Towards circular economy – enhancing anticipatory decision-making in organizations by gamification

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Outline

1. Circular economy transition
2. Conceptual framework for circular business model development
3. Gamification as a foresight tool, Circulate.Now game
4. Conclusions

Circular economy

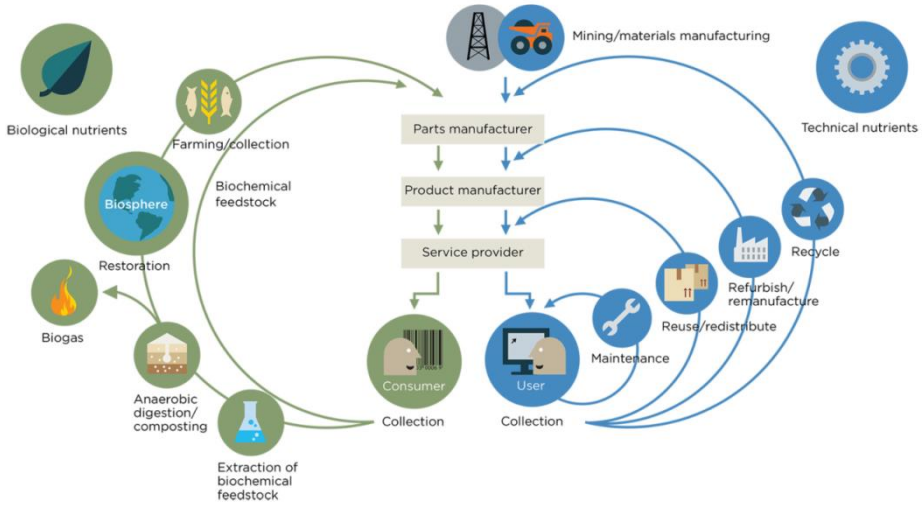
Linear economy

Take-make-dispose (1

Circular economy

Reuse

Reduction Recycling (2



Circular economy system diagram (3

" CE implies the adoption of cleaner production patterns at company level, an increase of producers and consumers' responsibility and awareness, the use of renewable technologies and materials as well as the adoption of suitable, clear and stable policies and tools. "
(Ghisellini et al. 2015)

1) Ness, D. 2008. Sustainable urban infrastructure in China: towards a factor 10 improvement in resource productivity through integrated infrastructure system. Int. J. Sustain. Dev. World Ecol., 15 (2008), pp. 288–301
2) E.g . Fang et al., 2007. Industrial sustainability in China: practice and prospects for eco-industrial development J. Environ. Manag., 83 (2007), pp. 315–328
3) EMF, 2015. http://www.ellenmacarthurfoundation.org/circular-economy/interactive-diagram
4) Ghisellini, P., et al. A review on circular economy:the expected transition to a balanced interplay of environmental and economic system. Journal of Cleaner production (2015), http//dx.doi.org/10.1016/j.jclepro.2015.09.007

Why towards circularity?

BENEFITS

RESOURCE
- Improves resource scarcity
- Decreases import dependency

ECONOMIC
- Cost savings -> value added
- Sustainable innovation

ENVIRONMENTAL
- Waste & emission prevention
- Resource efficiency

SOCIAL
- Job creation
- Social innovations
- Sustainable consumer behaviour

”In Europe the circular economy could bring an increase in GDP by 6.7%, and a reduction in CO2 emissions by 25% by 2030” (4

“In Finland the circular economy will have value creation potential of EUR 1.5–2.5 billion for national economy by 2030” (5

4) Ellen MacArthur Foundation, Stiftungsfonds für Umweltökonomie und Nachhaltigkeit (SUN) and McKinsey Center for Business and Environment, 2015. Growth Within: A Circular Economy Vision for a Competitive Europe,
5) Sitra, 2015. The opportunities of a circular economy for Finland. Sitra Studies 100. https://www.sitra.fi/julkaisut/Selvityksiä-sarja/Selvityksia100.pdf

CE drivers and trends

- **Political**
  - National and EU policies and directives
- **Economic**
  - Scarcity of raw materials & price volatily, resource efficiency
- **Social**
  - Sharing economy, collaborative consumption, urbanisation, population growth
- **Technological**
  - Digitalization, IoT, eco-design, new separation technologies, valorization technologies,
- **Environmental**
  - Sustainability, climate change

Circular busines models as enabling factors

- Circular business models could be based on e.g.[4,6-8]
  - Resource recovery, circular supplies , “waste as a resource”
  - Eco-design / product life extension
  - Reuse, repair & refurbish
  - Access over ownership
    - Product-oriented services (product + service)
    - User-oriented services (product leases, rental, sharing & pooling)
    - Result-oriented services, or product as a service (cooling, lighting)
    - Collaborative consumption (sharing platforms)

4) Ellen MacArthur Foundation, Stiftungsfonds für Umweltökonomie und Nachhaltigkeit (SUN) and McKinsey Center for Business and Environment, 2015. Growth Within: A Circular Economy Vision for a Competitive Europe,
6) Norden 2015 Moving towards a circular economy – successful Nordic business models. 2015 Policy brief. Nordic Council of ministers.
7) Tukker, A. 2006. Change Management for Sustainable Consumption and Production. Chanegs to Sustainable Consumption. Copenhagen
8) Accenture . 2015. Circular Advantage Innovative Business Models and Technologies to Create Value in a World without Limits to Growth.

Anticipatory decision making in the transition to circular economy

- Systemic changes require long-term perspective and challenging of existing mind-sets
- The transition has many obstacles from product design and supply chains to cultural resistance and the mind-set of consumers, business managers and authorities.
- To overcome these barriers, new anticipatory mind-sets in frameworks, cross-industry collaboration, technology, governance models, or regulation is needed.

A framework and **an IT-based tool** are suggested to help organizations in anticipating the impact of alternative choices, and enhance decision-making in complex socio-technical systems and transition.

Conceptual process framework for
PARTICIPATORY CIRCULAR BUSINESS MODEL DEVELOPMENT

BACKGROUND → PARTICIPATORY CIRCULAR BUSINESS MODEL DEVELOPMENT → IMPACTS ON AN ORGANISATIONAL LEVEL

FORESIGHT

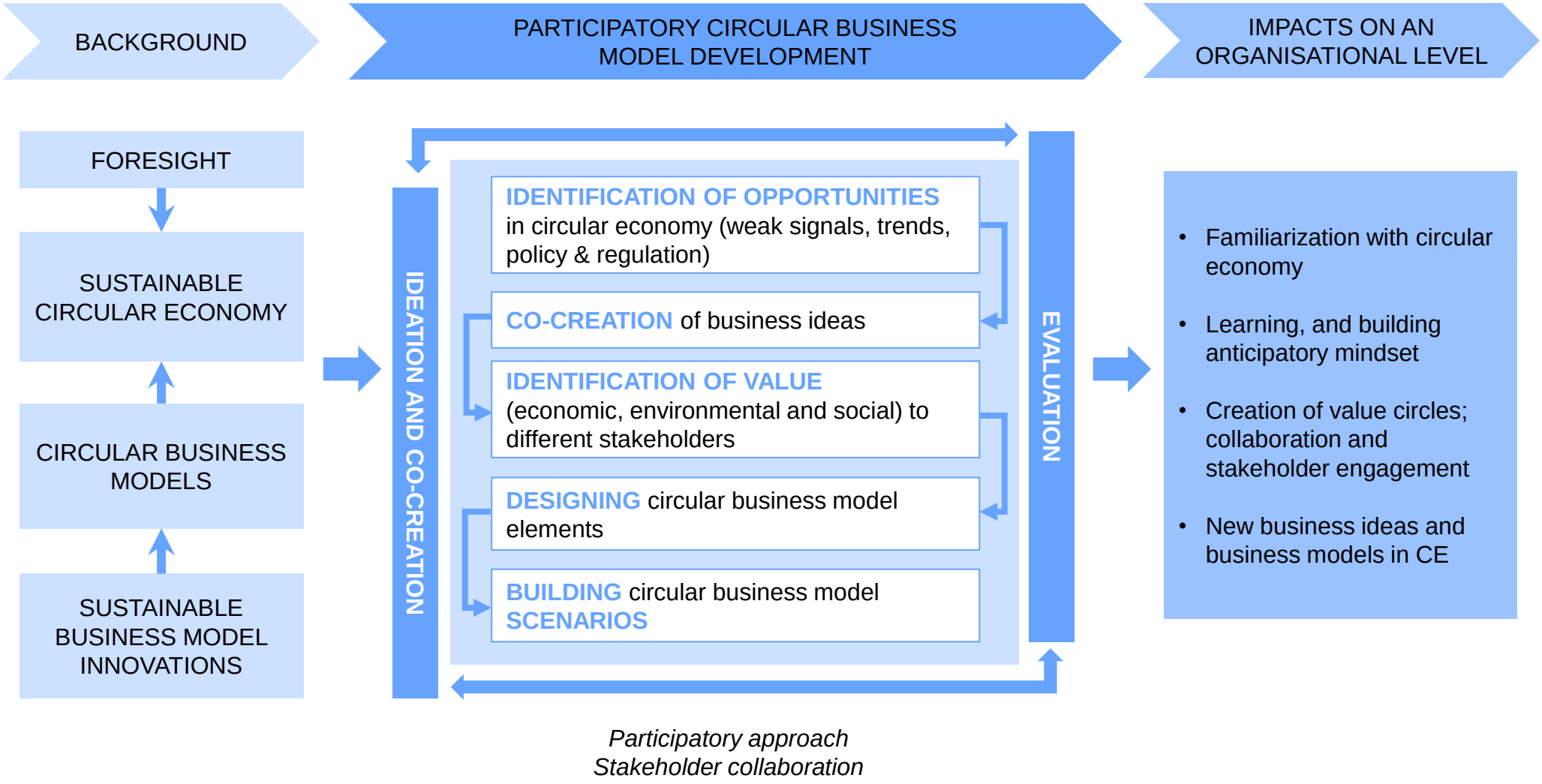
Circular economy

SBMI

ENHANCING ANTICIPATORY DECISION MAKING

Participatory approach
Stakeholder collaboration

Conceptual process framework for
PARTICIPATORY CIRCULAR BUSINESS MODEL DEVELOPMENT



Participatory approach
Stakeholder collaboration

Gamification as a foresight tool for enhancing anticipatory decision making

- Gamification is not a new concept in foresight nor in CE
  - Foresight, e.g.;
    - Foresight cards[6] , Drivers of change[7]
    - Foresight eXplorer [8]
  - Circular economy;
    - In the Loop [9]

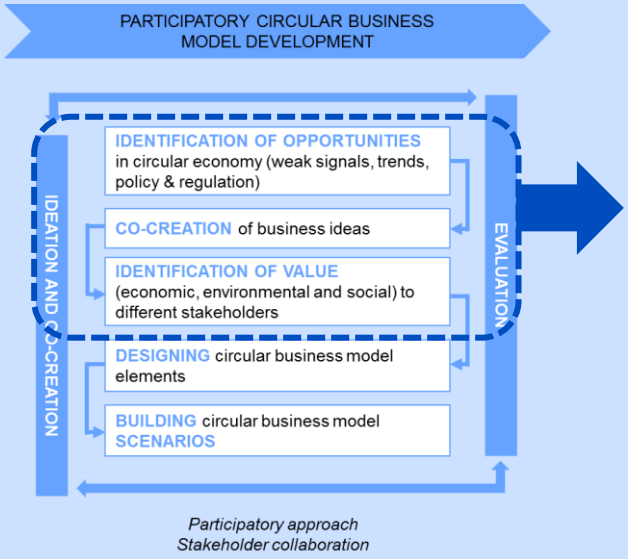
- Serious games provide a proactive way to support foresight activities, improve capabilities, lower barriers, and help creative and collaborative decision-making.

6) http://foresightcards.com/
7) http://www.driversofchange.com/tools/doc/
8) https://www.unteamworks.org/node/454008
9) http://www.intheloopgames.com/

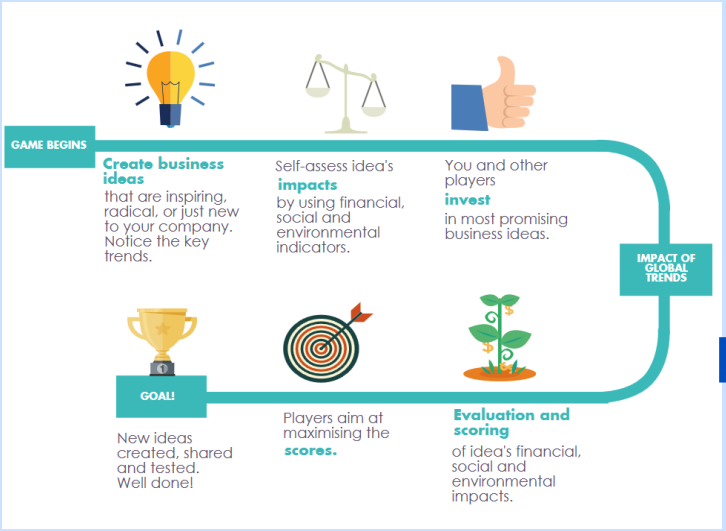
Circulate.Now foresight game development

- An IT-based foresight game on circular economy
- As an independent foresight excercise or as a workshop tool

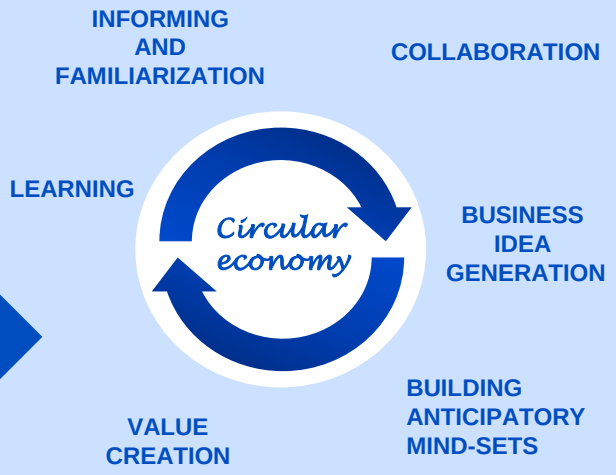
FRAMEWORK for CE BM development



IT-based foresight tool

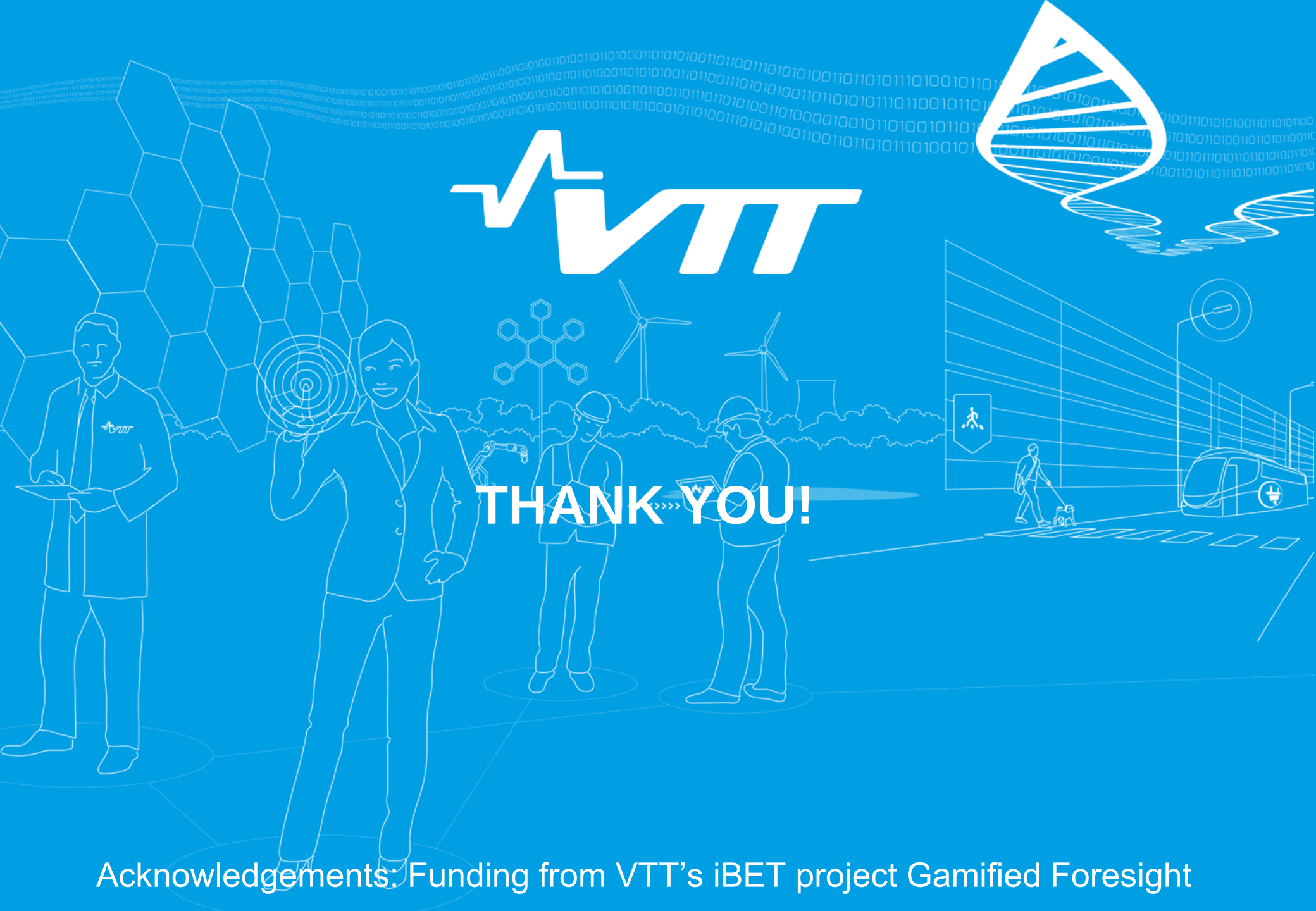


Implementation of the framework



Conclusions

- Transition to CE requires a shift in thinking about
  - **Material flows** - from linear to circular
  - **Value** - from economic-only to economic, environmental and social
  - **Process** - from exclusive to participatory business model development
- We have proposed a process framework to support this shift by helping participatory circular business model development
- The process is aided by a gamified ICT tool



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