# Smart City and Smart Mobility Business Models: A Review of the State-of-the-Art

Aline Pereira Da Silva, Mahsa Hadadpour, Puneet Mehta

Prof. Behzad Behdani, USN School of Business

# Outline

- **Part 1:**
  **Overview of basic concepts**
- **Part 2:**
  **Business models for Smart Mobility**
- **Part 3:**
  **Evaluating business models for Smart Mobility**
- **Part 4:**
  **Next steps**

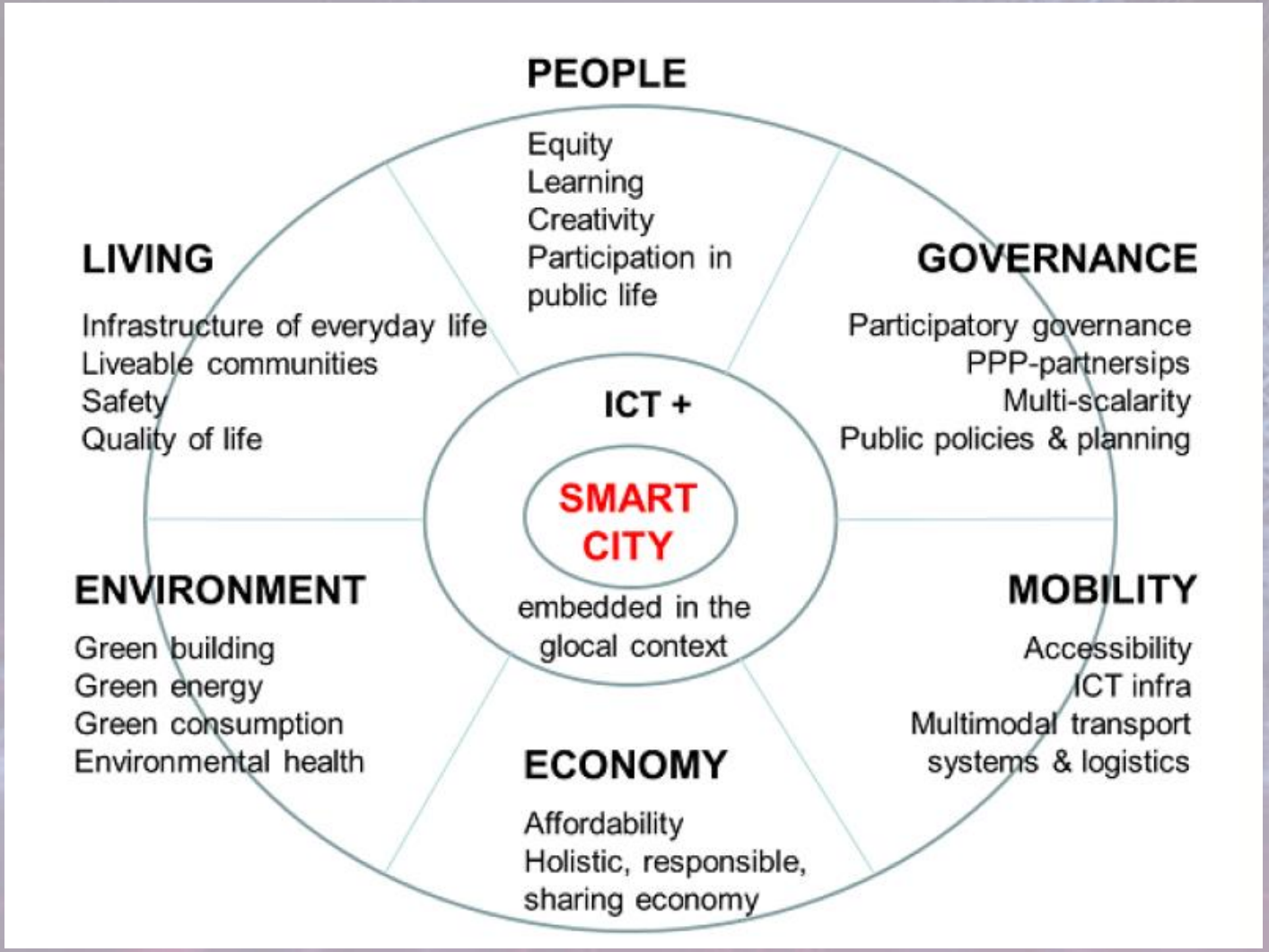
# Part 1:
# Overview of basic concepts

# Smart City

- As defined by United Nations, Smart City is an innovative city that uses **ICTs** and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while **ensuring** that it **meets** the needs of present and future generations with respect to **economic**, **social**, **environmental** as well as **cultural** aspects."(*Sustainable Smart Cities | UNECE*, n.d.).

- "A Smart City is a city that – meets the needs of its present inhabitants – without compromising the ability for other people or future generations to meet their needs, and thus, **does not exceed local or planetary environmental limitations**, and – where this is supported by  as known by all of us as ICT." (Höjer & Wangel, 2014)

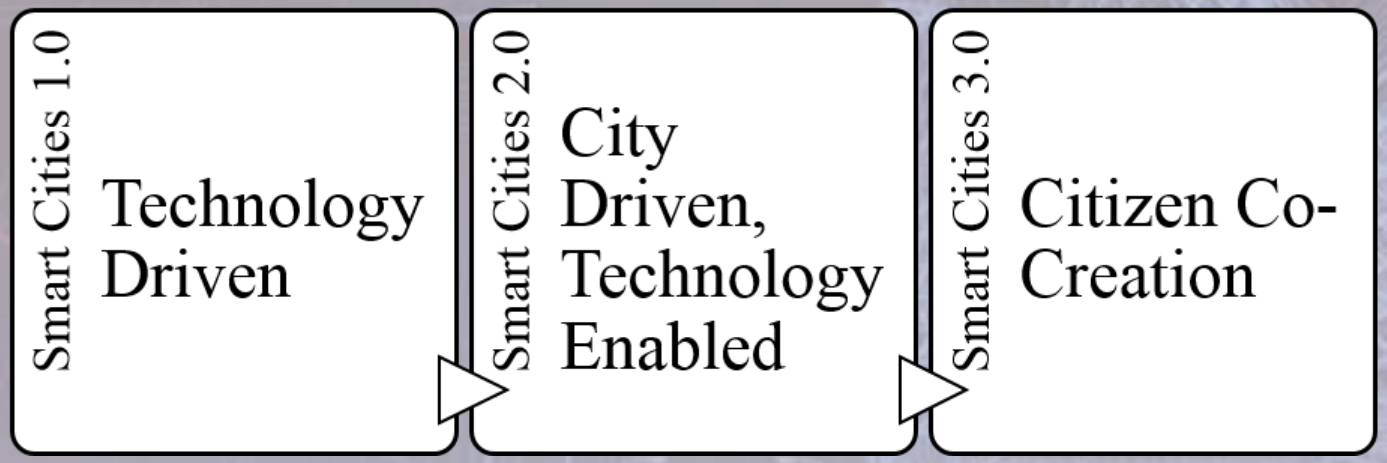
# Smart Cities Wheel Model



# Overview of the goals of a Smart City

| Economical | Environmental | Social |
|---|---|---|
| To Cultivate **Innovation** and Start up Culture (Gopinath et al., 2008)<br><br>**Sustainable Commercial Development** (City Branding)<br><br>Encouraging **sharing of existing resources** and reducing emissions and creating infrastructure and investments for Electric and Autonomous Vehicles (Al-Kaisy, 2022) | Reduce **CO2 Emissions** drastically leading to slower down Climate Change (Le Quéré et al., 2020) For e.g. To reduce 95% CO2 emissions in Oslo & Norway by 2030 (Bjerkan & Seter, 2021)<br><br>Align with National Transport Plans, for e.g. To achieve Norway National Transport Plan 2018-2029 to be zero emission.(O'Born et al., 2018) | Improve quality of daily life for their citizens (R. P. Dameri, 2017)<br><br>**Community building** and citizen engagement<br><br>Providing **customized services** for inhabitants (or visitors)<br><br>Value creation in tourist-oriented municipalities in regional Norway |

# Different phases and evolution of Smart Cities



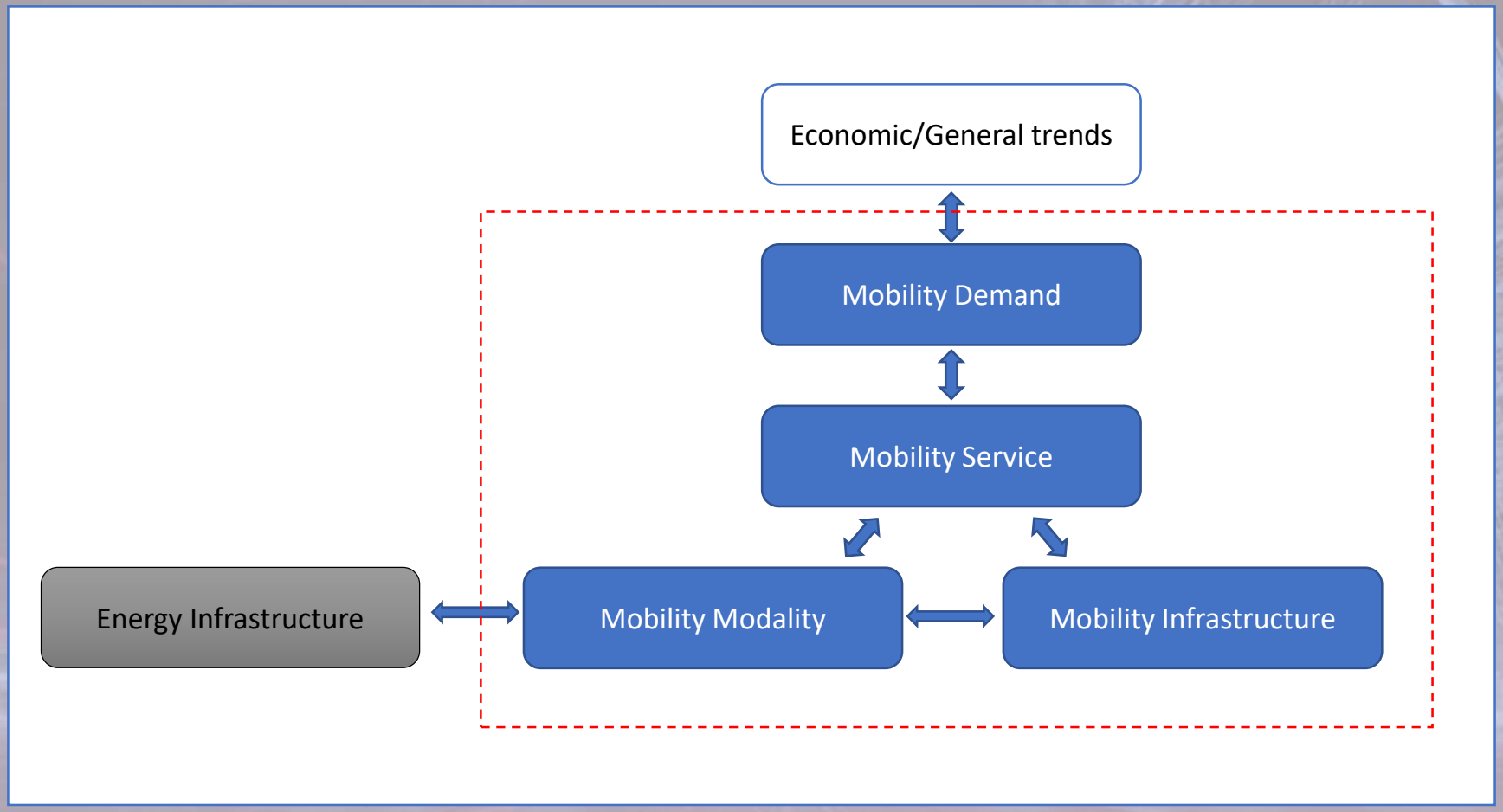
# What is Smart Mobility

- "the use of **Information and Communication Technology** in modern transport technologies to improve **urban traffic**". (Albino et al., 2015).
- "is a concept of comprehensive and smarter future traffic service in combination with **smart technology**. A Smart Mobility society is realized by means of the current intelligent traffic systems". (Chun & Lee, 2015).
- "local and supra-local accessibility, availability of ICTs, modern, sustainable and **safe transport systems**". (Faria et al., 2017).
- The aim is "Zero Emissions, Zero Accidents, Zero Ownership" (Neckermann, 2015).

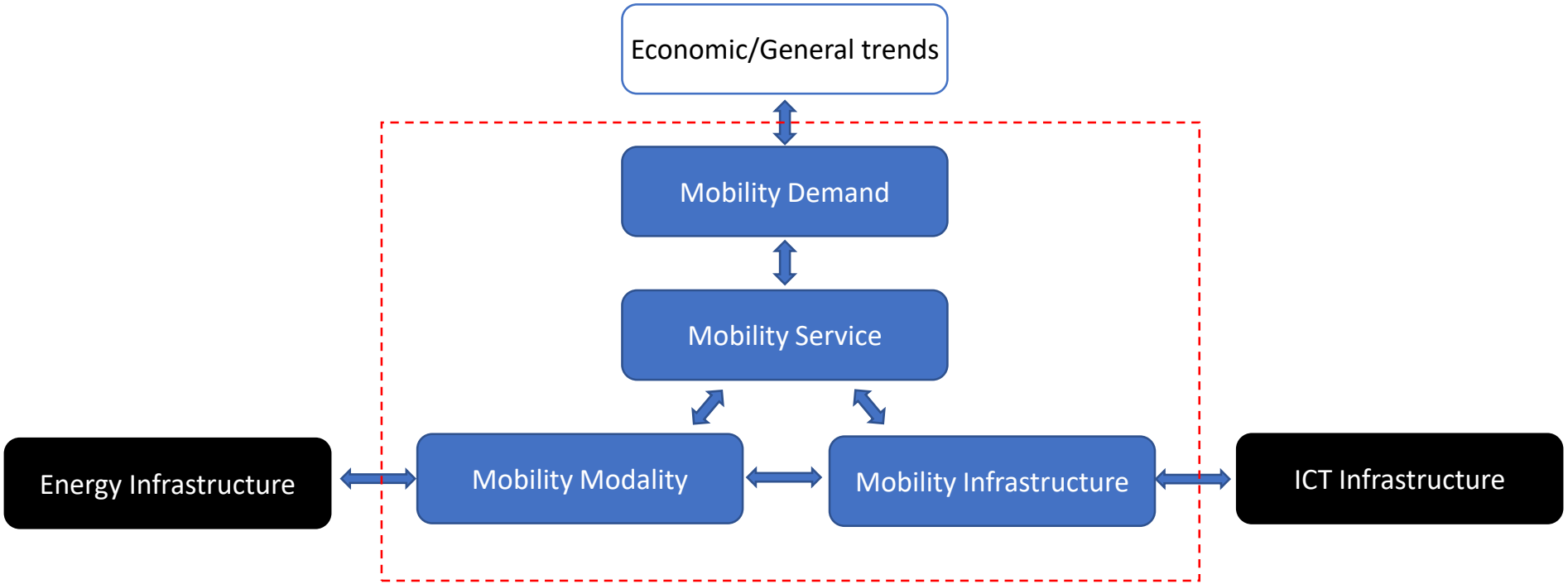
**+ Customized transport services**

**+ Improved Citizens' accessibility to transport service**

# Mobility system



# Smart Mobility system



# Dimensions of Smart Mobility


Source: Faria, R., Brito, L., Baras, K. & Silva, J. (2017). Smart mobility: a survey. In 2017 International Conference on Internet of Things for the Global Community (IoTGC).

# Smart Mobility Stakeholders

# Trends influencing Smart Mobility

## General Trends

- Environmental Conscious Citizens
- Hybrid Working  Style
- Aging Population

## Specific Mobility Trends

- Mobility as a Service
- Shared Mobility
- On-demand Transport
- Green Mobility and Electric Vehicles
- Autonomous Vehicles and Drones

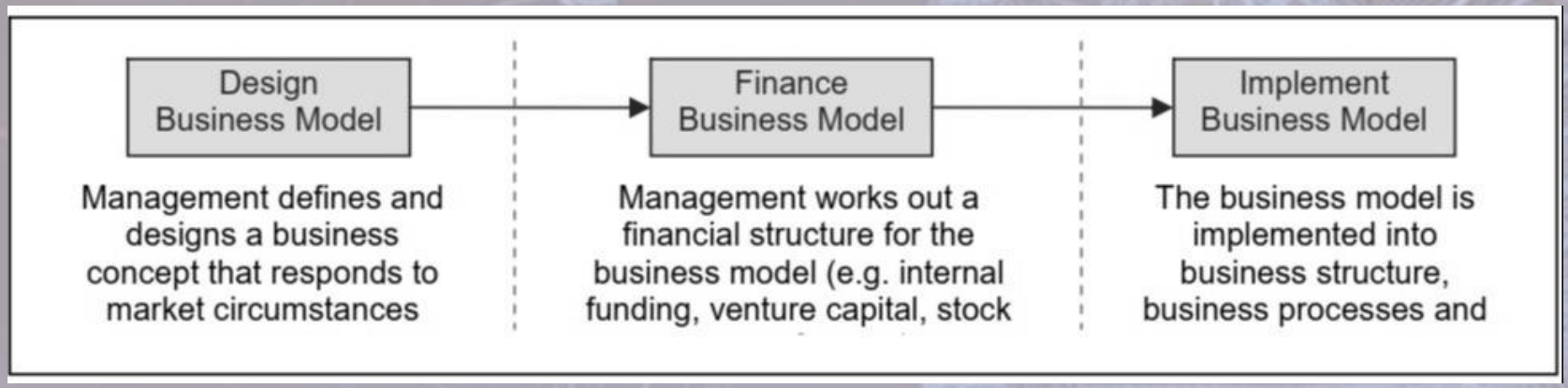
# Part 2:
# Business models for Smart Mobility

# Business model definition

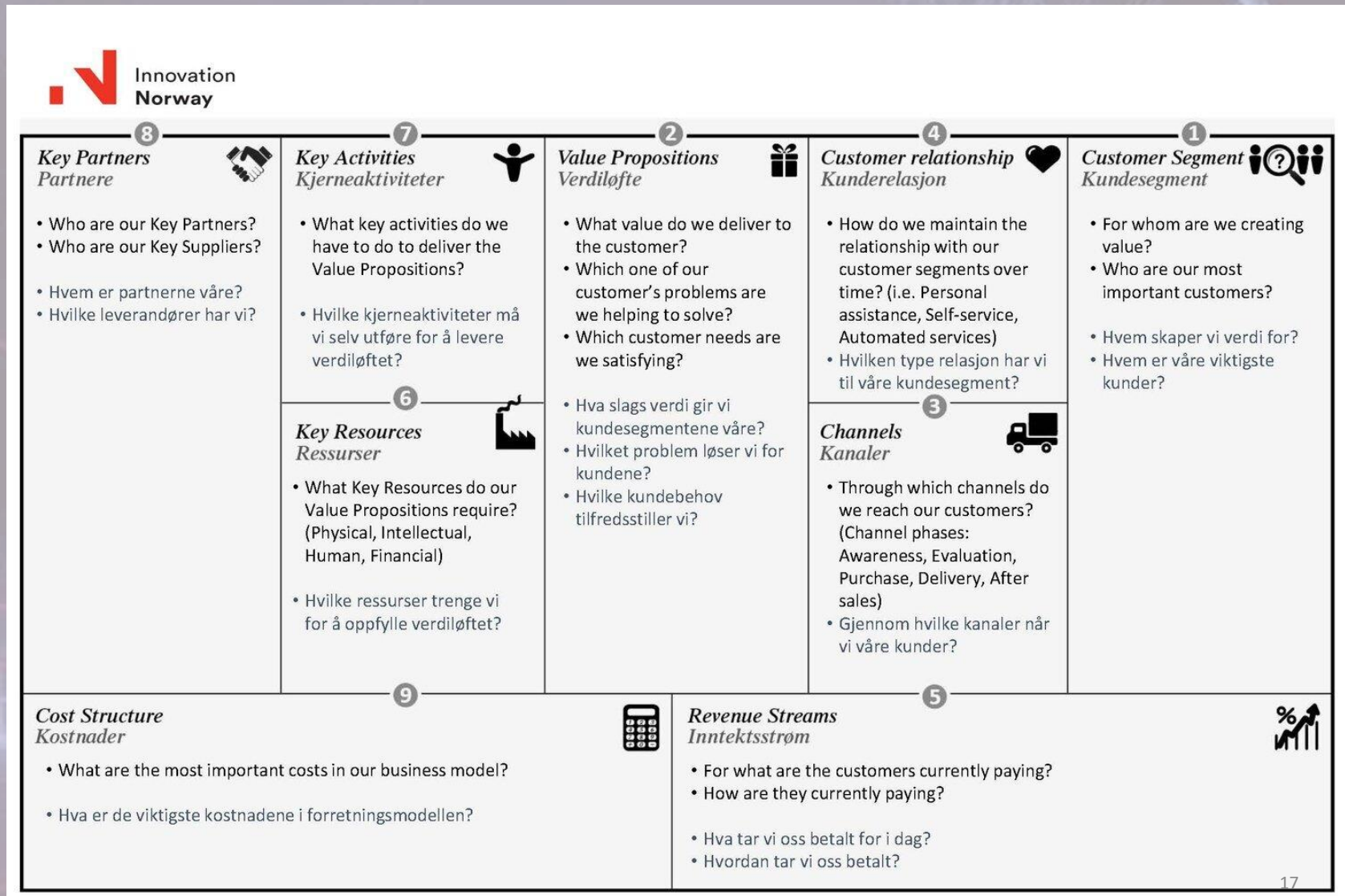
- A business model is a company's core profit-making plan which defines the **products** or **services** it will sell, its **target market**, and any **expected costs/Benefit**.

- A business model is a **conceptual tool** containing a set of objects, concepts, and their relationships with the objective to **express the business logic** of a specific organization (Osterwalder, 2005).

# The role and steps in Business Design



# Business model Canvas



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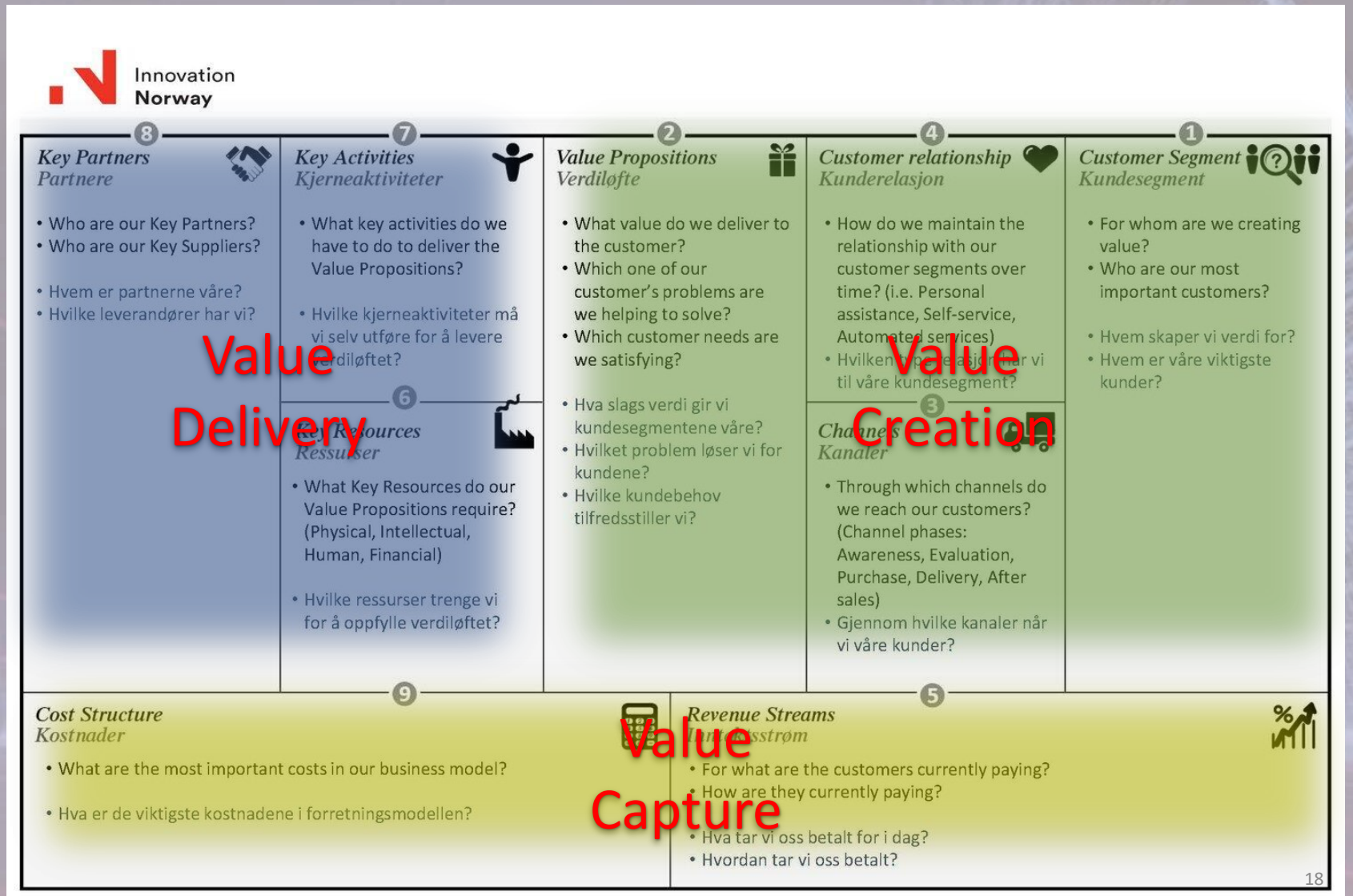
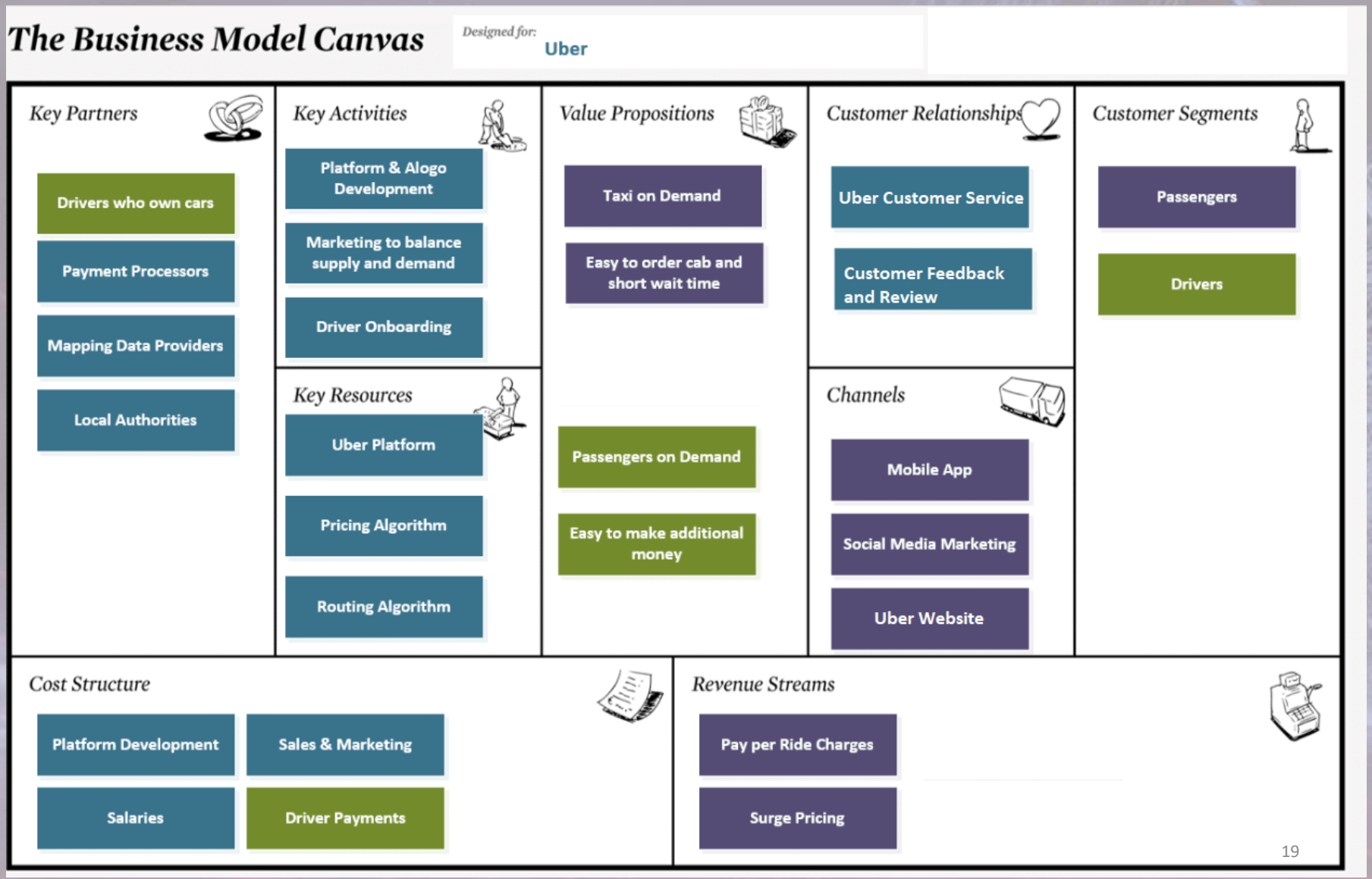


# Business model Canvas: one example



# Sustainable Business Model Canvas

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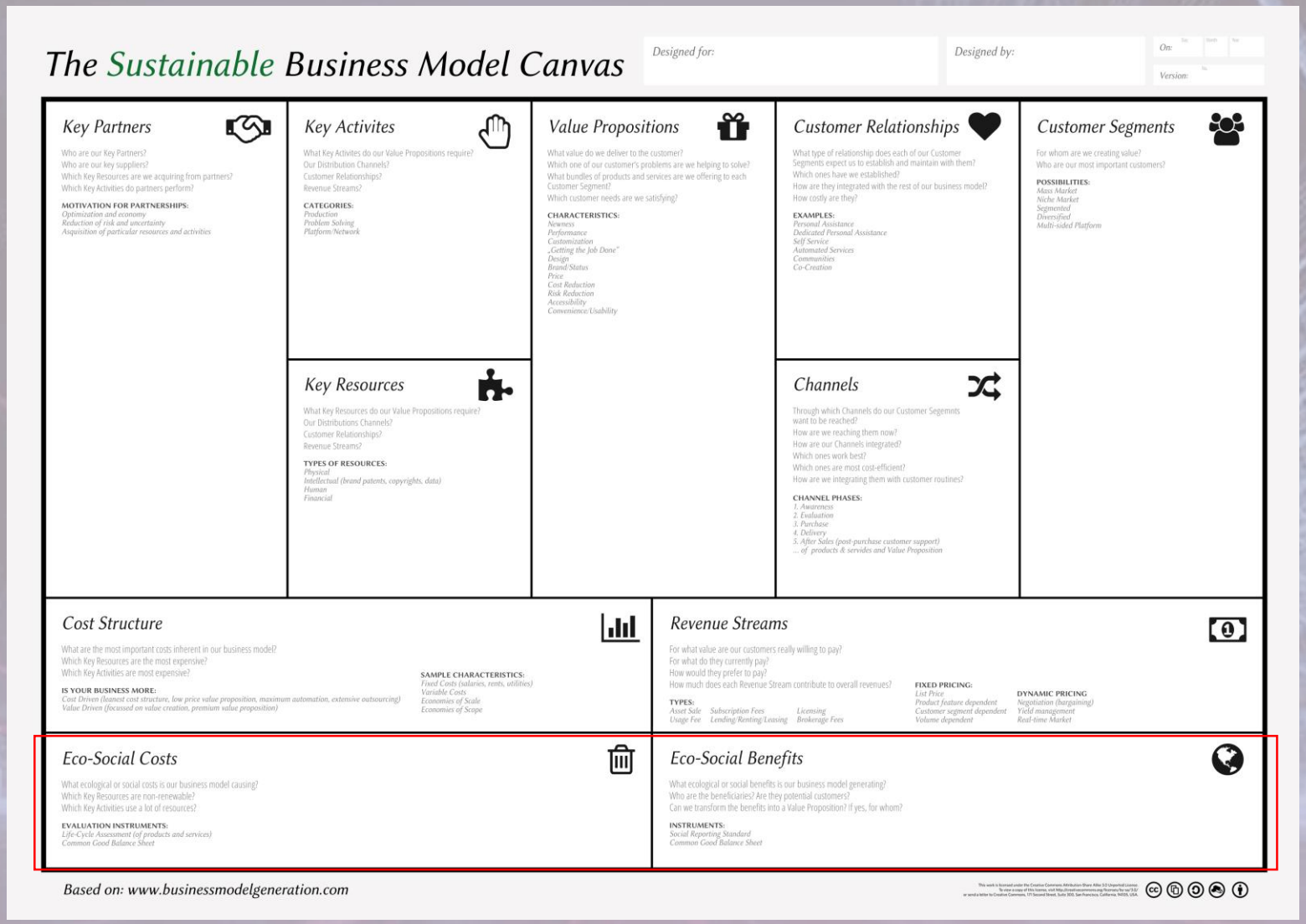
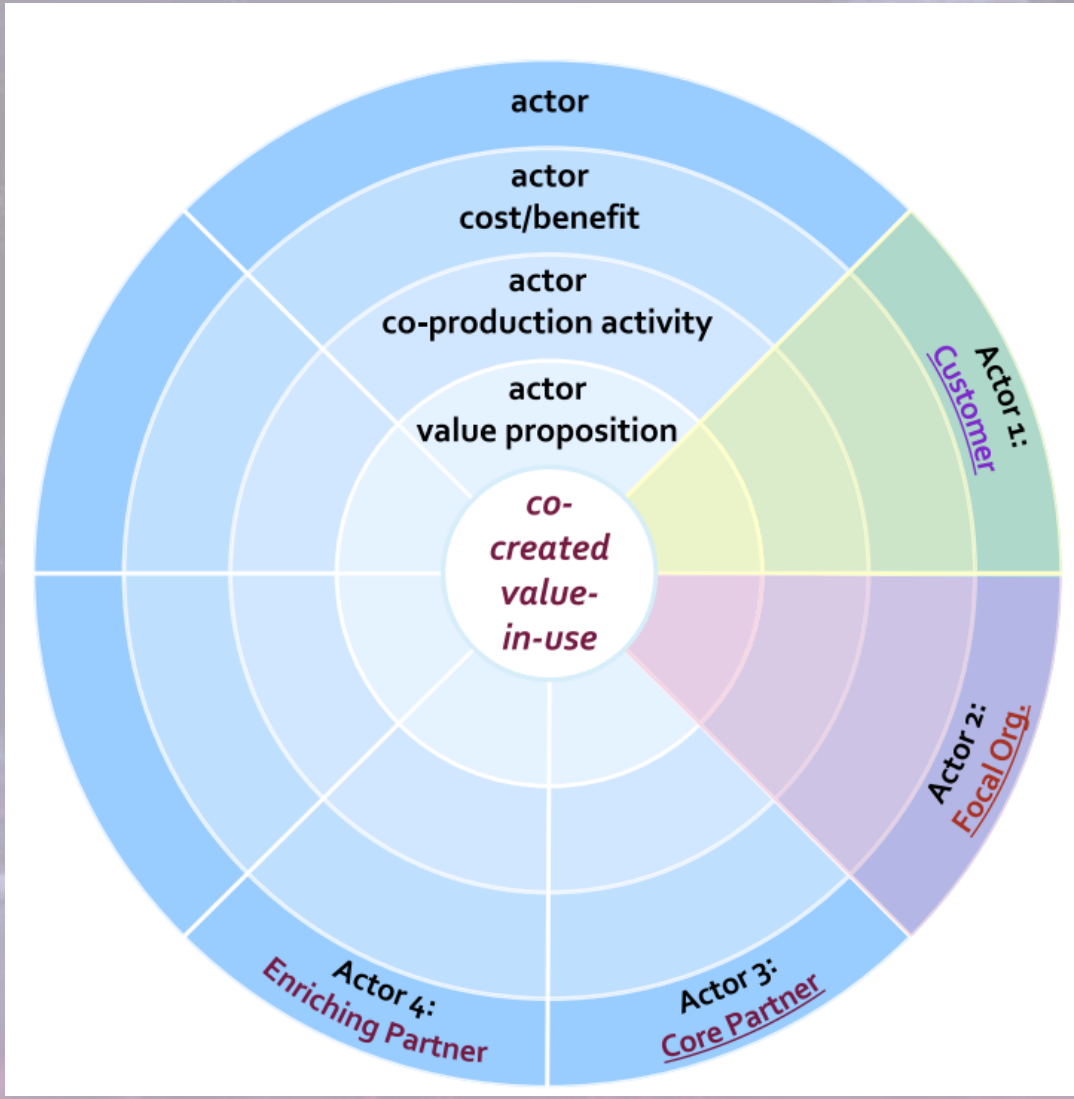



Source: the CASE project (Competencies for a sustainable socio-economic development)

# Service-dominant Business Model



# Smart City Business Model

| Key Actors | Key Activities | Value Proposition | Actor Relationship | Network Beneficiaries |
|---|---|---|---|---|
| Who are the smart city network key actors?<br>(City, end-user, core partner, supporting partner)<br>Who are the key suppliers? | Which key activities are required to realize the value proposition? | What value does each actor deliver?<br>Which of the end users' problems does the smart city solution is going to solve?<br>What are the respective target values-KPIs to be reached? | What type of relationship does each actor expect within the network?<br>Which ones are established?<br>How are they integrated with the rest of our BM? | What target users is the value created for?<br>How the target users benefit from the value created and what are their needs?<br>What specific values each network beneficiaries get? |
| **Key Actors Offering (*)**<br>What offering does each actor deliver?<br>**Key Actors co-creation operation (*)**<br>Which key operations do the key actors perform? | **Key Resources and Infrastructure**<br>What key resources are required for to realize the value proposition? | **Data (*)**<br>What data will be made available from the service designed?<br>To whom and under what conditions?<br>Availability and types of Open Data | **Deployment and Channels**<br>Through which channels do our customers want to be reached?<br>How are we reaching them now?<br>How are our channels integrated?<br>Which ones work best?<br>Which ones are most cost efficient?<br>How are they integrating with the customer routines? | |
| **Budget Cost**<br>What are the most important costs inherent for each actor deploying a smart city solution?<br>Which key resources and key activities are the most expensive?<br>What cost can be covered by each actor?<br>Is there opportunity for blending public funding with private financing? | | | **Revenue Stream**<br>For what value are the network beneficiaries being willing to pay?<br>For what do they currently pay?<br>How are they currently paying?<br>How much would they prefer to pay?<br>How much does each revenue stream contributing to overall revenues?<br>Which actors have revenues?<br>What are the non-monetary revenues? | |
| **Environmental Impacts: Costs and Benefits**<br>What is the ecological cost of the smart city solution?<br>What is the ecological benefit of the smart city solution?<br>The percentage of reducing energy consumption<br>The percentage of reducing the environmental footprint | | | **Social Impacts: Value and costs**<br>What is the negative social value created by the smart city solution?<br>What is the positive social value generated by the smart city solution? | |

# Smart Mobility Business Model Framework

<table>
<tr>
<td>Network Partners<br><br>-Who are the smart city network partners?<br>(city, end-user, core partner, supporting partner)<br>-who are the key suppliers?</td>
<td>Key Activities<br><br>-Which key activities are required to realize the value proposition?<br>-What are the side effects of these activities on the environment and society?</td>
<td rowspan="3">Value proposition<br><br>-What value does each partner deliver considering the social and environmental aspects?<br>-Which of the end-users problem does the smart mobility solution going to solve?<br>-What are the key respective target values-KPIs to be reached?</td>
<td>Network relationship<br><br>-What type of relationship does each partner expect within the network?<br>-Which ones are established?<br>-How are they integrated with the rest of our BM?</td>
<td>Network Beneficiaries<br><br>-What target users are the value created for?<br>-How do the target users benefit from the value created and what are their needs?<br>-What specific values does each network beneficiary get?</td>
</tr>
<tr>
<td>Network Partners offering<br>-What offer does each actor deliver?(Technology, R&D, IP rights)</td>
<td>Key resources<br><br>-What key resources are required to realize the value proposition?<br>(Physical resources, Human resources, Data)</td>
<td colspan="2" rowspan="2">Deployment and channels<br><br>-Through which channels do our users want to be reached?<br>-How are we reaching them now?<br>-How are our channels integrated?<br>-Which ones work best?<br>-Which ones are most cost-efficient?<br>-How are they integrating with the user's routines?</td>
</tr>
<tr>
<td>Network partners co-creation operation<br><br>-Which key operation does each partner perform? (Regulating, offering subsidies, partly funding)</td>
<td>ICT and infrustructure<br>-What type of ICT and Infrastructure is needed?<br>-Is it available now or not?<br>-How it should be provided?</td>
</tr>
<tr>
<td colspan="3">Budget cost<br><br>-What are the most important costs inherent for each partner deploying a smart mobility solution?<br>-Which key resources and key activities are the most expensive?<br>-What cost can be covered by each partner?<br>-Is there an opportunity for blending public funding with private financing?</td>
<td colspan="2">Revenue stream<br>-For what value are the network beneficiaries willing to pay?<br>-For what do they currently pay?<br>-How are they currently paying?<br>-How much would they prefer to pay?<br>-How much does each revenue stream contribute to overall revenue?<br>-Which partner has revenues?</td>
</tr>
<tr>
<td colspan="3">Environmental and social risks<br><br>-What is the ecological cost of the smart mobility solution?<br>-What is the ecological benefit of the smart city solution?<br>-The percentage of reducing energy consumption, traffic congestion, noise, and air pollution<br>-The percentage of reducing the environmental footprint</td>
<td colspan="2">Environmental and social benefits<br><br>-What is the positive social value generated by the smart mobility solution?<br>-What is the negative social value created by the smart city solution?</td>
</tr>
</table>

# Part 3:
# Evaluating business models for Smart Mobility

# The Logic for Evaluating Smart Mobility Business Models

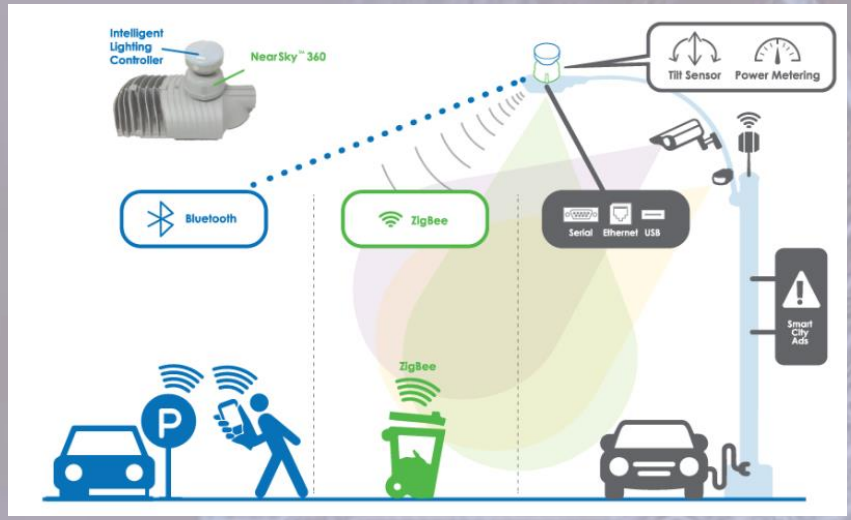
- Smart mobility is **not** smart only because of its **technical** innovation
- The organization should understand if the business model for the mobility solution is meant to be smart in the **city ecosystem** context
- Therefore, the **consistency** of the BM building blocks should be analyzed into the city ecosystem perspective
- A city ecosystem has enablers that affect timespan in which the Business model operates
- A BM for smart mobility rely on a supportive city ecosystem to deliver its maximum value
- A BM should objectively add value for the whole ecosystem

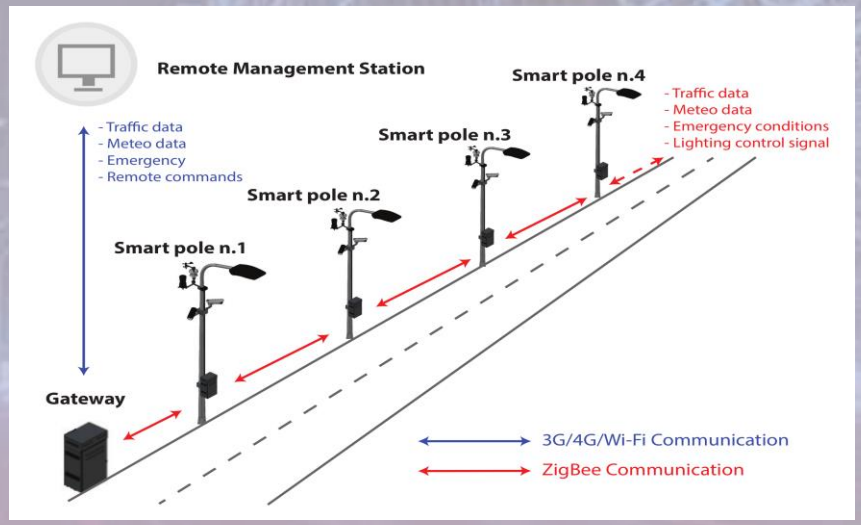
# Smart City Ecosystems

- Business ecosystems consist in multiple industries and the **interactions** occur among suppliers, customers, competitors, stakeholders and the like - named participants, whose capabilities influence one and all in the way they **collaborate**.
- "In a business ecosystem, companies coevolve capabilities around a new innovation: they work **cooperatively** and competitively to support new products, satisfy customer needs, and eventually incorporate the next round of innovations" (Moore, 1993)
- Cities are ecosystems where sustainability is maintained through the **interactions** of urban components. The different stakeholders perform a more active role: private sector participation is key in projects; citizens can interact directly to city officials and generate useful data coming from digital footprints, social media and crowd sourcing; Governments foster the **collaboration** of different actors (Díaz-Díaz, 2017)

# Smart City Ecosystems

- **Trend**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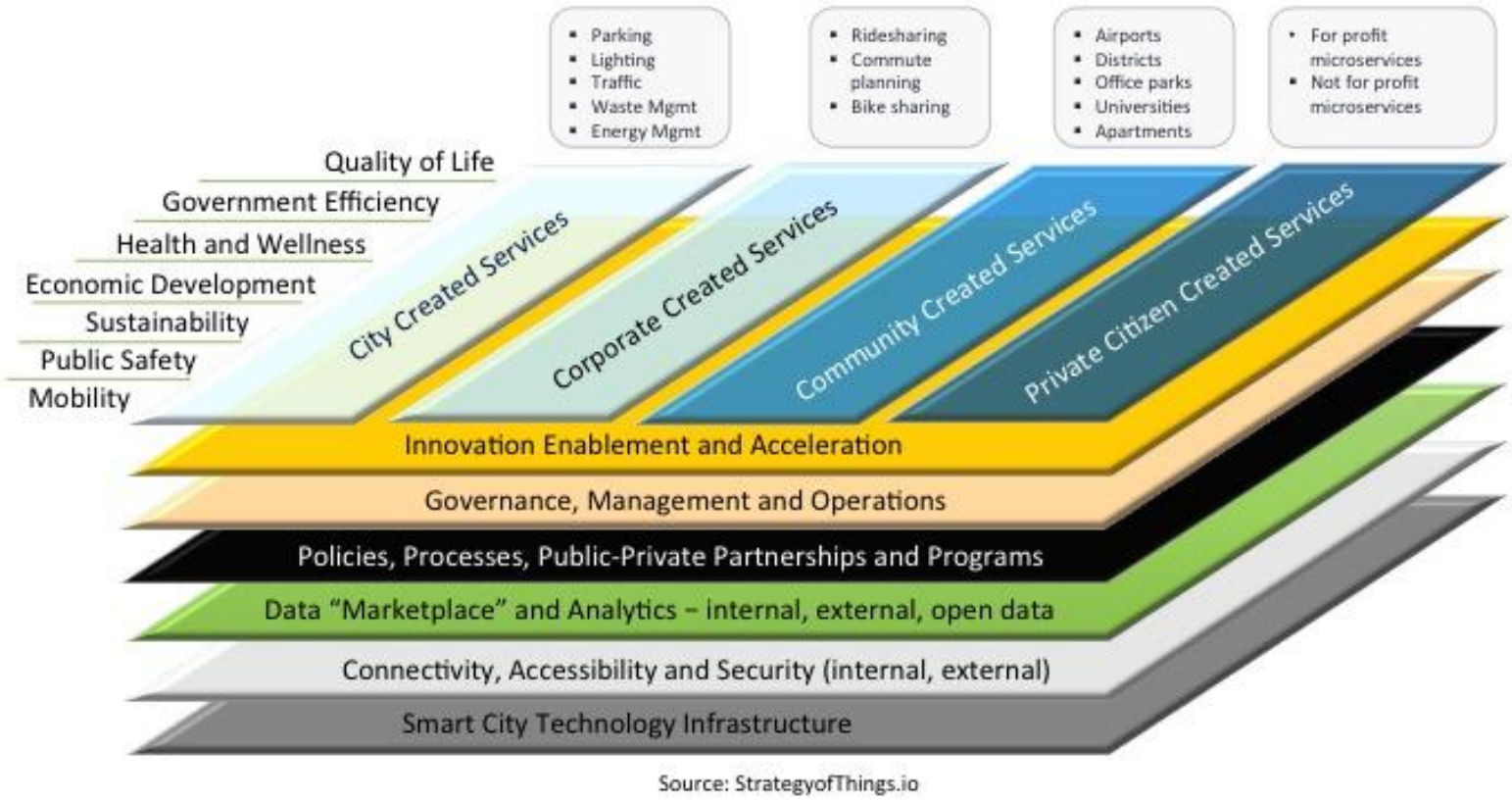
http://www.smartercity.tech/smart-pole-node/
https://www.mdpi.com/2624-6511/3/4/71/htm

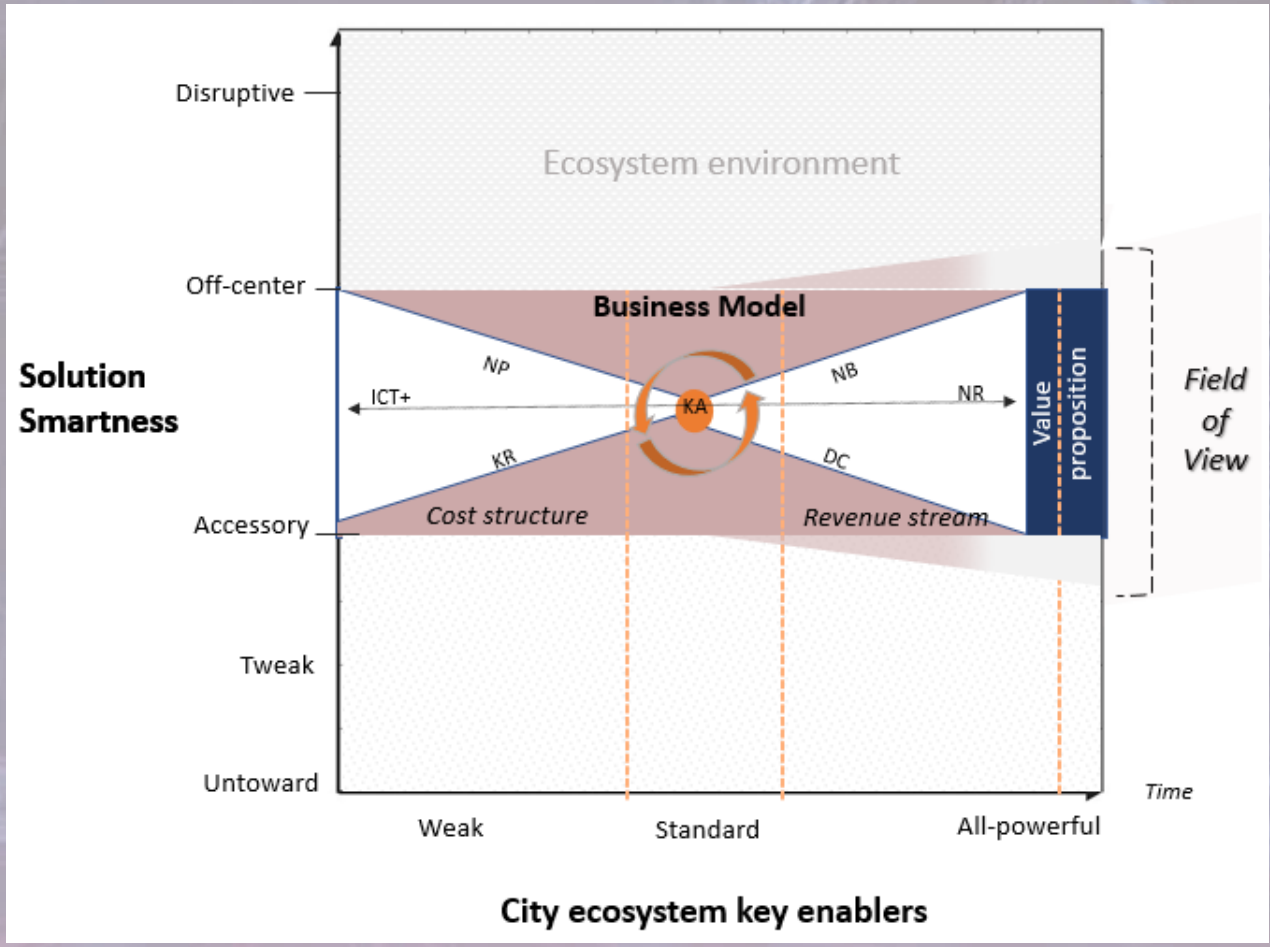
# Smart City Ecosystems



# Evaluation framework for Smart Mobility Business Models

•The FM extends the traditional perspective of business models of delivering value for customer targets to delivering it to **multiple-actors** and natural environment of the **city ecosystem**.

• It aims to evidence where the business model stands in the city ecosystem in a current and future state.



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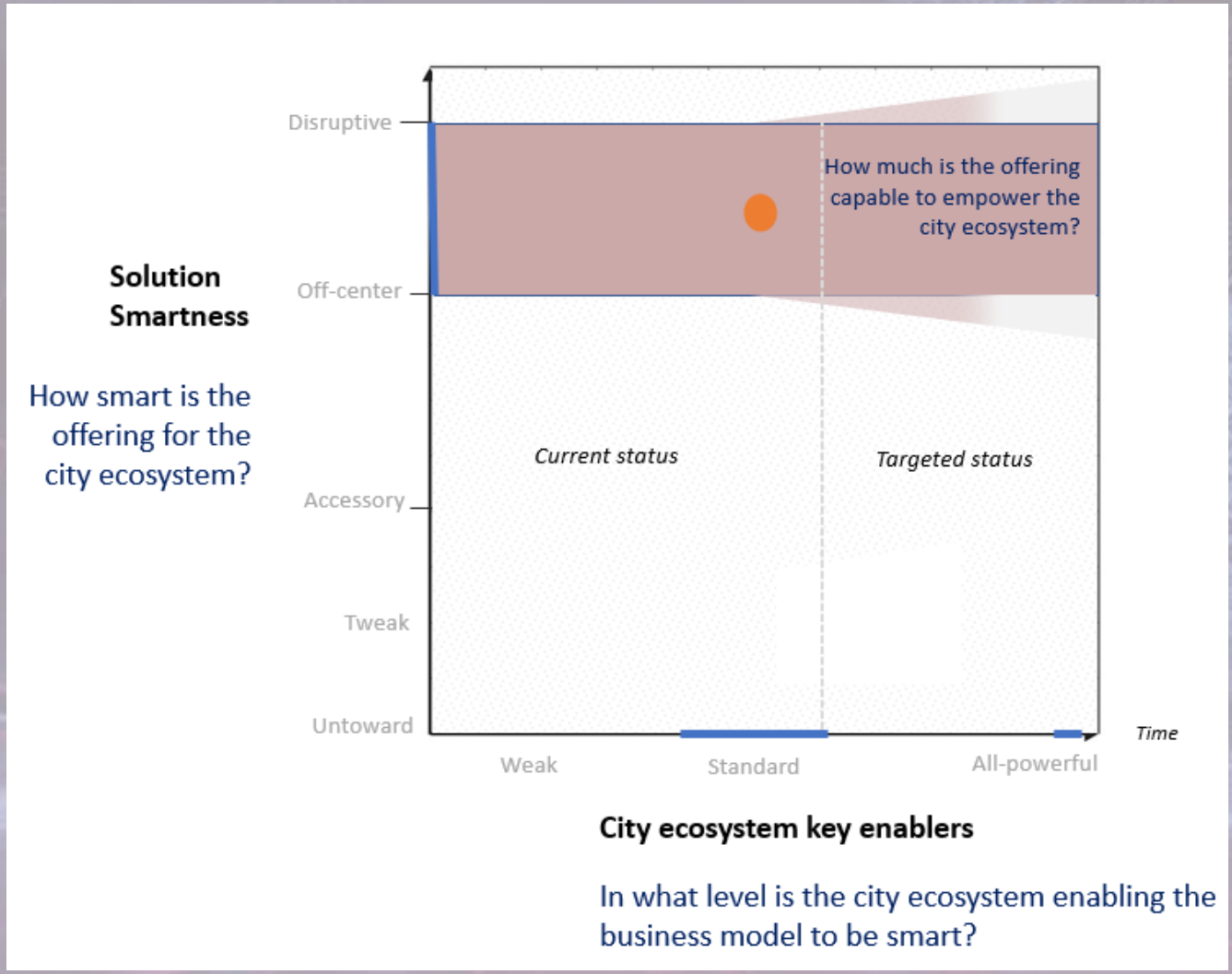


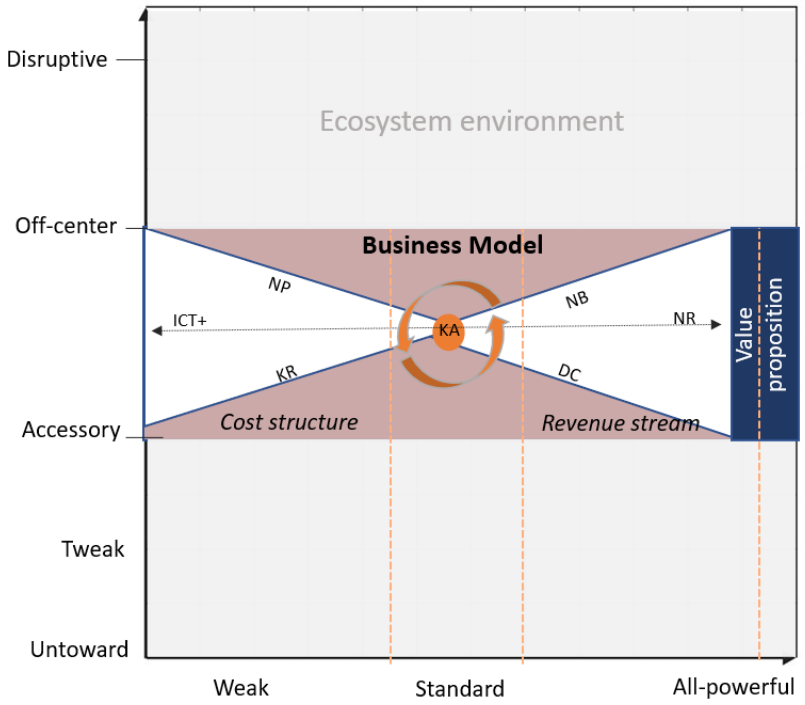
# Evaluation framework for Smart Mobility Business Models

**Solution Smartness**

**Sense of purpose:**
Market needs
Trends
Problem to solve
Existing modes of transportation
3 Building blocks

**Organization:**
Knowledge
Culture
Strategy: open innovation
Cross-departmental communication
Leadership

**Mobility solution:**
Technical innovation
Efficiency
Accessibility
Friendliness
Testing capabilities
Connection
Integration




**City ecosystem key enablers**

City Governance | ICT

**Evaluate:** Public interests, policymaking, regulations, urban planning, transparency, open collaboration strategies, e-government, participatory. Connectivity, Smart pole network, security, overall ICT performance and accessibility
**Activities behind:** Coordination, Alignment, Integration, Private-public partnership

Threats:
Big data/security
Economic instability
Political decision-making
Shortcomings in other smart dimensions
Social behavior
Competitors

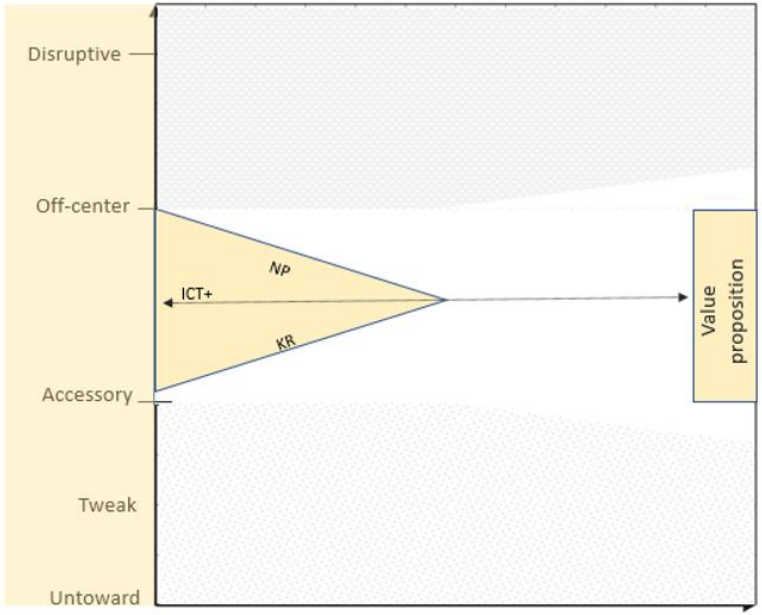
OUTCOMES
Efficiency
Quality of life
Wellbeing
Equity
Accessibility
Sustainable value

OUTCOMES
Integration
ICT empowerment
Innovation
Cross-sectoral engagement
Growth
Longevity

# Evaluation framework for Smart Mobility Business Models

3 perspectives to look at:

- **The smartness of the offering (Y)**
- The city ecosystem key enablers (X)
- The feedback loop zone (F)




**BUSINESS MODEL FRAMEWORK**

| | | | | |
|---|---|---|---|---|
| **Network Partners** | Key Activities | **Value proposition** | Network relationship | Network Beneficiaries |
| **Network Partners offering** | **Key resources** | | Deployment and channels | |
| **Network partners co-creation operation** | **ICT and infrustructure** | | | |
| Budget cost | | | Revenue stream | |
| Environmental and social risks | | | Environmental and social benefits | |

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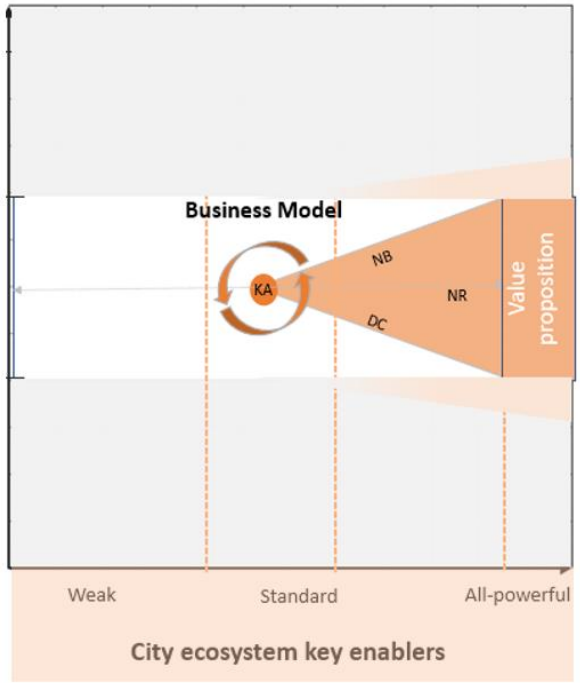


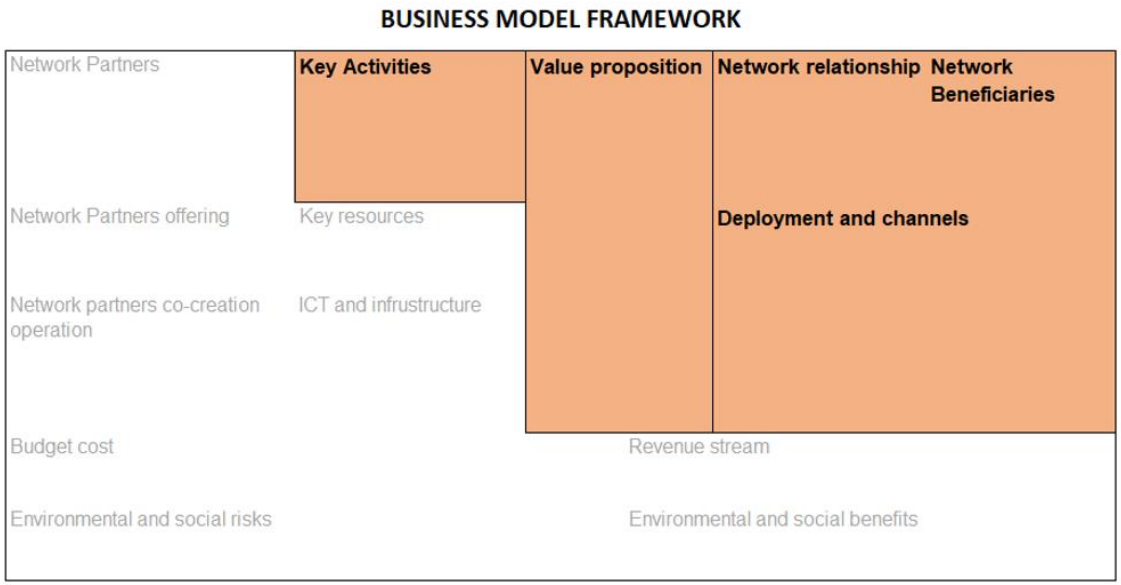

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The smartness of the offering (Y)
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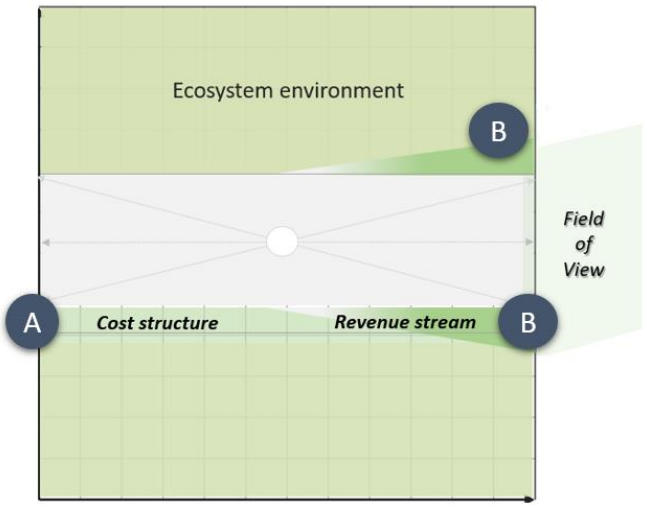
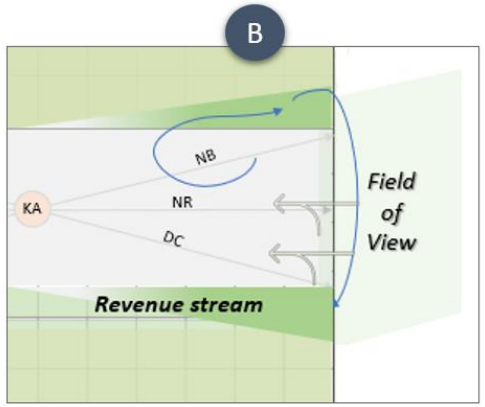


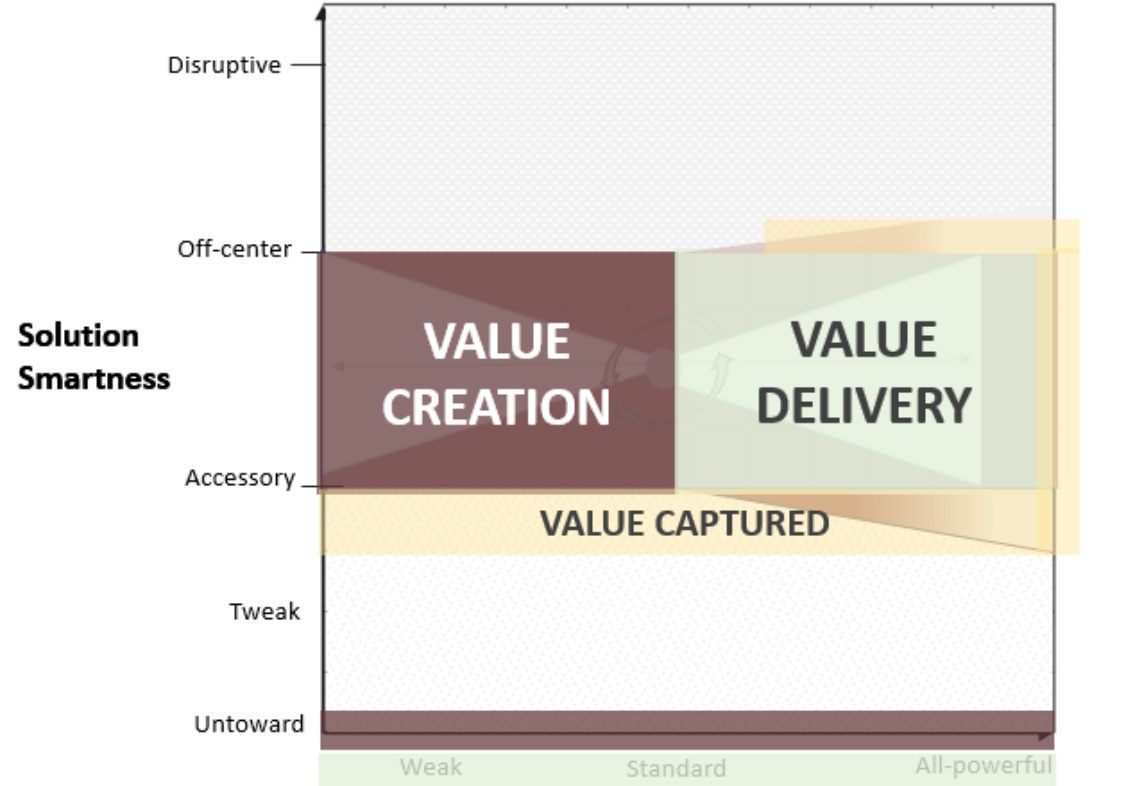




**BUSINESS MODEL FRAMEWORK**

| | | | | |
|---|---|---|---|---|
| Network Partners | Key Activities | Value proposition | Network relationship | Network Beneficiaries |
| Network Partners offering<br>Network partners co-creation operation | Key resources | ICT and Infrustructure | Deployment and channels | |

| | | | |
|---|---|---|---|
| Budget cost | A | Revenue stream |
| Environmental impact: cost and benefit | B | Social impact: value and cost |

# The value dynamics and risks in the Evaluation framework



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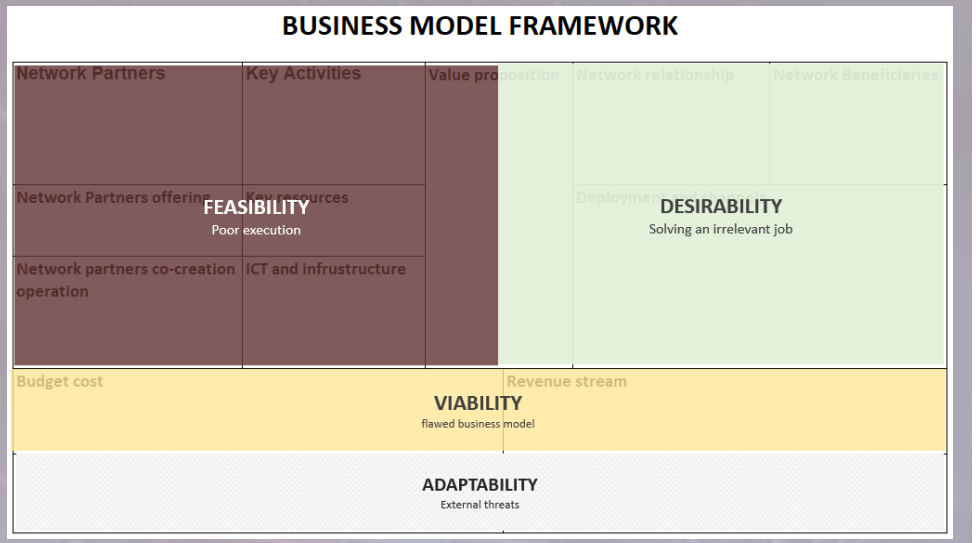


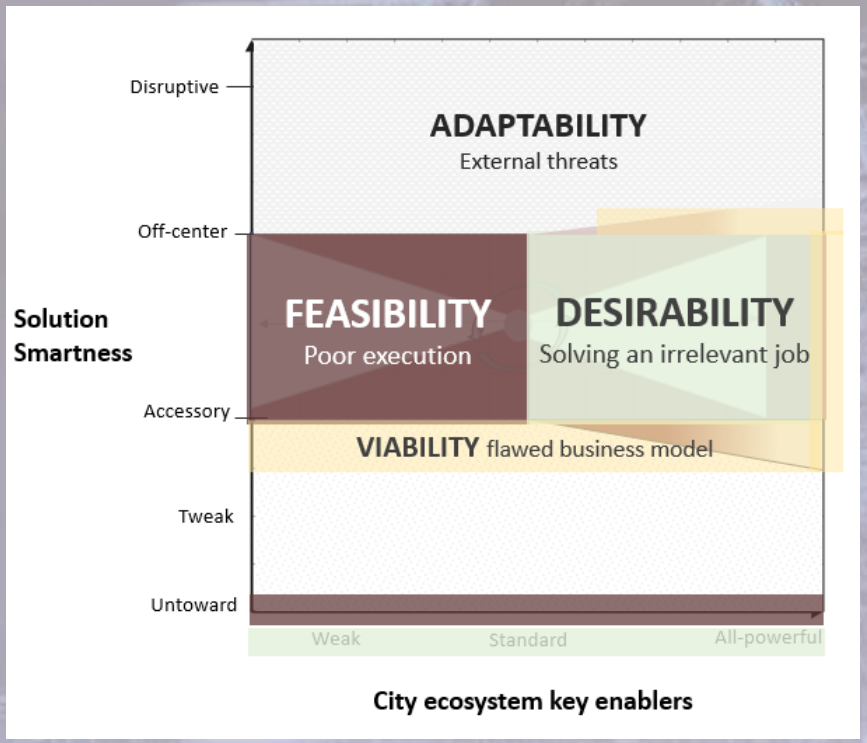

# Part 4:
# Next steps

# Some possible next steps

- Implementing the Business model blueprint for some on-going smart mobility projects in Norefjell
- Analysing the city eco-system, identifying current capabilities and gaps, and providing suggestions for improvement
- Evaluate existing and new smart city projects and initiatives against the ecosystem framework (to identify what is missing from the project plans and what is needed to make the projects fully successful).
- Ensuring Engagement of Stakeholders in Smart City Projects (Stake-holder analysis) and developing a stakeholder engagement plan

# Thanks for your attention!

Behzad.Behdani@usn.no