



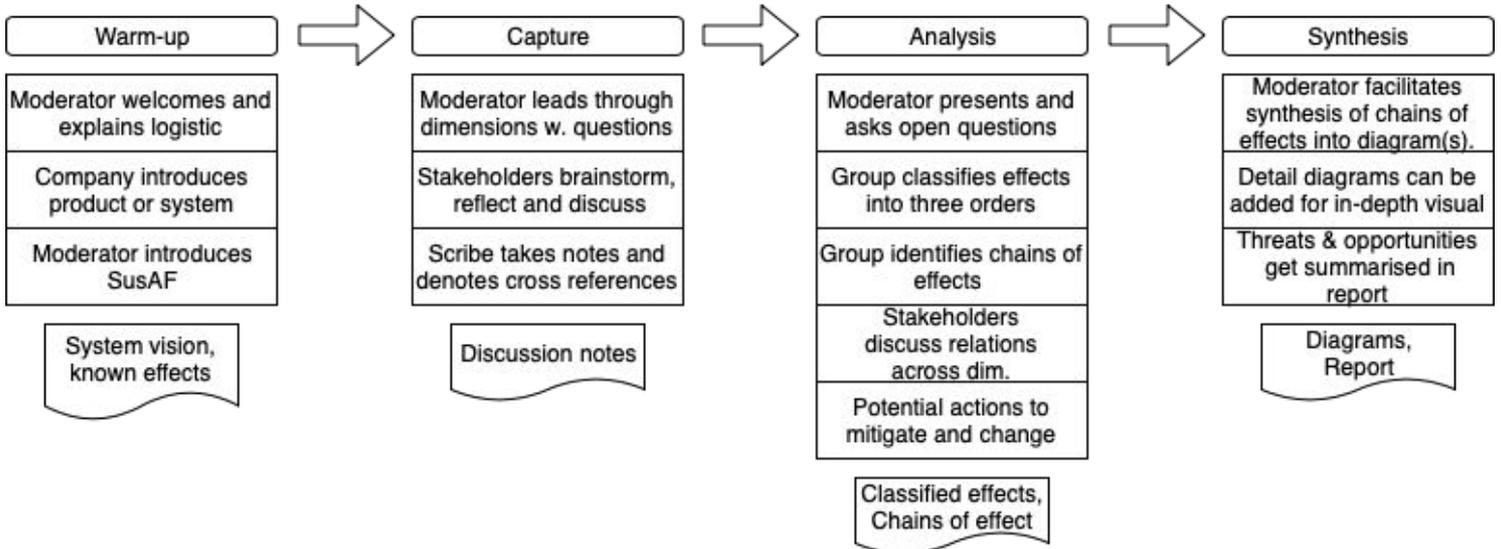
SUSAF

- THE SUSTAINABILITY AWARENESS FRAMEWORK

The workbook
- fill me in step by step.

OVERVIEW: THE SUSA FRAMEWORK ELEMENTS

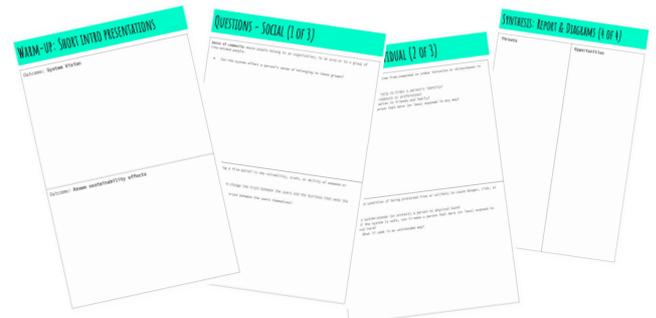
THE PROCESS



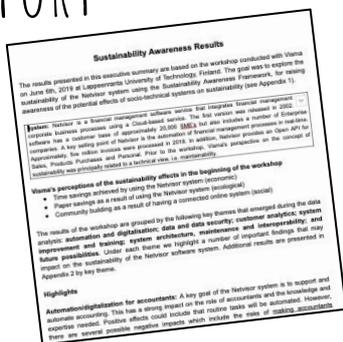
THE QUESTIONS

Social	Sense of community, trust, inclusiveness, equity, participation
Individual	Health, lifelong learning, privacy, safety, agency
Environment	Material & resources, waste & pollution, energy, biodiversity, logistics
Economic	Value, CRM, supply chain, governance, innovation
Technical	Maintainability, usability, adaptability, security, scalability

THE TEMPLATES



THE REPORT



THE DIAGRAM

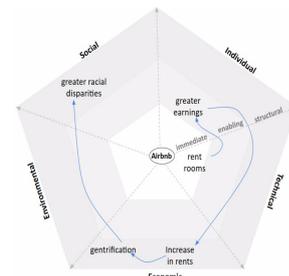


Figure 1. Simplified SusAD diagram for AirBnB system

Suggested timing:

Warm up 45 min, capture 5*40 min (incl. lunch break), analysis 45 min, synthesis 30 min.

WARM-UP: SCOPING

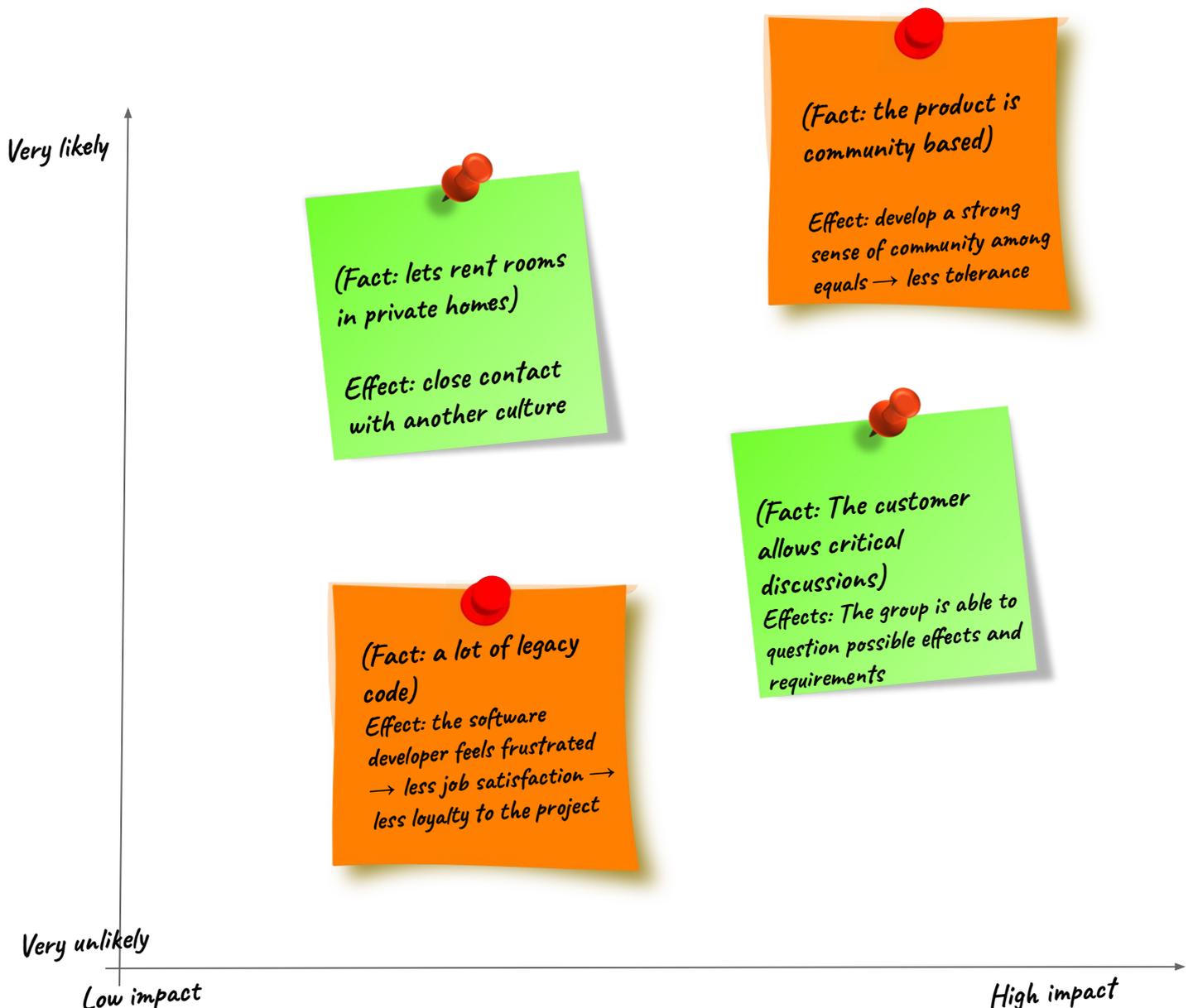
Outcome: **Product or Service Vision**

Outcome: **Known sustainability effects**

CAPTURE: BRAINSTORM & DISCUSSION

Instructions:

1. Listen to / read the question
2. Write down the first effects that come to mind in your notes sheets (1 minute)
 - a. Consider effects of any "fact" of the product / service
 - b. Functionality, characteristic, organization, business
3. Discuss all the ideas within the team (5 minutes max.)
 - a. Decide with effects are worth capturing
 - b. Write positive effects on green and negative on orange cards (with 'fact', if it was mentioned)
 - c. Paste in likelihood & impact matrix



QUESTIONS: SOCIAL

Sense of community means the feeling of belong to an organization, to an area or to a group of like-minded people.

- How can the product or service affect a person's sense of belonging to these groups?

Trust means having a firm belief in the reliability, truth, or ability of someone or something.

- How can the product or service change the trust between the users and the business that owns the system?

Inclusiveness and diversity refers to the inclusion of people who might otherwise be excluded or marginalized.

- How can the product or service impact on how people perceive others?
- What effects can it have on users with different backgrounds, age groups, education levels, or other differences?

Equity means the quality of being fair and impartial.

- How can the system make people to be treated differently from each other? (think data analytics or decision support)

Participation and communication refers to imparting or interchanging thoughts, opinions or information by speech, writing, or signs.

- How can the product or service change the way people:
 - create networks?
 - participate in group work?
 - support, criticize or argue with others?

QUESTIONS: INDIVIDUAL

Health means the state of a person's mental or physical condition.

- How can the product or service improve or worsen a person's physical, mental, and/or emotional health?

(For example, can it make a person feel anything good or bad - e.g. (under)valued, (dis)respected, (in)dependent, or coerced?)

Lifelong learning means the use of learning opportunities throughout people's lives for continuous development.

- How can the product or service affect people's competencies?

Privacy means being free from intrusion or disturbance in one's private life.

- How can the product or service expose (or help to hide) a person's identity, whereabouts or relations?

Safety means being protected from danger, risk, or injury.

- How can the product or service expose (or protect) a person from physical harm?
- How can it make a person feel more (or less) exposed to harm?
- What if used in an unintended way?

Agency means the capacity of an individual to act or make decisions of their free will.

- How can the product or service empower (or prevent) a person from taking an action / decision when necessary?
- Can those affected by the product or service understand its implications, express concerns or be represented by someone?

QUESTIONS: ENVIRONMENTAL

Material and resources includes everything that is needed to produce, deploy, operate, and cease a product or service.

- How are materials consumed to produce the product or service?
- What about to operate the product or service? E.g., requires hardware.
- How can it change the way people consume material? E.g., encourage to buy more?

Waste & pollution means effects the product or service might have on soil, atmospheric, and water pollution.

- How can producing parts or supplies generate waste or emissions?
- How can the use itself produce waste or emissions?
- How can it influence how much waste or emissions are generated?
- How can it promote (or impair) recycling?

Biodiversity includes the effects of a product or service on biodiversity in its operational environment and other affected land.

- How can it impact the plants or animals around it? Or elsewhere?
- How can it change composition of the soil around it? E.g., occupying / cropland?
 - What about elsewhere?

Energy means all energy use that results from producing and using a product or service.

- How can the product of service affect the need for production of energy?
- What about the use of energy? E.g. encourages less energy.
- Does the hardware run on renewable energy? Is there a way to incentivise that?

Logistics means the effects of the product or service on moving people and/or goods.

- How can it affect the
 - need (and distance) for moving people or goods?
 - means by which people or goods move?

QUESTIONS: ECONOMIC

Value means the worth, or usefulness of something, principles or standards; judgement of what is important in life.

- How can the product or service create or destroy monetary value? For whom?
- Are there any other related types of business value? For whom?

Customer Relationship Management steers a company's interaction with current and potential customers to improve business relationships (e.g. retention, growth).

- How can the product or service affect the relationship between the business and its customers?
- How can it enable co-creation or co-destruction of value?
- How can it impact the financial situation of their customers & others?

Supply Chain means a system of organizations, people, activities, information, and resources involved in moving a product or service from supplier to customer.

- How can the product or service affect the supply chain of the business who owns it?
- How can these changes in supply chain impact the financial situation?
- How can it impact the financial situation of their customers & others?

Governance means the processes of interaction and decision-making among the actors involved in a system through the laws, norms, power or language of an organized society.

- How can the product or service affect
 - how and by whom such decisions are made?
 - the communication channels by which the relationships takes place?
- How can these changes impact the financial situation of the business and partners?

Innovation refers to something new or to a change made to an existing product, idea, or field.

- Do (parts of) the product or service affect the investment on research & development?
- How can changes in innovation and R&D impact the financial situation?
- Can it also impact the financial situation of their customers & others?

QUESTIONS: TECHNICAL

(a) A conceptual idea of a **technological** product or service (before first design of the technical system that supports it)

(b) A **technological** product of service evolution (technical system already exists or is designed)

Maintainability means the degree to which an application is understood, repaired, or enhanced.

- (a)(b) How are the operating system and runtime environment expected to change what does that required from maintainers of this system?
- (a)(b) How can the correctness of the system be affected by other systems or affect the correctness of others?

Usability means the ability of users to productively use the system for the intended purpose.

- (a)(b) What kind of knowledge or physical properties are required to use the system and how can this affect different types of users? For example, is good eyesight and small, sensitive hands required to operate a system on a small handheld device?

Adaptability means the ability of a system to adapt itself to fit its behaviour according to changes in its environment or in parts of the system itself.

- (a)(b) How could someone want to use the system in another context?
 - (a)(b) What can make that easier/more difficult?
- (a)(b) What can make that easier/more difficult for the system to adapt itself to fit new usage scenarios?

Security means freedom from, or resilience against, potential harm (or other unwanted coercive change) caused by external or internal attacks.

- (a)(b) Which assets controlled by this system would be desirable to an attacker? E.g. financial information, people's whereabouts or preferences, etc.
 - (a)(b) What are the risks associated with these assets?
- (a)(b) What are other likely vulnerabilities of the system?

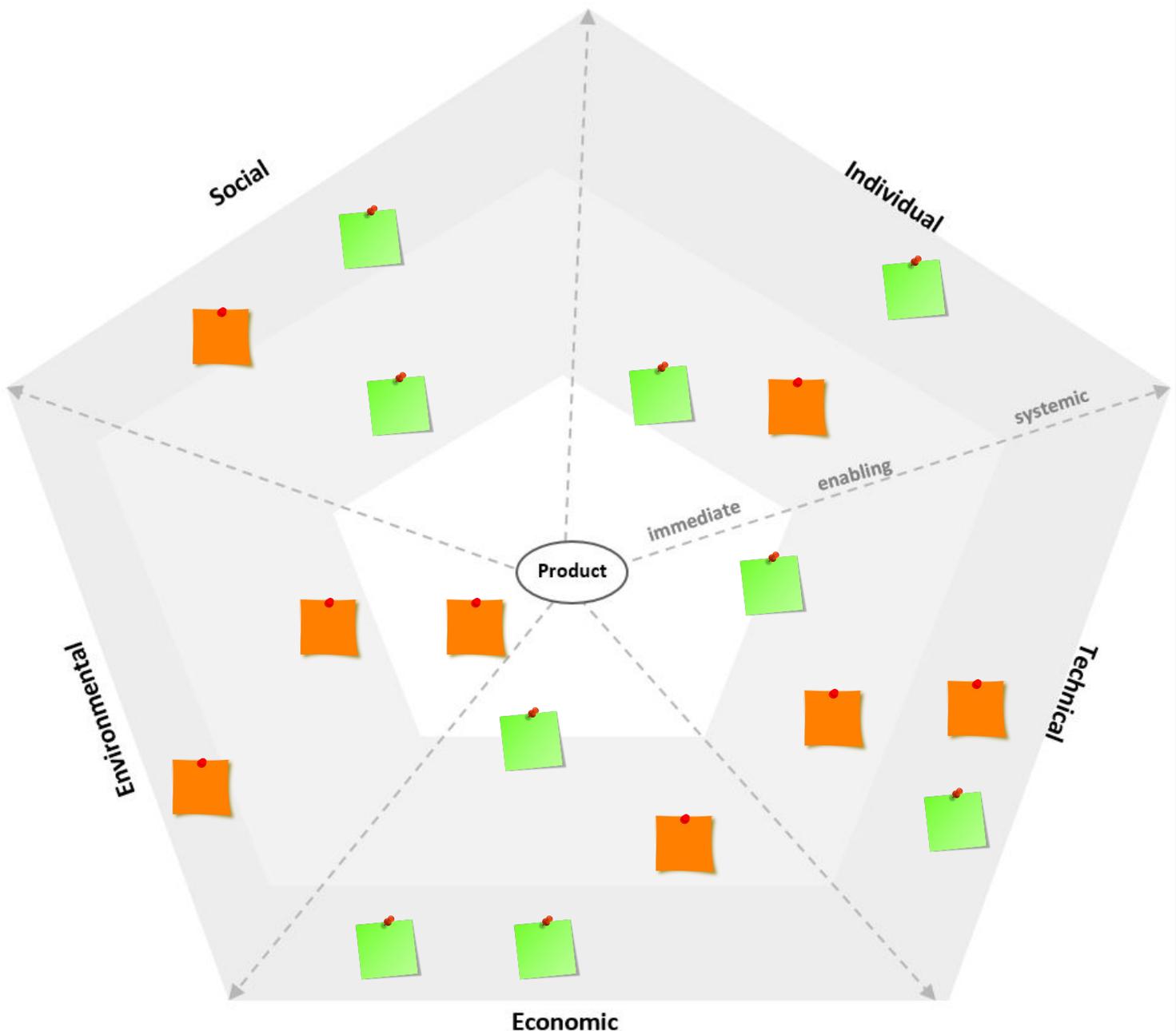
Scalability means the systems ability to handle growing amounts of work in a graceful manner or to be enlarged horizontally or vertically and will continue to function with comparable response times.

- (a)(b) How can the system support changes in workload?
- (a)(b) What can make that easier/more difficult?

ANALYSIS: SUSAD

Fill the SusAD:

1. Paste the effects from the high impact and likelihood corner of the matrix onto the SusAD according to dimension and order of effect.
2. Add the ones that are less likely and less impactful to the degree that is deemed necessary or beneficial by the group. (Not all post-its have to be transferred.)



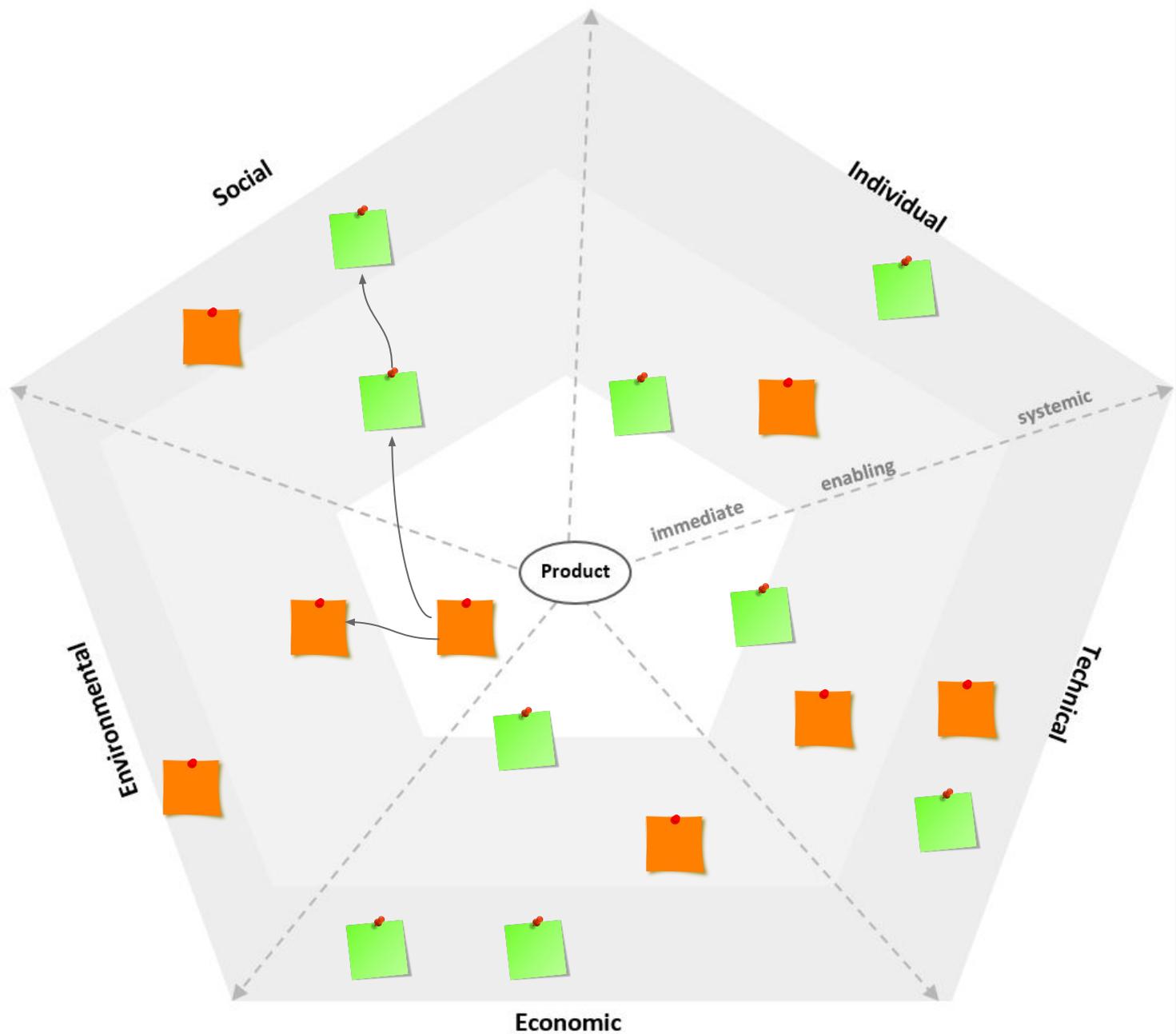
ANALYSIS: CHAINS OF EFFECTS

Identify: key chains of effect

Draw relations between the effects that may happen when many people use this product or service for several years:

1. Think about which second order effects stem from which first order effects, and
2. which third order effects can be a consequence of some second order effects
3. Effects can also have a related effect of the same order, and/or of a different dimension

Example: If people feel closer to their neighbors, they can choose to shop at local stores or choose local products, which can encourage local businesses and ultimately distribute wealth better



SYNTHESIS: THREATS, OPPORTUNITIES, ACTIONS

<p>Threats</p>	<p>Actions</p>
<p>Opportunities</p>	<p>Actions</p>

APPENDIX : SUSTAINABILITY AWARENESS FRAMEWORK

In this workshop, **sustainability** is the “*capacity of a socio-technical system to endure*”. More specifically, it refers to how systems that emerge from the interaction of a technical solution with humans and their environment can endure within the current economic, environmental, social, technical and individual settings. These are commonly referred to as the five dimensions of sustainability.

Example: Airbnb is a platform that offers a peer-to-peer short-term accommodation. In New York, homeowners can earn 55% more than the median long-term rental in the same neighbourhood (affecting the individuals and the economy). As a consequence, it is estimated that Airbnb has *removed* between 7,000 and 13,000 units of housing in New York from the long-term rental market, leading to an *increase of 1.4% in the median long-term rent* (affecting the society and the economy) and gentrification in areas where 72% are non-white, also increasing the race separations across the city (affecting the society).

The **Sustainability Awareness Framework** (SusAF) is a tool that supports stakeholders with different viewpoints to start a conversation on the possible effects of a socio-technical system on sustainability. It aims to raise awareness on the relationship between software and sustainability; a comprehensive sustainability impact analysis requires further work.

The SusAF is concerned with five **dimensions of sustainability** and the three **order of effects**:

Definition of Sustainability Dimensions

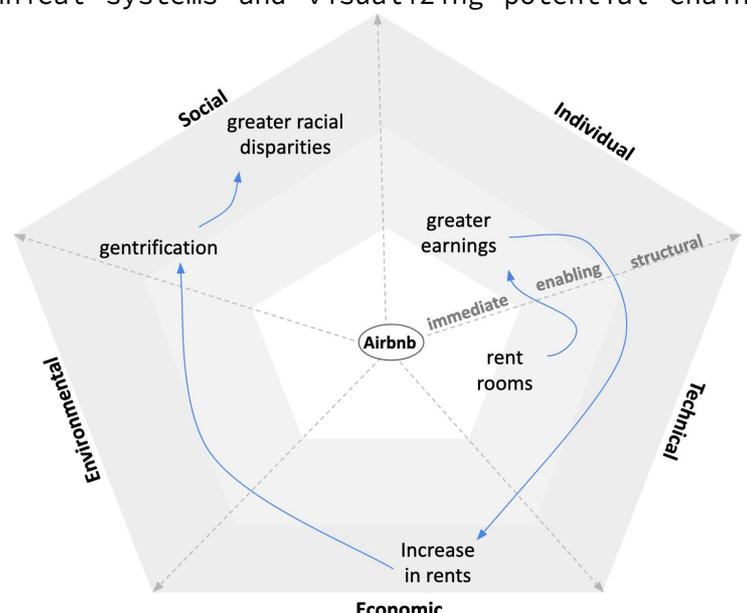
- Social:** covers the relationships between individuals and groups.
- Individual:** covers the individual's' ability to thrive, exercise their rights, and develop freely.
- Environmental:** covers the use and stewardship of natural resources.
- Economic:** covers the financial aspects and business value.
- Technical:** covers the technical system's ability to accommodate changes

Definition of the order effects

- Immediate** are direct effects of the production, operation, use and disposal of socio-technical systems. This includes the properties and the full lifecycle impacts, such as in the Life-Cycle Assessment (LCA) approach.
- Enabling** of operation and use of a system include any change enabled or induced by the system.
- Structural** represent structural changes caused by the ongoing operation and use of the socio-technical system

The SusAF **questions sheets** and the **Sustainability Awareness Diagram** (SusAD) for guiding discussion on the potential effects of technical systems and visualizing potential chains of effects.

Social	(1) Sense of Community; (2) Trust; (3) Inclusiveness and Diversity; (4) Equality; (5) Participation and Communication;
Individual	(1) Health; (2) Lifelong learning; (3) Privacy; (4) Safety; (5) Agency;
Environment	(1) Material and Resources; (2) Soil, Atmospheric and Water Pollution; (3) Energy; (4) Biodiversity and Land Use; (5) Logistics and Transportation;
Economic	(1) Value; (2) Customer Relationship Management (CRM); (3) Supply chain; (4) Governance and Processes; (5) Innovation and R&D;
Technical	(1) Maintainability; (2) Usability; (3) Extensibility and Adaptability; (4) Security; (5) Scalability;



Example of SusAD for one chain-of-effects in Airbnb



THANK YOU FOR USING
SUSAF!

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Feedback: Yes, please!