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SOUL

A PROJECT TO TRANSFORM SMART MOBILITY HUBS

Cities perspective and needs

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Use cases and cities perspective

Selection and mapping of three use cases

Ajuntament de Barcelona

Comune di Milano

Two use cases used as data feeder for the definition, testing, validation and optimization of the DSS. Milan and Barcelona have chosen the mobility hubs of major interest to be used data feeder

EINDHOVEN

One use case is the test case where the DSS will be used for the designing stage of a multimodal mobility hub. Eindhoven chose an area where a new multimodal mobility hub is being built

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Mobility hubs for SOUL project

Barcelona – Plaça de Catalunya

Milan – Stazione Centrale

Eindhoven – P&R Genneper Parken

Milan mobility hub: Stazione Centrale

- Opened in 1931, second Italian station for size and traffic volume with 650 trains and 300.000 passengers a day
- Interchange with several PT lines and the main national and foreign rail transport operators
- Airport shuttles to and from the airports (Linate, Malpensa and Orio al Serio)
- Taxis service and an area reserved for rental cars
- Shared mobility services, such as bike sharing, scooter sharing, car sharing and stalls for charging electric vehicles

- Pirelli skyscraper, headquarters of some offices of Regione Lombardia and many other offices
- 3 consulates
- Several restaurants, bars, about 30 grocery stores
- 3 schools and about 100 hotels

Milan mobility hub: Stazione Centrale

Mobility services

- Metro: 2 lines
- Trains: regional, intercity, high speed
- Bus & tram: 11 lines
- Car rent parking: 5 companies
- Tourist Bus: 3 companies
- Airport bus: 4 companies
- Bike sharing: 4 stations
- Charging stations: 1 for car sharing
- Taxi: 2 Stations
- Scooter sharing: 5 companies
- Car sharing: 4 companies
- Micromobility: 7 companies
- Electric car sharing: 1 company

Non mobility services

- Travel agencies
- Banks
- Automated teller machines
- Money change offices
- Info points
- Luggage storages
- Ticket machines
- Car rentals
- Lost and found office
- Car parking area
- Railway Police
- Assistance room
- Toilets
- Shopping Area
- Post offices

Milan mobility hub: Stazione Centrale

Rows: variables related to transport services (public and private), users (flows, quality), hub facilities (parking information, security, accessibility, non mobility services, shops)

Columns: current values of variables considered and two expected targets were identified, that's 2022 (eventual end of the SOUL project) and 2026 (Winter Olympics Games in Milano – Cortina)

STAZIONE CENTRALE - MILAN					
Thematics	**Aspects**	**Measures**	**2019**	**2022**	**2026**
Transport services	Train departures	Trains/day	650	650	pending
	PT departures	Public transport/day (bus + tram)	2311	2311	2311
		Metro/day	1075	1075	1075
	Airport bus services	Airport Bus Malpensa/day	159	175	190
		Airport Bus Linate/day	62	59	50
		Airport Bus Orio/day	149	152	158
	Mall transfers	Mall service bus/day	17	17	17
	Taxi services	Taxi stalls	66	66	66
	Sharing services	Car sharing/day	451	1503	2255
		Scooter sharing/day	20	41	42
		Bike sharing/day	425	873	990
		E-mobility/day	0	pending	pending
Users	Flows	Pedestrians/day	300.000	pending	pending
	Quality	Comfortable area	2	2	2
		Security perception (% people satisfied)	85	85	90
		Traveller info point	1	1	1
Hub facilities	Capacity	Tourist bus stalls	0	0	0
		Rental cars stalls	30	30	30
		Private car stalls	34	34	34
		Private bike stalls	445	600	700
		Private motorbike stalls	402	402	402
		E-charging columns	12	22	32
	Signage	Parking information	1	1	1
		Digital connectivity for travellers and mobility providers	0	3	6
		Dynamic arrival time table PT stops/Total PT stops	1	1	1
	Accessibility	PT stops accessible/Total PT stops	0,33	0,5	0,75
		PT vehicles accessible/Total PT vehicles	0,9	0,9	0,9
	Security	N° of security cameras	34	38	42
	Sustainability	Renewable energy production (Kwh/year)	0	28000	34000
	Basic services	Free public WI-FI	yes	yes	yes
		Travel agency	3	3	3
		Ticket machine	88	88	88
		Post office	1	1	1
		Toilete	2	2	2
		ATM machine	11	11	11
		Luggage storage	1	1	1
		Lost and found office	1	1	1
	Shops	Optic	2	2	2
		Beauty and Wellness	8	8	8
		News and Magazines	1	1	1
		Tobacco	5	5	5
		Hi-tech	7	7	7
		Healtcare	3	3	3
		Accessories	20	20	20
		Food	43	43	43
		Book and Music	1	1	1
		Clothing	16	16	16

Barcelona mobility hub: Plaça de Catalunya

- Was built in 1889 with the purpose to link the new Eixample district with the old center
- Is connected with the main streets in the city such as Rambla Catalunya, Portal de l'Angel avenue, Paseo de Gracia, Ronda de la Universitat and Ronda Sant Pere
- Many bus routes, airport shuttles, tourist lines, public bike service and electrical charging stations
- Related to the private mobility services, plaça Catalunya offer different taxi stalls, shared mobility companies.

- Several public mobility services under and above the square; local, national an international trains, metro lines
- The most of the jobs generate in the hub are in the service sector, such as transports, hotels, restaurants and bars, markets and shopping centers, etc.

Barcelona mobility hub: Plaça de Catalunya

Mobility services

- Metro: 2 lines
- Train (Rodalies Renfe): 3 lines
- Train (FGC): 7 lines
- Bus: 7 stops
- Tourist Bus: 2 lines
- Catalunya bus turistics: 6 lines
- Airport bus: 2 lines
- Bike (Bicing): 5 stations
- Charging stations: 5
- Taxi: 4 stops
- Scooter sharing: 5 companies
- Car sharing: 2 companies

Non mobility services

- Libraries
- Pubs
- Theater: Club Capitol Theater
- Guest houses and hotels
- University: Centre de Suport de la Universitat Oberta de Catalunya
- Pharmacies
- Commercial center: El Corte Ingles
- Shops
- Banks
- Money change offices
- Info points
- Luggage storages
- Ticket machines
- Lost and found office
- Toilets

Barcelona mobility hub: Plaça de Catalunya

Rows: variables related to transport services (public and private), users (flows, quality), hub facilities (parking information, security, accessibility, non mobility services, shops)

Columns: current values of variables considered and two expected targets were identified, that's 2022 (eventual end of the SOUL project) and 2024 (Barcelona SUMP scenario)

PLAÇA CATALUNYA - BARCELONA					
Thematics	**Aspects**	**Measures**	**2019**	**2022**	**2024**
Transport services	Train departures	Trains/day (FGC)	5031	5200	5300
		Trains/day (Rodalies)	Pending	Pending	Pending
	Metro departures	Metro/rush hour	57	58	60
		Metro (time between trains in each line/rush hour)	3'18''	3'15''	3'13''
		Metro/day	1.100 (63.000 Pass.)	1152 (66000)	1188 (68000)
	Bus departures	Bus/day	600	628	648
		Touristic bus/day	2818	2951	3043
		CatalunyaBusTuristic bus/day	Pending	Pending	Pending
		TibidaBus/day	Pending	Pending	Pending
	Airport bus services	Airport Bus passengers/day	15000	15707	16200
	Bicing services	Bicing ranks	5	5-6	6-7
		Bicing stalls	121	155	184
	Mall transfers	Mall service bus/day	N.A.	N.A.	N.A.
	Taxi services	Taxi ranks	4	-	-
		Taxi stalls	40	-	-
		Electric car - Public Charging Stations	3	5	6
		Motorbike - Public Charging Stations	2	4	6
	Sharing services	Car sharing/day (started and ended)	- -	-	-
		Scooter sharing/day (started and ended)	- -	-	-
		Bike sharing/day (started and ended)	- -	-	-
		E-mobility/day (started and ended)	- -	-	-
Users	Flows	Pedestrians/day	160000	163600	166054
	Quality	Comfortable area	-	-	-
		Security perception	-	-	-
		Traveller info point	1	-	-
Hub facilities	Capacity	Tourist bus stalls	2	-	-
		Rental cars stalls	-	-	-
		Private car stalls	1170	-	-
		Private bike stalls	-	-	-
		Private motorbike stalls	40	-	-
		E-charging columns	5	-	-
	Signage	Parking information	-	-	-
		Digital connectivity for travellers and mobility providers	-	-	-
		Dynamic arrival time table PT stops/Total PT stops	-	-	-
	Accessibility	PT stops accessible/Total PT stops		-	-
		PT vehicles accessible/Total PT vehicles		-	-
	Security	N° of security cameras	-	-	-
		N° of Police Officers/day	-	-	-
		Police Office	1	-	-
	Sustainability	Energy self-sufficiency	-	-	-
	Basic services	Free public WI-FI	3	-	-
		Travel agency	1	-	-
		Ticket machine		-	-
		Post office	-	-	-
		Toilete	-	-	-
		Banks - ATM machine	2	-	-
		Luggage storage	1	-	-
		Lost and found office	-	-	-
	Shops	Malls	2	-	-
		Optic	-	-	-
		Beauty and Wellness	1	-	-
		News and Magazines	2	-	-
		Tobacco	-	-	-
		Hi-tech	3	-	-
		Healtcare	1	-	-
		Accessories	2	-	-
		Food	19	-	-
		Book and Music	1	-	-
		Clothing	13	-	-
	Culture and leisure	Library	2	-	-
		Theater	1	-	-
		Pubs	1	-	-
		Disco club	1	-	-
	Guest house and hotels	Guest houses	3	-	-
		Hotels 2 stars	1	-	-
		Hotels 3 stars	1	-	-
		Hotels 4 stars	5	-	-
	Education	Non-regulated education - Languages	1	-	-
		Regulated education - Universities	1	-	-
	Environment	Trees collection point	2	-	-

Eindhoven mobility hub: P&R Genneper Parken

- Is being built in the South of Eindhoven (Genneper Parken), near the main roads access into the city centre
- Will be connected to the HOV (high quality public transport) lines, in order to reduce the amount of cars entering the city centre
- A great place to shift from private to public or shared mobility solutions
- Will provide 640 parking spots for private or shared cars, 240 sqm of space for shared bikes and scooters, and fast public transport options to the city centre and business campuses in the south of Eindhoven

The hub shares services with the adjacent Motel that has 263 rooms, a Tesla supercharger facility and two restaurants. Additional services in the hub such as parcel distribution points are still under consideration

Eindhoven mobility hub: P&R Genneper Parken

HUB Performance factors

Identification of the multiple factors, useful to define performance parameters for the mobility hub operation

Thematics	Aspects	Measures
Hub location	Logical spot between origin and destination	Verify only, no kpi
	Short distance from regular (car) route	Distance from closest main road
	Close to existing PT connection	Number of busses that stop at hub. Time between busses a
	Congestion free approach route	Travel time / congested travel time ratio. 1 = optimal
	No approach routes through residential districts	Verify only, no kpi
	Location on route before congested road sections	Travel time / congested travel time ratio on approach route
	Distance to PT	less than 250m
Hub Quality	Clear signage	Verify only, no kpi
	Dynamic signage	Yes / No
	Dynamic traffic information and PT timetable to c	Yes / No
	Accuracy of travel time info, indicated/actual	
Social Safety	Safe environment day and night	Questionnare, rating
	Clean and well-maintained	Questionnare, rating
Pricing	HubParking and PT rate combined must be less tha	Hub / innercity parking ratio
Services	Parcel Pickup / dropoff point	Yes / No
	Coffee and Sandwitch	Yes/ No, variety
Travel time	Ratio multimodal trip / car trip no higher than 1,25	in rush hour
	Ratio multimodal trip / car trip Upper limit 1,5	
PT frequency	8- 12 departures / hour	
	min. 4 / hour	
	No PT switchovers to destination	Network map of destinations without switchovers, vs dest
	Switchover time	as short as possible, rate?
	Sufficient PT seating	PT figures on bus occupancy
Choice influencers	Sufficient shared LEVs/Bikes available	capacity / availability
	Reliable PT time table	Time table departure time / actual departure time gap
	High equipment quality	Verify only, no kpi
	No PT congestion	Actual travel time / ideal travel time ratio
	Ease-of-use	Licence plate recognition (yes/no)
		Single ticket parking / PT
		Mobility as a Service available (yes/no)
	Improve bike connection to city centre	Traffic light optimization, bike speed lane
		Availability of parking spaces at destination (ratio with hub
		Financial benefits to hub usage (for daily commute and pri
		Hub tariff (for <10k travellers)
	Demographics of users and target group	Age, income, travel type (commute/private), education, ge

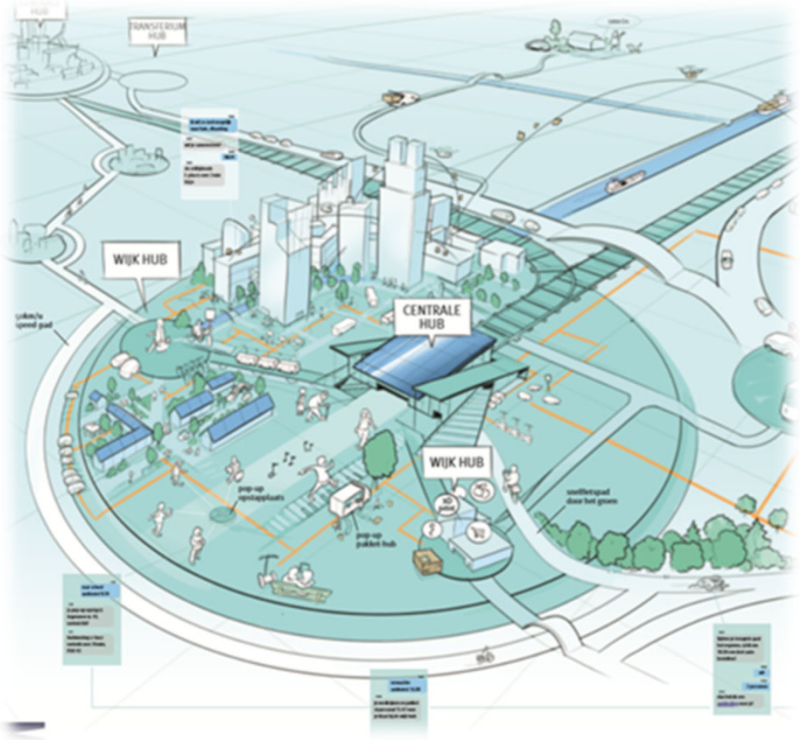
Mobility hubs: smarter, more inclusive, more connected

Mobility hubs are:

- extremely important places for short-term and long-term development of urban transport systems
- extremely complex environments for planning, design, and management

Need to develop customized features in the hub infrastructure and services, responding to different user profiles

Need for higher integration of various transport and non-transport services in the hub, aiming for systemic efficiency and effectiveness



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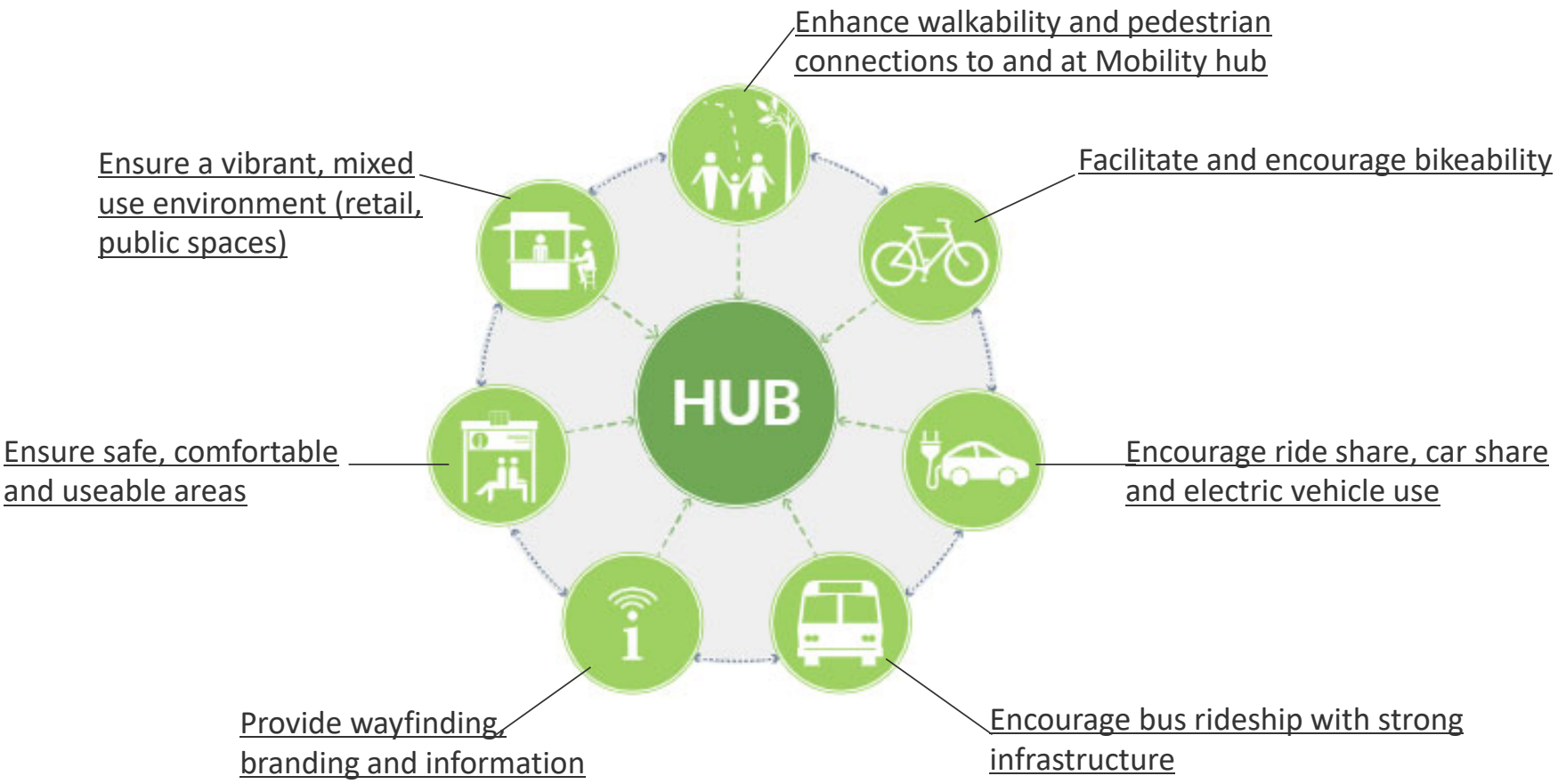
Mobility hubs: smarter, more inclusive, more connected



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DSS and mobility hubs: needs from cities perspective

- The **integration** of **data** from different data sources and providers
- The need to have access to a DSS tool to visualize the hub performance by means of selected key performance indicators (**KPIs**)
- The need to have a DSS tool to support decisions in the **medium** and **long term**

DSS and mobility hubs: pains&gains

Pains in the planning / managing processes

- Defining a common goal
- Access to the information
- new modes of traveling
- Missing data interoperability
- Legal / regulatory barriers
- balancing viability and feasibility with user needs

Gains through the support of SOUL DSS

- clear communication to users
- Better understanding of the needs of the hub
- Evaluate hub performance
- Help to report current situations
- Not only information of mode transport but social networks information
- Reduce the decision process costs

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Thank you!

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