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In the face of uncertainty, fast changing society, and fast moving technology:

Design thinking and co-creation in harnessing local wisdom and green technologies in building a sustainable transport and mobility system

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BMIMI Endowed Professorship in Digitalisation and Automation in Transport and Mobility System

Outline, through 3 different stories:

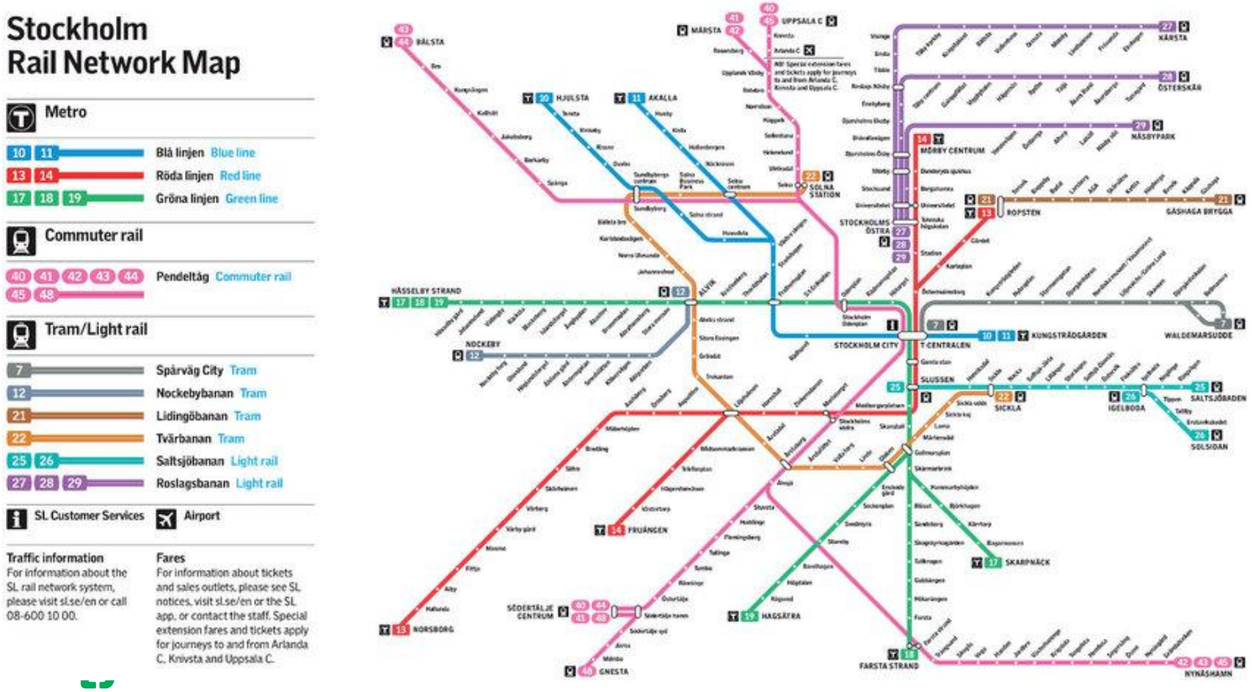
1. Changes and complexity in the transport systems

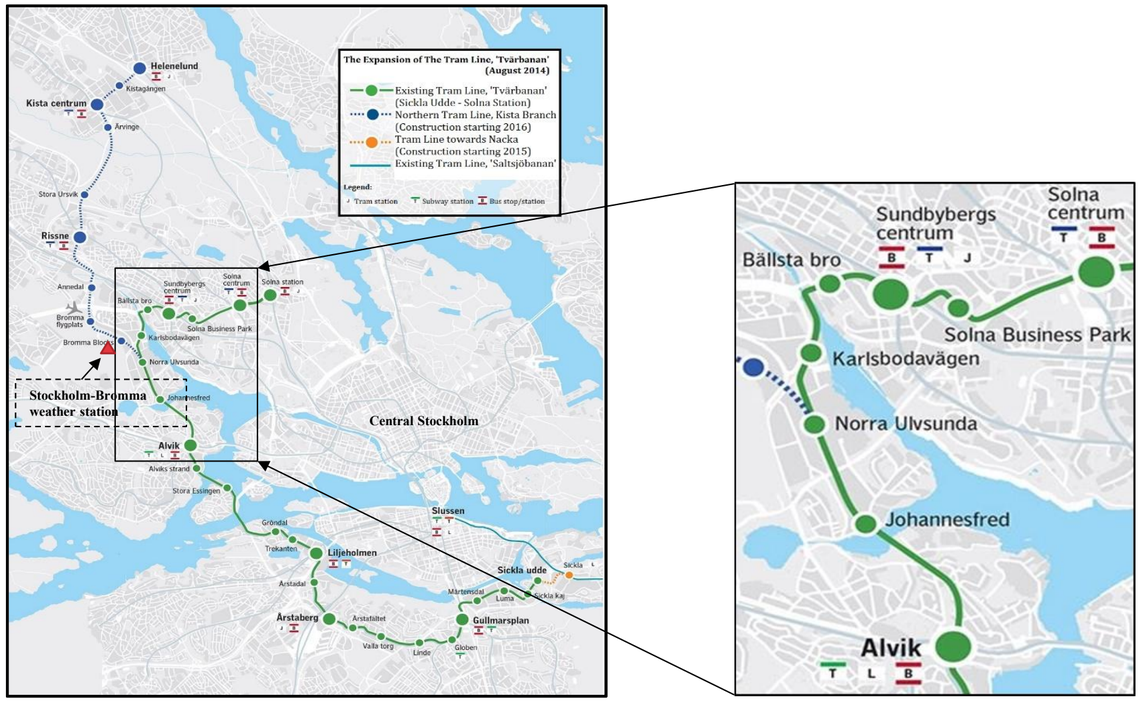
2. Why and how design thinking can help to develop a better system

3. How we can harness local wisdom through co-creation and design thinking

Story 1: Opening of a new LRT extension

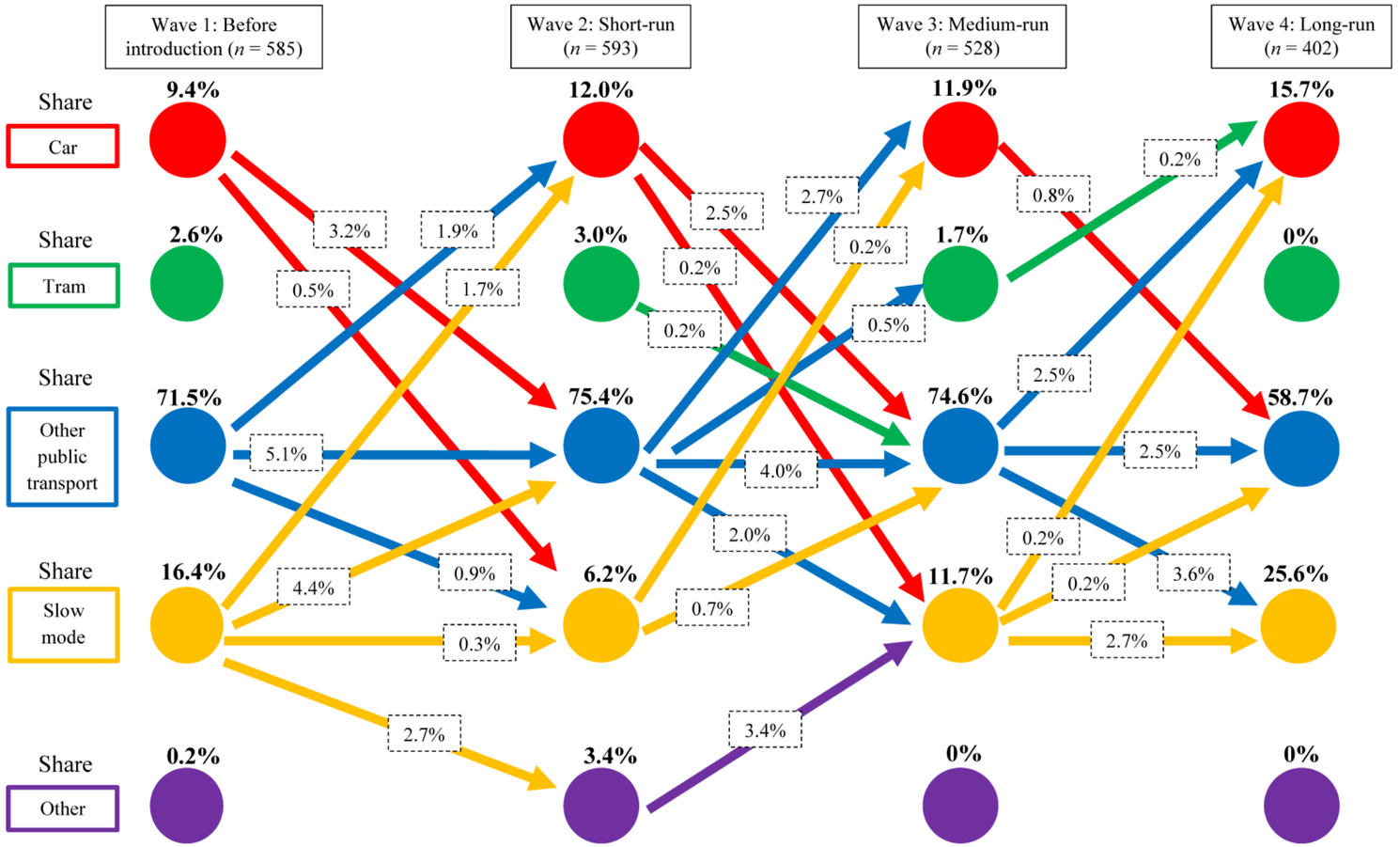
- October 2013: an extension of Stockholm PT transverse line, connecting multiple major interchanges and activity centres
- 4 waves of data collections (2 weeks diary each, N= 400-600)





Source: sll.se

Story 1: Opening of a new LRT extension



- Car drivers who suffered daily congestion made early behavioural change – they jumped to the service pretty soon, but then jumped back not long after – and since they became one of the most unlikely groups to use the service in the future.

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Ahmad Termida, N., Susilo, Y.O. and Franklin, J. (2016) Observing Dynamic Behavioural Responses due to the Extension of a Tram Line by using Panel Survey: Preliminary Analysis. *Transportation Research part A*, 86, pp. 78-95, doi:10.1016/j.tra.2016.02.005.

People behaviour is not a light switch

- Socio-Economic Development
  Population: Size, Age + Gender Structure, Household Structure
  Economy: Income, Employment, Gross Domestic Product, Sector Development --- *proxies of measuring the roles and impacts of local wisdoms*
- Spatial Development
  Accessibility, Choice of Living and Employment Locations
- Development of Preferences and Production Structures
  Behaviour Patterns, Social Values and Norms
- Technological Development
  Vehicle Technologies, Infrastructure, Controlling and Signalling
- Changes in the State of the Environment
  as Living Space, Production Resources, Consumption Goods
- Development of Public Governance
  Regulations, Finances, Taxation, Institutions

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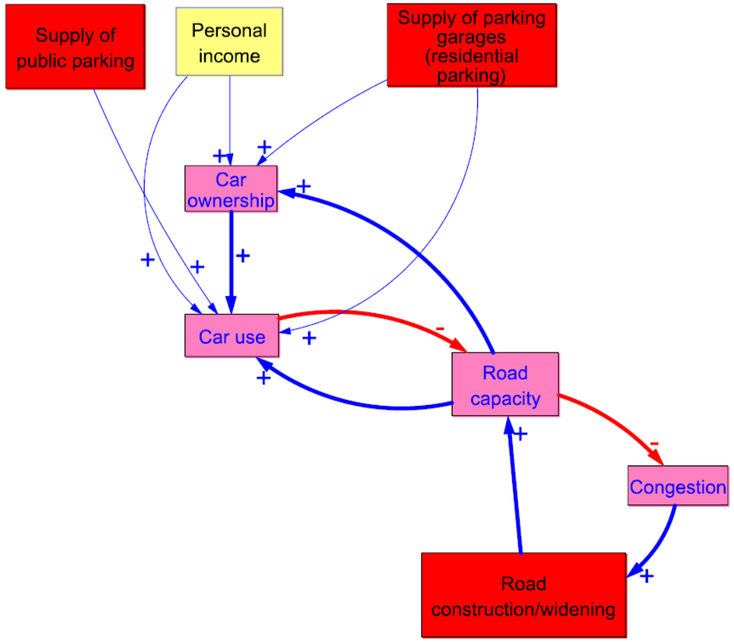
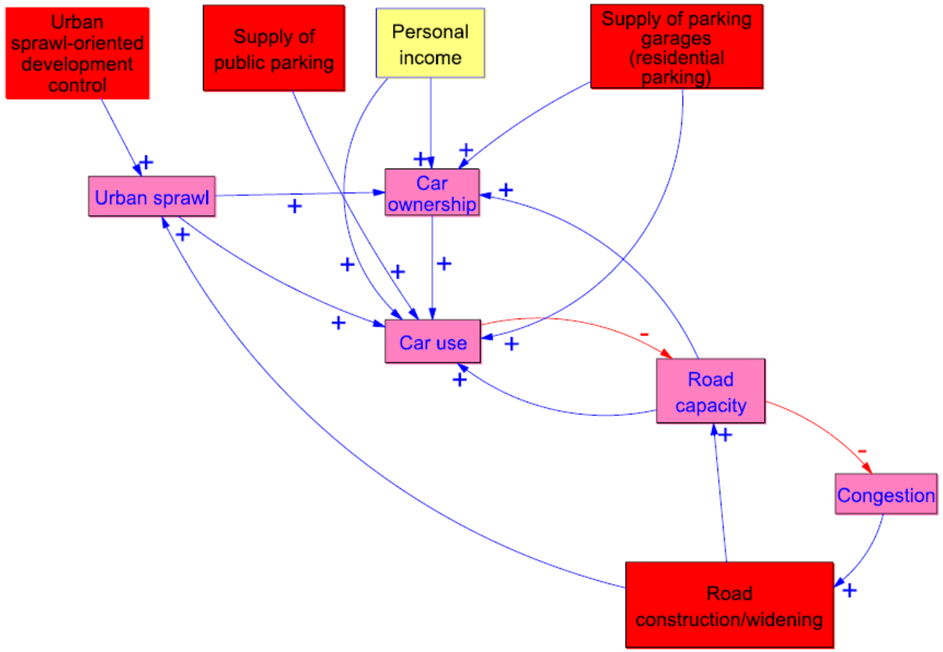
Transport is a wicked problem



Source: R. Pokharel et al., 2023

Notation: + Positive relationship, − Negative relationship, Starting variable, Endogenous variables, Auto-oriented policy variables, Bold links represent parts of the cycles

Transport is a wicked problem



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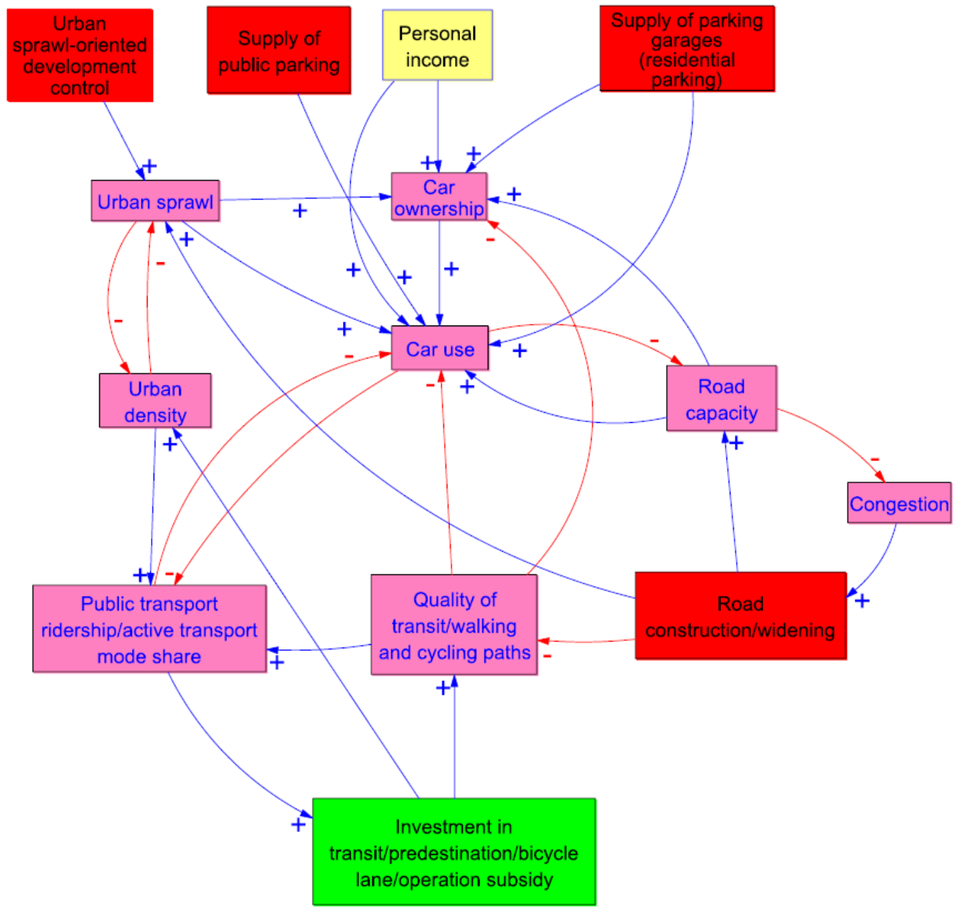
Transport is a wicked problem

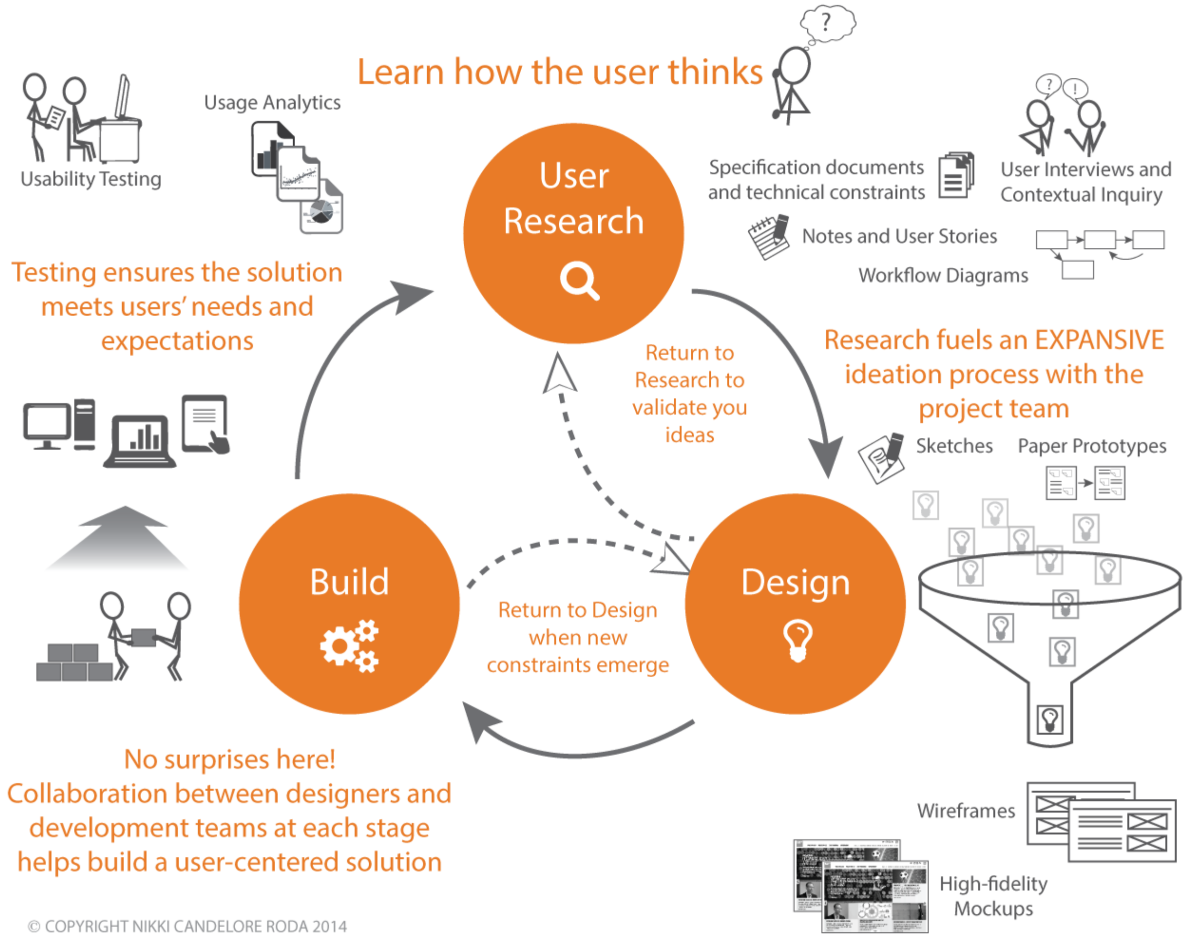


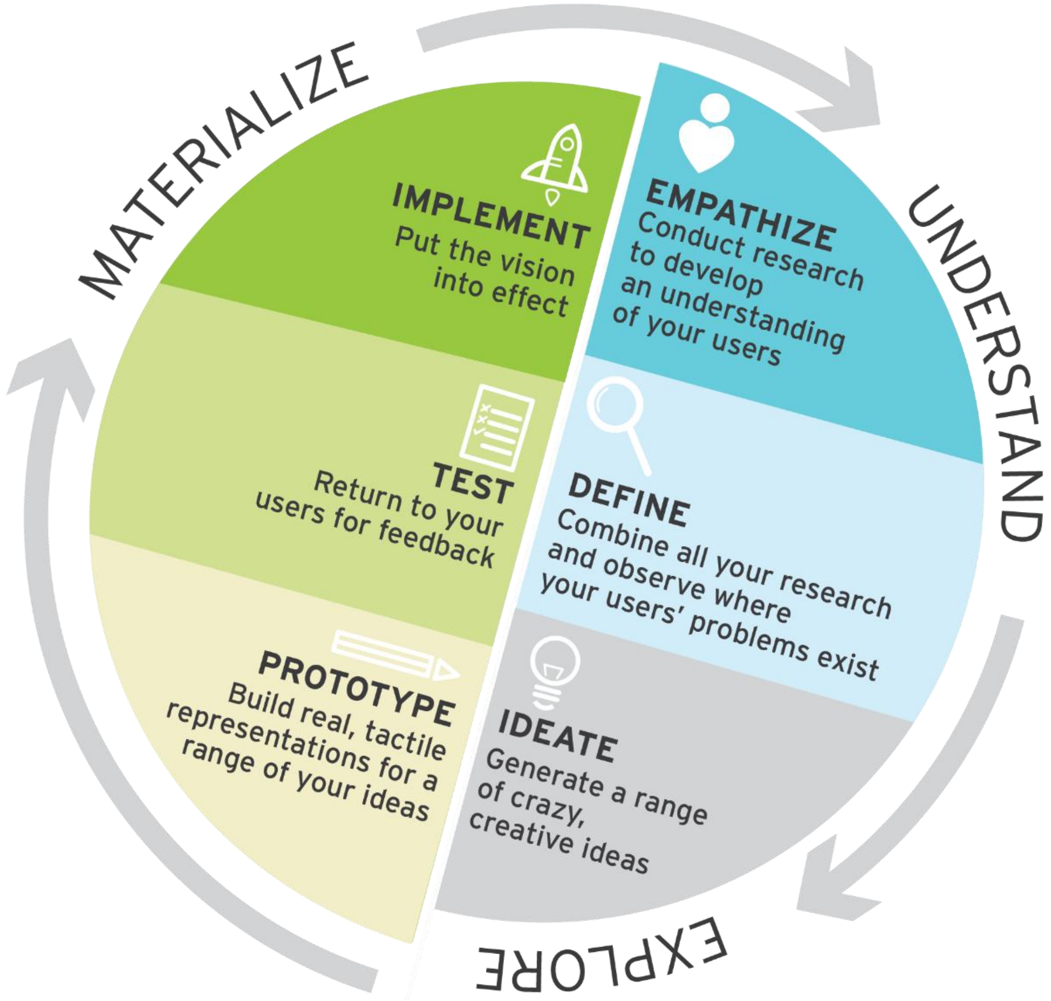
Source: R. Pokharel et al., 2023

Design thinking

- What is design thinking?

"... a methodology that we use to solve complex problems (wicked problems), and it's a way of using systemic reasoning and intuition to explore ideal future states"





Sou[illegible]era, 2023; Tnartscommission.org, 2023

Statistical accuracy vs structural accuracy?

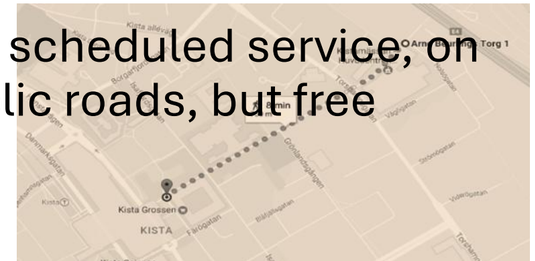
- Two main aspects relate to ‘model fidelity’:
  - Structural accuracy refers to having the correct set of variables in the model, and the correct set of causal relationships linking those variables.
  - Statistical accuracy refers to the exact numerical parameters and functional forms used in defining the model relationships.
- Generally, the emphasis in travel demand modeling has been on statistical accuracy. Such an emphasis may be appropriate for shorter term forecasts, where many variables and relationships can be assumed to remain constant or to be exogenous and one-directional.

- The farther that one expands the time horizon the more important structural accuracy becomes relative to statistical accuracy.

Time and Place:
Stockholm (SE), 2017-2024 & Salzburg (AT), 2020-2021

Story 2: Iterative learning process is important

- SARA1 (Drive Sweden), Kista, Stockholm, Jan-Jul 2018
- Urban setting, 0.75 - 1 km, 10-15’ headway, simple route
- 2 EZ10, “Connecting” metro station to regional train station
- Full scheduled service, on public roads, but free

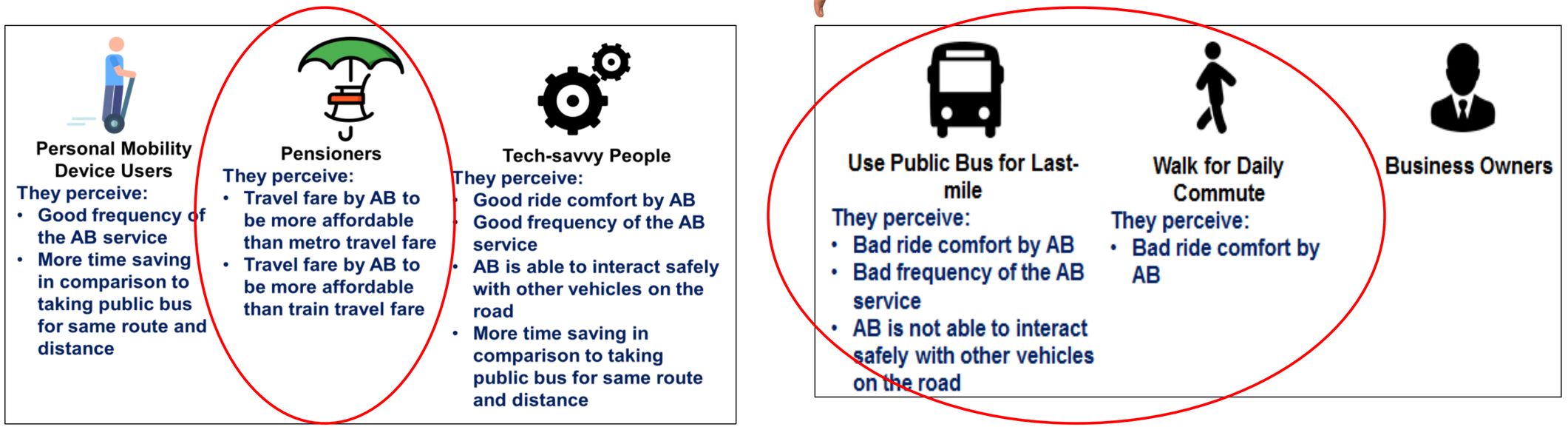


- MMiB (Drive Sweden), Barkarby, Stockholm County, October 2018 – 2024
- Urban residential setting, 2.5 km, 10‘ (weekday), 15’ (weekend) headway
- Step-wise development, 4-6 EZ10s, roundabout, minor-major roads
- Integrated to rest of PT services (route 549), not free

- Digibus Austria (FFG/BMK) Koppl, Salzburg, autumn 2020
- Rural setting, approx. 1.3 km route, hilly terrains
- Few months operations, with a few scheduled services
- Free service, supported by on-demand shuttle service

Story 2: Iterative learning process is important

Technically, the progress of the technology has been visible, but analyzing demand has become a very complex process because the mechanism far from straight forward:



Chee, E.P.N, Susilo, Y.O., and Wong, Y.D. (2020) Determinants of Intention to Use First-/Last-mile Shared Autonomous Bus Service. *Transportation Research part A*, 139, pp. 350 – 375, doi: 10.1016/j.tra.2020.06.001.

Tipping point and higher expectation

		Adopters			Potential-adopters		
Variable		Value	Standard Error	Sig.	Value	Standard Error	Sig.
Attitudinal Variable							
Reliability							
Reliability		.04	.22	.84	.09	.20	.65
Speed		.44	.33	.18	.18	.30	.54
Frequency		.10	.23	.64	.17	.19	.38
Travel time than bus service		.13	.30	.65	.34	.26	.19
Travel time than car		-.01	.29	.98	.02	.26	.94
Safety							
Safety with No operator		.39	.23	.09	.30	.21	.15
Safety with operator		.46	.21	.03	.33	.19	.08
Hacked		-.15	.21	.47	-.30	.19	.11
Informative		.41	.28	.15	-.16	25	.53
Ride comfort							
Pleasant ride		.23	.30	.44	.32	.27	.24
Expectation of comfortability		-.68	.29	.02	-.25	.26	.33
Social demographic							
Gender	Male 1; Female -1	.18	.42	.67	.30	.37	.43
Age	Young 1; Old -1	-.21	.43	.62	.27	.38	.48
Income	Low 1; High-1	.26	.42	.54	31	.37	.41
Car ownership	Own cars 1; Have no car -1	-.93	.57	.10	-.84	.53	.10
Constant		-2.88	1.64	.08	-.86	1.48	.56
Pseudo R-Square		.16					

Tipping point:

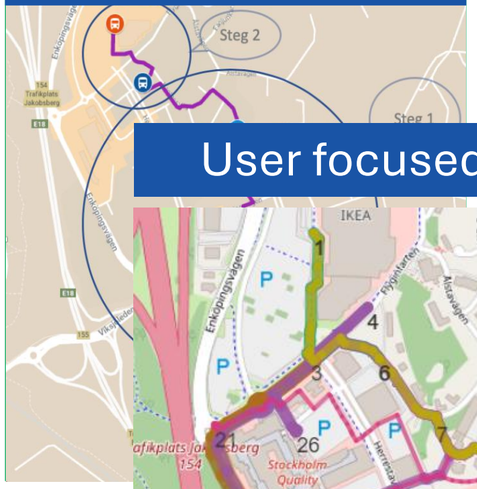
- Safety perception, car ownership, and ability to cope with (or avoiding) disappointment (towards own expectations of what technology could do)

Automated vs Regular Bus:

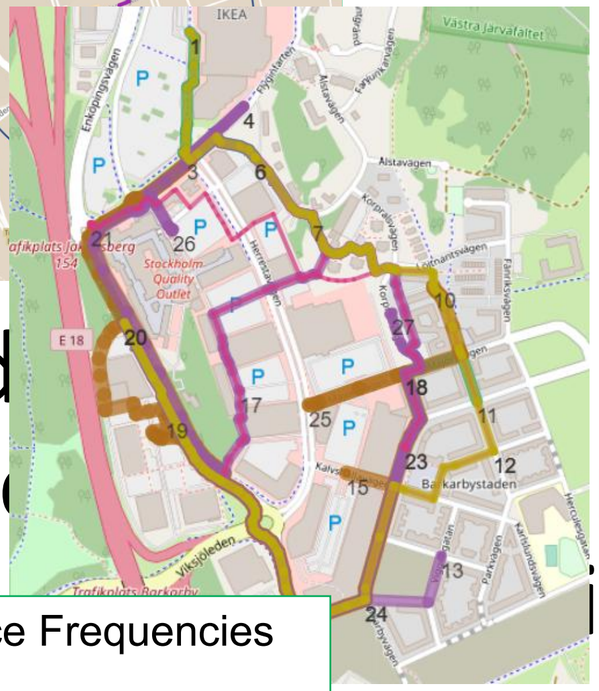
- Automated bus passengers are more sensitive to the drop of LOS, in particular towards frequency and walking distance.

Guo, J., Susilo, Y.O., Antoniou, C. and Pernestål, A. (2021) When and Why do People Choose Automated Buses over Conventional Buses? Results of a Context-dependent Stated Choice Experiment. *Sustainable Cities and Society*, 102842, doi: 10.1016/j.scs.2021.102842.

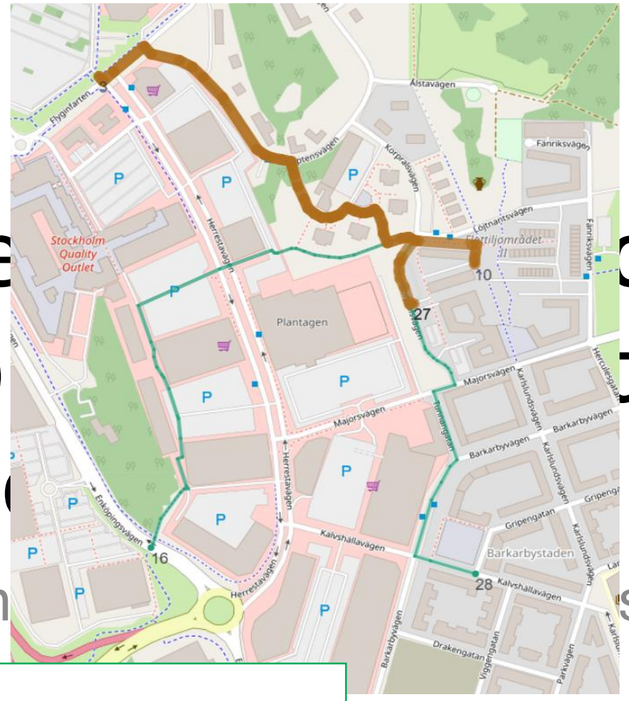
Suggested solution by operator



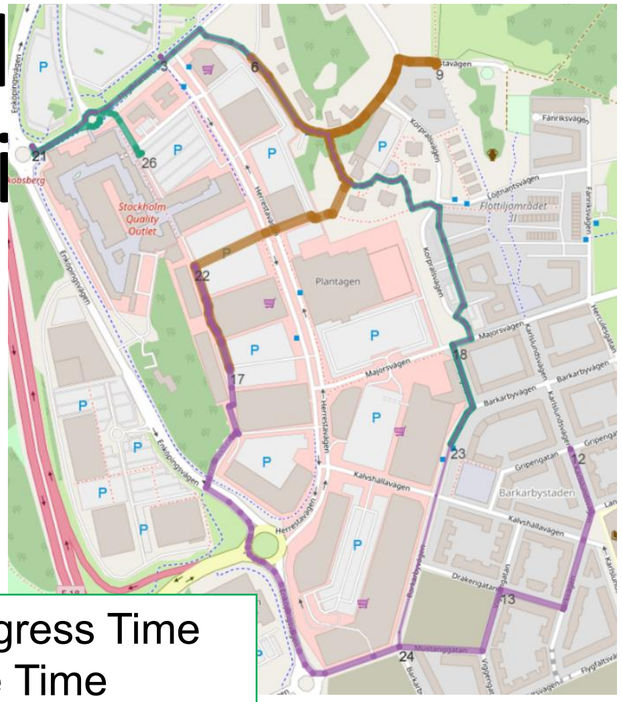
User focused Design



Operator focused Design



Compromise Design



To d … the … cided … seri… n p… thinki… imp… ice …

… had a more th… studies … t the end of …

- High Service Frequencies
- Many lines
- No unsatisfied Demand
- High Infrastructure Cost

- Few lines
- High unsatisfied Demand
- Low Infrastructure Cost

- Low Access/Egress Time
- Low In-Vehicle Time

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Hatzenbühler, J., Cats, O. & Jenelius, E. (2022). Network design for line-based autonomous bus services. Transportation, 49(

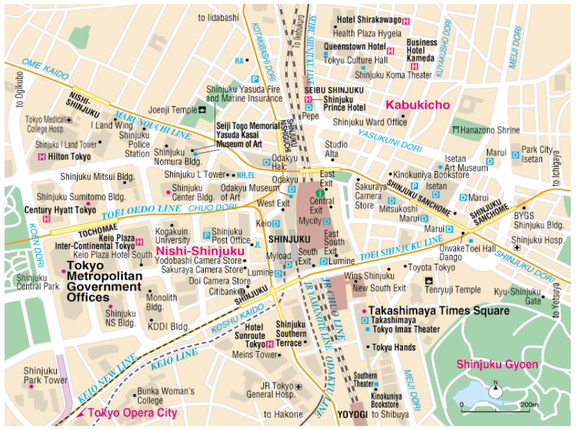
To avoid expensive mistakes, a co-creation process – harnessing the local wisdom - can be a help that we need

In the face of uncertainty, fast changing society, and fast moving technology, we can embrace infinite possibilities through co-creating with locals

Story 3: Creating mobility hubs that make difference

What is a Mobility Hubs, and from where it came from?

- An integrated, multi-modal, land-based MaaS which functions as small, more modern, cheaper, agile and multi-purposes TOD, with more local and personalized basis design.



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Components of mobility hubs

Mobility hubs can be seen as an interface between the transport network and spatial structure of an area. Mobility hubs include a range of different components, This diagram illustrates some of the most commonly used components:

A1: Mobility components: Public Transport

A2: Mobility components: Non - public transport

B: Mobility related components

C: Non-mobility & Urban realm improvement

C: NON-MOBILITY & URBAN REALM IMPROVEMENT

- Package delivery lockers
- Mini fitness or play area
- Café and Co-working space
- Outdoor water fountain

A1: MOBILITY COMPONENTS - PUBLIC TRANSPORT MODES & OTHER PICK UP /DROP OFF:

- Bus
- Tram
- Rail
- Demand responsive mini-buses (all one points)
- Ride hailing, (shared) taxis

A2: MOBILITY COMPONENT: SHARED MOBILITY

- Car share: back to base, one way, electric.
- Bike share: back to base, one way, electric.
- Cargo bike share, cargo bike logistics store
- Other future micro-mobility options e.g. e-scooters, moped share
- Ride sharing

Branded pillar

Mobility hubs require a prominent sign or pillar with a common brand to make them visible to the public. The inclusion of a digital elements in a pillar can provide:

- Access to a local transport website for information on services
- A journey planning service for multi-modal trips
- A way finding option for local walking and cycling trips
- Registration and ticketing
- Customer services.

B: MOBILITY RELATED COMPONENTS

- EV car charging
- Bike parking, (Standard, covered, restricted access, EV charging)
- Bike repair, pumps
- Digital pillar, (transport info, ticketing, way finding, walk distances, local services
- Child car seats, bike seats & trailers
- Community concierge parcel last mile delivery

C: NON-MOBILITY & URBAN REALM IMPROVEMENT

- Improved public realm, safer crossings, step free access, road repairs, adjustments for disabilities.
- Waiting area space, covered, seating, planting, artwork, kiosks for coffee etc.
- Wi-Fi, phone charging

CoMoUK, 2019. UK Mobility Hub Guidance.

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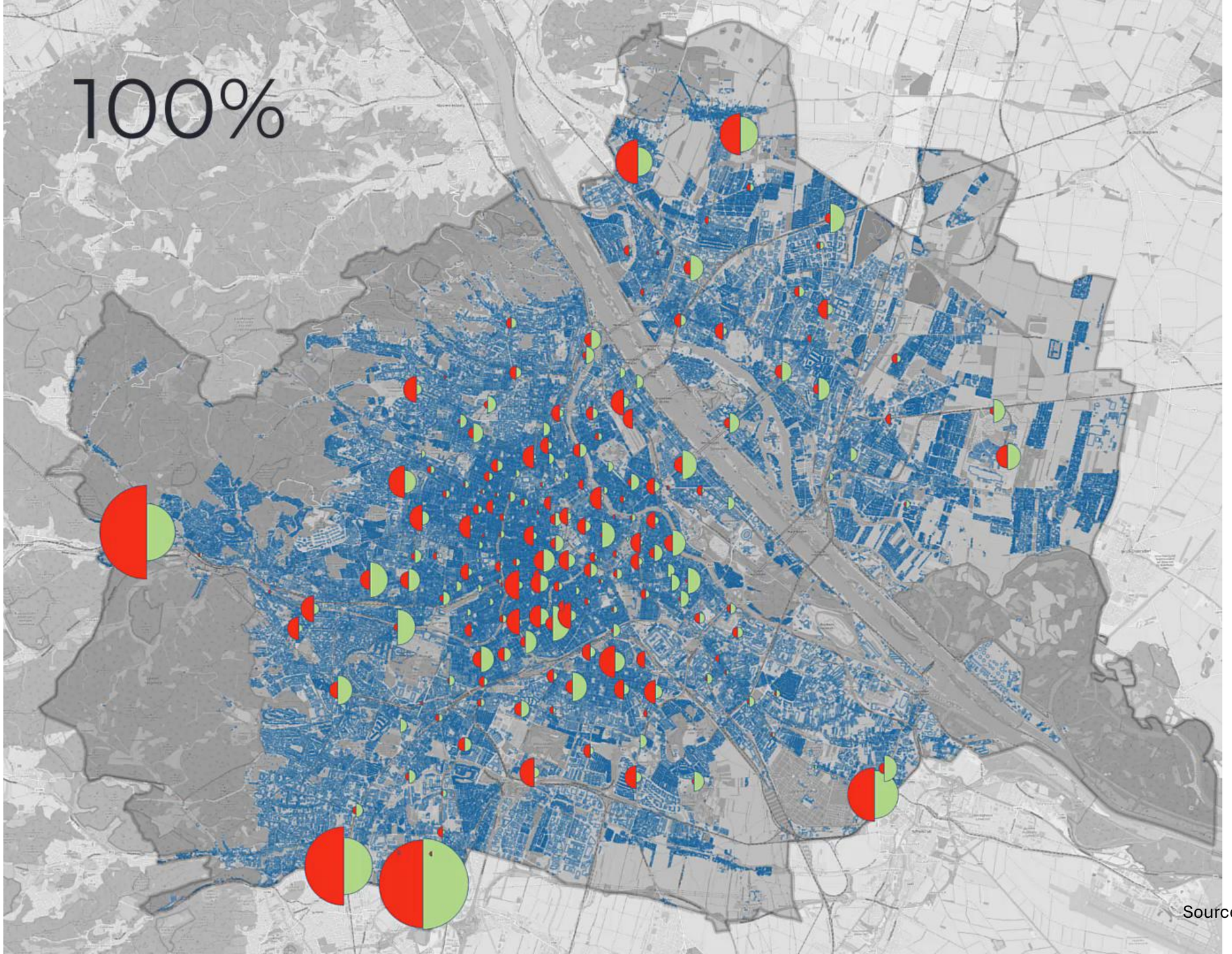
Agent based simulation (MATSim, based on VISUM OD matrix, with 10% population)



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Source: Chrisnawati et al., 2023

News March 14, 2024

Mobility startup MaaS Global files for bankruptcy

The creator of the travel app Whim raised more than €160m in investment and employed 120 people at its peak

Tim Smith 1 min read

MaaS Global, a Finnish mobility startup founded in 2015, has filed for bankruptcy today, according to Helsinki District Court records.

The company raised more than $162m from investors including NordicNinja, BP Ventures, Toyota and Mitsubishi.

Its city travel app Whim enabled customers to see all the available travel options in a city in one place.

electrek

Exclusives Autos Alt. Transport Autonomy Energy Tesla Shop Store

EBIKES

Banned! Why 2023 saw more e-bike and e-scooter bans than ever before

Micah Toll | Dec 26 2023 - 1:11 pm PT | 42 Comments

CNN Business Markets Tech Media Calculators Videos Wat

Scooter sharing company Bird files for bankruptcy

By Peter Valdes-Dapena, CNN

2 minute read · Published 4:00 PM EST, Wed December 20, 2023

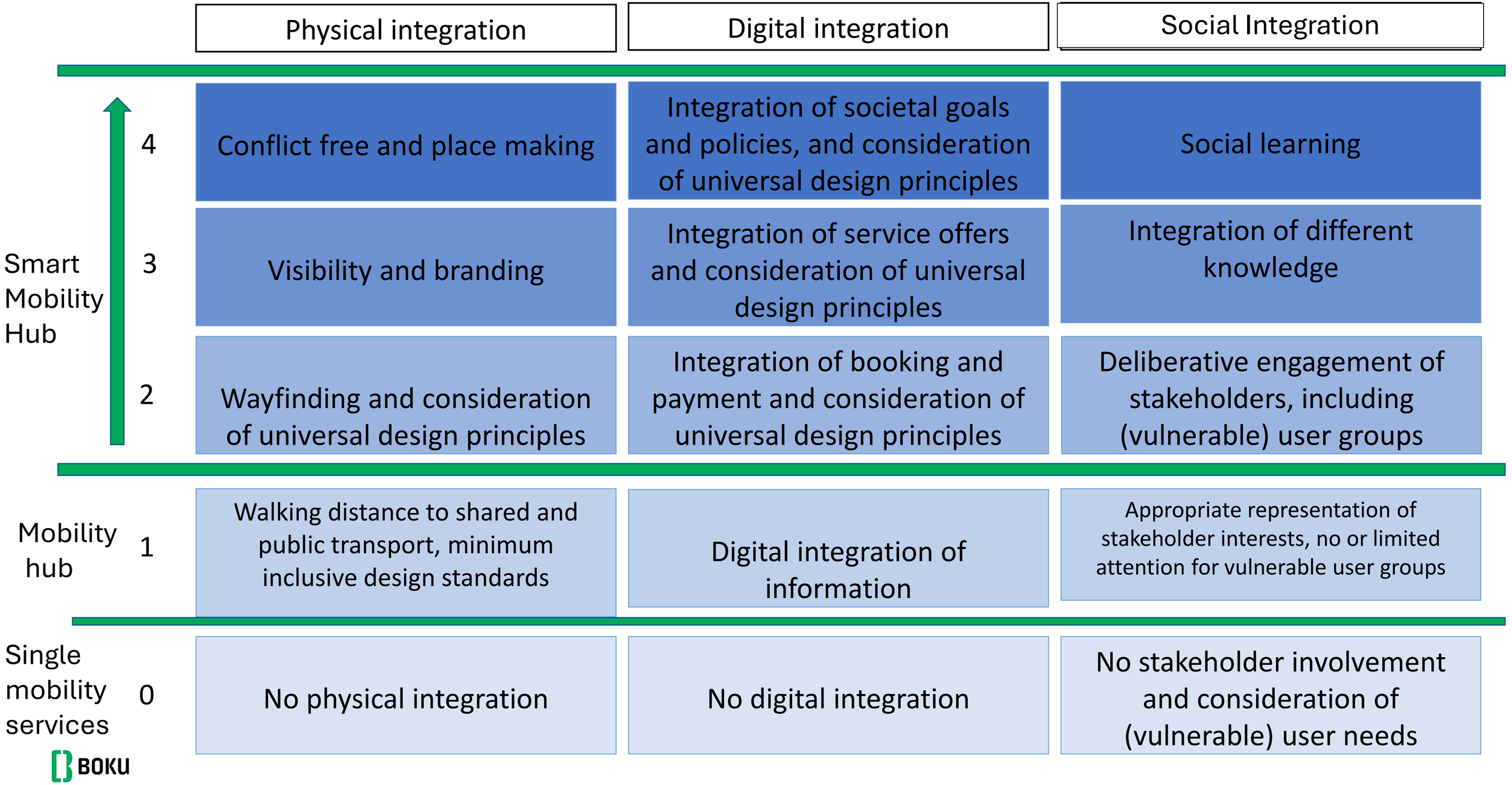
1. Know the targets to aim:

What are the keys of the success of a Mobility Hubs?

User centric design (means: treats the users as ourselves) - 3 integrations ladder

Physical integration

- Locations of mobility hub (residential density, proximity to other activities and services)
- Placement of different modes of transport in the vicinity of each other.
- Design of mobility hubs that are accessible for all (e.g. barrier free)
- Design of mobility hubs that are clearly visible with information and common logos
- Design of mobility hubs as a placemaker


Physical integration
Digital integration
Social Integration
Smart Mobility Hub
4
3
2
Conflict free and place making
Integration of societal goals and policies, and consideration of universal design principles
Social learning
Visibility and branding
Integration of service offers and consideration of universal design principles
Integration of different knowledge
Wayfinding and consideration of universal design principles
Integration of booking and payment and consideration of universal design principles
Deliberative engagement of stakeholders, including (vulnerable) user groups
Mobility hub
1
Walking distance to shared and public transport, minimum inclusive design standards
Digital integration of information
Appropriate representation of stakeholder interests, no or limited attention for vulnerable user groups
Single mobility services
0
No physical integration
No digital integration
No stakeholder involvement and consideration of (vulnerable) user needs
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2. Knowing where we are

- The higher up the ladder, the “smarter” the mobility hub, and the higher the expected impact on user behaviour and societal impacts

- Where are we now on the ladder?

- How can we climb the ladder?

- What are the potential impacts?

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SmartHubs | Mobility Hubs Database | SmartHubs Project | Search

Welcome to the SmartHubs project's Open Data Platform!

The SmartHubs project examines mobility hubs, dedicated on-street locations where citizens can choose from different shared and sustainable mobility options. learn more...

On this platform you are able to view, edit and compare mobility hub learning examples. **Integration levels**, developed by the SmartHubs project team, allow standardized benchmarking and the planning of development goals for hubs. For more information on the integration levels see here: Overview on integration levels

Have a look on all hubs in table view or see which hubs are organized in an hub network on the seperate sub-pages: Hubs, Networks. For research and innovation projects with dedicated case study hubs have a look on this sub-page.

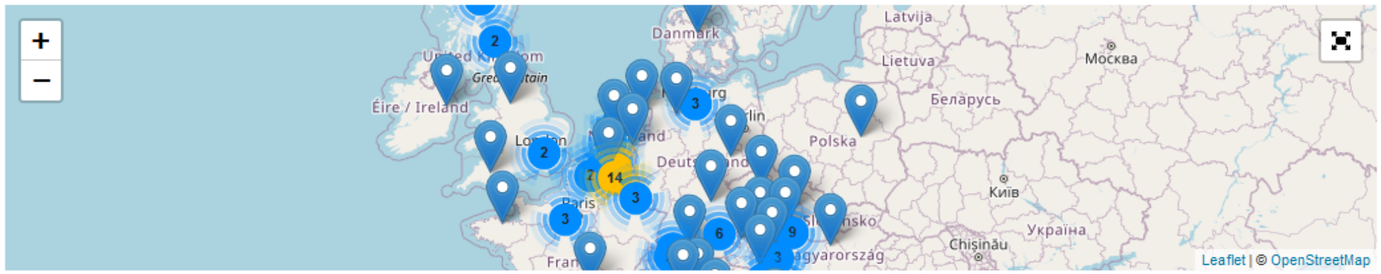
Submit a Hub

in the database: **154** Hubs (**9** of which are Case Studies in the SmartHubs Project), **26** Mobility Hub Networks

Mobility Hubs

data.smartmobilityhubs.eu

FILTER
Typology: central-urban · national · rural · urban-fringe · urban-large · urban-small
Smartness: Mobility Hub · Single Mobility Services
Physical Integration Level: 0 · 1 · 2
Digital Integration Level: 0 · 1 · 2
Democratic Integration Level: 0 · 1 · 2



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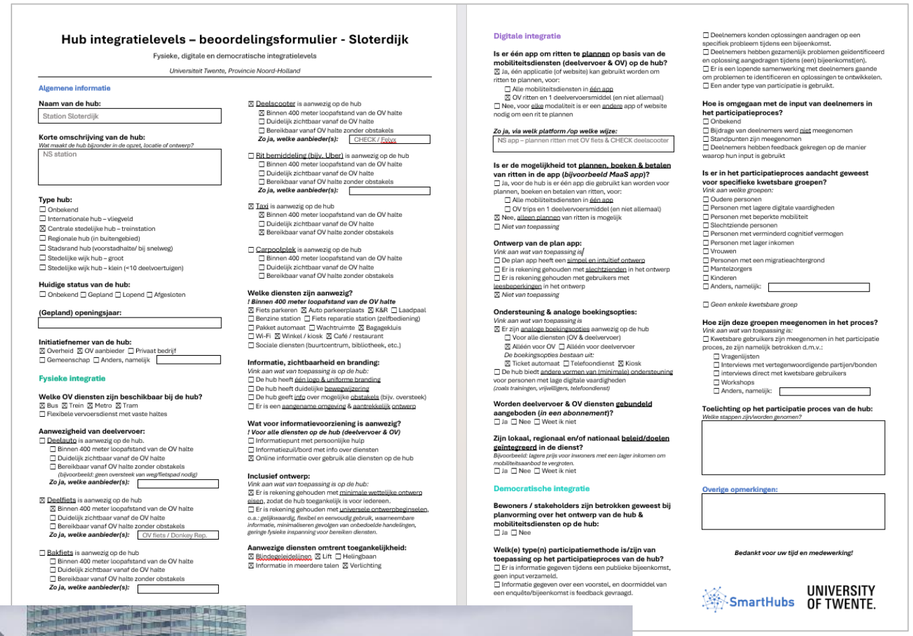
SmartHubs

Application of the SmartHubs integration ladder (3)

Application for Dutch hubs



Hub integratielevels – beoordelingsformulier - Sloterdijk

Fysieke, digitale en democratische integratielevels

Universiteit Twente, Provincie Noord-Holland

Algemene informatie

Naam van de hub: Station Sloterdijk

Korte omschrijving van de hub: *Wat maakt de hub bijzonder in de opzet, locatie of ontwerp?* NS station

Type hub:
☐ Onbekend ☐ Gepland ☐ Lopend ☐ Afgesloten
☐ Internationale hub – vliegveld
☒ Centrale stedelijke hub – treinstation
☐ Regionale hub (in buitengebied)
☐ Stadsrand hub (voorstadshaltes/ bij snelweg)
☐ Stedelijke wijk hub – groot
☐ Stedelijke wijk hub – klein (<10 deelvoertuigen)

Huidige status van de hub:
☐ Onbekend ☐ Gepland ☐ Lopend ☐ Afgesloten

(Gepland) openingsjaar:

Initiatiefnemer van de hub:
☒ Overheid ☒ OV aanbieder ☐ Privaat bedrijf
☐ Gemeenschap ☐ Anders, namelijk:

Fysieke integratie

Welke OV diensten zijn beschikbaar bij de hub?
☒ Bus ☒ Trein ☒ Metro ☒ Tram
☐ Flexibele vervoersdienst met vaste haltes

Aanwezigheid van deelvervoer:

☐ Deelauto is aanwezig op de hub.
☐ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels
(bijvoorbeeld geen oversteek van weg/fietspad nodig)
Zo ja, welke aanbieder(s):

☒ Deelfiets is aanwezig op de hub
☒ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels
Zo ja, welke aanbieder(s): OV fiets / Donkey Rep.

☐ Bakfiets is aanwezig op de hub
☐ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels
Zo ja, welke aanbieder(s):

☒ Deelscooter is aanwezig op de hub
☒ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels
Zo ja, welke aanbieder(s): CHECK / Felyx

☐ Rit bemiddeling (bijv. Uber) is aanwezig op de hub
☐ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels
Zo ja, welke aanbieder(s):

☒ Taxi is aanwezig op de hub
☒ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☒ Bereikbaar vanaf OV halte zonder obstakels

☐ Carpoolplek is aanwezig op de hub
☐ Binnen 400 meter loopafstand van de OV halte
☐ Duidelijk zichtbaar vanaf de OV halte
☐ Bereikbaar vanaf OV halte zonder obstakels

Welke diensten zijn aanwezig?
I Binnen 400 meter loopafstand van de OV halte
☒ Fiets parkeren ☒ Auto parkeerplaats ☒ K&R ☐ Laadpaal
☐ Benzine station ☐ Fiets reparatie station (zelfbediening)
☐ Pakket automaat ☐ Wachtruimte ☒ Bagagekluis
☐ Wi-Fi ☒ Winkel / kiosk ☒ Café / restaurant
☐ Sociale diensten (buurtcentrum, bibliotheek, etc.)

Informatie, zichtbaarheid en branding:
Vink aan wat van toepassing is op de hub:
☐ De hub heeft één logo & uniforme branding
☐ De hub heeft duidelijke bewegwijzering
☐ De hub geeft info over mogelijke obstakels (bijv. oversteek)
☐ Er is een aangename omgeving & aantrekkelijk ontwerp

Wat voor informatievoorziening is aanwezig?
I Voor alle diensten op de hub (deelvervoer & OV)
☐ Informatiepunt met persoonlijke hulp
☐ Informatiezuil/bord met info over diensten
☒ Online informatie over gebruik alle diensten op de hub

Inclusief ontwerp:
Vink aan wat van toepassing is op de hub:
☒ Er is rekening gehouden met minimale wettelijke ontwerp eisen, zodat de hub toegankelijk is voor iedereen.
☐ Er is rekening gehouden met universele ontwerpbeginselen, o.a.: gelijkwaardig, flexibel en eenvoudig gebruik, waarneembare informatie, minimaliseren gevolgen van onbedoelde handelingen, geringe fysieke inspanning voor bereiken diensten.

Aanwezige diensten omtrent toegankelijkheid:
☒ Bindingsleidingen ☒ Lift ☐ Hellingbaan
☒ Informatie in meerdere talen ☒ Verlichting

Digitale integratie

Is er één app om ritten te plannen op basis van de mobiliteitsdiensten (deelvervoer & OV) op de hub?
☒ Ja, één applicatie (of website) kan gebruikt worden om ritten te plannen, voor:
☐ Alle mobiliteitsdiensten in één app
☒ OV ritten en 1 deelvervoersmiddel (en niet allemaal)
☐ Nee, voor elke modaliteit is er een andere app of website nodig om een rit te plannen

Zo ja, via welk platform /op welke wijze:
NS app – plannen ritten met OV fiets & CHECK deelscooter

Is er de mogelijkheid tot plannen, boeken & betalen van ritten in de app *(bijvoorbeeld MaaS app)*?
☐ Ja, voor de hub is er één app die gebruikt kan worden voor plannen, boeken en betalen van ritten, voor:
☐ Alle mobiliteitsdiensten in één app
☐ OV trips en 1 deelvervoersmiddel (en niet allemaal)
☒ Nee, alleen plannen van ritten is mogelijk
☐ *Niet van toepassing*

Ontwerp van de plan app:
Vink aan wat van toepassing is/
☐ De plan app heeft een simpel en intuïtief ontwerp
☐ Er is rekening gehouden met slechtzienden in het ontwerp
☐ Er is rekening gehouden met gebruikers met leesbeperkingen in het ontwerp
☒ *Niet van toepassing*

Ondersteuning & analoge boekingsopties:
Vink aan wat van toepassing is
☒ Er zijn analoge boekingsopties aanwezig op de hub
☐ Voor alle diensten (OV & deelvervoer)
☒ Alléén voor OV ☐ Alléén voor deelvervoer
De boekingsopties bestaan uit:
☒ Ticket automaat ☐ Telefoondienst ☒ Kiosk
☐ De hub biedt andere vormen van (minimale) ondersteuning voor personen met lage digitale vaardigheden
(oude trainingen, vrijwilligers, telefoondienst)

Worden deelvervoer & OV diensten gebundeld aangeboden (*in een abonnement*)?
☐ Ja ☐ Nee ☐ Weet ik niet

Zijn lokaal, regionaal en/of nationaal beleid/doelen geïntegreerd in de dienst?
Bijvoorbeeld: lagere prijs voor inwoners met een lager inkomen om mobiliteitsarmoed te vergroten.
☐ Ja ☐ Nee ☐ Weet ik niet

Democratische integratie

Bewoners / stakeholders zijn betrokken geweest bij planvorming over het ontwerp van de hub & mobiliteitsdiensten op de hub:
☐ Ja ☐ Nee

Welk(e) type(n) participatiemethode is/zijn van toepassing op het participatieproces van de hub?
☐ Er is informatie gegeven tijdens een publieke bijeenkomst, geen input verzameld.
☐ Informatie gegeven over een voorstel, en doormiddel van een enquête/bijeenkomst is feedback gevraagd.
☐ Deelnemers konden oplossingen aandragen op een specifiek probleem tijdens een bijeenkomst.
☐ Deelnemers hebben gezamenlijk problemen geïdentificeerd en oplossing aangedragen tijdens (een) bijeenkomst(en).
☐ Er is een lopende samenwerking met deelnemers gaande om problemen te identificeren en oplossingen te ontwikkelen.
☐ Een ander type van participatie is gebruikt.

Hoe is omgegaan met de input van deelnemers in het participatieproces?
☐ Onbekend
☐ Bijdrage van deelnemers werd niet meegenomen
☐ Standpunten zijn meegenomen
☐ Deelnemers hebben feedback gekregen op de manier waarop hun input is gebruikt

Is er in het participatieproces aandacht geweest voor specifieke kwetsbare groepen?
Vink aan welke groepen:
☐ Oudere personen
☐ Personen met lagere digitale vaardigheden
☐ Personen met beperkte mobiliteit
☐ Slechtziende personen
☐ Personen met verminderd cognitief vermogen
☐ Personen met lager inkomen
☐ Vrouwen
☐ Personen met een migratieachtergrond
☐ Mantelzorgers
☐ Kinderen
☐ Anders, namelijk:

☐ *Geen enkele kwetsbare groep*

Hoe zijn deze groepen meegenomen in het proces?
Vink aan wat van toepassing is:
☐ Kwetsbare gebruikers zijn meegenomen in het participatie proces, zo zijn namelijk betrokken d.m.v.:
☐ Vragenlijsten
☐ Interviews met vertegenwoordigende partijen/bonden
☐ Interviews direct met kwetsbare gebruikers
☐ Workshops
☐ Anders, namelijk:

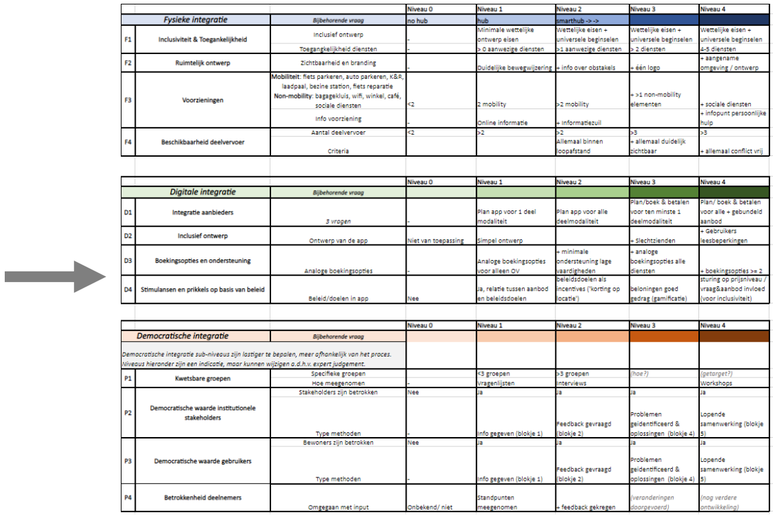
Toelichting op het participatie proces van de hub:
Welke stappen zijn/worden genomen?

Overige opmerkingen:

Bedankt voor uw tijd en medewerking!

SmartHubs UNIVERSITY OF TWENTE.

2-page questionnaire
(based on ODP)
- *Pre filled by UT*
- *Checked by local project leader*

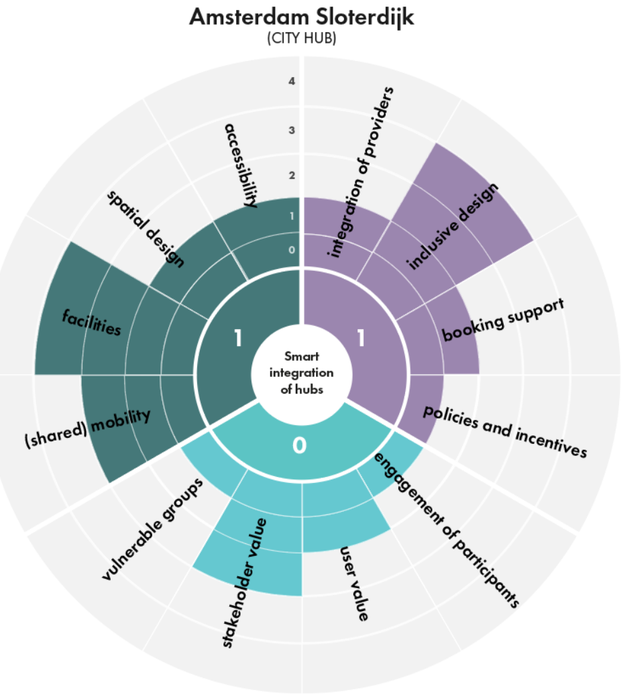


			Niveau 0	Niveau 1	Niveau 2	Niveau 3	Niveau 4
	Fysieke integratie	*Bijbehorende vraag*	no hub	hub	stedelijke hub		
F1	Inclusiviteit & Toegankelijkheid	Inclusief ontwerp	-	Minimale wettelijke ontwerp eisen	Wettelijke eisen + universele beginselen	Wettelijke eisen + universele beginselen	Wettelijke eisen + universele beginselen
		Toegankelijkheid diensten	-	> 0 aanwezige diensten	>1 aanwezige diensten	> 2 diensten	&3 diensten
F2	Ruimtelijk ontwerp	Zichtbaarheid en branding	-	Duidelijke bewegwijzering	+ info over obstakels	+ één logo	+ aangename omgeving / ontwerp
F3	Voorzieningen	Mobiliteit: fiets parkeren, auto parkeren, K&R, laadpaal, bezine station, fiets reparatie Non-mobility: bagagekluis, wifi, winkel, café, sociale diensten	>2	2 mobility	>2 mobility	+ >1 non-mobility elementen	+ sociale diensten
		info voorziening	-	Online informatie	+ informatiezuil		+ infopunt persoonlijke hulp
F4	Beschikbaarheid deelvervoer	Aantal deelvervoer	>2	>2	>2	>3	>3
		Criteria			Allemaal binnen loopafstand	+ allemaal duidelijk zichtbaar	+ allemaal conflict vrij

			Niveau 0	Niveau 1	Niveau 2	Niveau 3	Niveau 4
	Digitale integratie	*Bijbehorende vraag*					
D1	Integratie aanbieders	*3 vragen*	-	Plan app voor 1 deel modaliteit	Plan app voor alle deelmodaliteit	Plan/boek & betalen voor ten minste 1 deelmodaliteit	Plan/ boek & betalen voor alle + gebundeld aanbod
D2	Inclusief ontwerp	Ontwerp van de app	Niet van toepassing	Simpel ontwerp		- Slechtzienden	+ Gebruikers leesbeperkingen
D3	Boekingsopties en ondersteuning	Analoge boekingsopties		Analoge boekingsopties voor alleen OV	+ minimale ondersteuning lage vaardigheden + analoge boekingsopties alle diensten		+ boekingsopties >= 2
D4	Stimulansen en prikkels op basis van beleid	Beleid/doelen in app	Nee	Ja, relatie tussen aanbod en beleidsdoelen	beleidsdoelen als incentives ('korting op oceatie')	beloningen goed gedrag (gamificatie)	sturing op prijsniveau / vraag&aanbod invloed (voor inclusiviteit)

			Niveau 0	Niveau 1	Niveau 2	Niveau 3	Niveau 4
	Democratische integratie	*Bijbehorende vraag*					
	Democratische integratie sub-niveaus zijn lastiger te bepalen, meer afhankelijk van het proces. Niveaus hieronder zijn een indicatie, maar kunnen wijzigen o.d.h.v. expert judgement.						
P1	Kwetsbare groepen	Specifieke groepen		<3 groepen	>3 groepen	*(hoe?)*	*(getarget?)*
		Hoe meegenomen	-	Vragenlijsten	Interviews		Workshops
P2	Democratische waarde institutionele stakeholders	Stakeholders zijn betrokken	Nee	Ja	Ja	Ja	Ja
		Type methoden	-	Info gegeven (blokje 1)	Feedback gevraagd (blokje 2)	Problemen geïdentificeerd & oplossingen (blokje 4)	Lopende samenwerking (blokje 5)
P3	Democratische waarde gebruikers	Bewoners zijn betrokken	Nee	Ja	Ja	Ja	Ja
		Type methoden	-	Info gegeven (blokje 1)	Feedback gevraagd (blokje 2)	Problemen geïdentificeerd & oplossingen (blokje 4)	Lopende samenwerking (blokje 5)
P4	Betrokkenheid deelnemers	Omgegaan met input	Onbekend/ niet	Standpunten meegenomen	+ feedback gekregen	*veranderingen doorgevoerd)*	*(nog verdere ontwikkeling)*

Computing scores
(based on questionnaire)
- 4 sub-levels



Final scores
Sub-scores & ODP levels

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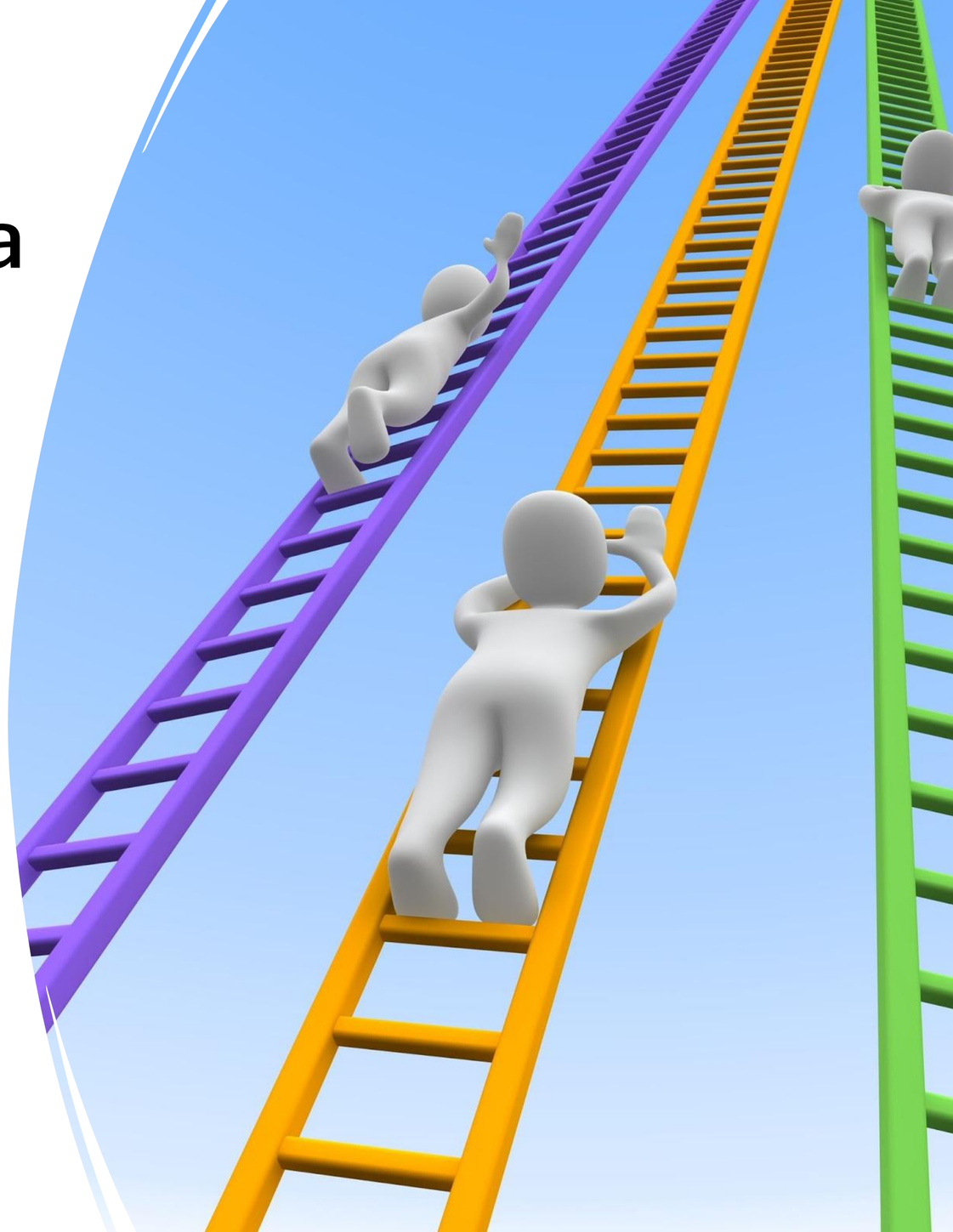
Facilitating cross learning across different local practices and local wisdom

3. Based on local wisdom, how to make our solution a real gamechanger?

1. Experiments with physical, digital and social integration

2. Impact analysis: tools and survey



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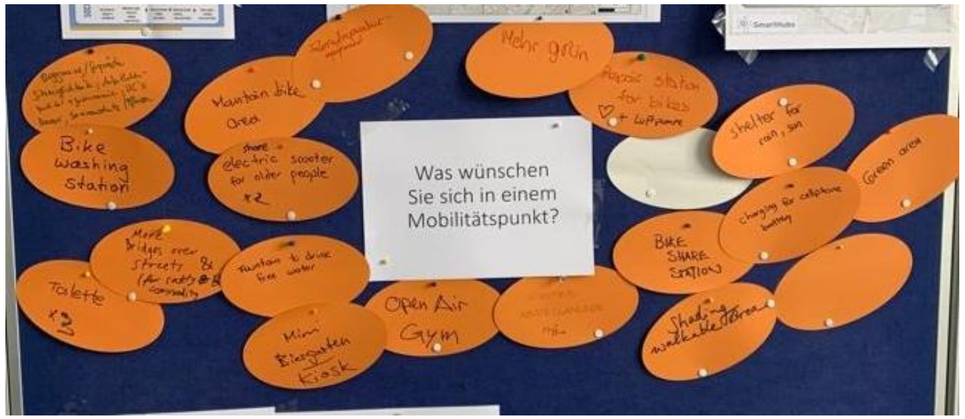
Physical integration: Learning together with local community

Before:

After:



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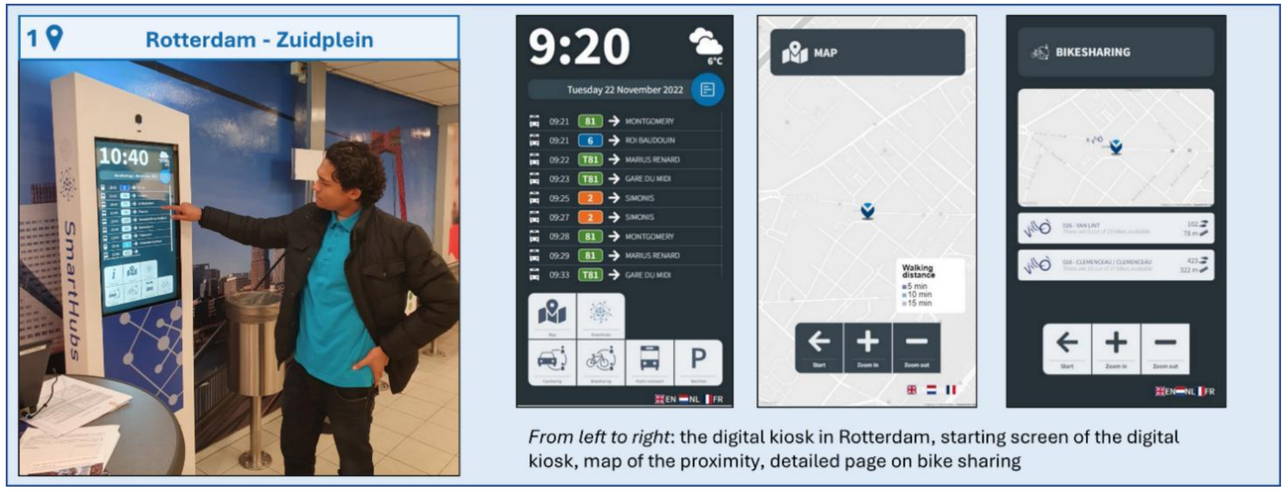
Digital integration:
Working together with the industries - the role of a digital kiosk (Anderlecht, Rotterdam)



From left to right: the digital kiosk in Rotterdam, starting screen of the digital kiosk, map of the proximity, detailed page on bike sharing

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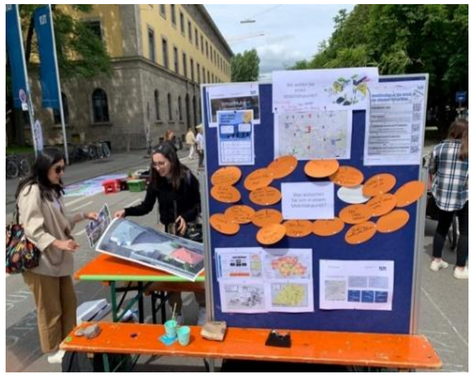
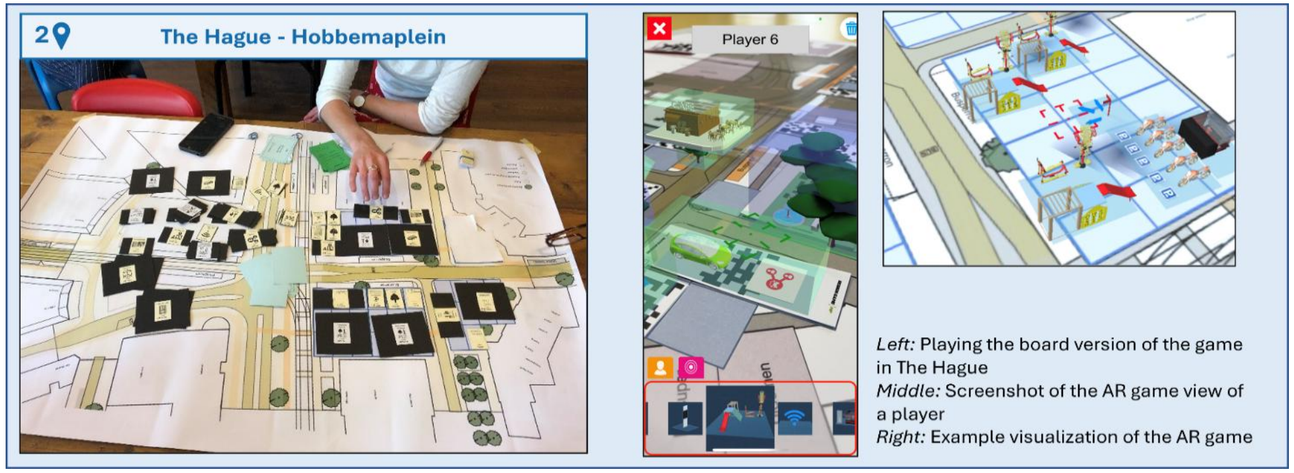
Social integration:
Bring people on-board via co-design games, participation events





Left: Playing the board version of the game in The Hague
Middle: Screenshot of the AR game view of a player
Right: Example visualization of the AR game

Create simple guide to enabling the local stakeholders

1. The integration ladder can be used as a framework to create smarter mobility hubs.
2. The implementation of mobility hubs should be integrated in the local SUMP
3. Selection of the appropriate location for mobility hubs is crucial
4. Carefully consider placemaking as part of hub design
5. Consider the specific needs of vulnerable to exclusion groups
6. A good participation process has a clear goal
7. Use participatory assessment methods to increase the quality of decision-making processes
8. Co-design enables the design of inclusive, context-sensitive mobility hubs
9. Provide training and assistance for citizens with limited digital mobility skills
10. User-friendly interfaces contribute to inclusivity and usage of mobility hubs

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Summary

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What is the take home message?

- By end of the day, both ‘commercial product development’ should not be that different than ‘creating a sustainable transport and mobility system’

- Both of them are involving a complex, users oriented, process and we are there for our customers – and with the rising on-demand services, the urgency to move towards this paradigm will become much more stronger in the future

- It is important to integrate design thinking and co-creation in building a successful sustainable and inclusive transport and mobility system

Acknowledgement

- The mentioned works were produced as a part of various projects' activities, including:
  - SARA1 and MMiB (Modern Mobilitet i Barkarbystaden) projects, which parts of Drive Sweden project, funded by Vinnova, a collaboration led by Nobina AB, with SLL, Järfälla municipality, and KTH ITRL.
  - Research program Sustainable Accessibility and Mobility Services – Mistra SAMS, funded by the Swedish Foundation for Strategic Environmental Research
  - JPI Urban Europe and Driving Urban Transformation programme: SmartHubs
  - FFG/BMK DAVeMoS Endowed Professorship programme

  … and collaboration with multiple researchers and colleagues at KTH Royal Institute of Technology and Institute of Transport Studies at the University of Natural Resources and Life Sciences

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Q&As

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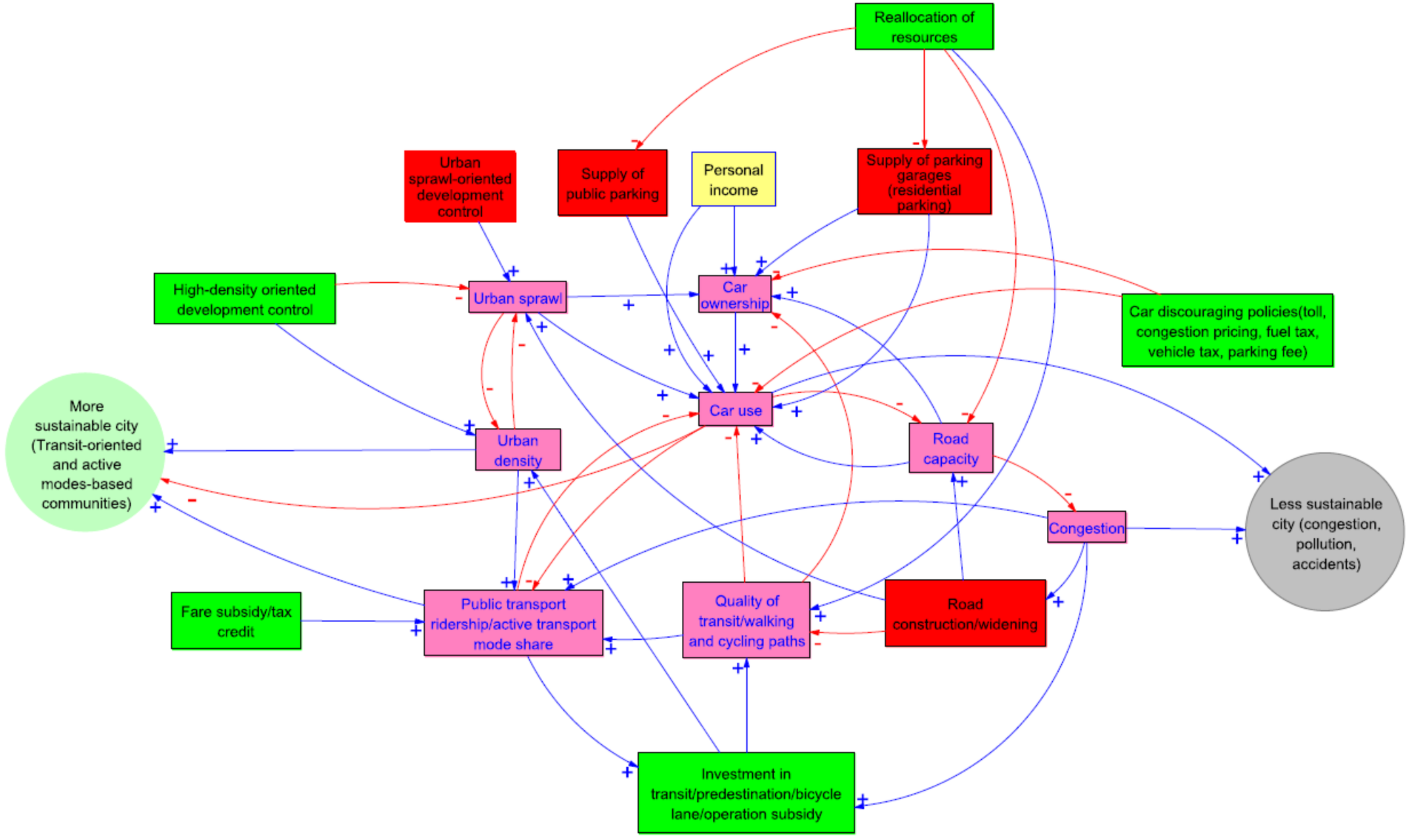
[Merci BOKU]



Notation: + Positive relationship, − Negative relationship, Starting variable, Endogenous variables, Auto-oriented policy variables, Sustainable policy variables.

Source: R. Pokharel et al., 2023

“If Karenin had been a person instead of a dog, he would surely have long since said to Tereza, `Look, I’m sick and tired of carrying that roll in my mouth everyday. Can’t you come up with something different? `And therein lies the whole of man’s plight” (Kundera, 1984; cit. from Huff and Hanson, 1990).

If there is anything that is certain, it is CHANGES - not only the way we behave but also WHY we behave

Even the “local wisdom”—also referred to as indigenous, traditional, or ancestral knowledge— is a product of continuous learning process of the given indigenous society over a very long period
THUS, local wisdom should not be a hindrance of change, but a proof that changes can lead to a better condition

Huff and Hanson (1990) noted, “... happiness is the longing for repetition as well as for variety and change”

Picture Source: akc.org

All good ideas can lead to ‘wrong’ (unexpected) behaviours

… and this is why design thinking in transport and mobility planning is very important

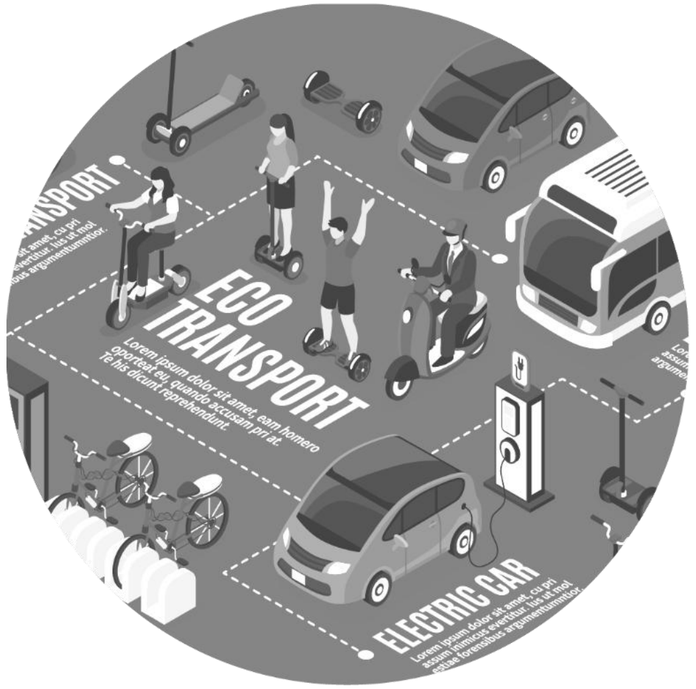
Time and Place:
Stockholm County (SE), 2017-2022

Story 3: When innovation produces opposite effects …

- Working with the local authorities and major national companies, can this solution promote ASI (Avoid-Shift-Improve) for a better societal impacts?

Neighbourhood Telecommuting Centres (NTC)

+



New mobility services

=

optimal work and travel arrangement **tailor-made** to cater to an individual's specific travel needs while **promoting** better quality of life.

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Vaddadi, B., Susilo, Y., and Pernestål, A. (2022) Activity and time-use diary for a neighbourhood telecommuting centre in Stockholm, Sweden. The 16th International Association in Travel Behaviour Research conference, Santiago, Chile

Case study location: Tullinge, Stockholm

- 70% population is commuting
- 345 cars/1,000 inhabitants (70% hh own a car)
- 75% have a functioning bicycle(s)
- 4 lines of buses (15-30 minutes headway)
- The place is provided by the municipality
- 2 waves of recruitments:
  - 20 recruited via facebook among locals
  - 40-50 recruited via company partner (Ericsson, KTH, and the City)

Case study location: Tullinge, Stockholm

52 (67)
active participants

14
workplaces

3
soundproofed rooms

1
meeting room

2
electric bikes

1
electric cargo bikes

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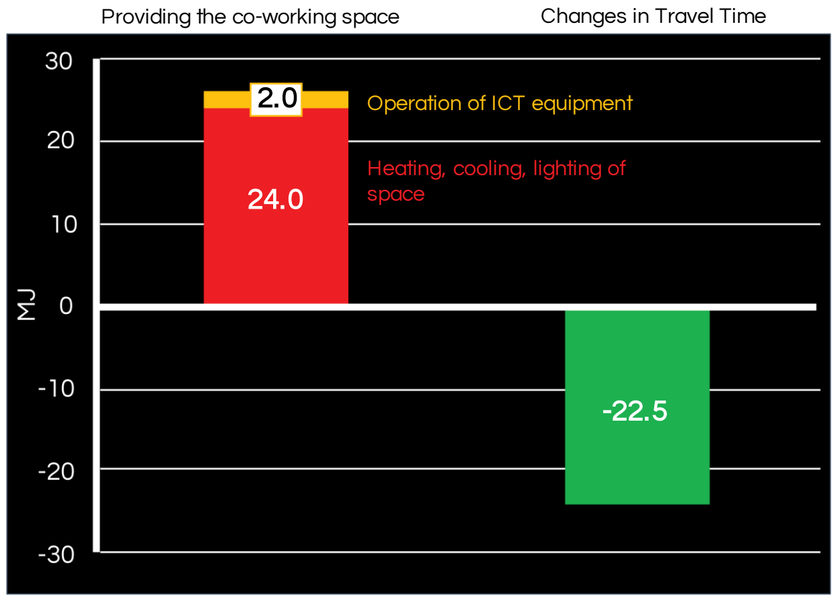
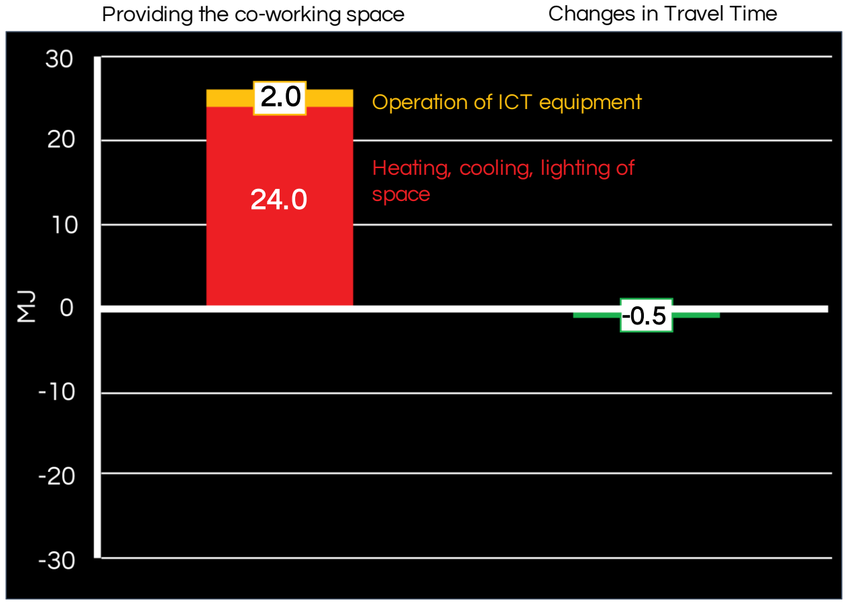
B. Vaddadi, "Understanding the system-level for Mobility as a Service : A framework to evaluate full-scale impacts of MaaS," Doctoral Thesis, KTH Royal Institute of Technology 2022.

What we found …

- The use of the NTC did not lead to avoiding travel or shifting to more sustainable travel modes
- It triggered significant lifestyle changes – more time with family, but also new trip chaining … which many done with car
- That is said, this project made the attitudes towards remote work seem to have changed dramatically.



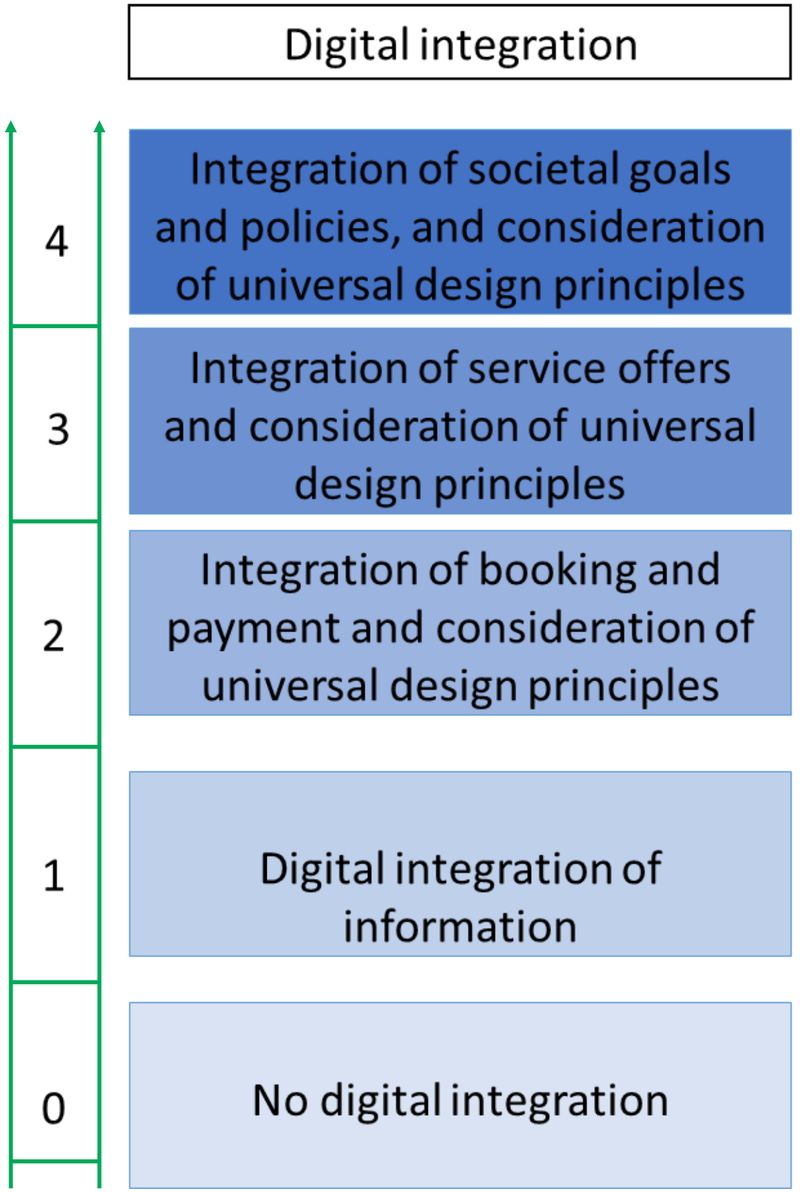
Compared to a workday at the employers' office



Compared to a workday at the home office

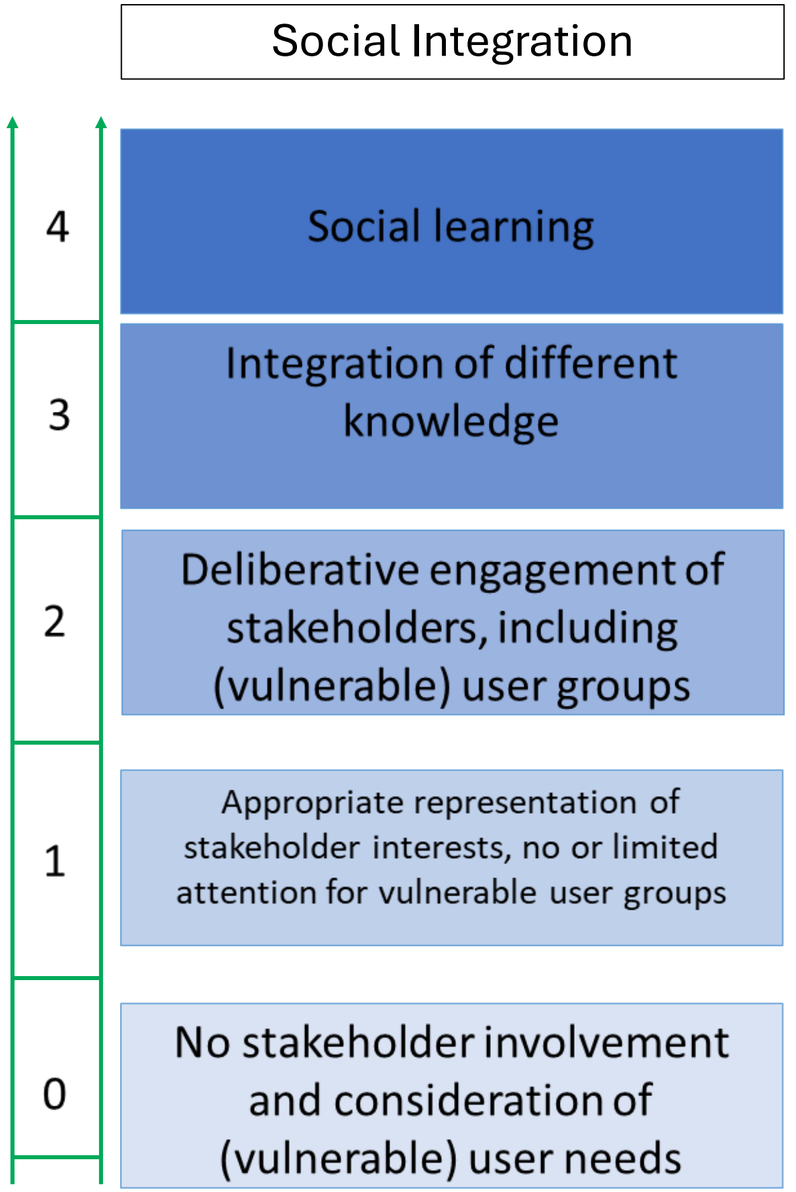
Digital integration

- The Mobility as a Service (MaaS) promise is to deliver digital integration of mobility options - planning, booking and payment using a single app or platform.
- Low levels of digital engagement may create a new layer of transport disadvantage on top of existing ones (Durand et a. 2021)
- Services for non-digitally skilled - analogue booking options, training, assistance, helpdesks etc.



Social (democratic) integration

- Have residents, users and other stakeholders been consulted in the development of hubs?
- Have their inputs had influence on the decision making process / design of on hubs?
- Have vulnerable user groups been reached?
- Is there any roles for the local wisdom?



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1. As we step to the unknown it is important to implement design thinking and co-creation in implementing different solutions in creating a sustainable transport and mobility system
   - Most people don't make much of an effort to explore the problem space before exploring the solution space

2. Importance of longer term structural changes :
   - Behavioural change, adaptation and adoption processes is not one way, there is no clear before-after, but back-and-forth process, which determinants and mechanisms are keep evolving overtime
   - Instead of model accuracy, there is real importance of looking closer to structural change of people behaviours over a longer term period

3. With the fast change of the society and technology, it is important to be humble and provides the service that matters