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Sustainable mobility

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Paris, 26th September 2011

COST Exploratory Workshop on Smart Cities

Two projects for a (future) smart city

Vehicle Sharing: Green Move (GM)

- An innovative vehicle-sharing system based on a **peer2peer** approach, with different categories of **electric vehicles**

Car Pooling: PoliUniPool

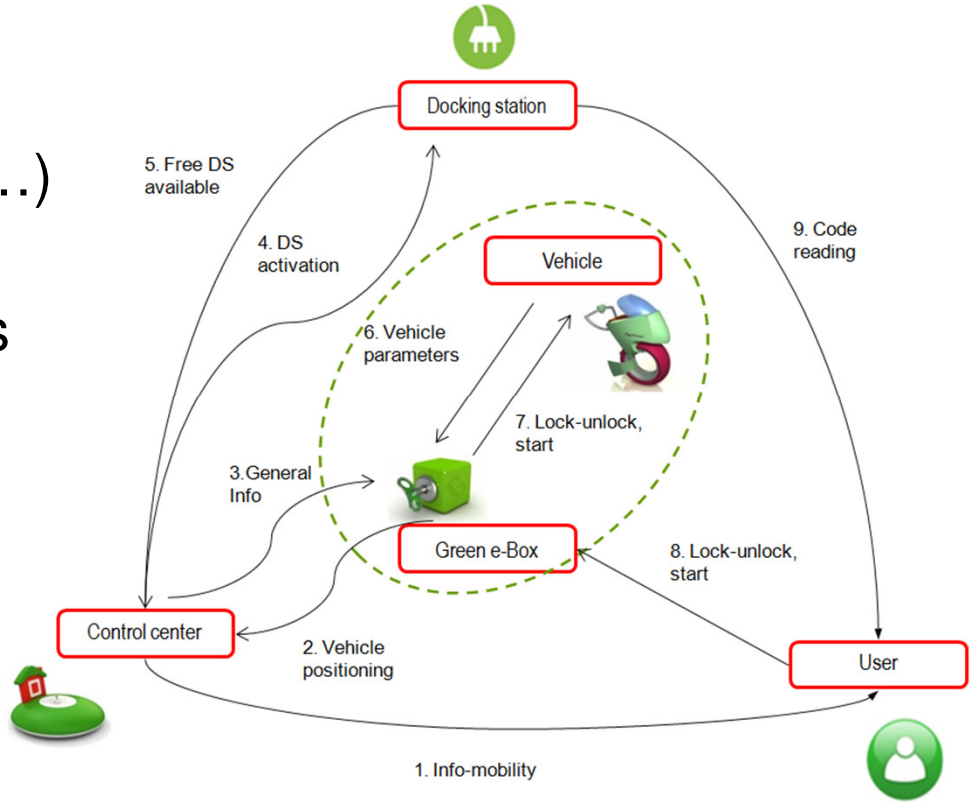
- A controlled and **organized car pooling** system for **two universities** of Milan, with automatic generation of the carpooler trips

GM: the frame

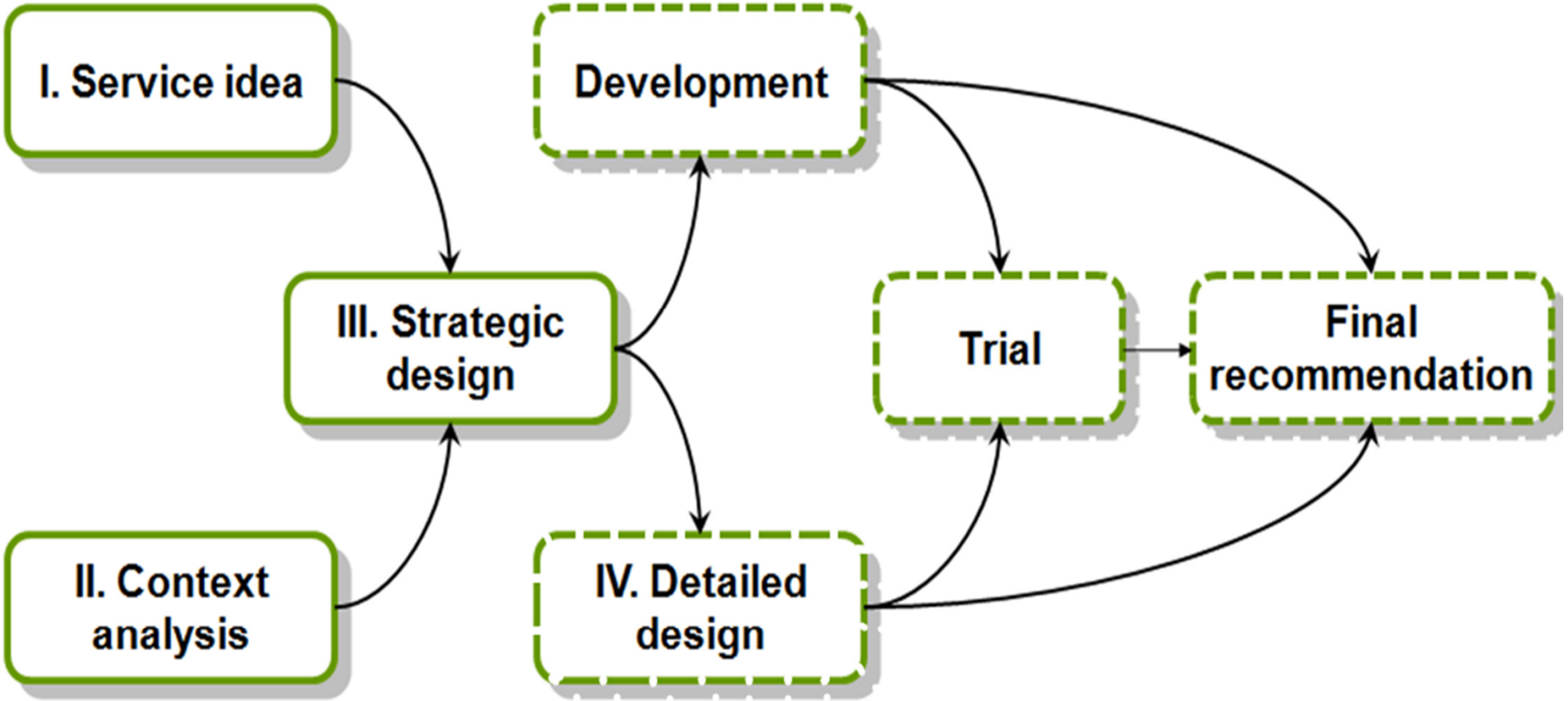
- Two year ongoing project (start in March 2011)
- Financed by the Lombardia Region (5 mln. €)
- Involving 8 research centres of Politecnico:
  - **DEI** – Computer eng. + Technology
  - **MATE** – Mathematics
  - **DIAP** – Urban planning
  - **INDACO** – Design
  - **DIG** – Management
  - **DIIAR** – Environment and mapping
  - **Poliedra** – Decision aiding
  - **FPM** – Administration
- Work Packages:
  - **WP1** Objectives and business model identification
  - **WP2** Preliminary analysis and evaluation of system and service
  - **WP3** System and services design and development
  - **WP4** Monitoring and evaluation of impacts and benefits
  - **WP5** Project management
- Outcome: design of a **full scale** service and a **trial** with a limited number of vehicles in a specific area of Milan

GM: the model

- Key-features of the service:
  - **multi-owners** – single users, private companies and associations share their electric cars → a p2p system
  - **multi-business** – set of flexible business models
  - **mobility credits** – credit system to incentive/repay virtuous behaviors
  - **electric vehicles** – to reduce pollution in the cities (Milan, …)
  - **new technologies** – to allow real time full information flows



GM: the steps



Communication Participation Dissemination

What challenges for Decision Theory?

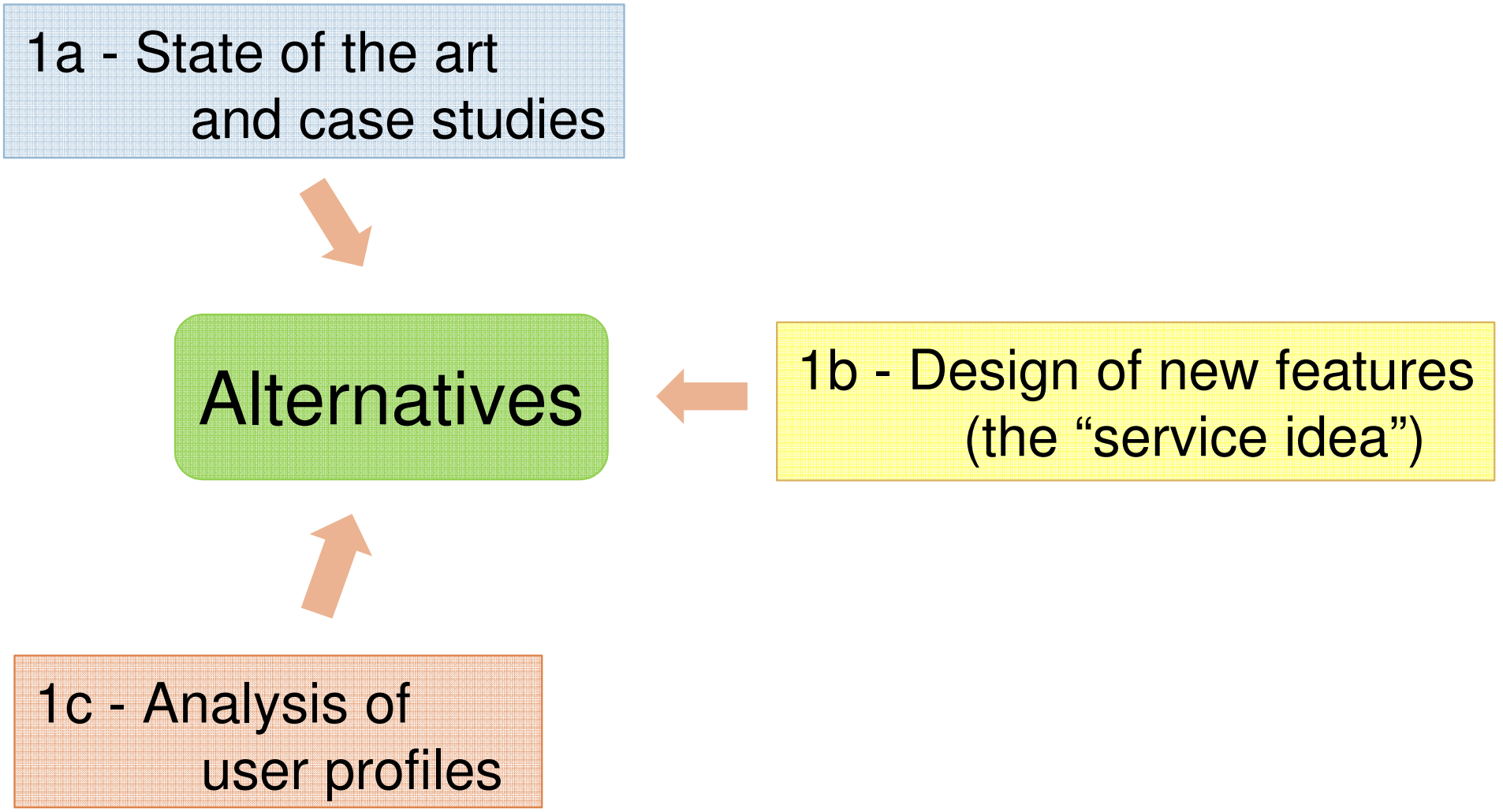
1. The generation of **alternatives**
   (design of service configurations)

2. The selection of **attributes**
   (not pure technology, innovation service)

3. The analysis of **stakeholders**
   (network of subjects and objectives)

4. The complete **evaluation model**
   (different methods; recommendations)

1 – The generation of alternatives



Case studies
(services operating nowadays)

Altcar	Greenwheels
Autolib	GuidaMi
Botelleros	ICS
Cambio	ICVS _ Honda
Car2go	I-go
CiteVu	London Liftshare
Citycarshare	Mobility Car Sharing
Cityzencar	MoveAbout
Drive mycar	Phone Booths Charging
eE-Tour Allgäu	Pordenone Birò
E-mobility	Sarecar
E-moving	Spride
eVai	Tamyca
Flinc/MobileRidesharing	Whipcar
Frankfurt Model	Yèlomobile
Getaround	ZEC
Go Op	Zen Car
Google's Relay Rides	ZipCar

Case studies

	Project	ILink
1	Altcar	www.altcar.org/
2	Autolib	www.autolib-paris.fr
3	Botelleros	==
4	Cambio	www.cambio-carsharing.com
5	Car2go	www.car2go.com/ulm/en/
6	CiteVu	www.citevu.com/
7	Citycarshare	www.citycarshare.org
8	Cityzencar	https://fr.cityzencar.com/
9	Drive mycar	www.drivemycarrentals.com.au/
10	eE-Tour Allgäu	www.ee-tour.de
11	E-mobility	www.emobilityitaly.it
12	E-moving	www.a2a.eu
13	eVai	www.carsharing-evai.it/web/evai/home
14	Flinc/MobileRidesharing	www.flinc.org
15	Frankfurt Model	==
16	Getaround	www.getaround.com/
17	Go Op	www.go-op.net/
18	Google's Relay Rides	http://relayrides.com
19	Greenwheels	www.greenwheels.nl
20	GuidaMi	www.atm-mi.it/it/guidami/Pagine/default.asp
21	ICS	www.icscarsharing.it/main/
22	ICVS _ Honda	www.world.honda.com/ICVS/
23	I-go	www.igocars.org
24	London Lifteshare	https://london.liftshare.com
25	Mobility Car Sharing	www.mobility.ch/de/pub/
26	MoveAbout	www.moveabout.net
27	Phone Booths Charging	==
28	Pordenone Birò	www.comune.pordenone.it/comune/progetti/auto-elettriche
29	Sarecar	www.sarecar.net/es/
30	Spride	http://spride.com/
31	Tamycar	==
32	Whipcar	www.whipcar.com/
33	Yèlomobile	www.yelomobile.fr
34	ZEC	www.parmanetwork.it/zec/
35	Zen Car	www.zencar.eu
36	ZipCar	www.zipcar.com

1a - State of the art: the case studies

Case studies
(services operating nowadays)

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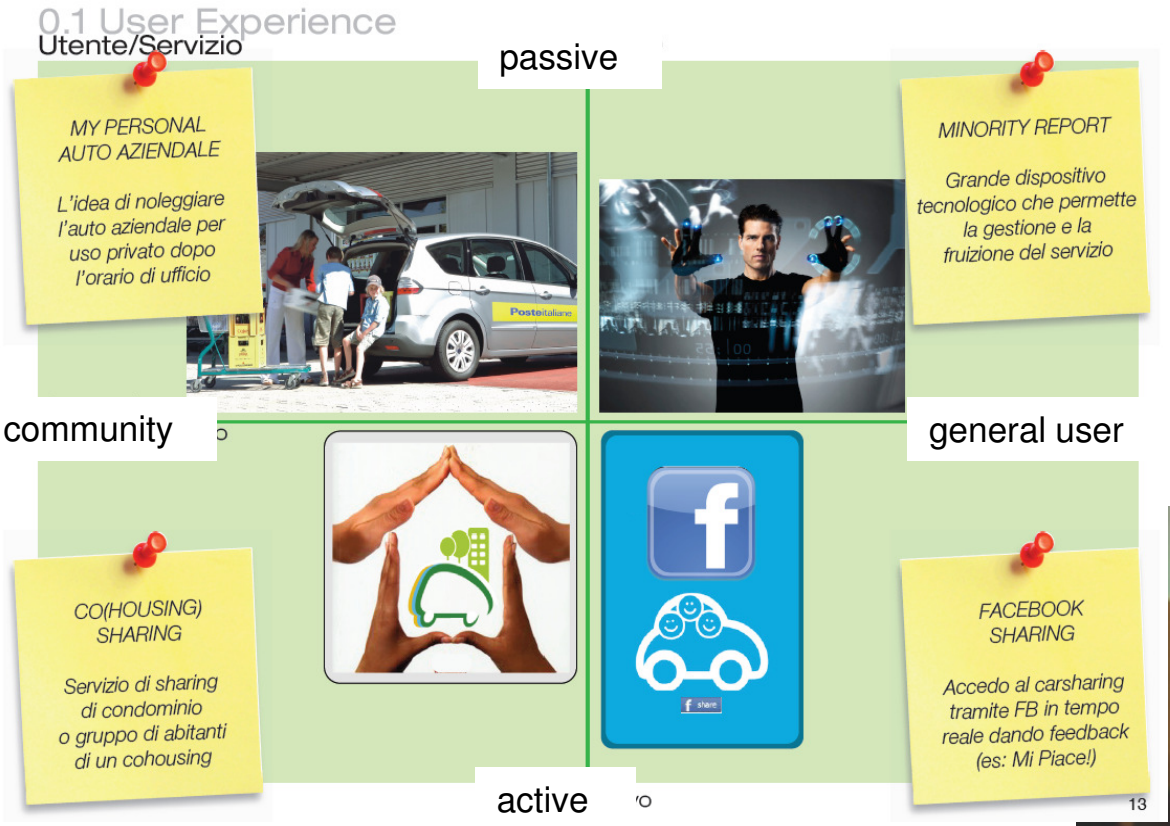
Main features

- Undefined user profiles
- Wide range of parameters
- Success hard to quantify

1b - Design of new features: the method

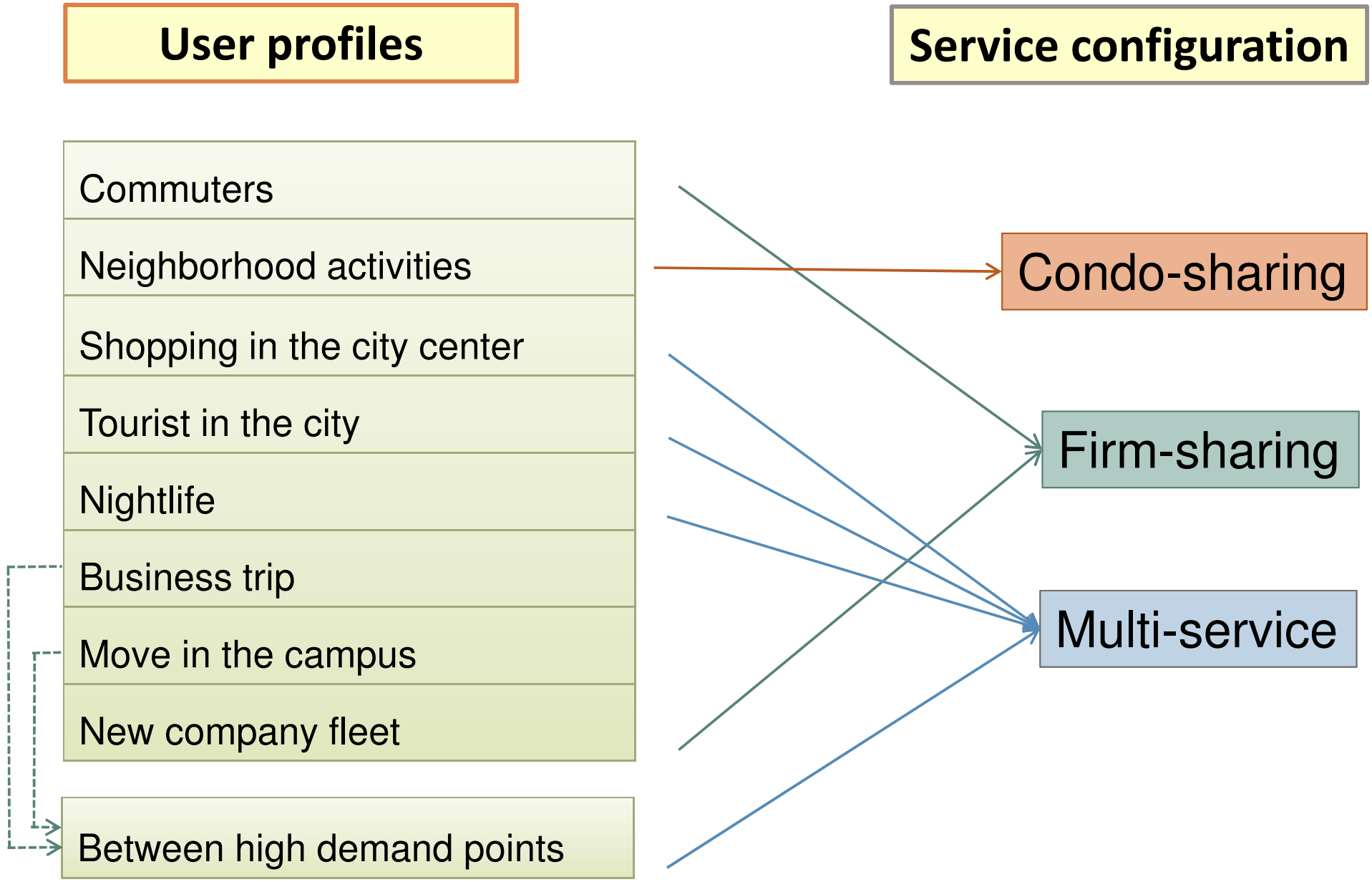


Workshop for a free and wide generation of ideas

Cross scheme in the brainstorm. on service concept generation

1b - Design of new features: some results

Pricing/incentives	Firm sharing	Education	Real time on the move
			
Procurement	Consulting	Feedback management	Micro-macro communities
			
Cooperation	Customization/profilation		Micro-enterprise
			


User profiles
Service configuration
Commuters
Neighborhood activities
Shopping in the city center
Tourist in the city
Nightlife
Business trip
Move in the campus
New company fleet
Between high demand points
Condo-sharing
Firm-sharing
Multi-service

2 – The selection of attributes

From 45 parameters to describe the case studies

to 25 selected parameters to define the main features

ATTRIBUTES	PARAMETER	METRIC
capillarità	area territoriale coperta	nazione, area metropolitana, intera città, centro, aree selezionate (campus, ospedali, …)
capillarità	capillarità	alta, media, bassa
intermodalità	intermodalità - fisica	stazioni situate in prossimità di punti di accesso di altre tipologie di trasporto: si/no
intermodalità	intermodalità - operativa	si, no, non disponibile
costo	tariffa - quota iscrizione	0-50 €/anno, 50-100, più di 100
costo	tariffa - tariffa al consumo	0-5, 5-10, più di 10 €/ora, variabile
costo	tariffa - abbonamento	no, si
incentivi	tariffa - incentivi - incentivi altri	parcheggi riservati, parcheggi gratuiti, corsie riservate, sconti, accesso ZTL
flessibilità	flessibilità spaziale	tipologia di viaggio consentita: rilascio libero, one way, two way
flessibilità	flessibilità temporale	durata viaggio: aperta, variabile in un range, stabilita
gamma e range	gamma	più di 2 posti, 2 posti
gamma e range	range	distanza percorribile tramite un/a rifornimento/carica completo/a
facilità sistema di prenotazione	prenotazione - obbligatorietà	obbligatorietà: no/si
facilità sistema di prenotazione	prenotazione - tipologia	semplice (solo la stazione di partenza) o multi-porto (anche la stazione di arrivo)
facilità sistema di prenotazione	prenotazione - mezzo	internet, telefono, applicazione smartphone
facilità sistema di prenotazione	prenotazione - tempistiche	on the move (real time), preventiva
facilità di accesso	accessibilità veicolo	chiave, smartcard, smartphone, sms, altro
facilità di accesso	accessibilità servizio	24 ore, fasce orarie
facilità di accesso	numero veicoli disponibili	numero
facilità di accesso	tempi di ricarica	ore ↓
facilità sistema di pagamento	pagamento	carta di credito, carta prepagata, telefonino, crediti di mobilità, co-produzione nel servizio, altro
servizi aggiuntivi	tipologia	infomobilità, meteo, condivisione auto, …
servizi aggiuntivi	personalizzazione	presenza di sistemi di personalizzazione del servizio: si/no
servizi aggiuntivi	tipologia dati forniti all'utente	educazione, info eco consumo, consumi, profilazione: si/no
servizi aggiuntivi	tipologia dati forniti dall'utente	feedback, social network, altro: si/no

2a - Matching profiles with performances

The 10 main features
Capillarity
Intermodality
Fares
Incentives
Flexibility (spatial/temporal)
Vehicle range
Ease of booking
Access/use ease
Ease of payment
Extra services

To be shared

	Capillarity	Intermodality	Fares	Incentives	Flexibility (spatial/temporal)	Vehicle range	Ease of booking	Access/use ease	Ease of payment	Extra services
Commuters	high	high	high	high	low	low	high	high	high	low
Neighborhood activities	high	low	mid	low	low	high	mid	high	mid	low
Shopping in the city center	low	mid	high	high	high	high	mid	mid	mid	high
Tourist in the city	low	mid	mid	high	high	high	high	high	mid	high
Nightlife	low	low	mid	mid	high	high	low	mid	mid	high
Business trip	low	high	low	high	high	mid	high	mid	mid	high
Move in the campus	low	low	high	low	mid	mid	low	low	high	mid
New company fleet	high	low	low	high	low	high	mid	mid	mid	mid

- Statistical technique, today used in many social and applied sciences including psychology, marketing, product management, operations research.

- It requires participants to make a series of trade-offs; analysis of these trade-offs will reveal the relative importance of component attributes.

- The trade-offs can be presented as a “choice exercise”, where the respondent simply chooses the most preferred alternative from a set of competing ones

- In our case we try to use CA in a very simple context, with a set of Facebook 50 people (students)

2b - Conjoint analysis

- **Step 1** Definition of attributes, levels and profiles
- **Step 2** Collect stated preferences
- **Step 3** Estimate partial utility
- **Step 4** Determine the importance of the attributes
- **Step 5** Estimate the precision of the previsions

The experiment (50 respondents)

	LEVELS	
ATTRIBUTES	**1**	**2**
1. Fixed cost	12 €/month	5 €/rent
2. Typology	Electric car (5€/30 min)	Petrol car (2.20 €/hr + 0.48 €/km)
3. Flexibility	one way	two ways

Main results:

~ 70% prefers a monthly subscription instead of a rate for each rent
~ 60% prefers an electric car instead of a petrol car
~ 80% prefers one way (free return) instead of two ways (fixed return)

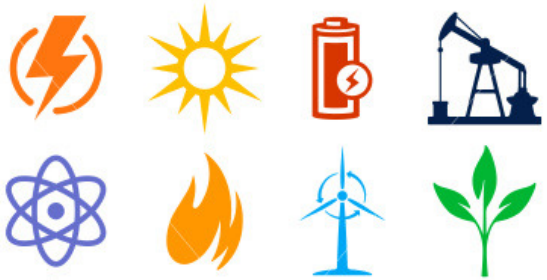
3 – The analysis of stakeholders

The network of the stakeholders has to be designed depending on literature and specific service ideas

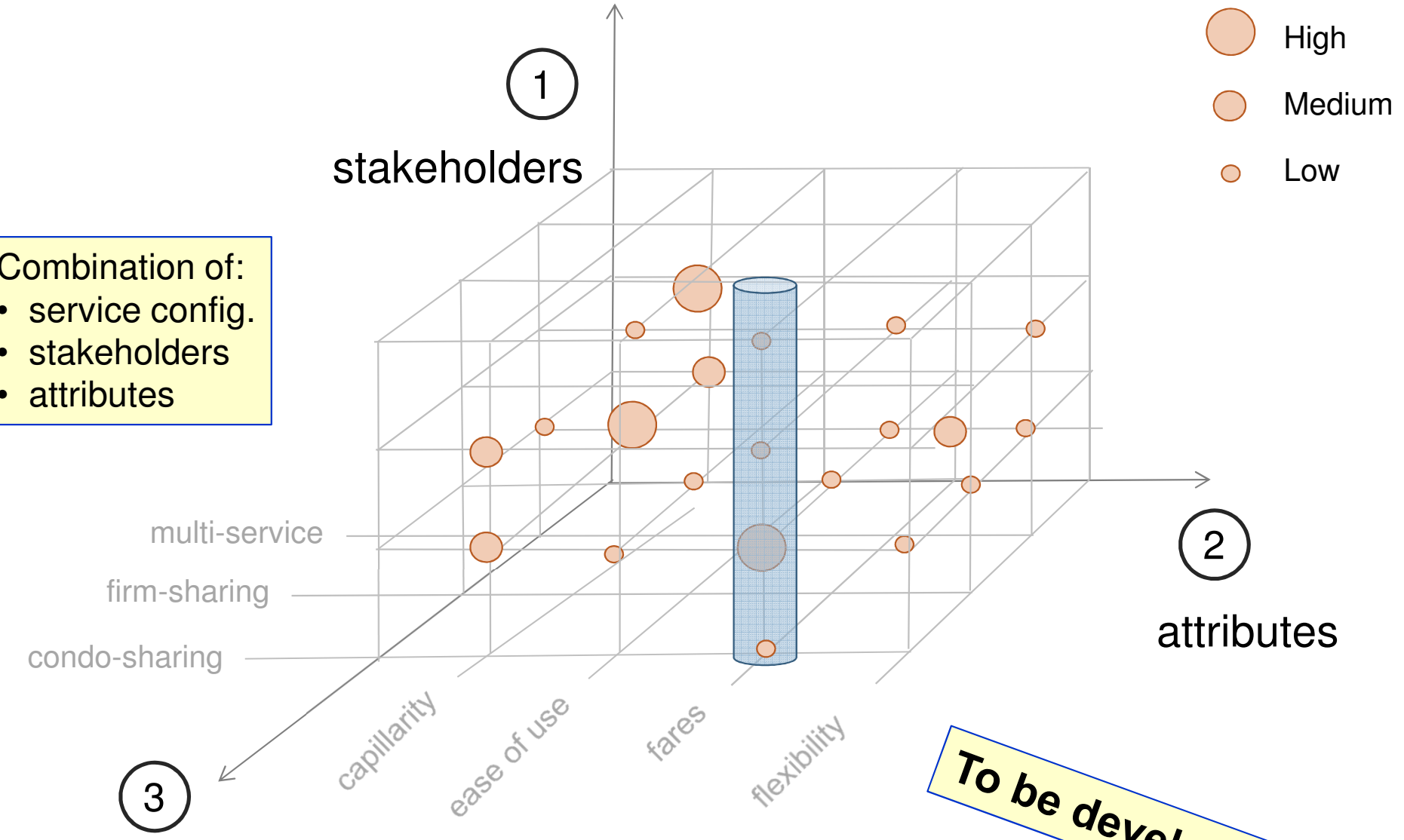
To be developed

Example

- local authority (owns roads & parking places + promotes the service)
- public transport companies
- condominiums
- real estate developers
- energy suppliers
- mobility managers
- local communities
- press and other media
- road users (walkers, cyclists,…)
- taxi drivers



4 – The final evaluation model



Combination of:
- service config.
- stakeholders
- attributes

To be developed

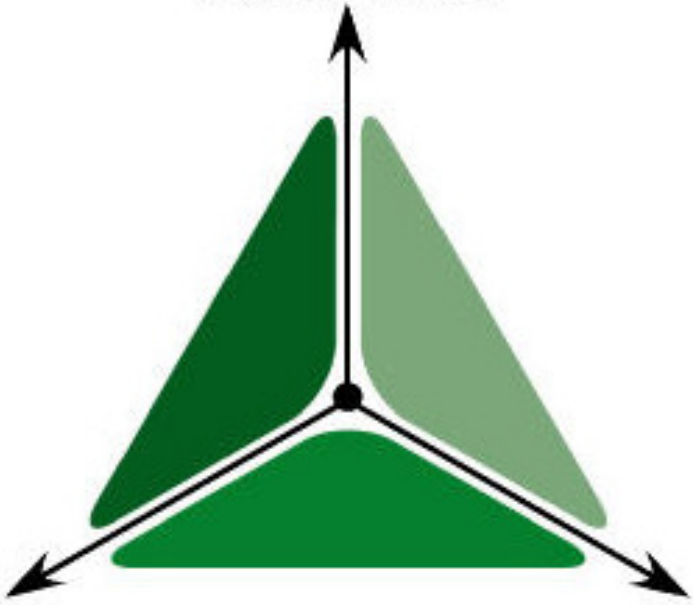
Car pooling (CP): some hints

- A group of users **shares a private car** reaching the same or different destinations
- Main objectives:
  - to decrease the number of travelling cars
  - to increase the cars occupancy rate
  - to improve the accessibility
- Main categories:
  - spontaneous: casual carpooling, among friends, colleagues, …
  - carpool "post-it" board: organized by users
  - certified but not organized: certified hitchhiking
  - controlled and organized: a system creates the user equipages, manages communications and emergencies
- Main stakeholders involved:
  - public administration,
  - companies, universities, …
  - users (poolers).

CP: trade-off between points of view

Environment

- reduction of cars
- reduction of travelled distances
- increase of accessibility



Costs

- incentives costs
- system costs
- control costs

Benefits

- money saving
- journey time
- travel preferences

CP: the PoliUniPool project

- **PoliUniPool** is the car pooling service of Politecnico di Milano and Università degli Studi di Milano:
  - designed for university students, teachers, personnel
  - launch of the service → October 10th , 2011

- **Key characteristics** of the service:
  - **algorithm** – besides suggesting a matching between the users, the system provides the expected schedule for their trips;
  - **multimodality** – the main railway and subway stations can be selected as destinations;
  - **infomobility** – info are provided immediately to users in case of delay or changes, to improve the reliability of the service;
  - **costs** – the system can estimate the costs for each user, in order to let the users know how to share them;
  - **social network functionalities** – partial prearranged crews, different categories (friends or "I don't like him/her").

Conclusions: sustainable mobility

- **Sustainability** → a particular attention given to
  - the **process** in general (with monitoring and control, evaluation procedures, analysis of performance indexes);
  - an **integration** of competencies and tools, a participated planning (focus for policies and social innovative behaviors).

- **Sustainable mobility** → low impact transport systems such as:
  - walking and cycling,
  - electric vehicles,
  - car sharing and car pooling;

  in general design and implementation of urban transp. systems fuel-efficient, space-saving, promoting healthy lifestyles.

Thank you for your attention

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