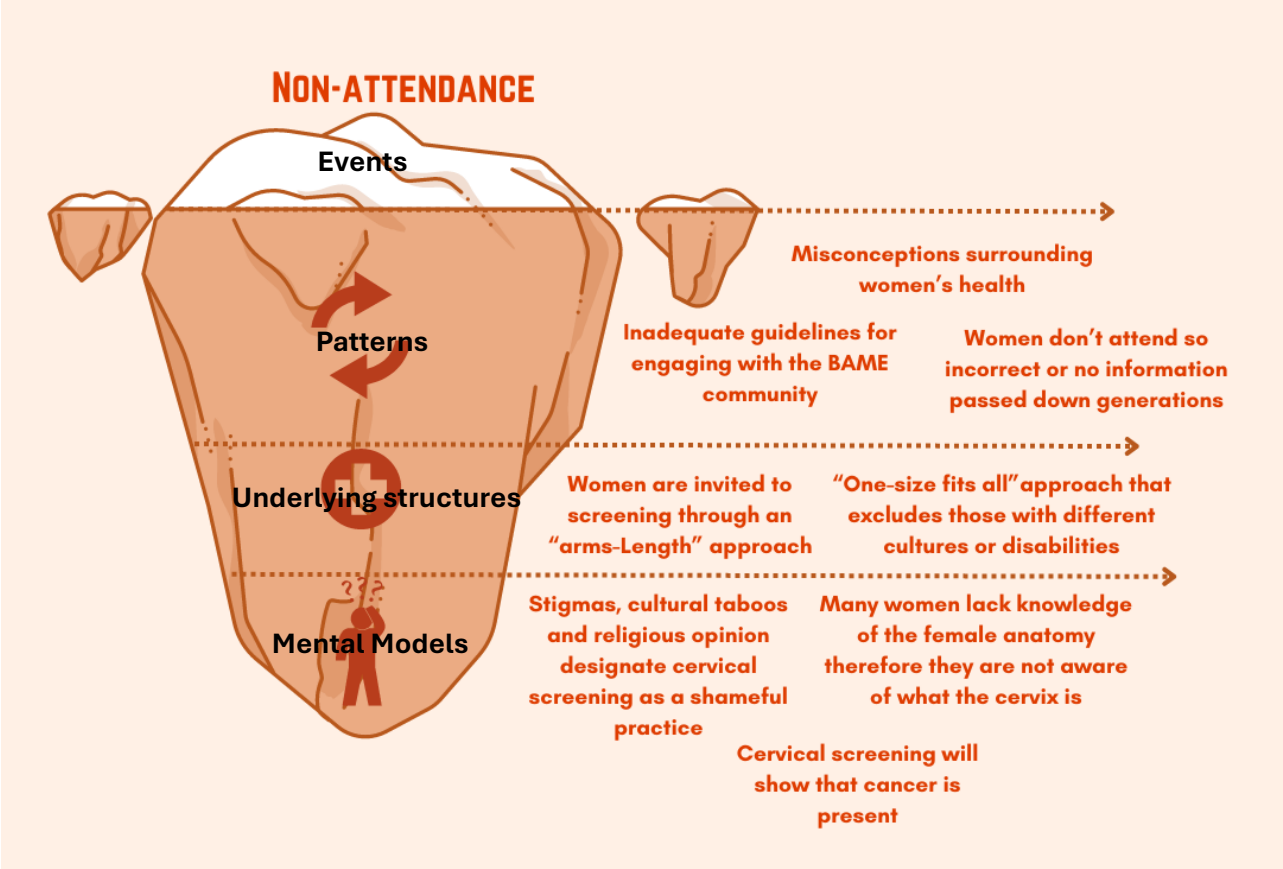


Figure 4: Iceberg model explaining the reasons for non-attendance of women for Cervical screening.

One of the best tools for creating systems map is Kumu which is completely free to use for public projects. Students and doctoral researchers can request three free private projects from Kumu however. The idea of a systems map is not about mapping all of the available data. A systems map should tell a story to help visualise the underlying problems and links and identify key stakeholders who can help address challenges in various parts of the system. It should neither be too complex that it discourages one to meaningfully address an issue not should it be too simple that they lack the richness and rigour required to understand the issue. The following systems map (**Figure 5**) was created by a student taking the Enterprise in Healthcare module. The systems map is structured into various themes each with a well-defined scope and focus.

Another useful emerging tool is Metamaps, an open source, collaborative concept mapping platform for visual sense-making by individuals and collectives (see **Figure 6** for the concept). It allows users to access ideas, connections, and insights of other users in the system. Currently Metamaps is invite only, but the source code is available for free on Github for deploying locally.

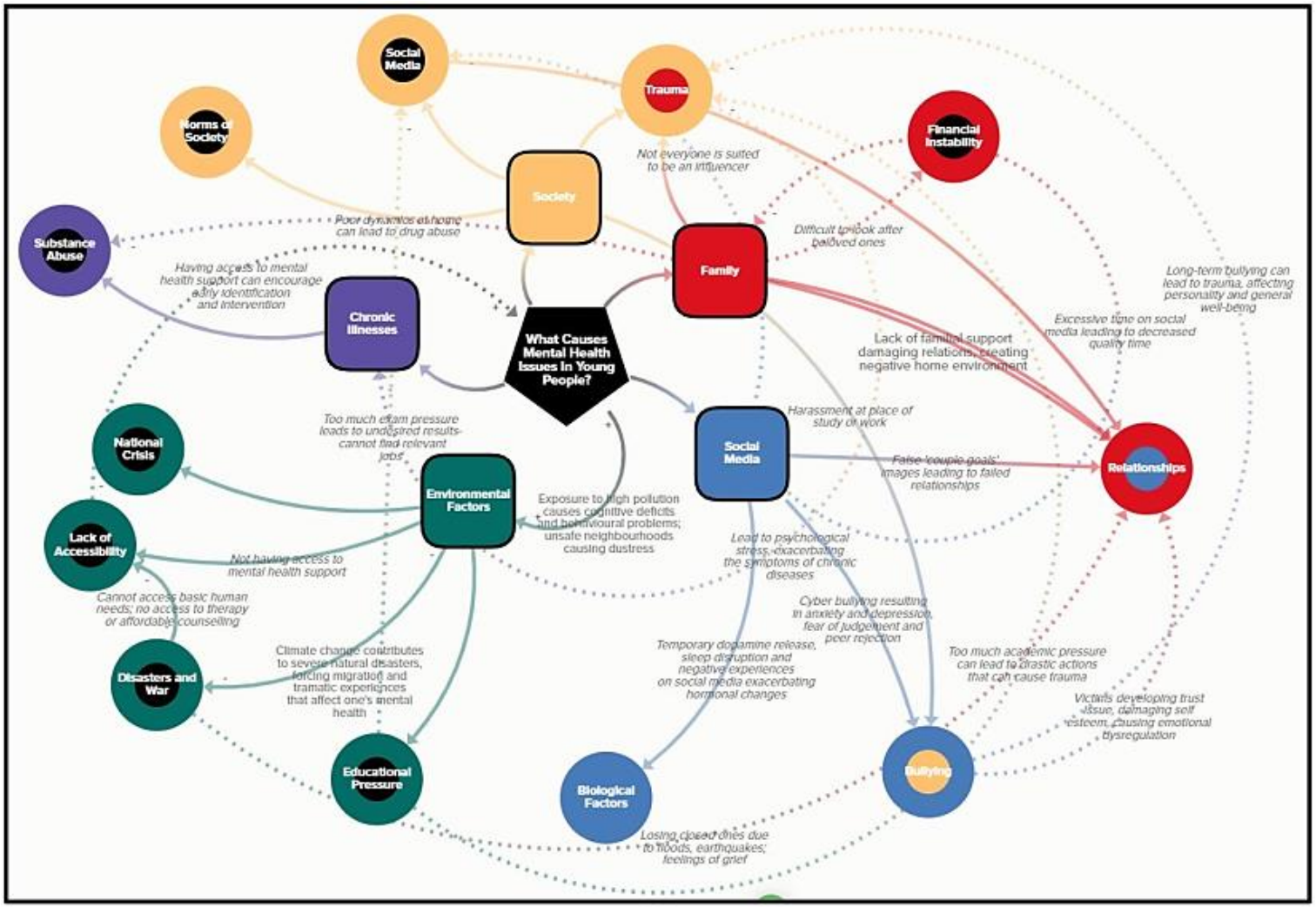


Figure 5: A systems map that answers the framing question: "What causes Mental health Issues in Young People".

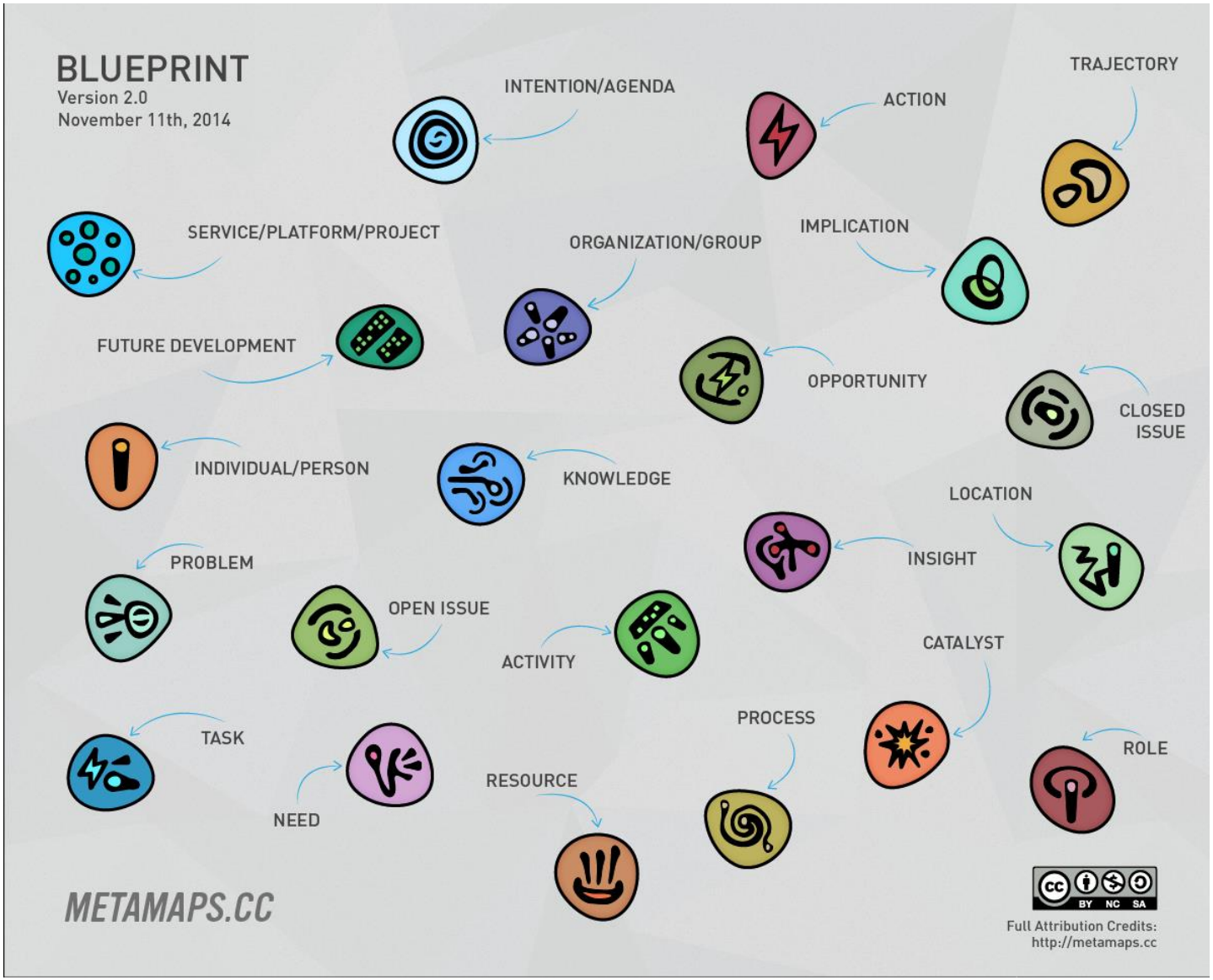


Figure 6: Metamaps concept codes.

Facilitation Guide:

Step 1

Group brainstorming

This tool is designed to be used in teams of 4 or 5. If possible, have the teams fill in the Iceberg model and generate a systems map in advance of the class. Otherwise plan for 40 minutes to do this during the class.

Step 2

Collective brainstorming + reflection

Have each team (or some of the teams depending on class size) present their findings. Ask other students to provide input.

1.3 Collective Thinking

OPERA method is an excellent tool for sharing ideas within a classroom. The task starts with the tutor providing a brief. For example:

"*Given the planetary challenges, what ideas can you come up with that can significantly reduce environmental impact , and are not just less bad?*"

The method consists of five steps:

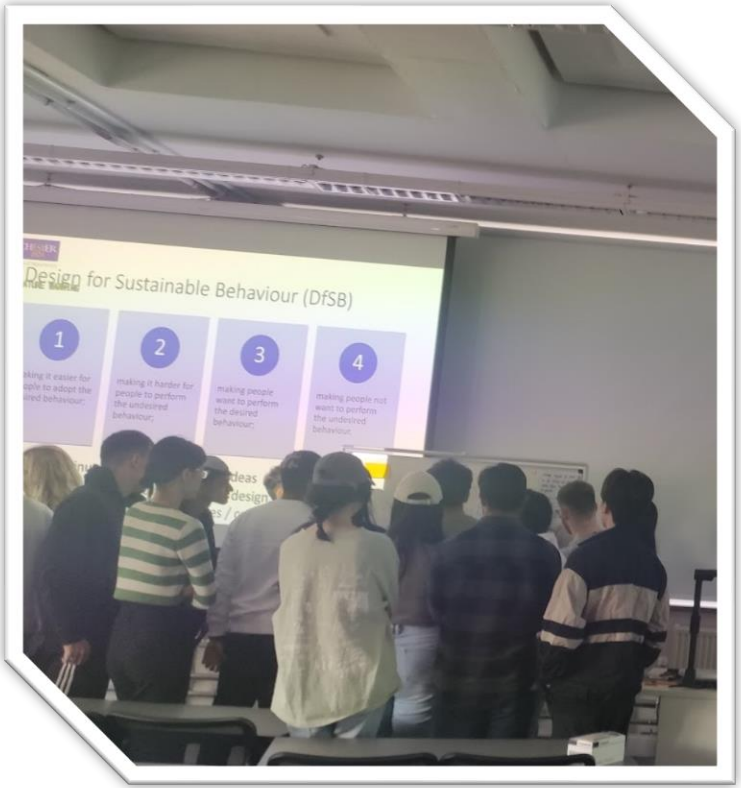
1. **Own thoughts:** The participants spend 3-5 minutes alone pondering the lead question, writing down individually their ideas on a piece of paper (no discussion is allowed at this stage).
2. **Pair suggestions:** The participants form pairs and discuss their written thoughts. Allow 5 minutes here. Following the discussion, the pairs will come up with their (consensus-based) joint idea, which they record on an A4 paper. These papers are then posted to the workboard for everyone to see.
3. **Explanation:** Each pair briefly (1-2 min) explains to the rest of the audience the proposals they have attached to the workboard. No one is allowed to comment on the suggestions of others at this stage.

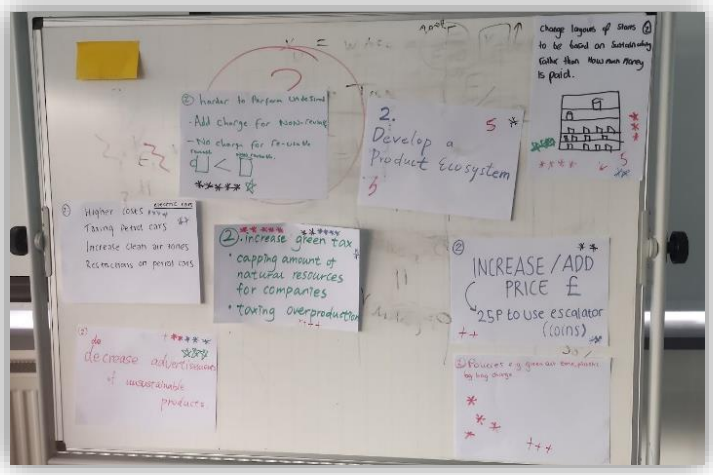
4. **Ranking:** Each pair can be given a certain number of points, for e.g. 10 points, to distribute to others ideas. Time here will depend on class numbers and ideas.
5. **Alignment/Arranging:** For the last step, the facilitator arranges the suggestions on the workboard linking and merging similar proposals. This is done together with the participant. But this last step would be optional in a classroom, particularly when there are 50 or more students with 25+ ideas. Instead, the lecturer can pick ideas with the highest and lowest scores and facilitate a critical discussion.

The entire exercise should take about 40 minutes.

When the OPERA method was combined with **Design for Sustainable Behaviour (DfSB)**, students gave more thoughts to policy issues and why consumption must be disincentivised. The four principles of DfSB are:

1. making it **easier** for people to adopt the **desired behaviour**.
2. making it **harder** for people to perform the **undesired behaviour**.
3. making people **want to** perform the **desired behaviour**.
4. making people **not want to** perform the **undesired behaviour**.





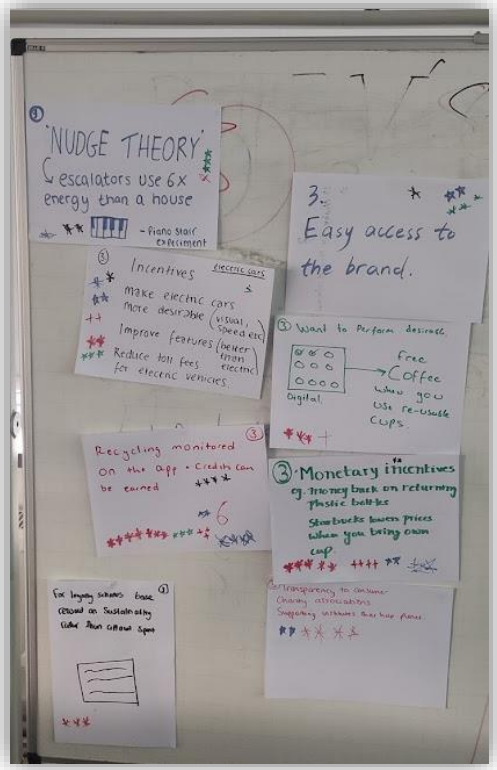


Figure 7: Students on an Essential Enterprise" module enthusiastically ranking each others ideas. Students on the module come from across the university, including humanities, sciences and engineering.

We have also used Padlet to share ideas within classroom. But when Padlet was used simply as an Ideas board for ‘Eco-solutions’, students mainly generated consumption driven ideas that lacked systems thinking and behaviour change. It also did not generate the enthusiasm that OPERA method generated.

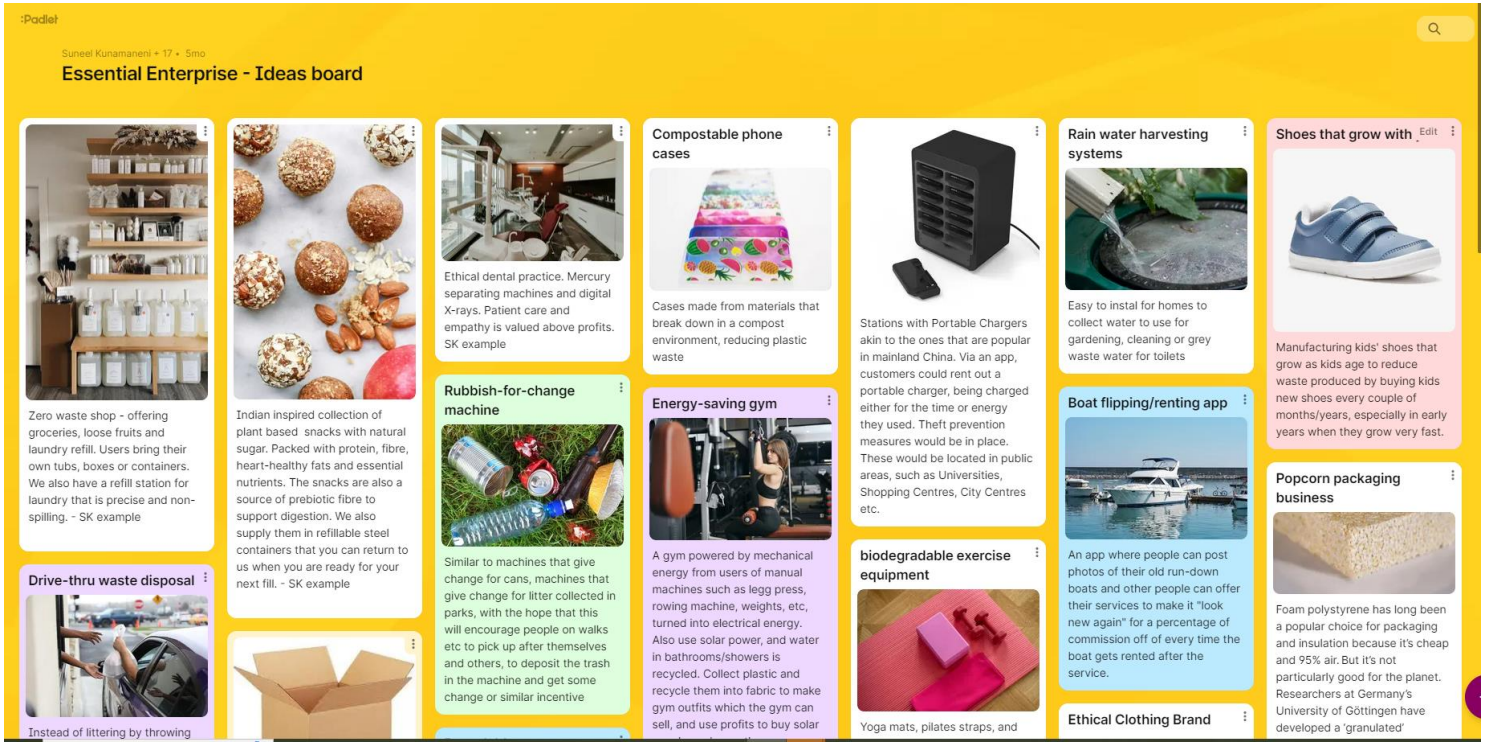


Figure 8:

Use of Padlet as an Ideas Board. The exercise mostly generated consumption driven Ideas.

A tool that we think may be useful and which was developed by open university is Litemap (previously Cohere). Its an online tool to build collaborative discussion and common understanding of complex problems through semantic mapping. However, we have been unable to use this tool with students because it uses an unsupported protocol that is blocked by our university.

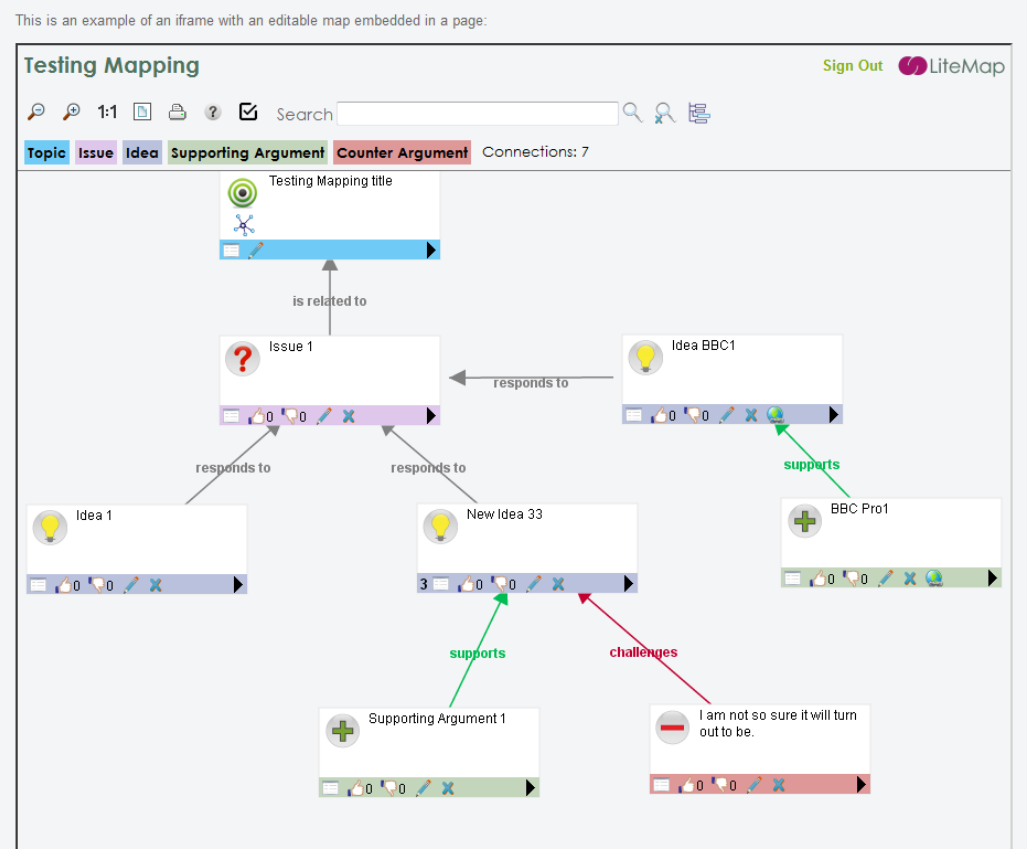


Figure 9: Litemap is a visual tool to create, connect and share Ideas. One can back them up with websites. Users can support or challenge them.

2. Design Solution

2.1 Systemic Design

Systemic design is different from systems design. Systems design often refers to hard technical systems that are completely ‘designable’. Here designers have complete control over systems parts and components, understand how they link to each other and can define the system boundaries.

In systemic design, the boundaries cannot be objectively defined and the systems have properties that cannot be fully predicted. For example, a ‘healthcare system’ where it is usually not clear what and who is included or excluded? And how it will look like and behave in the next 1, 2 or 10 years from now.

Systemic design is about the **collective** – neighbourhoods, societies, ecological systems – rather than isolated individuals. Recognising that no-one has a true picture of the system, systemic designers invite **multiple stakeholders** to participate in defining and driving a course of action. They may even challenge the deep structure of current systems and work on **shifting systems** design into a desired direction, for

example designing urban vertical farms to develop a more resilient food system. **Figure 10** illustrates this idea from a student work on the Essential Enterprise module. However, many students on the module focused on simply updating traditional products with potentially disruptive technologies, for example a minimalist recyclable trainer using advances in bio-derived materials. This still reinforces current individual based consumption systems and markets, and their ecological impacts, rather than collective thinking. But **Figure 11** is a student idea which suggests collaborating with a radical automation technology and local authority to raise awareness among citizens about not just recycling, but also encouraging users to reduce waste. Citizens here provide collective intelligence and data. Though the design of such a digital solution is at a micro-level, it can be linked with other similar ideas into a bigger idea. And even though the student proposal is of a speculative nature, it invites further possibilities to reduce wasteful consumption and change people's mental models.

SOCIAL BENEFITS

Verdant Hydroponics offers a range of social benefits tailored to our clients. Primarily, a sustainable fresh food source, aiding in healthy lifestyles and once Verdant Hydroponics expands, potentially implemented in areas of food insecurity or 'food deserts' found around the UK (Butler, 2022).

Below are some more indirect social benefits of hydroponics:

Urban greenery - Incorporating more greenery into our everyday urban surroundings has known benefits for our health and wellbeing. Cleaner air, positive impacts on mental and physical health are all achieved simply with more plants.

Social cohesion – Diversifies food sources, income opportunities + sense of community resources.

Education – Raising awareness on the importance of local, fresh food and food miles.

Climate change mitigation – Having local fresh food resources combats climate change in many ways. Notably, climate resilience from local supplies, lower food miles and resource efficiency (much less water).

OUR PARTNERSHIP WITH Manchester Central foodbank

Once Verdant Hydroponics is established for 1 year, we will partner with Manchester Central foodbank. By providing them with hydroponic systems and ongoing maintenance support, we would be able to ensure a constant fresh supply of vegetables. This is particularly significant as many food banks struggle to receive fresh produce as canned, processed food is much easier to store for extended periods.

Image taken from Manchester Central Foodbank website

Unfortunately, this often results in long-term food bank users suffering nutritional deficiencies (Morris, 2015). We can help alleviate the burden on food banks, reducing the amount food they must spend on food items that are not frequently donated (Morello, 2021). Enabling food banks to allocate more funds elsewhere in their charity and allowing those suffering from food insecurity to have more access to healthy, fresh food.

Figure 10:

A vertical farming Idea from a student work. The student recognises community ownership and partnership with local stakeholders.

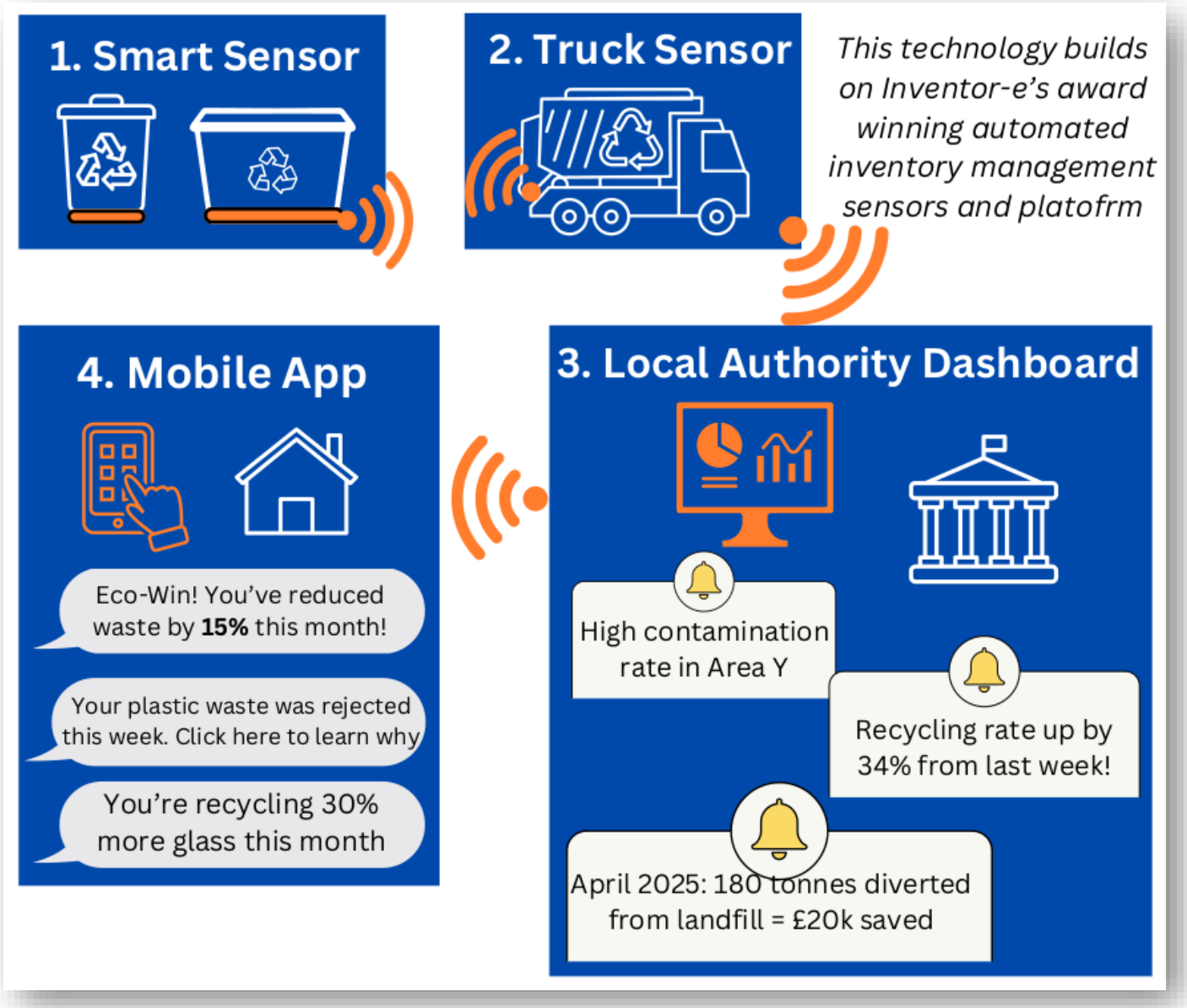


Figure 11:

A digital waste management Idea from a student work. The student recognises the importance of waste reduction among citizens, not just recycling and the role of collective intelligence and data in waste management.

The **Theory of change** model provides a comprehensive framework for designing and implementing sustainable solutions that address complex social issues. After analyzing the root causes of a problem through systems mapping and Iceberg model, the Theory of Change model helps design a roadmap for success. It goes beyond traditional logic models by incorporating a deep understanding of the context and the various stakeholders involved. With its focus on 'systemic' change, the model can help drive long-term social impact. The process typically includes the following steps:

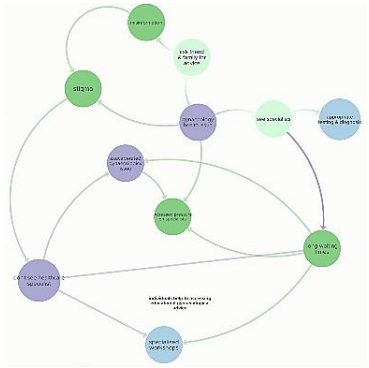
1. Define the Issue: Start by mapping the system. Conduct research, gather data, and consult with stakeholders to gain a deep understanding of the problem's root causes and the context in which it exists.

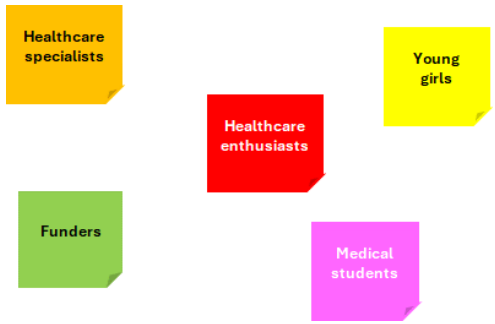
2. Identify the desired outcomes and Impact: Define the long-term impact or change that the programme wants to achieve. Consider the vision of change and the aspirations of the various stakeholders involved.

3. Map out the theory of change: Design interventions (activities) and resources (inputs) that align with the desired outcomes. Consider the constraints of the stakeholders.

Figures 12-15, show the work of a student on the Enterprise in Healthcare course. The student's idea "Thrive Women's Wellness" proposed a programme to support women become more aware of gynaecological issues. A system map and analysis of stakeholder needs helped understand the desired impact / outcomes and stakeholder activities / resources needed to achieve them.

Systems Mapping





Evaluating Stakeholder Needs

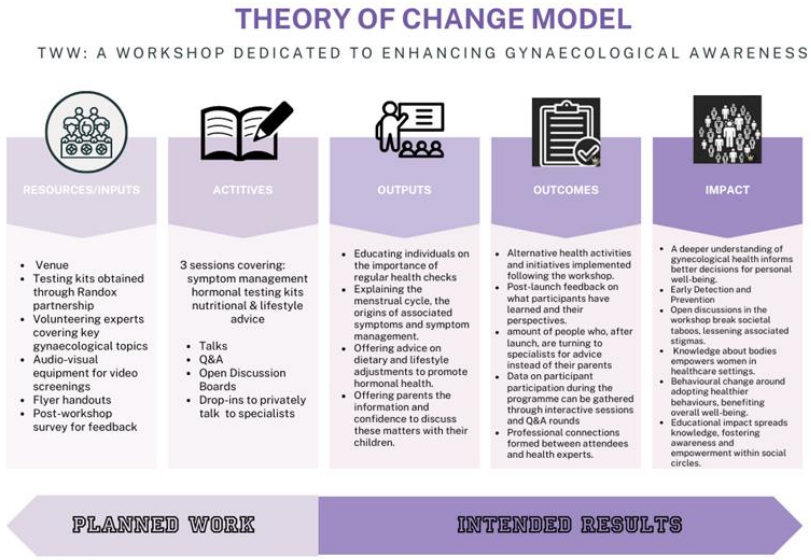


Figure 12: A student work demonstrating how to derive Theory of Change from Systems Mapping and understanding Stakeholder Needs.

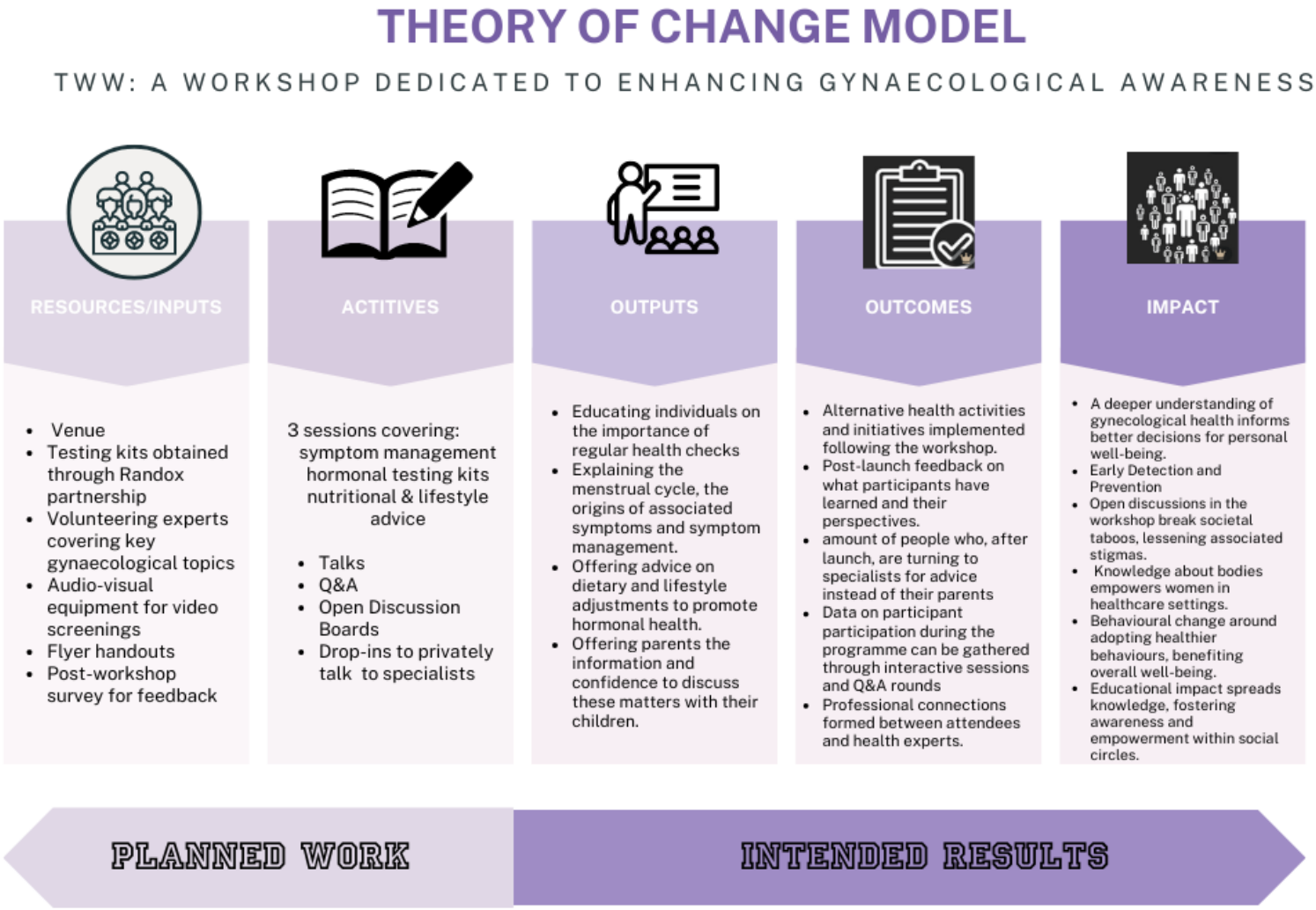


Figure 13: Magnified: Theory of Change for a community education programme to raise awareness among women about Gynaecological issues.

STAKEHOLDER GROUP	ROLE/INTEREST	ENGAGEMENT DETAIL
Healthcare Specialists	- Provide expert knowledge and volunteer services. - Access to latest research and practices in gynaecological health - Their aim: reduce stigma around gynaecological care & share success stories	- Gynaecologists and specialists to offer sessions on hormone health, nutritional advice, and address gynaecological issues. - Pro bono initiative / volunteers - Promote natural and holistic health as well as stress reduction techniques. - Provide feature panel discussions for direct audience interaction with experts. - Provide informational booths with materials to correct misconceptions.
Healthcare Enthusiasts	- Attend and participate in discussions	- Attend panel discussions, interact with experts, use informational booths, engage with menstrual and fertility-tracking apps like Clue - Virtual access will be available
Young girls & Women	- Direct beneficiaries seeking health solutions - Interested in managing menopause and maintaining wellness.	- Participate in sessions addressing specific health issues like hormonal imbalances or fertility challenges. - Participate in sessions focused on menopause and overall wellness management
Sponsors/Healthcare Providers	- Providing access to testing Kits	- Companies like Randox can provide access to hormone testing kits.
General Public	- Access to health information and encouragement for proactive health management	- Attend the workshop, use virtual access to sessions, and benefit from increased health awareness and understanding.
Medical Students	- Educational enhancement	- Benefit from learning opportunities through expert sessions and direct interactions with healthcare professionals

Figure 14: Understanding stakeholder needs related to women's Gynaecological health.

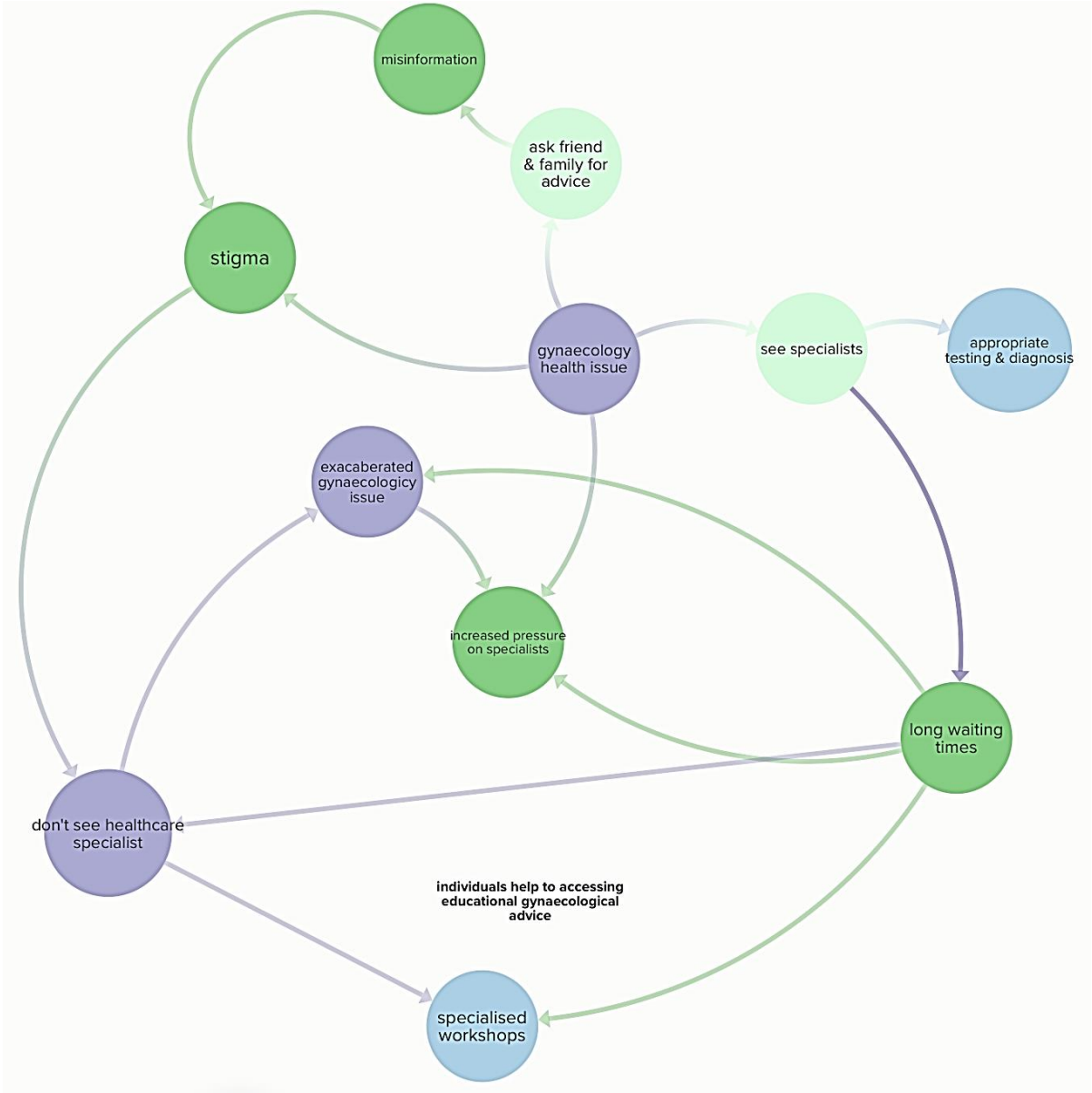


Figure 15: Magnified: A simple systems mapping to understand the causes for lack of awareness about Gynaecological issues among women. (misinformation, stigma, waiting times and burden on specialists) and links between them.

Facilitation Guide:

Step 1

Individual brainstorming + Sharing

The Theory of Change tool is ideally designed to be used in pairs. The pair ideally should be working on the same problem, but approach it differently. If a group of more than 2 is working on the same problem, consider splitting them into pairs. If possible, have them build a theory of change before the class. Otherwise plan for 30 minutes to do this during the class.

Step 2

Collective Reflection

Pick some of the Ideas and reflect on whether the resources and impact are aligned and how any resource gaps can be filled or more Impact can be achieved with the given resources.

2.2 Co- Design

There are many methods for co-design and co-creation in the public domain, such as Co-creation navigator, JISC's co-design playbook. But for a classroom or extra-curricular environment, we find that just giving simple tools such as QFD (Quality Function Deployment) prompts students to consider stakeholder view points while designing a product, service or system. QFD is a systematic design method for translating the voice of the users. Though the toolkit has roots in engineering product development, it can be applied to services and programme/project/organisational systems design too. The House of Quality (HoQ) (**Figure 16**)is central to QFD analysis and it simultaneously addresses the following questions:

- **WHAT does the user want?**
- **What is the RELATIVE IMPORTANCE of each user requirement?**
- **HOW can the product/service/system respond to user requirements?**
- **How does each product/service/system feature RELATE TO others?**

The answers to these questions are given in the various rooms of the HoQ (**Figure 16**), namely:

Room 1: User Requirements (obtained through open interviews and observational techniques and translated into a technical language)

Room 2: Product/Service/System Features (characteristics that the product/service/system must have to satisfy user requirements)

Room 3: Relationships Matrix (which evaluates how each Product/Service Feature affects each user Requirement based on experience, user responses and literature). The relationship values can be 0 (no relationship), 1 (weak relationship), 3 (moderate) or 9 (strong)

Room 4 (Roof): Relationships among Features (which analyses the impact (positive or negative) that Product/Service/system Features have on each other and, thus, helps to understand which features must be improved/changed in parallel in order to have a net positive effect on the overall design)

Room 5: Benchmarking Analysis (user evaluations of alternatives and substitutes in relation to the new product/service/system that is under development)

Room 6: Technical Importance: a weighted ranking of each feature. The user importance rating for each of their wants is multiplied by the relationship values for a particular service feature and added to get the importance for each feature.

Lucidchart offers a template for conducting QFD Analysis.

Figure 17 shows the work of a student at Leeds Beckett University (where the first author lectured before) on a Technology Entrepreneurship module. The student adopted an iterative approach with users (patients) and other stakeholders (healthcare providers) to create a digital health application in a local council area.

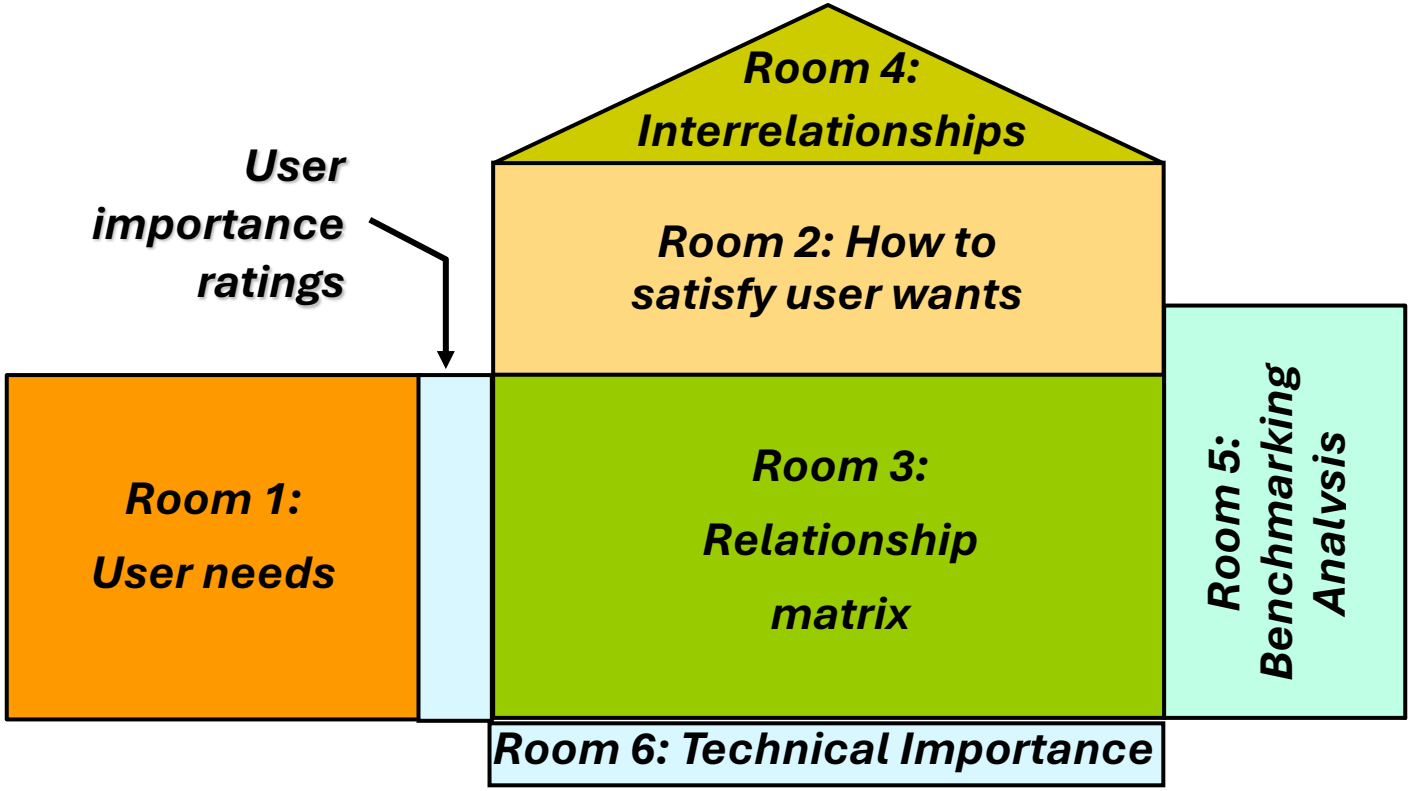
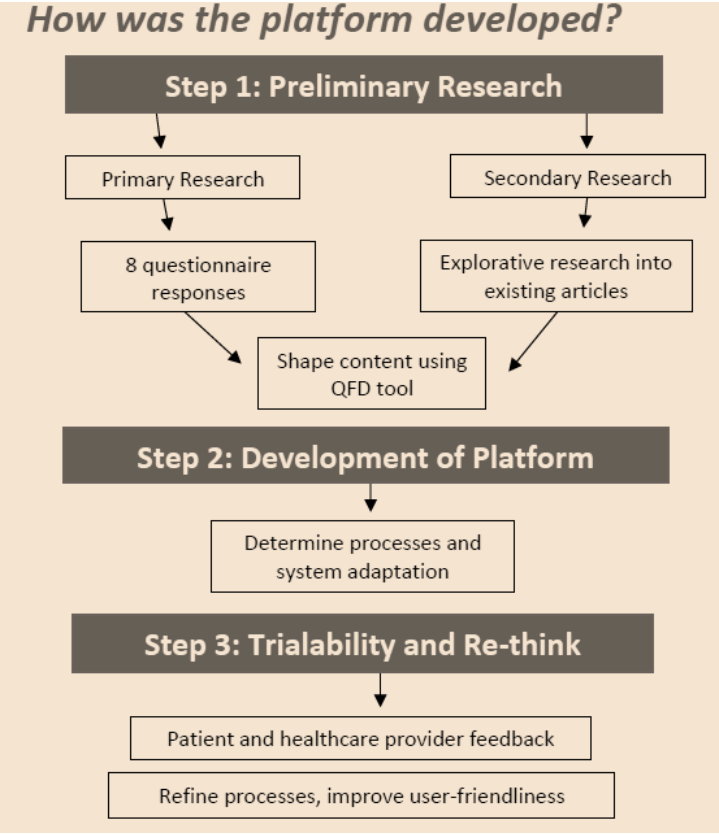


Figure 16:

House of Quality



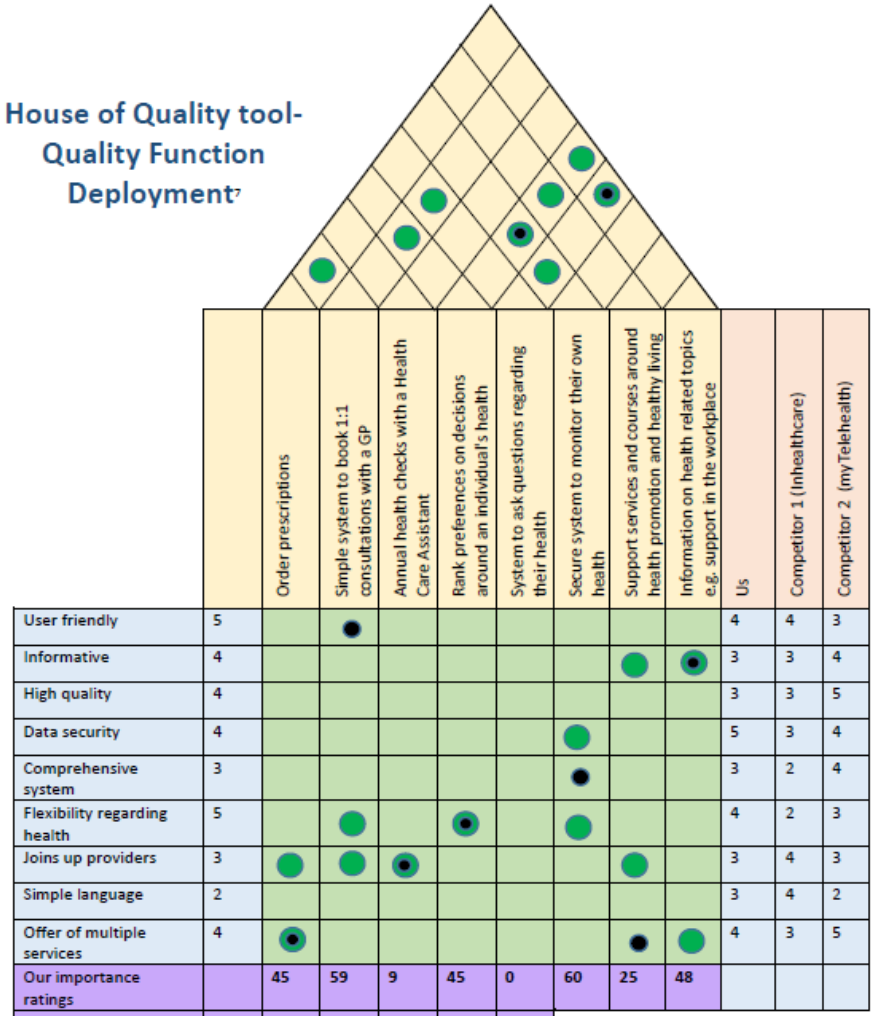


Figure 17: Developing features for a digital healthcare application in an iterative way with users and stakeholders.

Another particularly useful tool for co-design that can be combined with QFD or used on its own is a **Kano survey.** The Kano model proposes that the relationship between the performance of product/service attributes and user satisfaction is non-linear, and therefore it is important to classify them as must-be, one-dimensional, attractive and neutral. Must-be attributes are related with the basic functions of the product/service and, consequently, must be integrated into the new design. On the other hand, attractive attributes are unexpected features, which, if absent, do not lead to dissatisfaction, but, if included in the new design, can cause user delight. Having one or two attractive attributes in the new product/service is essential to differentiate it and stand out. The attributes classification is based on the way the user reacts to presence/absence of a given attribute and therefore for each attribute the Kano survey has two questions. First, they rate how they would feel if a product/service had the feature (the functional question). In the next question, they rate how they would feel if the product/service lacked the feature (the dysfunctional question). A guide can be found on the Qualtrics site.

Figure 18 shows the application of Kano for a student idea in an Entrepreneurial marketing module at Leeds Beckett University around a peer-to-peer (P2P) MPA (Mobile Phone Application) platform for university textbooks. The service was inspired by the students inability to afford textbooks during university and was designed with students needs in mind. When designing community-based opportunities, the Kano model opens up opportunities to go beyond ‘gut feeling’ based on personal pains when defining value, because other end-users may prioritise differently than you

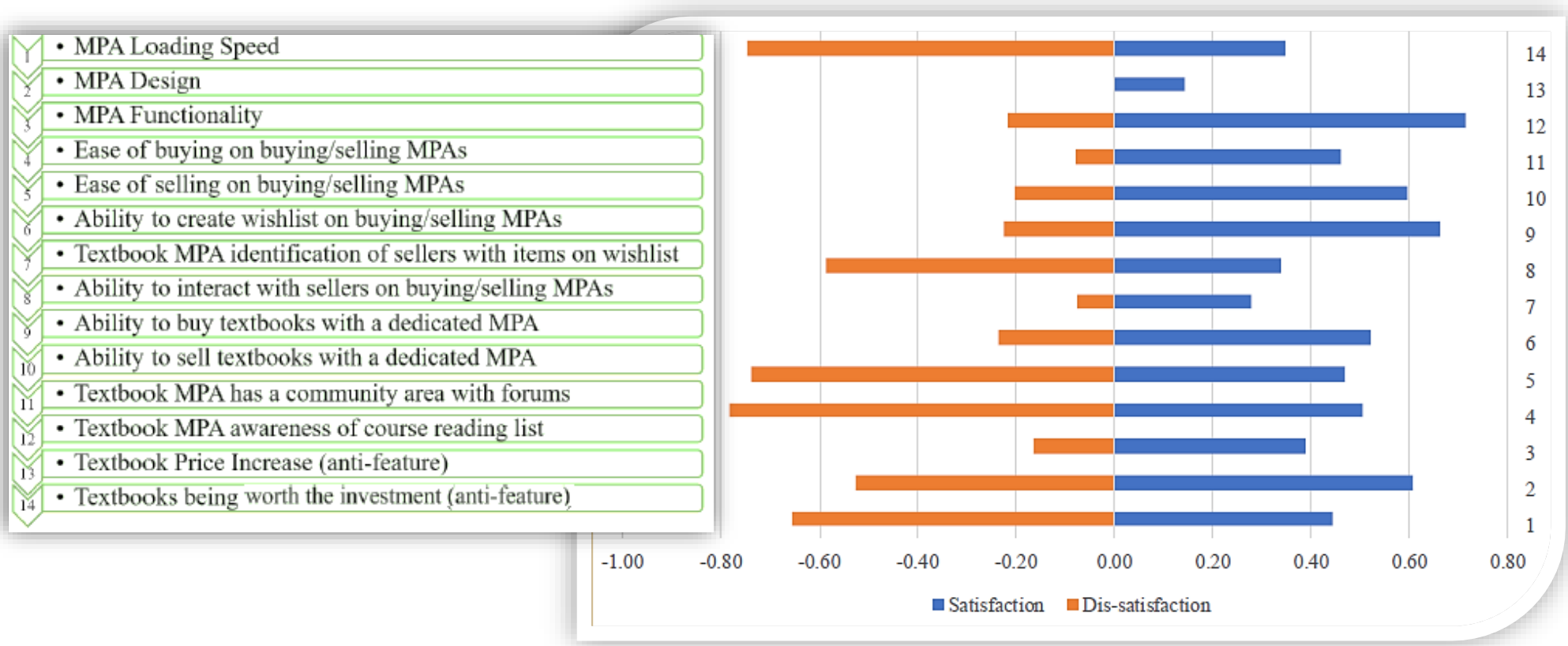


Figure 18: Developing a P2P platform using Kano survey, accounting for users needs, not just own experiences and pains.

Facilitation Guide:

Step 1

Class Demonstration

Both the QFD and Kano tools need interview and/or survey. Therefore, first demonstrate to students how the tools work in the classroom. Ideally give them at least 2 weeks to collect preliminary data and analyse. This tool should not be left to Weeks 11 and 12 as students often struggle to use these tools.

Step 2

Sharing and Doubt Clarification

Have students brainstorm and share their findings in Pairs. Ask them to clarify any doubts with you. This should take 30 minutes.

Step 3

Collective Brainstorming

Pick some of the Ideas and ask other students if they agree with the scores and ratings.

2.3 Sustainable Design

Sustainable design is the approach to creating products and services that have considered the environmental, social, and economic impacts from the initial phase through to the end of life. We find Leyla Acaroglu's EcoDesign tool (**Figure 19**) to be very useful in prompting students to think through how to design products, systems, and services for enhanced value whilst also maintaining functionality, aesthetics, and practicality. Students should in particular be strongly encouraged to think through:

1. How to convert products into product-service systems.
2. How to design in an equitable way so that the product/service/system is accessible to all.
3. How to design in a way so that it Influences higher quality of life.

Figure 20 shows extract from a student work on the Essential Enterprise module on Helmet rental and sharing service in partnership with the Manchester Bee Network Cycle Hire. The sharing model here not only emphasizes circularity, but also accessibility (convenient, affordable) and Influence (Safe physical activity).

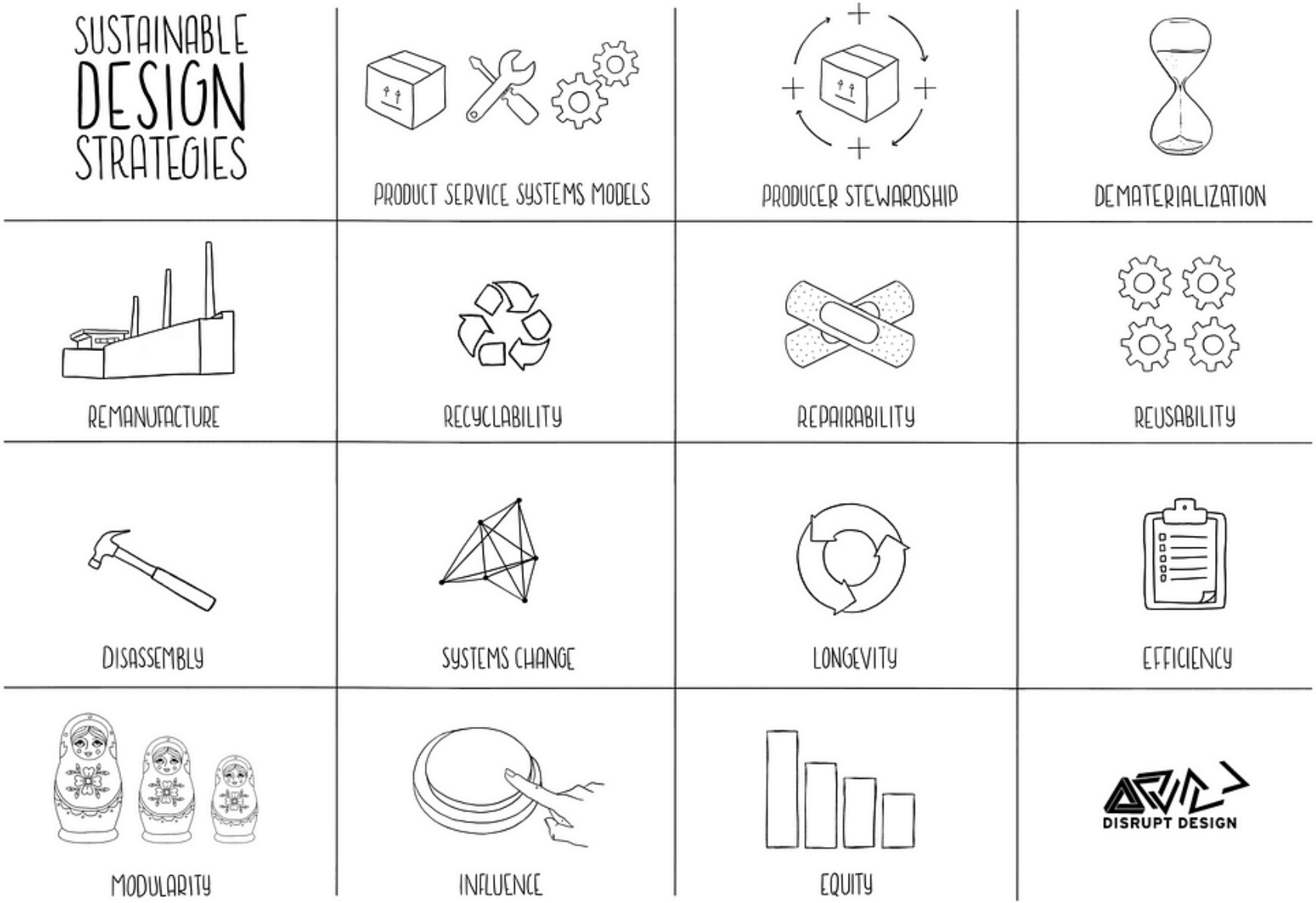


Figure 19: Sustainable Design Strategies (credit: Leyla Acaroglu, Disrupt Design)

Figure 20: Sustainable Design strategies applied to a Bike Helmet renting/sharing model.

Values	Existing Bike-Share Customers	SafeRide Helmets
Sustainability	In 2021, 13,000 carbon tons were saved by cycling commuters (Morley, Rebecca). Opting to cycle is a positive shift towards cutting carbon emissions and reducing air pollution.	Introduces a circular economy to bike helmets encouraging borrowing over buying.
Convenience	Removes the need for storage of personal bike and provides the opportunity for shorter and unplanned trips. Manchester's bike-share offers 24/7 bike access with bikes located and unlocked through a mobile app.	Allows users to not bring around their personal helmet with them pre and post ride.
Affordability	61% of bike-share customers said that bike-share saved them money and 24% of users were noted to come from low-income groups (CoMoUK Annual Bike Share Report, 2023). Bike-share removes expenses associated with a personal bike, provides access to active mobility in disadvantaged areas, and provides a transport option often cheaper than taxi or bus.	Cheaper than purchasing a personal helmet and minimizes the chance of medical expenses due to an accident.
Wellbeing	Physical inactivity is responsible for 1 in 6 UK deaths costing the NHS nearly a billion pounds annually (Gov.UK, 2022). Providing access to cycling helps to encourage physical activity and improved psychological wellbeing, with 3/4 of users stating that it benefitted their mental health (CoMoUK Annual Bike Share Report, 2023).	Provides the opportunity for and encourages safer practices for cyclists.

Facilitation Guide:

Step 1

Individual or Group brainstorming

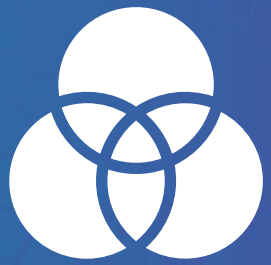
This tool is designed to be used Individually or in Teams. If possible, ask the students to think through what sustainable design strategies they have applied to their Idea before the classroom. If not expect students to spend 30 minutes in the classroom.

Step 2

Collective brainstorming + reflection

Have some of the students or teams present their findings. Ask other students to provide their input and suggest any new strategies .

3. Evaluate Sustainability



3.1 Balancing Purpose and Profit – Triple Bottom Line (TBL) Framework

The TBL is an accounting framework that incorporates three dimensions of performance: social, environmental and financial. The TBL dimensions are also commonly called the 3Ps: people, planet and profits. Though the profit can be measured in £s, the plant (or environmental) and people (or social) measures can be difficult to assign appropriate means of measurement.

A simple exercise is to ask students to evaluate **What** Impacts they plan to achieve and **Which** they might choose to prioritize, putting them at the centre of the TBL framework (**Figure 21**). They can put other lesser priority impacts further out, but these could be important to some of the stakeholders. Whilst this is a useful exercise to brainstorm what positive impacts to achieve, it does not tell how well the 3P impacts (both positive and negative) of the product, service or system design are balanced. Every product, service of system will have both positive and negative impacts, and trying to improve the positives on one of the Ps can have negative impacts on another P.

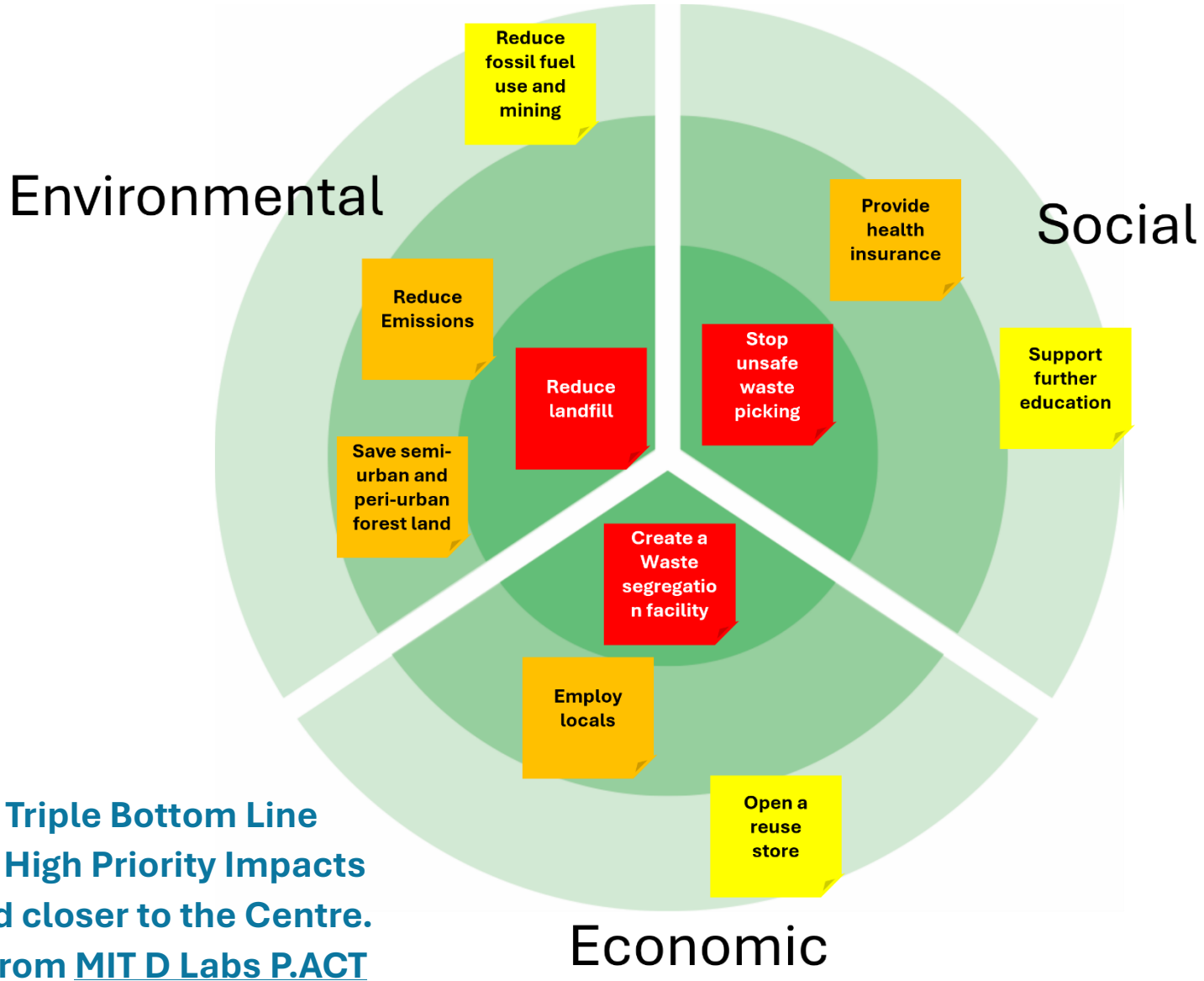


Figure 21: Triple Bottom Line Analysis. High Priority Impacts are placed closer to the Centre. Adapted from MIT D Labs P.ACT co-design toolkit.

A solution to measuring the 3Ps balance would be a **Sustainability index (SI)** that allows comparing performance between companies, cities, development projects or some other benchmark. A method suitable for classroom education is that by Penn and Fields. It's a semi-quantitative methodology to evaluate the design on a relative scale of sustainability. A radar chart with three axes, representing people (P1), planet (P2) and price (P3) was the chosen approach. Price can be used as an alternative to "profit" when accessibility, affordability are important or when profit is not the main purpose, for e.g. in the case of healthcare organisations. For a given design, each of the 3Ps is given a value from 0 to 100. In an ideal case, where there are no negative impacts, this would result in each of the 3Ps having a value of 100 and the sum of the 3Ps would be 300. Summing the scores however when the values are not 100, does not offer a measure of how balanced the 3Ps are. To account for the relative imbalance among P scores, Penn and Fieds suggest a Sustainability Index (SI):

Sustainabilty Index (SI) =

[sum of 3Ps – (maximum of 3Ps – minimum of 3Ps)]

One of the students doing the Recycling tracking and management opportunity mentioned in **Figure 11** took an approach where they assigned a score of 10 for each of the factors contributing to the 3Ps and converted the total score for each P into a percentage. Their analysis is given in **Figure 22**. Higher the SI, the more balanced and sustainable the opportunity is.

There will be inherent biases with the approach. The student may assign a higher score for their own idea. But the method helps users to prioritise and evaluate important design options. For example in the case of the above opportunity, clearly the student recognises that campaigns for citizen engagement and behaviour change would be important design drivers that need to be evaluated with respect to alternatives to measure success. This will help them prototype and measure this for generating proof of concepts for generating interest from key stakeholders.

Criteria		Binsight	Standalone Smart Bins	Traditional Waste Management	Waste Analytics Platforms	Recycling Apps	Community/NGO Initiatives
Environmental (Planet)	Reduction in landfill waste	8	7	6	5	4	5
	Increase in recycling rates	9	7	5	6	8	7
	Carbon emission reduction	7	6	4	5	3	4
	Total	24	20	15	16	15	16
	Total Percentage	80	66.66666667	50	53.33333333	50	53.33333333
Social (People)	Community engagement	7	5	3	4	6	8
	Behaviour change	9	6	4	3	7	8
	Total	16	11	7	7	13	16
	Total Percentage	80	55	35	35	65	80
Economic (Price)	Reduced Landfill Tax	7	6	4	4	2	3
	Increased collection efficiency	8	7	8	8	3	4
	Increased campaign efficiency	9	5	6	6	7	8
	Total	24	18	18	18	12	15
	Total Percentage	80	60	60	60	40	50
Calculations							
Sum (A = P1 + P2 + P3)		240	181.6666667	145	148.3333333	155	183.3333333
Max P		80	66.66666667	60	60	65	80
Min P		80	66.66666667	60	60	65	80
Diff (B = Max P - Min P)		0	0	0	0	0	0
Sustainability Index (A-B)		240	181.6666667	145	148.3333333	155	183.3333333

Figure 22: Example showing the calculation of SI Index for a smart waste management service benchmarked against other efforts .

Facilitation Guide:

Step 1

Collection brainstorming

Show using an example how to benchmark against alternatives and give a score for each of the 3Ps and calculate the Sustainability Index. Tell them that this is a semi-objective measurement and highlight to them that there will be inherent biases, but the tool prompts them on all the possibilities to improve their scores and also achieve a good balance.

Step 2

Individual brainstorming and Sharing

OR Collective brainstorming

Then ask students to do this for their own ideas and share in Pairs. If working in teams, they can collectively brainstorm.

Step 3

Individual game playing + Collective Reflection

After they do the exercise, you can ask them to play **purpose-profit trade-off game** on FT and ask them to reflect on whether the SI Index provides a meaningful way of balancing the 3Ps.

3.2 Multi-Criterion Decision Making (MCDM)

Decision making on sustainability involves complex links between ecological, economic, and social aspects and requires active participation by all relevant stakeholders and their early involvement in the process. Thus, a multi-criteria decision-making (MCDM) approach is required to support decision making for Sustainable Development. Among the methods that support decision making, the analytic hierarchy process (AHP) is the most often used and well known. The AHP is an MCDM technique that makes use of pairwise comparisons between alternatives.

The technique was developed by Saaty in the 1970s. AHP supports decision making through pairwise comparisons of pre-specified criterion. The necessary and important criteria are chosen and organized “in a hierarchy structure descending from

an overall goal to criteria, sub criteria, and alternatives in successive level (**Figure 23**). Decision making is based on a numerical scale for pairwise comparisons, which is used to indicate how much more important one factor is in relation to another. The numerical scale varies from 1 to 9, where 1 signifies the equality of importance between two factors, and 9 indicates that one factor is much more important than the other. The importance ratings for each criterion can be developed through a brainstorming exercise based on available evidence and/or by engaging with experts and stakeholders. The easiest way to derive the rankings for the various alternatives is using the free Super-Decisions software.

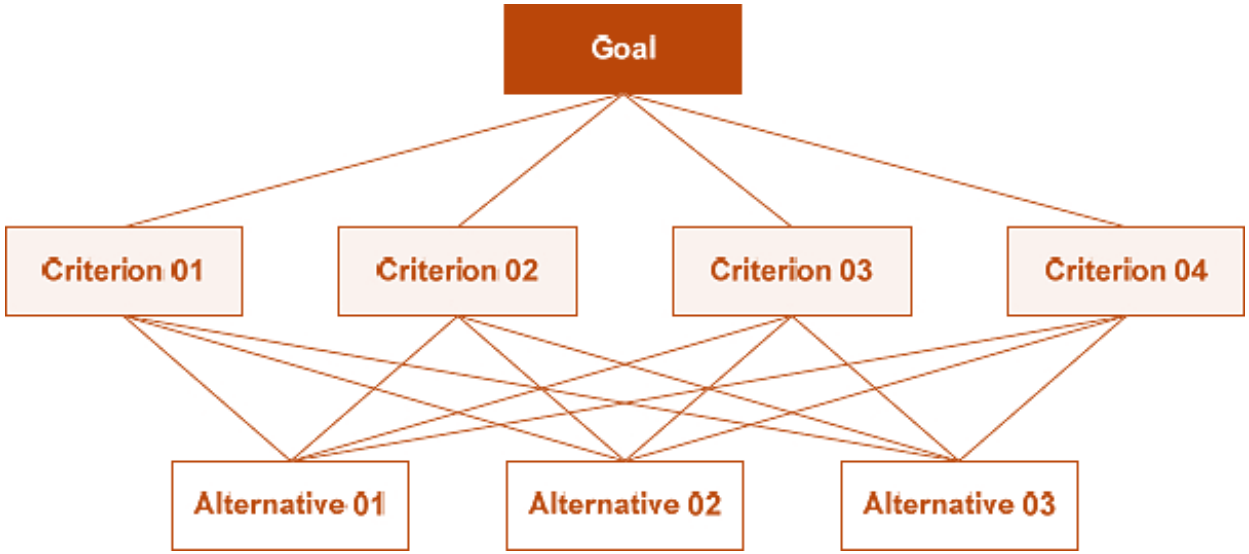


Figure 23: Tree structure for the Analytical Hierarchy Process (AHP).

Figures 24 shows a project by a student group on the Technology Entrepreneurship module at Leeds Beckett university. AGRO-VENTURER, is a technology based agro-forestry & dairy platform, which connects small investors and farmers to create large capital ventures superintended by a centralized panel of industry experts and professionals to create attractive and sustainable long-term ventures, which yield higher returns while reducing the risk, which would not have been possible individually. The platform also provides various services for input and output management and offers a digital market place for farmers. **Figure 25** provides the approach taken for AHP analysis, including the sub-criterion and alternatives.

Figure 24: Agro-venturer Agri Investment and supply chain management platform.

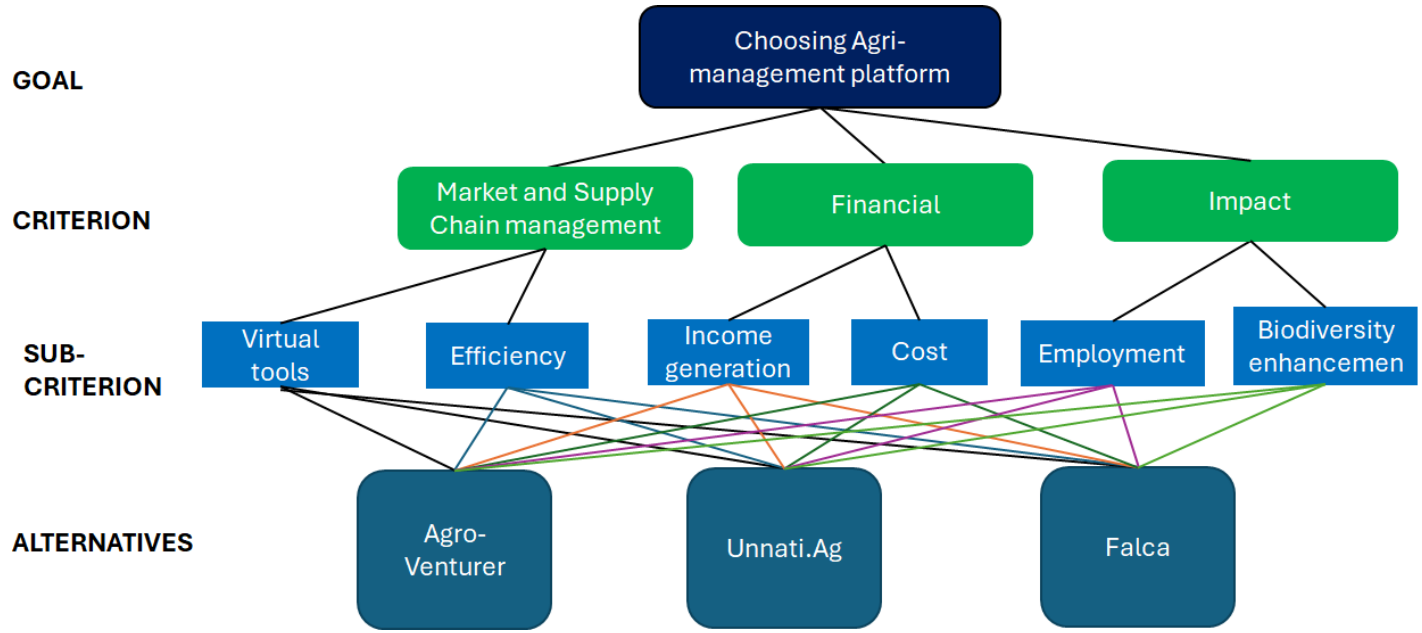


Figure 25: AHP Analysis for Agro-venturer.

The AHP methods main drawback is in the way experts / stakeholders opinions are converted to a pairwise importance ranking between the criterion or sub-criterion. The students may also not have considered every criterion, but the goal is not to achieve a perfect decision. The initial analysis can offer a good hunch and as a learning tool it offers a useful lens in demonstrating the complexity in trading off the various design options in achieving the desired impact. Both QFD and AHP can be combined when benchmarking against alternatives and support design possibilities in an iterative way.

Facilitation Guide:

Step 1

Class Demonstration

First demonstrate to students how the tools work in the classroom. As the tool requires data, give them at least 2 weeks to collect preliminary data and analyse. This tool should not be left to Weeks 11 and 12 as students often struggle.

Step 2

Brainstorm and Doubt Clarification

This should be a team project exercise ideally. Have students further brainstorm their findings and analysis in their teams. Ask them to clarify any doubts with you. This should take 30 minutes.

Step 3

Collective Reflection

Pick some of the Ideas and reflect on the implications of the findings for design changes.

4. Address Impact

4.1 Impact Business Models (IBMs)

Impact Business Models (IBMs) are the ways that a programme/business is designed to create a specific positive benefit/outcome for one of its stakeholders. It is focused on benefiting a specific stakeholder group with a specific positive benefit / outcome, rather than a "general" overall positive impact that is not specific to a particular beneficiary or not linked to a specific benefit that the stakeholder receives. **Figure 26** offers an IBM for an Idea called Pregnateen that that proposes to offer free comprehensive workshops designed specifically for female teenagers aged 15-19. Through education and empowerment, the goal is to prevent unintended pregnancies and enable young women to embrace brighter futures. **Figure 27** offers a Business model for an Idea called Cervix & Biscuits that is a non-profit enterprise that aims to work directly within communities to increase knowledge on cervical screening/cancer and therefore, increase attendance at appointments. The ideas in **Figures 26 and 27** emerged from the Enterprise in Healthcare course. Both IBMs target very specific beneficiaries, Female Teenagers and Women not attending or making Cervical Screening appointments respectively. Impact Business Models represents a paradigm shift in business thinking, because it includes purpose and co-creation.

The business model in **Figure 26** was created using [Board of Innovation's](#) free Business modelling toolkit on [Miro](#). One can create the business model on Miro, or download the ecosystem icons and create a Business model offline, for example on powerpoint.

How do They Make Money ? and How should it be created ?

As a non-profit, Pregnateen proposes to raise money from NHS and Schools. They should be co-created with Schools and can be supported by Local Sexual Health Clinics.

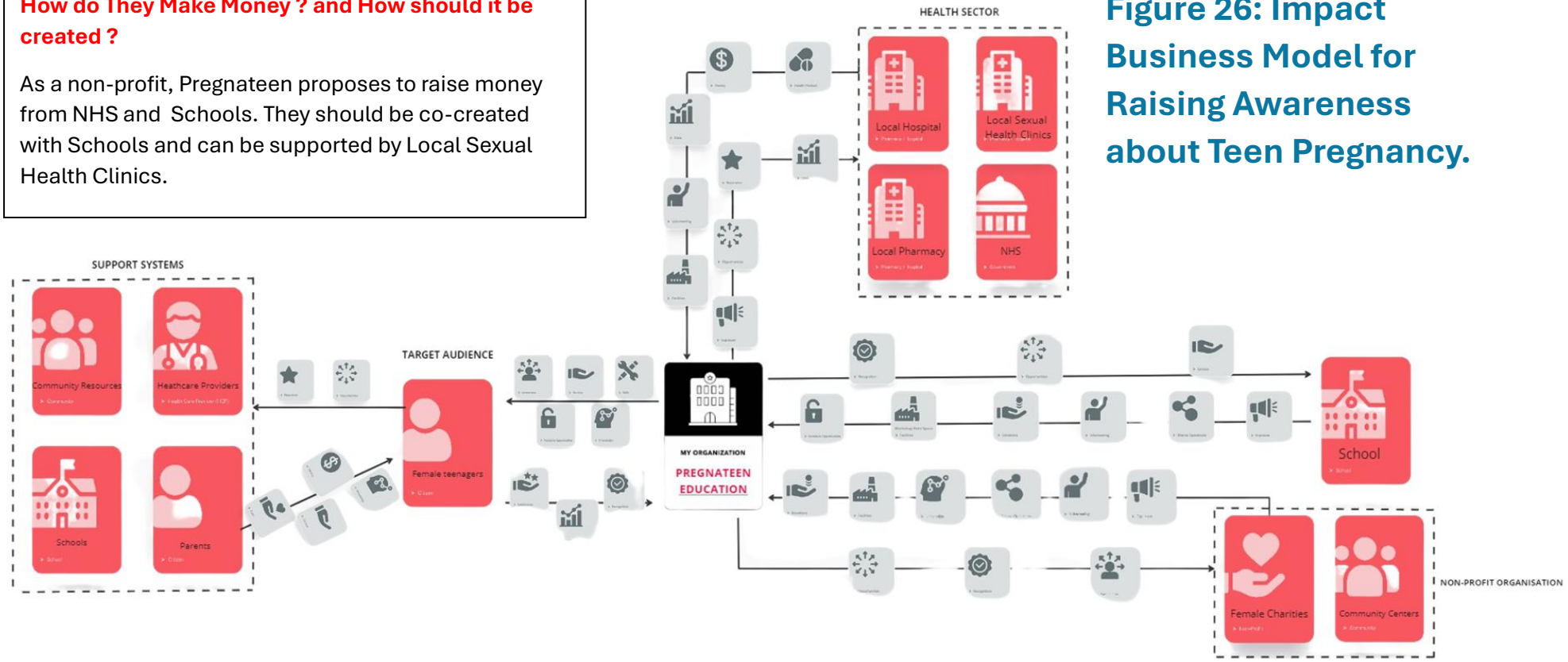


Figure 26: Impact Business Model for Raising Awareness about Teen Pregnancy.

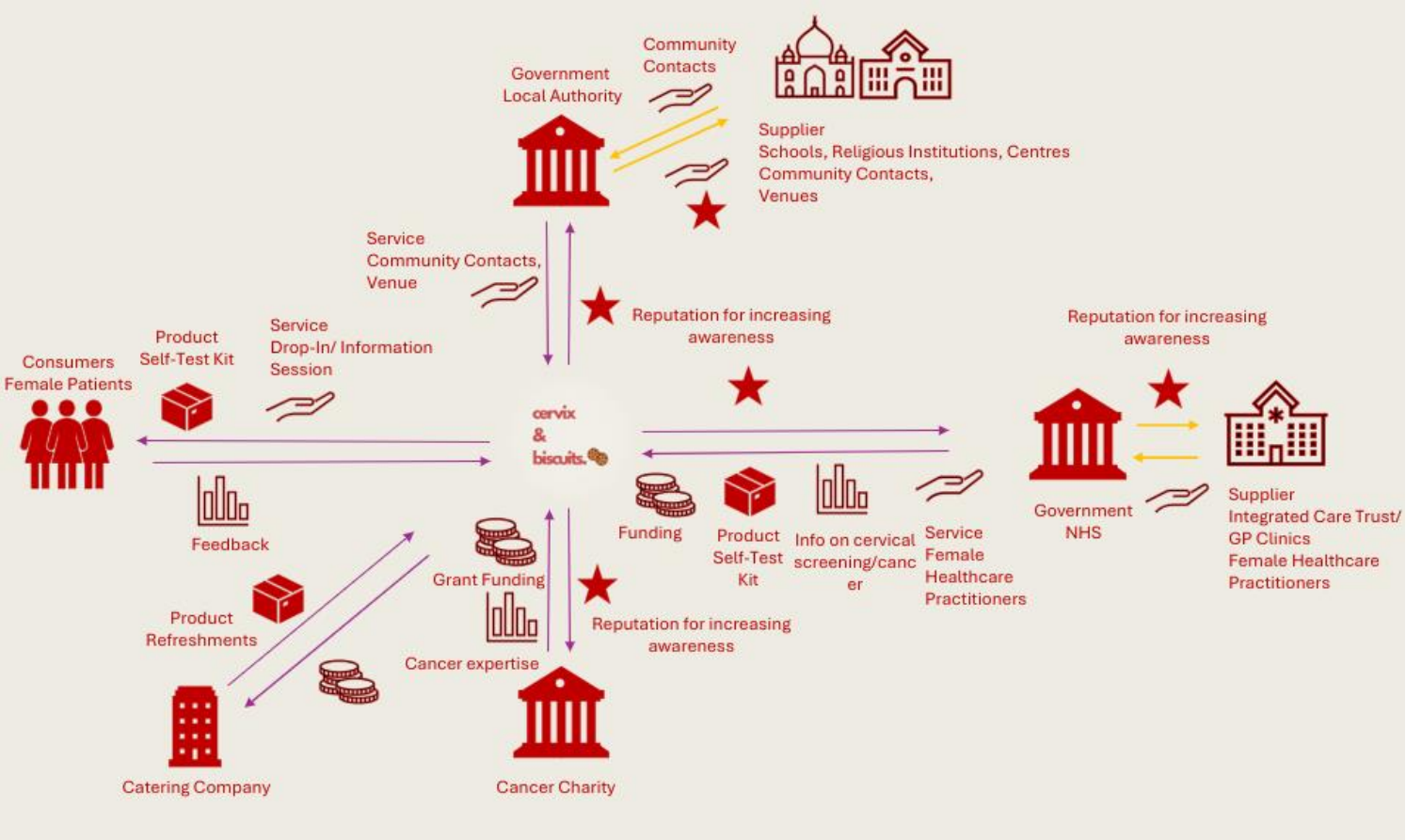


Figure 27: Impact Business Model for Raising Awareness about Cervical Screening.

How do They Make Money ? and How should it be created ?

As a non-profit, Cervix & Biscuits proposes to raise money from NHS and Local authorities, but work in partnership with Cancer charities such as Cancer UK. They should be co-created with female users who are hesitant to attend because of underlying beliefs.

A **3 A's framework** offers an important lens to complete the Impact Business model:

Awareness: How will your beneficiaries know they need your service / product ? How will they know about it ?

Accessibility: How and will they access it ? How will they know how to use it ? How do they approach you after the service should they need a follow-up ?

Affordability: Who will pay for it ? How will they afford it ?

Once the students have built a business model, discuss the following questions:

1. Have you considered all the key stakeholders ? Who else might join to support with funding, resources or delivery ?
2. Are there enough incentives for each stakeholder to support the initiative ? If not, how can you improve the incentives ?
3. Does the model create the benefits expected by the user ?
4. Does the business model generate the impact expected by or promised to the beneficiaries ?

Facilitation Guide:

Step 1

Individual brainstorming

The Business modelling is designed to be used individually or in teams. If possible, have them build the business model before class. Otherwise plan for 45 minutes to do this during the class.

Step 2

Sharing and Collective Brainstorming

Ask some of the students to share their business models. Ask audience for input on what further activities / stakeholders can be designed into the business model. Discuss whether any further changes in the product/service offering can support the beneficiaries better and incentivise other stakeholders.

Step 3

Collective Reflection

Reflect on why its important to be lean and agile when first implementing. It isn't always realistic or achievable to have all design possibilities and all stakeholders involved. Though, it is useful to think of all possibilities, make students realise that sometimes they need a leaner version that can help with small learning experiments and dynamically and iteratively help the programme/business move toward a more impactful and effective business model. This will help you stay focused on what matters immediately.

4.2 Social / Environmental Returns Forecast

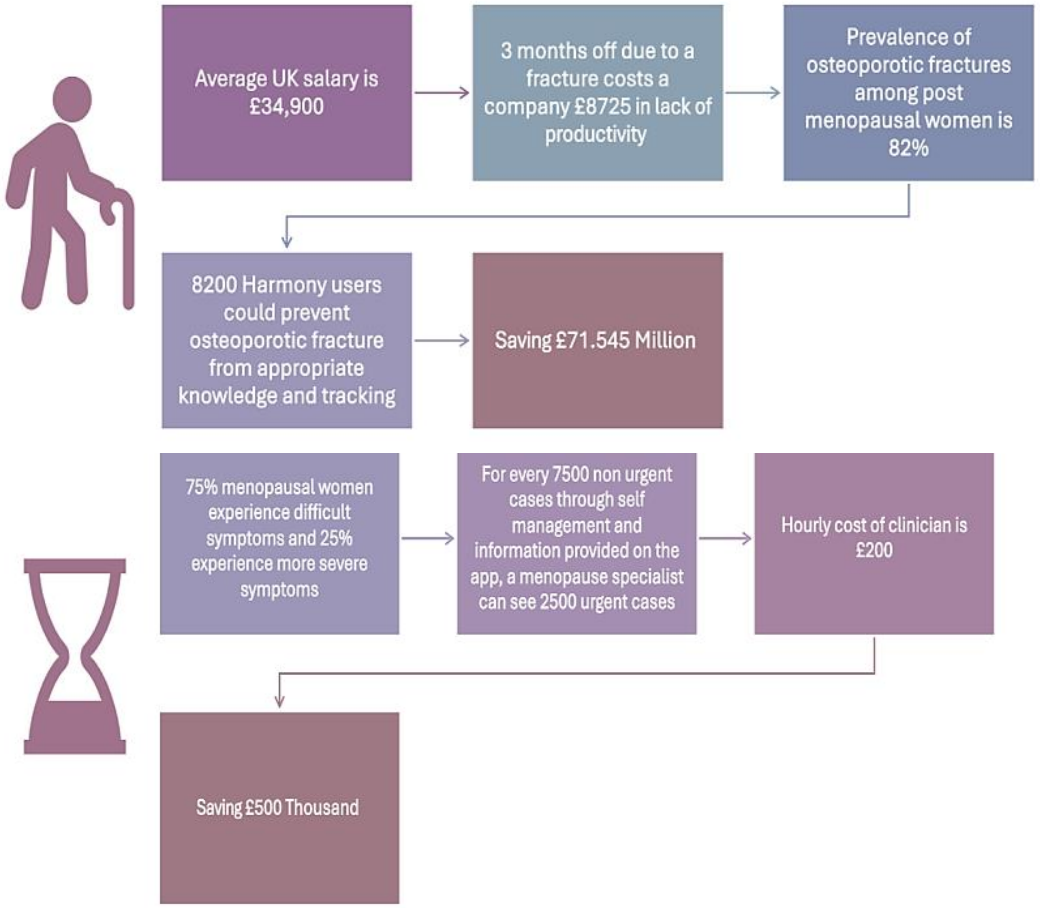
A growing number of grant funders and philanthropists attempt to monetise the impact of their funding, assigning monetary values to the social value they create. This allows them to speak the same language as equity investors. Monetisation techniques are very useful for demonstrating cost savings or increased incomes. For example, **Figure 28** shows the impact of treating post-menopausal Osteoporosis to

employers (and hence national productivity) and savings to the NHS as a result of the intervention.

Communicating monetisation can help entrepreneurs communicate more effectively with their stakeholders, as it reflects how they can benefit from an intervention. But the results of monetisation methodologies should be presented in a way in which the complexity of the problem are recognized and captured. Achieving positive net impact might not justify the negative impact created. For example, whereas e-bikes and electric cargo bikes can certainly clean up inner city air, clear traffic congestion and to an extent help exercise, the complexity of electric battery end of life management is undeniable. Though e-cargo bikes are certainly more efficient than Vans in Cities, but for commute, would it be better to design a good mass rapid transport and encourage walking the last mile or just have normal bicycles and a helmet to rent at a more nominal charge in 15-minute intervals and not by the minute ?

Thus, instead of thinking on how challenging and expensive it is to cure the consequences of social and environmental problems, we should focus on how prevention or not relying on something technologically superior is cheaper and better

for both taxpayers and society. Therefore, the exercise requires analysing the financial costs of social exclusion, under-productivity, environmental degradation etc for a community, region or country and showing how doing something can provide significant benefits.



Lifetime cost based on 10k users in Year 1, growing to 24 k by year 5 = £1.83m

Social Return = (71,545,000+ 500,000) / 1,830,000

= 39

Figure 28: Estimated Social Returns for a programme to support women at risk of post-menopausal Osteoporosis.

Facilitation Guide:

Step 1

Individual brainstorming

The Returns calculation is designed to be used individually or in teams. If possible, have them research, gather data and conduct analysis before the class. Otherwise plan for 1 hour to do this during the class as some secondary data will need to be gathered.

Step 2

Sharing and Collective Reflection

Ask some of the students to show all the possible ways in which they save costs and generate income. Ask audience for input on other cost savings and income generation indicators. Discuss whether the social return numbers are realistic and whether they hide any negative impacts.

Collaborate with us

We hope you find the toolkit useful. Let's share best practices and tools and make an impact on the wider enterprise educator's community. We would love to hear your feedback and suggestions. To contribute to this toolkit, please get in touch by email:

Dr Suneel Kunamaneni

suneel.kunamaneni@manchester.ac.uk

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