



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

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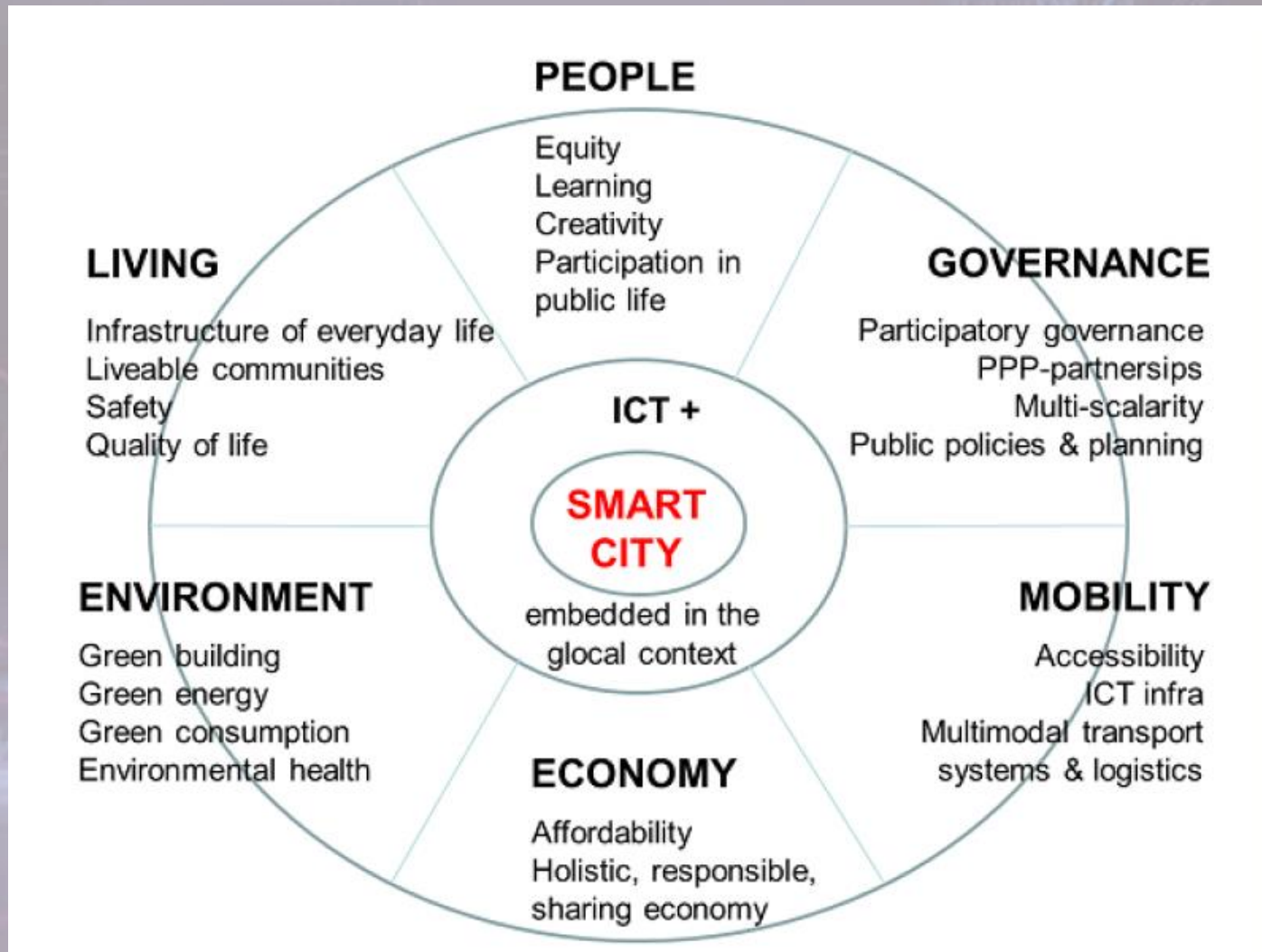


Part 1: Overview of basic concepts

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)

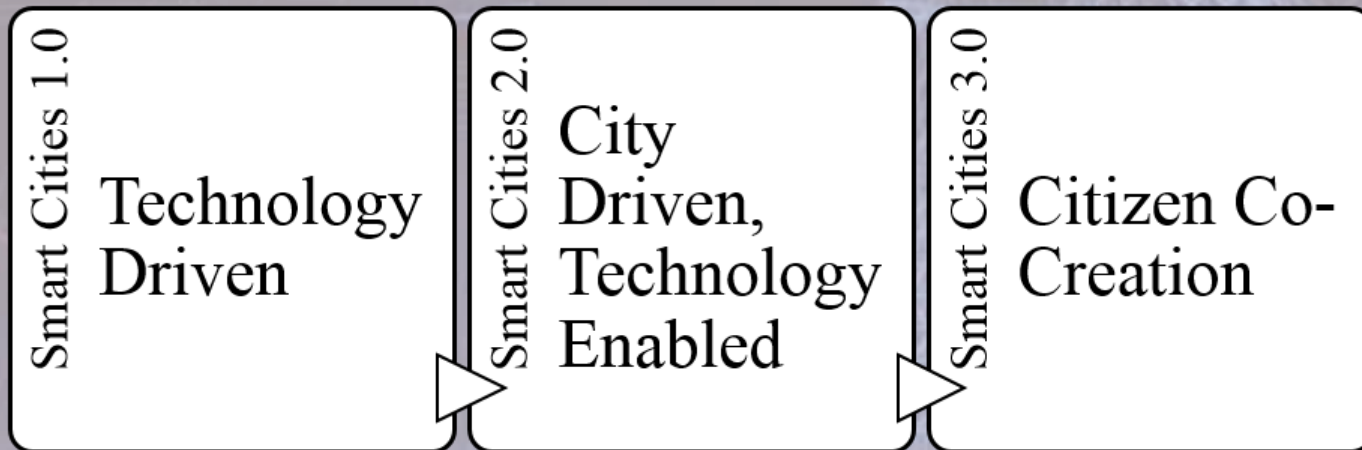
Smart Cities Wheel Model



Overview of the goals of a Smart City

Economical	Environmental	Social
<p>To Cultivate Innovation and Start up Culture (Gopinath et al., 2008)</p> <p>Sustainable Commercial Development (City Branding)</p> <p>Encouraging sharing of existing resources and optimise city functions and promote economic growth while also improving the quality of life for citizens using smart technologies and data analysis</p>	<p>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)</p> <p>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)</p>	<p>Improve quality of daily life for their citizens (R. P. Dameri, 2017)</p> <p>Community building and citizen engagement</p> <p>Providing customized services for inhabitants (or visitors)</p>

Different phases and evolution of Smart Cities



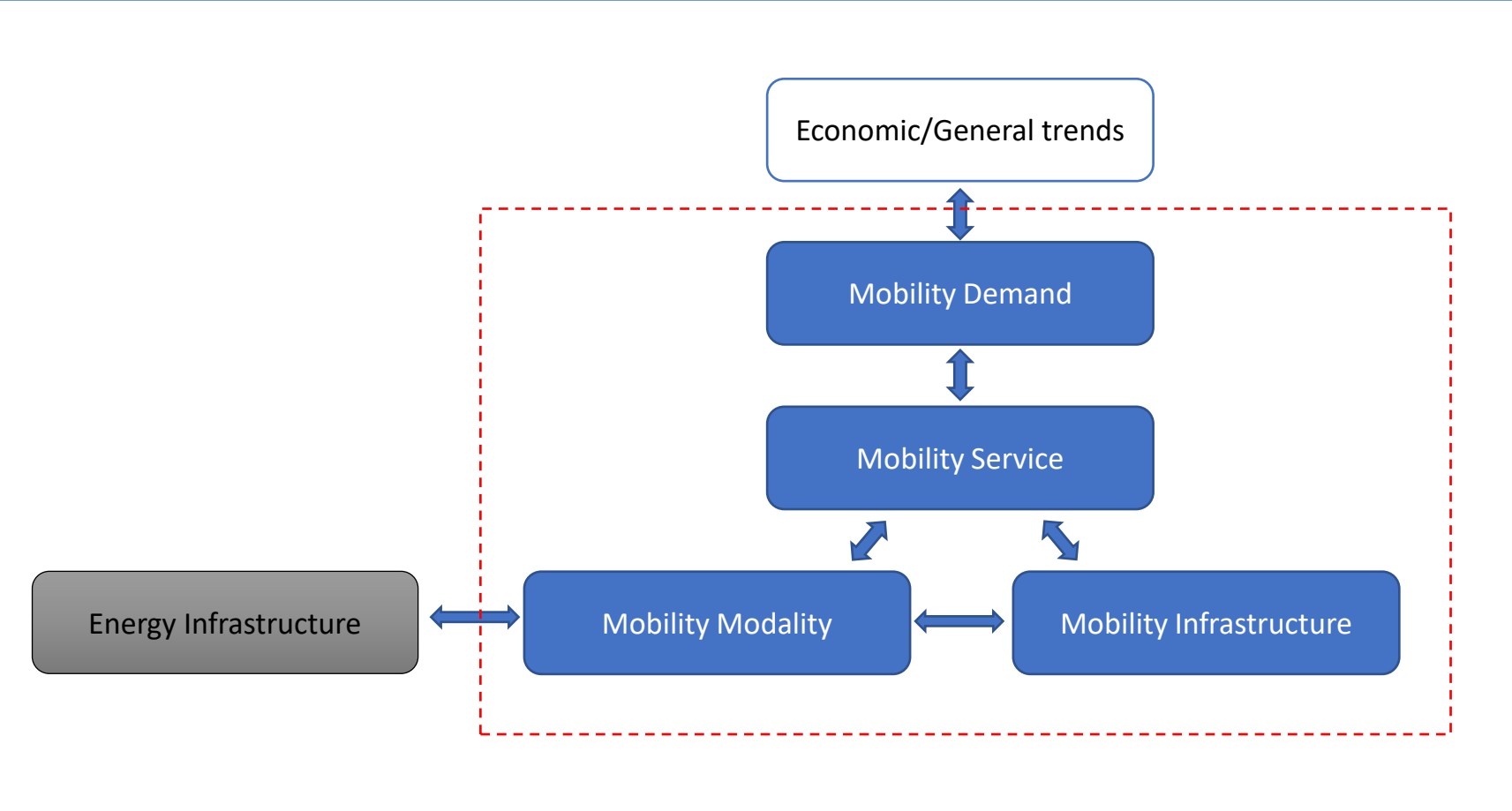
What is Smart Mobility

- “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).

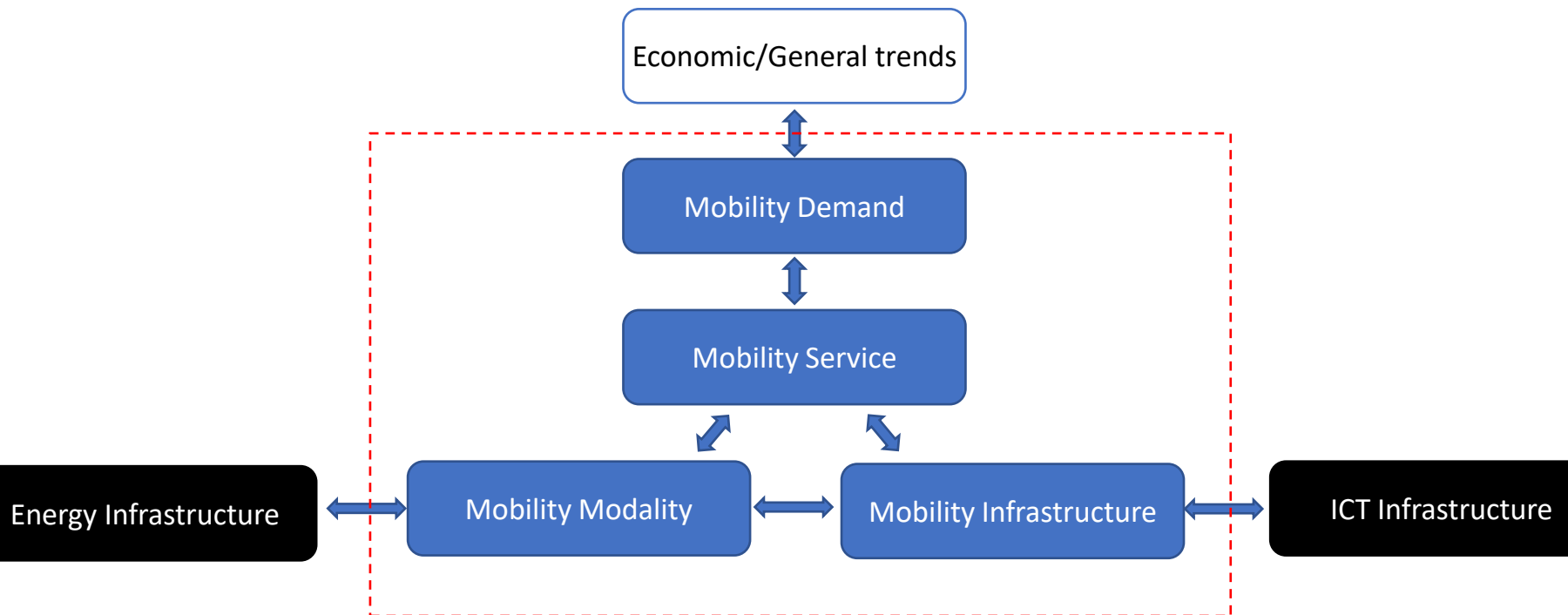
+ Customized transport services

+ Improved Citizens' accessibility to transport service

Mobility system



Smart Mobility system

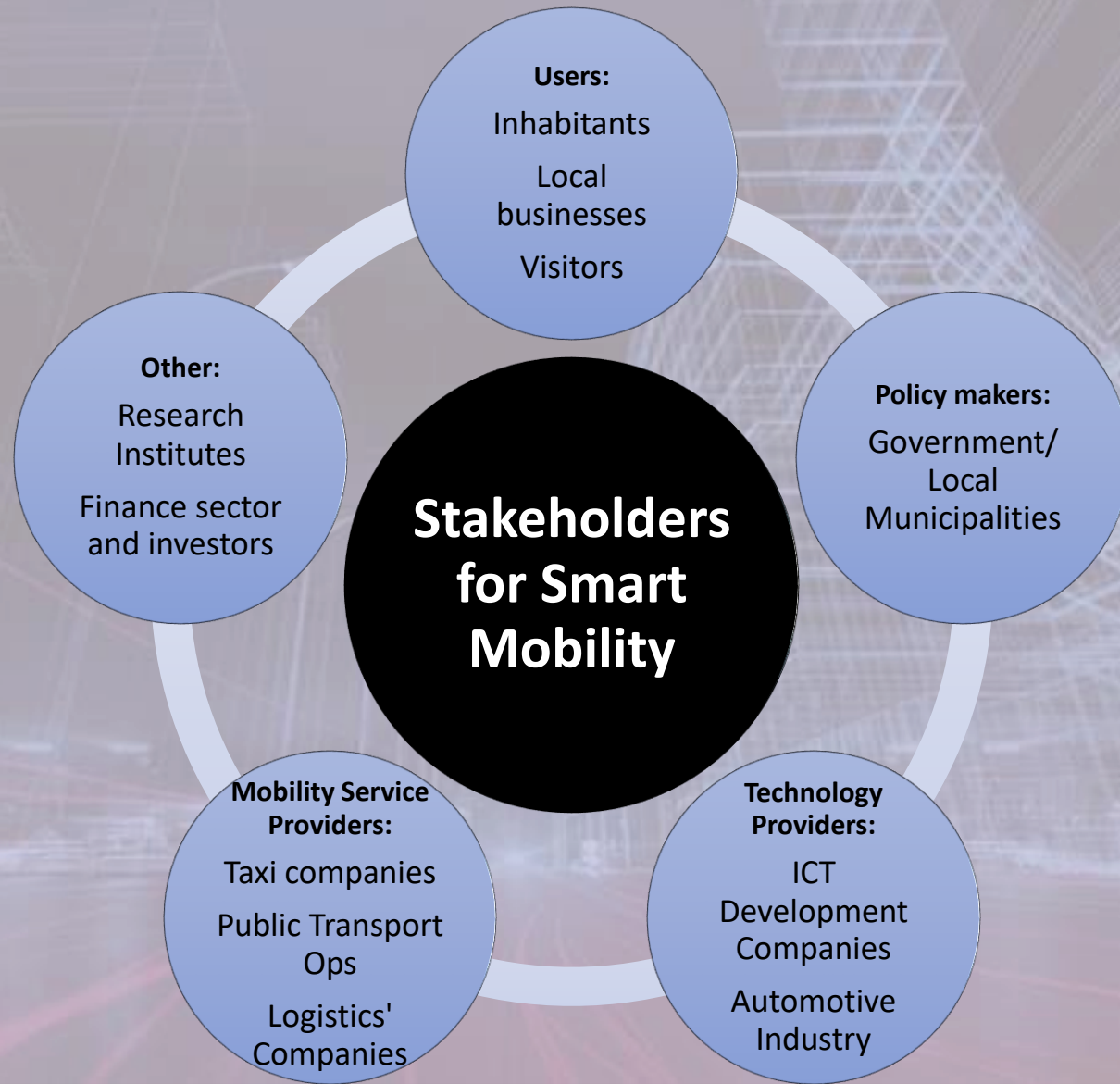


Dimensions of Smart Mobility



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

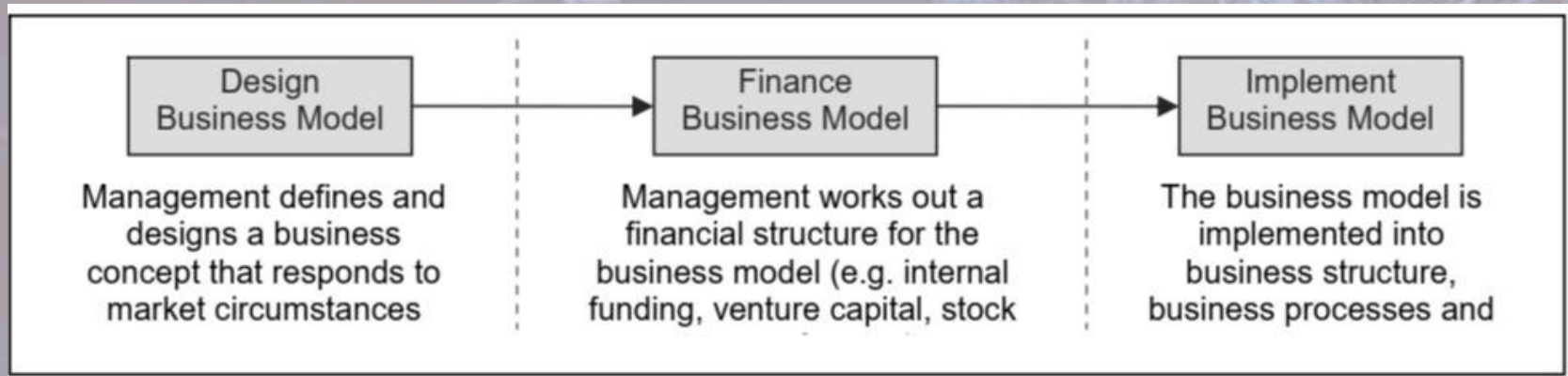


Part 2: Business models for Smart Mobility

Business model definition

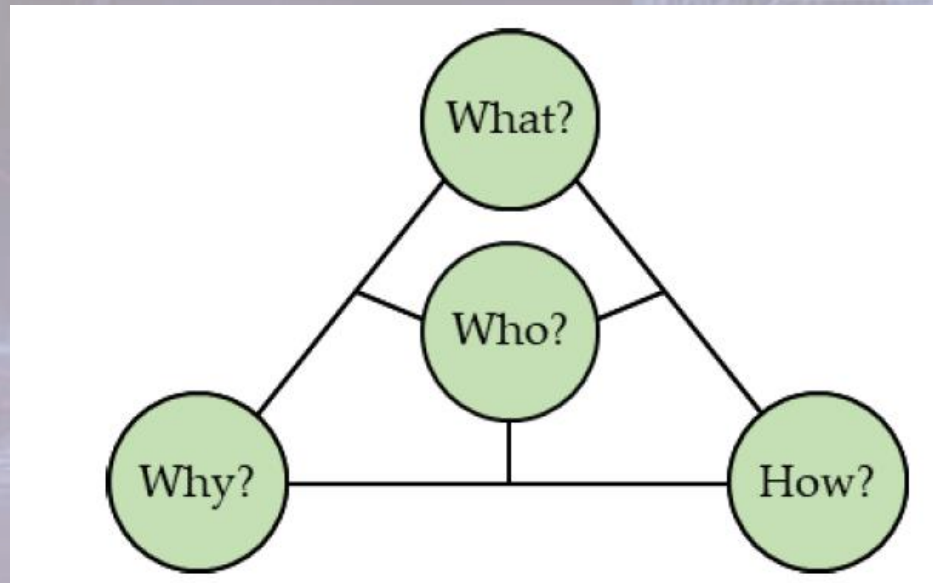
- A business model is a company's core profit-making plan which defines the **products** or **services** it will sell, its **target market**, and any **expected costs/Benefit**.
- A business model is a **conceptual tool** containing a set of objects, concepts, and their relationships with the objective to **express the business logic** of a specific organization (Osterwalder, 2005).

The role and steps in Business Design



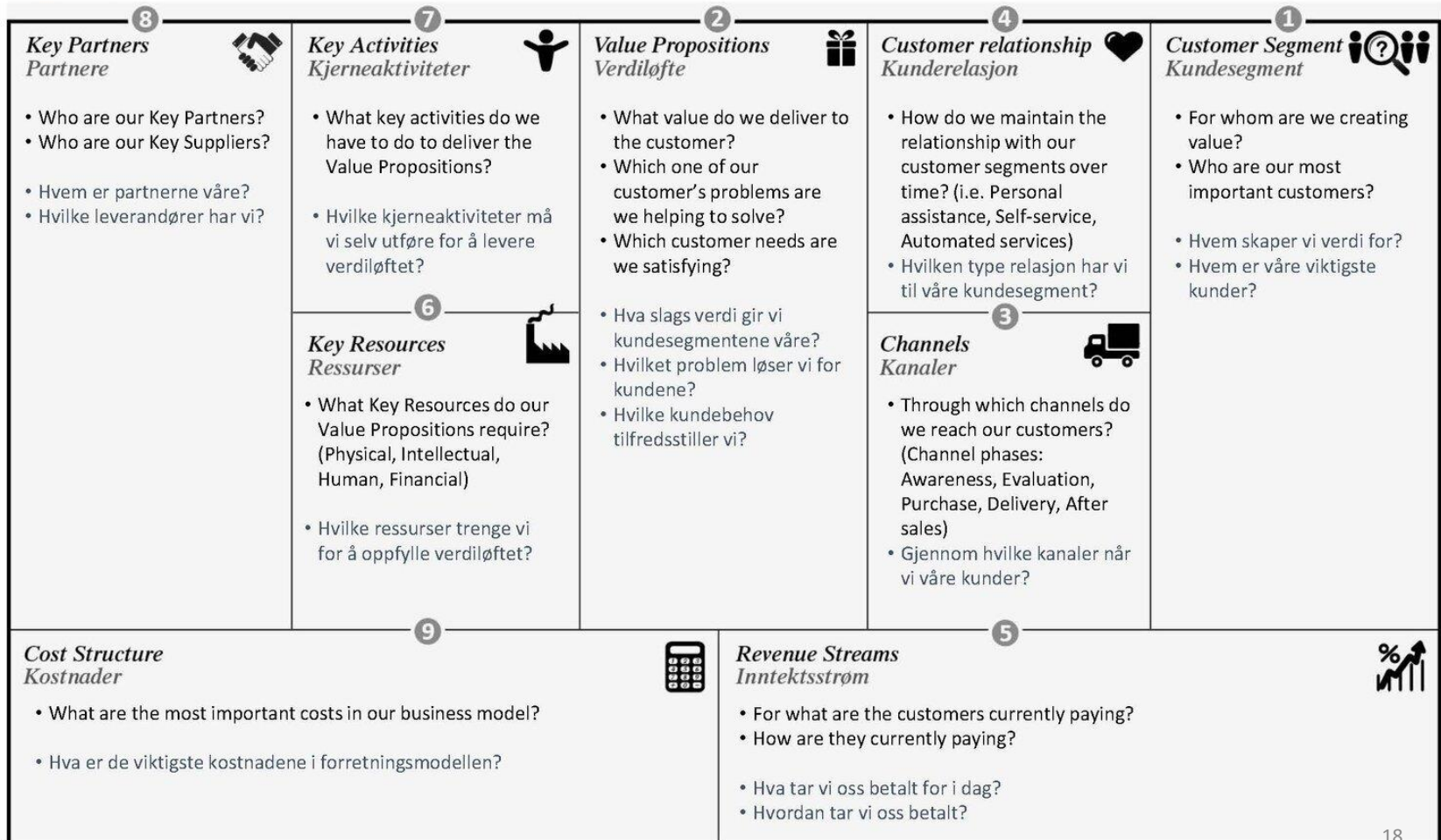
What business model does?

- Business model is the “unit of analysis” of innovations
- Business models underline a systemic, holistic approach to understand how firms “do business” or how an idea can turn into a business
- Business models seek to explain how value is created and how it is captured.

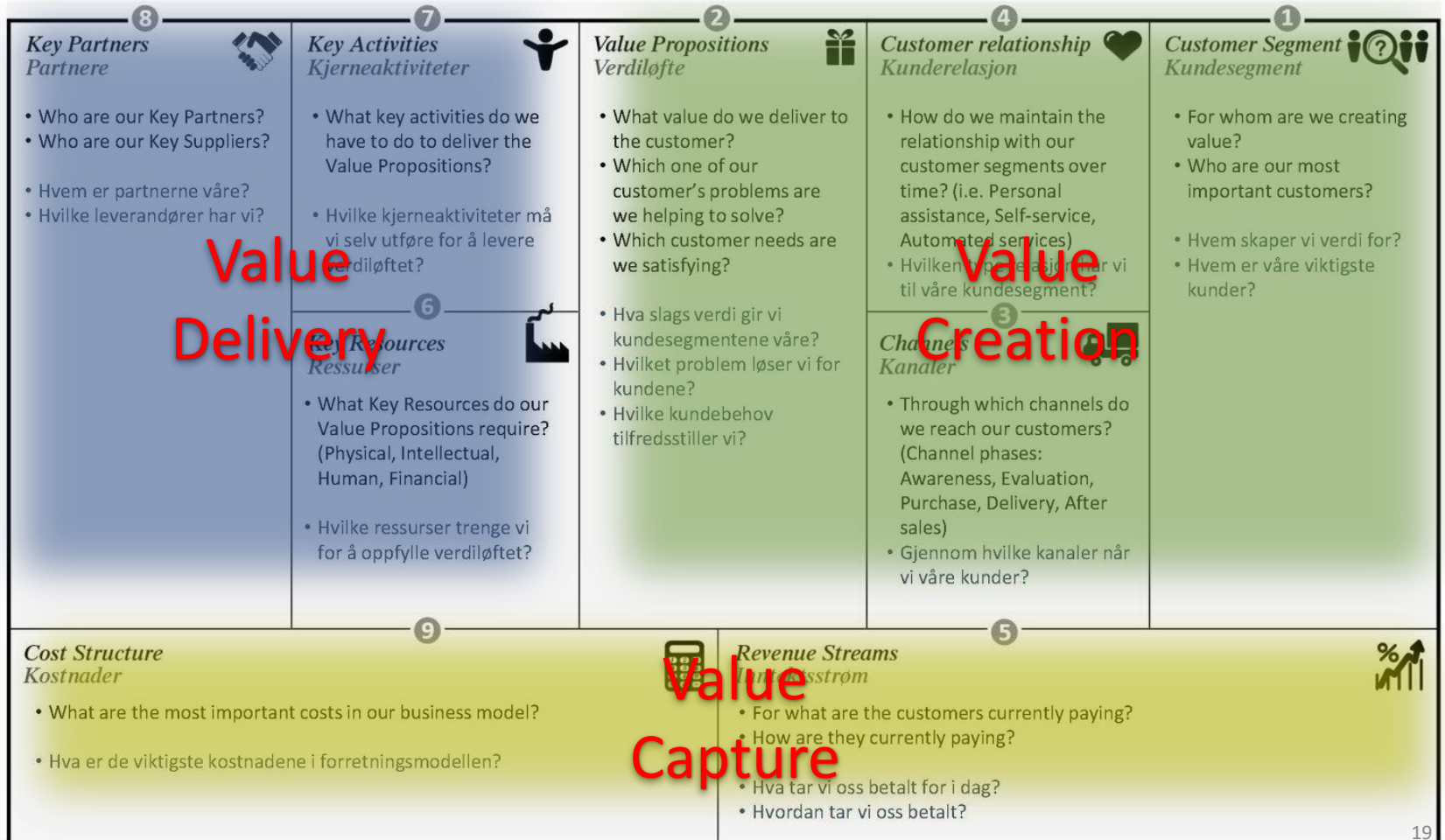


Magic Triangle. Source: Gassmann et al., (2014).

Business model Canvas



Business model Canvas



Value Delivery

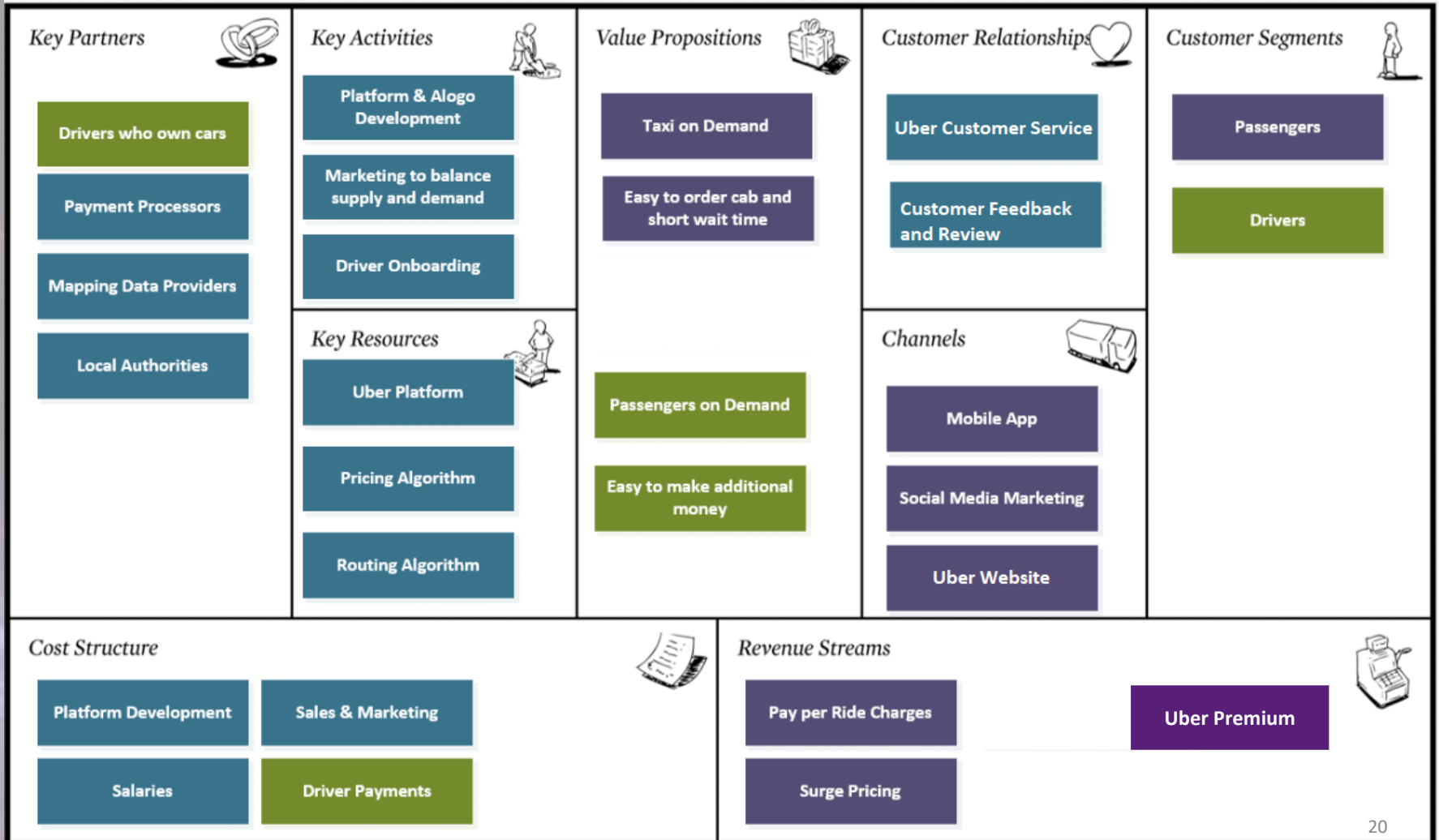
Value Creation

Value Capture

Business model Canvas: one example

The Business Model Canvas

Designed for: **Uber**



Business model Canvas: another ex



Business Model Canvas

Key partners <ul style="list-style-type: none"> - Public transport operators for digital integration & customer service / marketing - Local governments (depending on the branch) - Businesses (carsharing & housing projects, shuttles, etc.) - Car manufacturers (for purchase & maintenance) 	Key activities <ul style="list-style-type: none"> - Platform maintenance - Fleet maintenance - Contract development 	Value Proposition <ul style="list-style-type: none"> - Easy cancellation with no long-term commitments - Personalised plans & conditions - 24/7 access - Special tariffs for public transport users, & they can use their key card for public transport - Offers electric cars - Free public street parking 	Customer relationships <ul style="list-style-type: none"> - Customer service call centre 	Customer segments <ul style="list-style-type: none"> - Occasional users, to frequent users - Drivers who do not want to pay for maintenance, insurance, road taxes & parking - Families - Eco-conscious individuals - Movers - Businesses - Anyone who needs to run errands or take trips
Key resources <ul style="list-style-type: none"> - Chip card technology - Website platform 	Channels <ul style="list-style-type: none"> - Website - Mobile app - Call centre 			
Cost structure <ul style="list-style-type: none"> - Vehicle fleet acquisition - Insurance contracts - IT platforms - Personnel costs 		Revenue streams <ul style="list-style-type: none"> - Rule-breaking charges - Subscription fees & deposits (branch & plan dependent) - Drivers pay based on distance & time travelled (per km or set of km, & by the minute, hour or day) 		

Let's focus on one element: Cost Structure

- Cost structure refers to the various types of **expenses** a business incurs and is typically composed of two **categories**:
 - Fixed Costs: costs that remain unchanged regardless of the amount of output a company produces, examples include cost of physical infrastructure (like equipment/machines, buildings, or salaries, or cost of producing a software/website)
 - Variable costs: change with production volume or the number of services, like raw material cost or maintenance cost (or cost of using the website)
- **Economies** in (variable) cost:
 - Economies of scale: a proportionate saving in costs gained by an increased level of production of products or delivering a service
 - Economies of scope: cost advantages due to a larger scope of operations, for example, the same Equipment or Distribution Channels for multiple products or bundling Services in one package

Let's focus on one element: Revenue Streams (and Pricing)

- A revenue model is how a business makes money.
- It provides answer to four following questions:
 - **How** will you charge?
 - One time fee
 - Recurring fee
 - Combination
 - **Who** will you charge?
 - Users, suppliers, advertisers
 - **How** will you price?
 - Fixed pricing
 - Dynamic pricing (based on options, usage, different customer segments, etc); can be done based on time/availability or Realtime supply/demand
 - Volume pricing (based on Economies of scale)
 - Combination
 - **What** will be your price?
 - Cost plus or Markup strategy
 - Pricing based on Perceived Value or Willingness-to-Pay
 - Price of competitive services

Let's focus on one element: Different Revenue Models

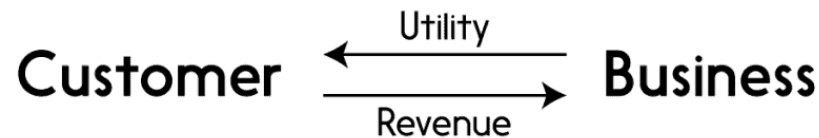
- **Transaction-based model:** is a classic way a business can earn money. The revenue is generated by directly selling an item or a service to a customer. It can be done in different ways:
 1. **Licensing/one-time purchase.** The general idea is to offer a product that requires making only one payment for it, e.g. Microsoft Windows, Apache Server, a majority of video games.
 2. **Subscription/recurring payment.** Unlike licensing, a user receives access to the service by paying a subscription fee on a monthly/annual basis, e.g. Netflix, Spotify, Adobe products.
 3. **Pay-per-use.** This pricing tactic is not recurring but per usage.
 4. **Freemium/upselling.** Freemium is a type of app monetization in which a user may access the main product for free, but will be charged for additional functions, services, bonuses, plugins, or extensions, e.g. Skype.
 5. **Hybrid pricing.** Sometimes pricing plans are a mixture of more than one. So that freemium plan might morph into some form of pay-per-use tiered plan. After passing some limit, a user can be forced or offered to use another type of pricing

Let's focus on one element: Different Revenue Models

- **Product-as-a-service model:** Product-as-a-service businesses charge customers to use physical products. They may charge a subscription fee, a per-use or per-mile fee, or a combination of both, like car rental or bike rental services
- **Advertising or affiliate marketing model:** The advertising and affiliate marketing business models leverage a business's audience as an asset. With advertising, a business sell its audience's attention (it can be both for online and physical business). With affiliate marketing, a business earns a commission when a member of its audience buys a product or service it recommends.
- **Bundling model:** the bundling business model involves selling two or more products/services together as a single unit, often for a lower price than they would charge selling the products/services separately.

Let's focus on one element: Different Revenue Models

- **Symmetric Revenue Model:** In symmetric revenue models (which includes the majority of previous models), the user of the business's offering is also the customer who pays for it. Generally, this model involves a single sided flow of offering and money – offering from the business to the customer and money from the customer to the business.



- **Data Sales model or Asymmetric Revenue Model:** In asymmetric revenue models, the user of the business's offering is not the customer who pays for it. This company uses a two-fold revenue model where it monetises the data provided by its offering's users and sells the same to another customer segment.



Sustainable Business Model Canvas



Sustainable Business Model Canvas












The Sustainable Business Model Canvas

Designed for:

Designed by:

On:

Version:

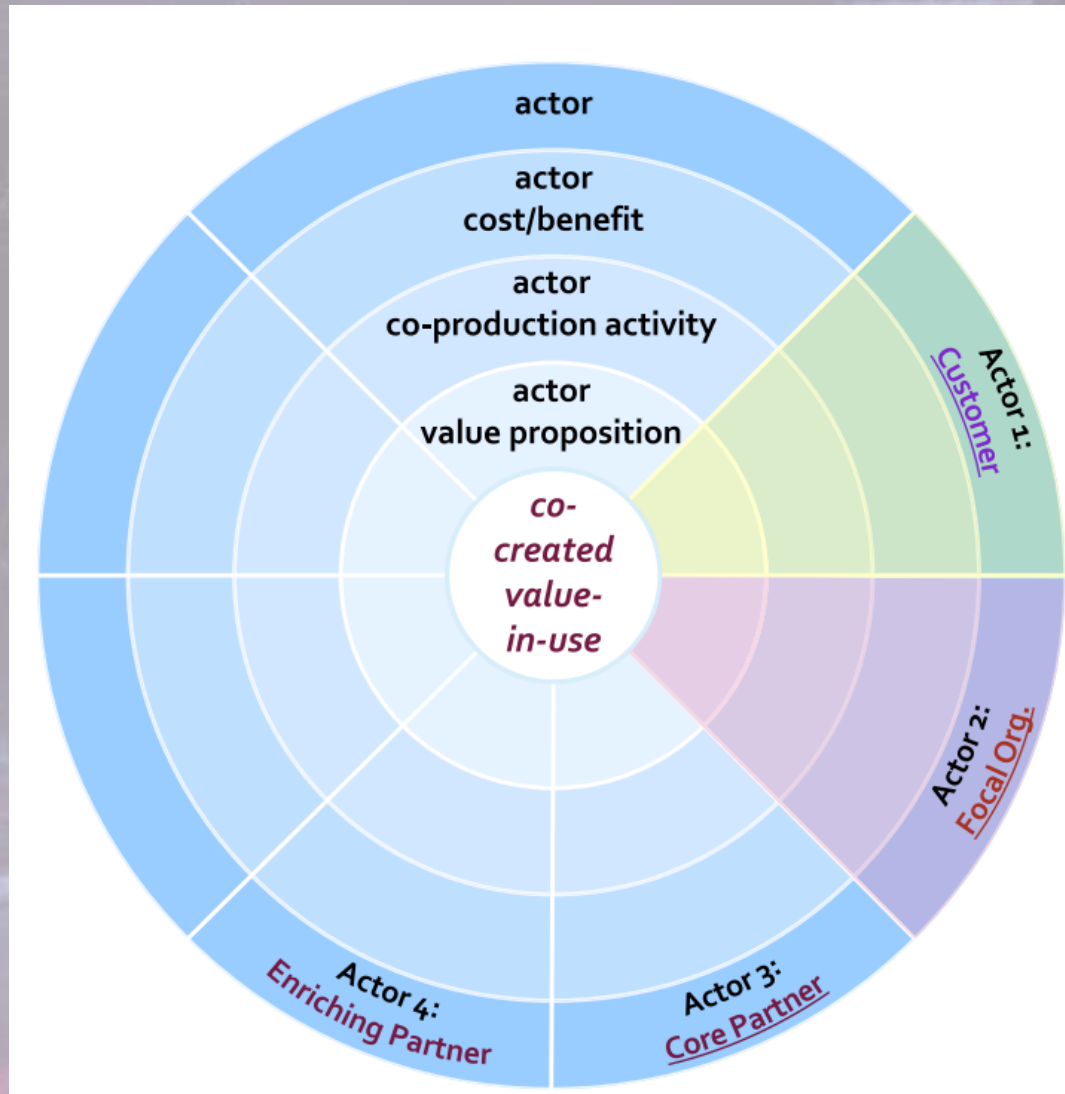
<p>Key Partners </p> <p>Who are our Key Partners? Who are our key suppliers? Which Key Resources are we acquiring from partners? Which Key Activities do partners perform?</p> <p>MOTIVATION FOR PARTNERSHIPS: Optimization and economy Reduction of risk and uncertainty Acquisition of particular resources and activities</p>	<p>Key Activities </p> <p>What Key Activities do our Value Propositions require? Our Distribution Channels? Customer Relationships? Revenue Streams?</p> <p>CATEGORIES: Production Problem Solving Platform/Network</p>	<p>Value Propositions </p> <p>What value do we deliver to the customer? Which one of our customer's problems are we helping to solve? What bundles of products and services are we offering to each Customer Segment? Which customer needs are we satisfying?</p> <p>CHARACTERISTICS: Newness Performance Customization „Getting the Job Done“ Design Brand Status Price Cost Reduction Risk Reduction Accessibility Convenience/Usability</p>	<p>Customer Relationships </p> <p>What type of relationship does each of our Customer Segments expect us to establish and maintain with them? Which ones have we established? How are they integrated with the rest of our business model? How costly are they?</p> <p>EXAMPLES: Personal Assistance Dedicated Personal Assistance Self-Service Automated Services Communities Co-Creation</p>	<p>Customer Segments </p> <p>For whom are we creating value? Who are our most important customers?</p> <p>POSSIBILITIES: Mass Market Niche Market Segmented Diversified Multi-sided Platform</p>
<p>Key Resources </p> <p>What Key Resources do our Value Propositions require? Our Distributions Channels? Customer Relationships? Revenue Streams?</p> <p>TYPES OF RESOURCES: Physical Intellectual (brand patents, copyrights, data) Human Financial</p>		<p>Channels </p> <p>Through which Channels do our Customer Segments want to be reached? How are we reaching them now? How are our Channels integrated? Which ones work best? Which ones are most cost-efficient? How are we integrating them with customer routines?</p> <p>CHANNEL PHASES: 1. Awareness 2. Evaluation 3. Purchase 4. Delivery 5. After Sales (post-purchase customer support) ...of products & services and Value Proposition</p>		
<p>Cost Structure </p> <p>What are the most important costs inherent in our business model? Which Key Resources are the most expensive? Which Key Activities are most expensive?</p> <p>IS YOUR BUSINESS MORE: Cost Driven (lowest cost structure, low price value proposition, maximum automation, extensive outsourcing) Value Driven (focussed on value creation, premium value proposition)</p> <p>SAMPLE CHARACTERISTICS: Fixed Costs (salaries, rents, utilities) Variable Costs Economies of Scale Economies of Scope</p>		<p>Revenue Streams </p> <p>For what value are our customers really willing to pay? For what do they currently pay? How would they prefer to pay? How much does each Revenue Stream contribute to overall revenues?</p> <p>TYPES: Asset Sale Subscription Fees Licensing Usage Fee Lending/Renting/Leasing Brokerage Fees</p> <p>FIXED PRICING: List Price Product feature dependent Customer segment dependent Volume dependent</p> <p>DYNAMIC PRICING: Negotiation (bargaining) Yield management Real-time Market</p>		
<p>Eco-Social Costs </p> <p>What ecological or social costs is our business model causing? Which Key Resources are non-renewable? Which Key Activities use a lot of resources?</p> <p>EVALUATION INSTRUMENTS: Life-Cycle Assessment (of products and services) Common Good Balance Sheet</p>		<p>Eco-Social Benefits </p> <p>What ecological or social benefits is our business model generating? Who are the beneficiaries? Are they potential customers? Can we transform the benefits into a Value Proposition? If yes, for whom?</p> <p>INSTRUMENTS: Social Reporting Standard Common Good Balance Sheet</p>		

Based on: www.businessmodelgeneration.com

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Service-dominant Business Model



Smart City Business Model

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

Smart Mobility Business Model Framework

<p>Network Partners</p> <p>Who are the smart city network partners?</p> <p>(city, end-user, government, core partner, Complementary partner)</p> <p>who are the key suppliers?</p>	<p>Key Activities</p> <p>Which key activities are required to realize the value proposition?</p> <p>Are the key activities in line with the sustainability goals?</p>	<p>Value proposition</p> <p>What co-created value does each partner deliver considering the social and environmental aspects?</p> <p>Which of the end-users problem does the smart mobility solution going to solve?</p> <p>What are the key respective target values-KPIs to be reached?</p>	<p>Network relationship</p> <p>What type of relationship does each partner expect within the network?</p> <p>Which ones are established?</p> <p>How are they integrated with the rest of our BM?</p>	<p>Network Beneficiaries</p> <p>What target users is the value created for?</p> <p>How do the target users benefit from the value created and what are their needs?</p> <p>What specific values does each network beneficiary get?</p> <p>Network beneficiaries could be end/users, other community, citizens, city councils, environmental groups</p>
<p>Network Partners offering</p> <p>What offer does each actor deliver?(Technology, R&D, IP rights)</p>	<p>Key resources</p> <p>What key resources are required to realize the value proposition?</p> <p>(Physical resources, Human resources, Data)</p>	<p>ICT and Infrastructure</p> <p>What type of ICT and infrastructure is needed?</p> <p>Is it available now or not?</p> <p>How it should be provided?</p>	<p>Deployment and channels</p> <p>Through which channels do our users want to be reached?</p> <p>How are we reaching them now?</p> <p>How are our channels integrated?</p> <p>Which ones work best?</p> <p>Which ones are most cost-efficient?</p> <p>How are they integrating with the user's routines?</p>	
<p>Budget cost</p> <p>What are the most important costs inherent for each partner deploying a smart mobility solution?</p> <p>Which key resources and key activities are the most expensive?</p> <p>What cost can be covered by each partner?</p> <p>Is there an opportunity for blending public funding with private financing?</p>			<p>Revenue stream</p> <p>For what value are the network beneficiaries willing to pay?</p> <p>For what do they currently pay?</p> <p>How are they currently paying?</p> <p>How much would they prefer to pay?</p> <p>How much does each revenue stream contribute to overall revenue?</p> <p>Which partner has revenues?</p>	
<p>Environmental impact: cost and benefit</p> <p>What is the ecological cost of the smart mobility solution?</p> <p>What is the ecological benefit of the smart city solution?</p> <p>The percentage of reducing energy consumption, traffic congestion, noise and air pollution</p> <p>The percentage of reducing the environmental footprint</p>			<p>Social impact: value and cost</p> <p>What is the positive social value generated by the smart mobility solution?</p> <p>What is the negative social value created by the smart city solution?</p>	

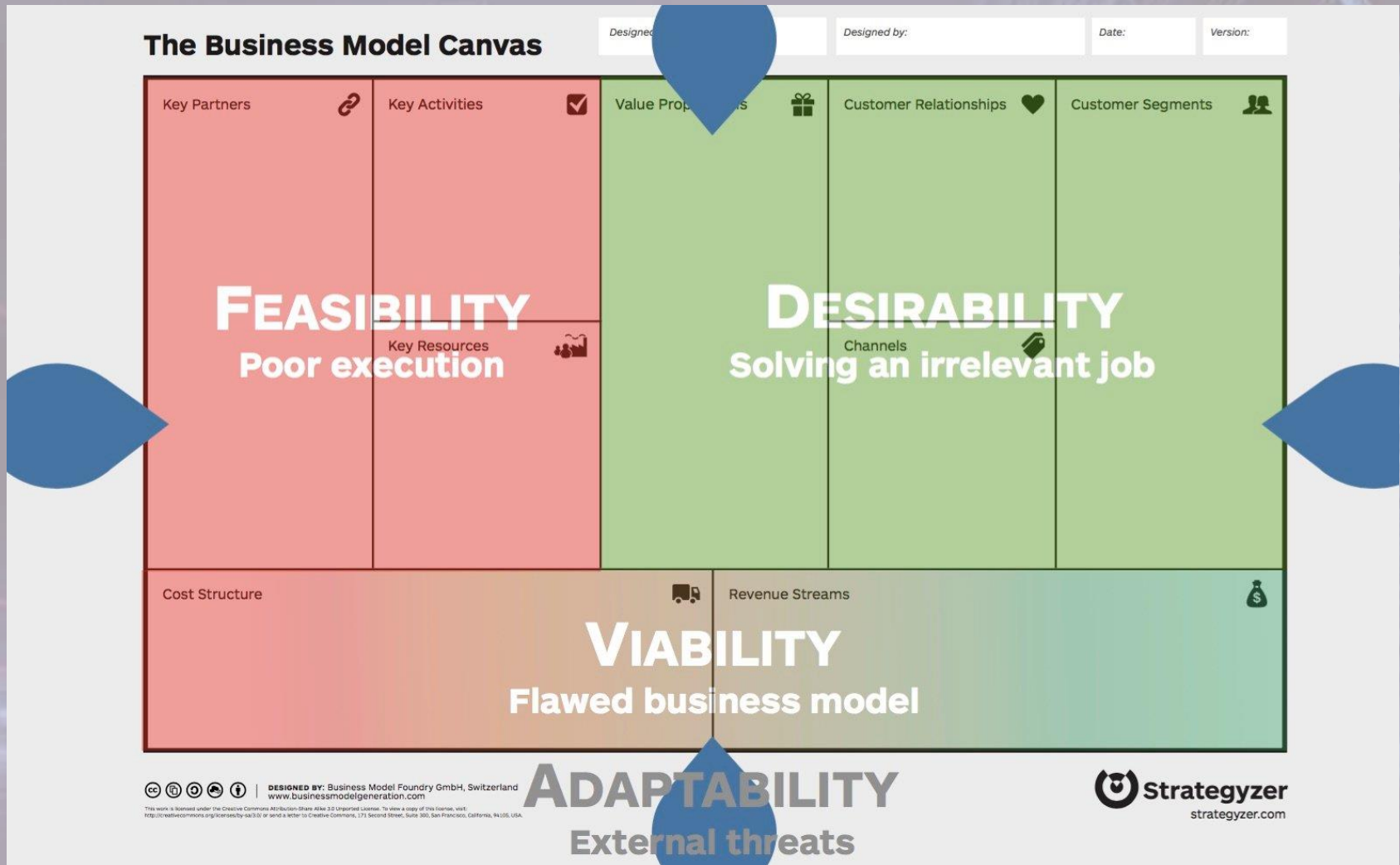


Part 3: Evaluating business models for Smart Mobility

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:
 1. Internal analysis (is business model) internally consistent
 2. External analysis: the business model is meant to be smart in the **city ecosystem** context. Is the city ecosystem support the business model (and vice versa)

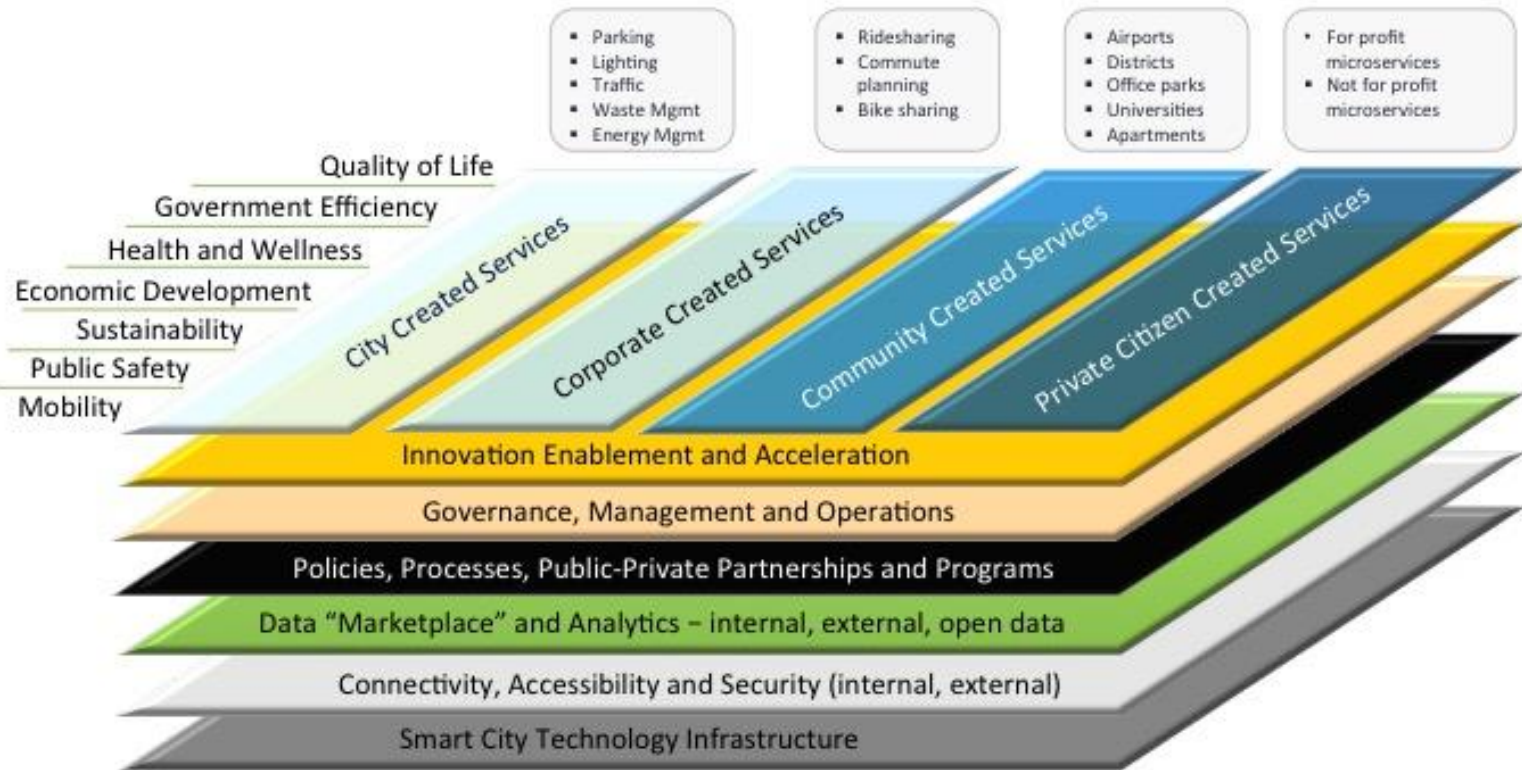
Internal Analysis of Business Models



Smart City Ecosystems and Business Models

- 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)
- 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



Source: StrategyofThings.io



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!

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