Technische Universität München

Städtische Mobilität in der digitalisierten Welt

TUM Living Lab Connected Mobility

Prof. Florian Matthes – Karlsruher Entwicklertag 2016 – 15. Juni 2016

TUM Living Lab Connected Mobility (TUM LLCM)
Faculties of Informatics and Civil, Geo and Environmental Engineering
Technische Universität München, Germany
www.tum-llcm.de

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Overview

1. **The digital transformation of mobility and transportation**

2. **Challenges for the established players**
   - The innovator’s dilemma
   - Exponential business models
   - Competition by strong customer-focused digital players
   - Fragmented markets

3. **Vision: An open marketplace and ecosystem of digital mobility services**

4. **The TU München Living Lab Connected Mobility (TUM LLCM)**
   - Guiding principles
   - Research areas and research projects

„Something interesting is happening“

Tom Goodwin

The world‘s most valuable retailer…
… has no inventory

UBER

The world‘s largest taxi company…
… owns no fleet

The world‘s most popular media owner…
… creates no content

The world‘s largest accommodation provider…
… owns no real estate

Source: http://techcrunch.com/2015/03/03/in-the-age-of-disintermediation-the-battle-is-all-for-the-customer-interface/

Cars are becoming a victim of their own success

Mittlerer Ring, München, Germany

Current megatrends

... are challenging the status quo of urban mobility

Growing population

- Explosive growth of the global population
- Demand for mobility per capita is increasing

Urbanization

- For the first time in history, a majority of people live in cities
- Density increases in cities and decreases in rural areas

Aging society

- The proportion of elderly people is increasing
- Many traditional modes of transportation become difficult with age

Need for sustainability

- Wise use of resources can mitigate social and environmental problems
- Moving people from one place to another is a major factor

Source: Jan Becker (Bosch, Stanford AI Lab)

Bill Ford

A new perspective on vehicles

“If we do nothing, the sheer number of people and cars in urban areas will mean global gridlock.

Now is the time for all of us to be looking at vehicles the same way we look at smart phones, laptops and tablets: as pieces of a much bigger, richer network.”

Source: http://www.ford.co.uk/experience-ford/AboutFord/News/CompanyNews/2012/Bill-Ford-Outlines-Blueprint

Technology trends

… might provide an answer to the big challenges

- **Increasing automation**
  - Drivers become passengers
- **New mobility trends**
- **Vehicle communication and connectivity**
  - Many-to-many communication opens new possibilities
- **Mobility services and shareconomy**
  - from ownership to access

Innovative concepts and products are emerging

… and platforms

Apple Car Play

Android Auto

Samsung Connect Auto

LandAirSea 3000 Silver Cloud SYNC OBD ll Port GPS

A new perspective on transportation

Mobility is beyond „Getting from A to B“

- “**Information Everywhere**” and **Ubiquitous Computing** provide a new perspective on mobility and **introduce new opportunities**

- Mobility is **more than getting from A to B** (i.e. geographical relocation)

- Mobility in a broader sense encompasses relocation in the
  - **social space**
  - **virtual space**

How can we improve mobility within the next years?

Source: http://www.ford.co.uk/experience-ford/AboutFord/News/CompanyNews/2012/Bill-Ford-Outlines-Blueprint

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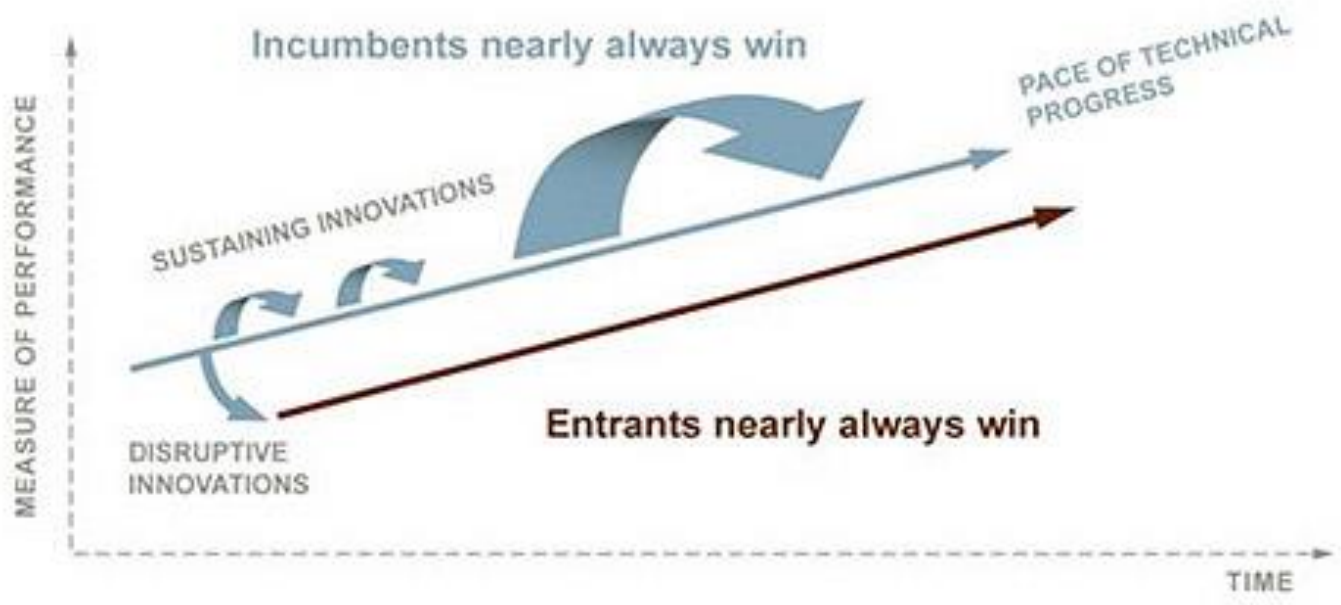
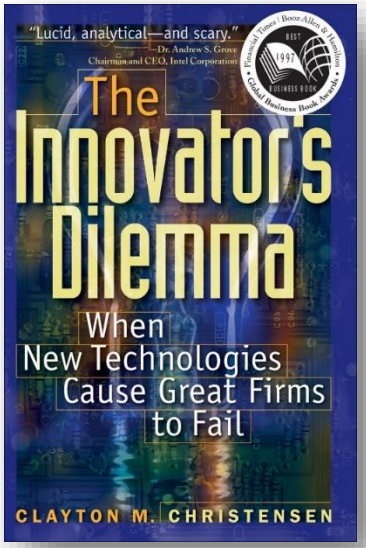
The innovator‘s dilemma

When new technologies cause great firms to fail

„… the logical, competent decisions of management that are critical to the success of their companies are also the reasons why they lose their positions of leadership.“



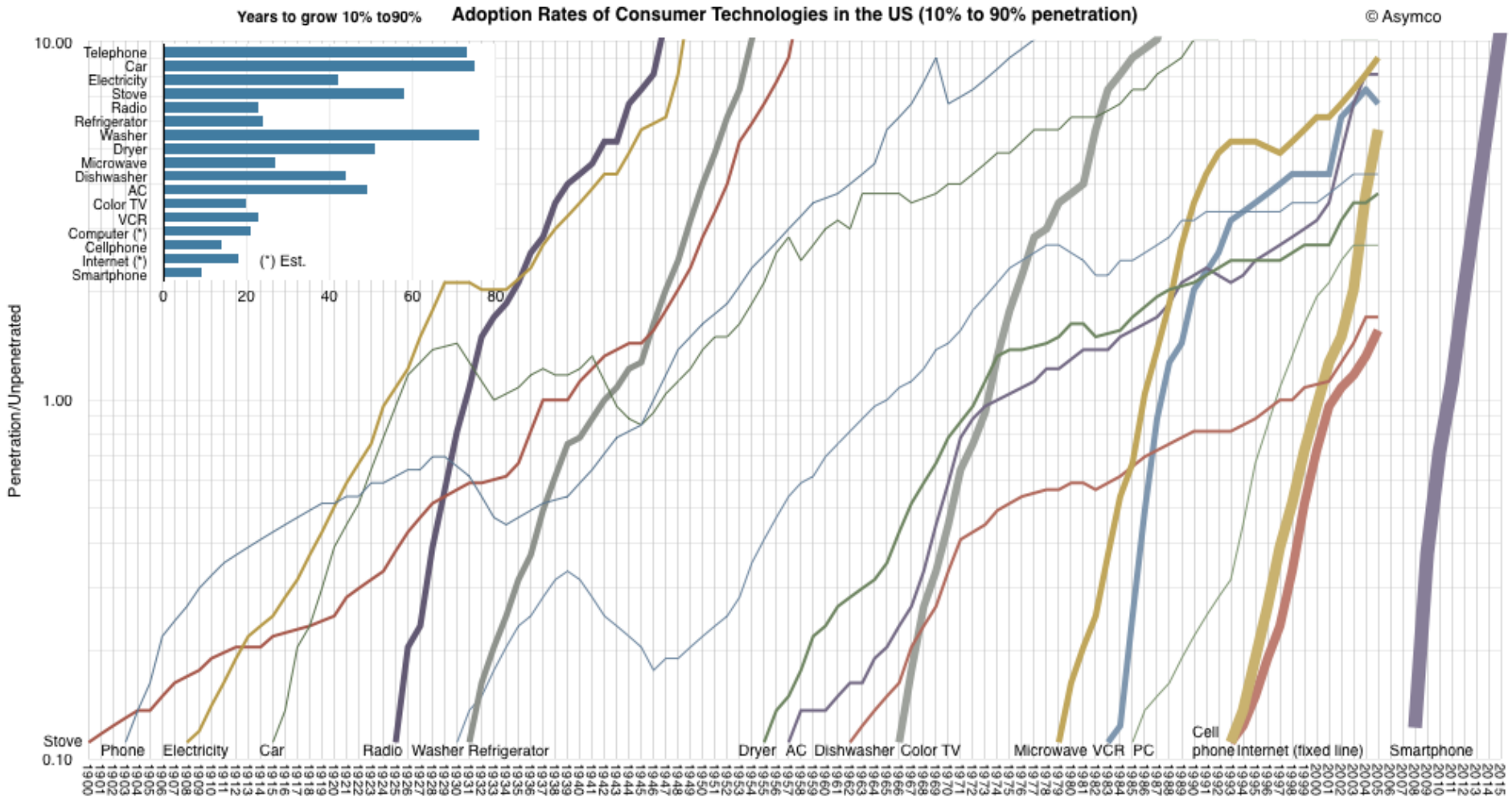


Clayton M. Christensen, Harvard Business School

Incumbents beat newcomers at sustaining innovations, but lose with disruptive innovations.

Source: The Innovator‘s Dilemma, http://www.claytonchristensen.com/key-concepts/

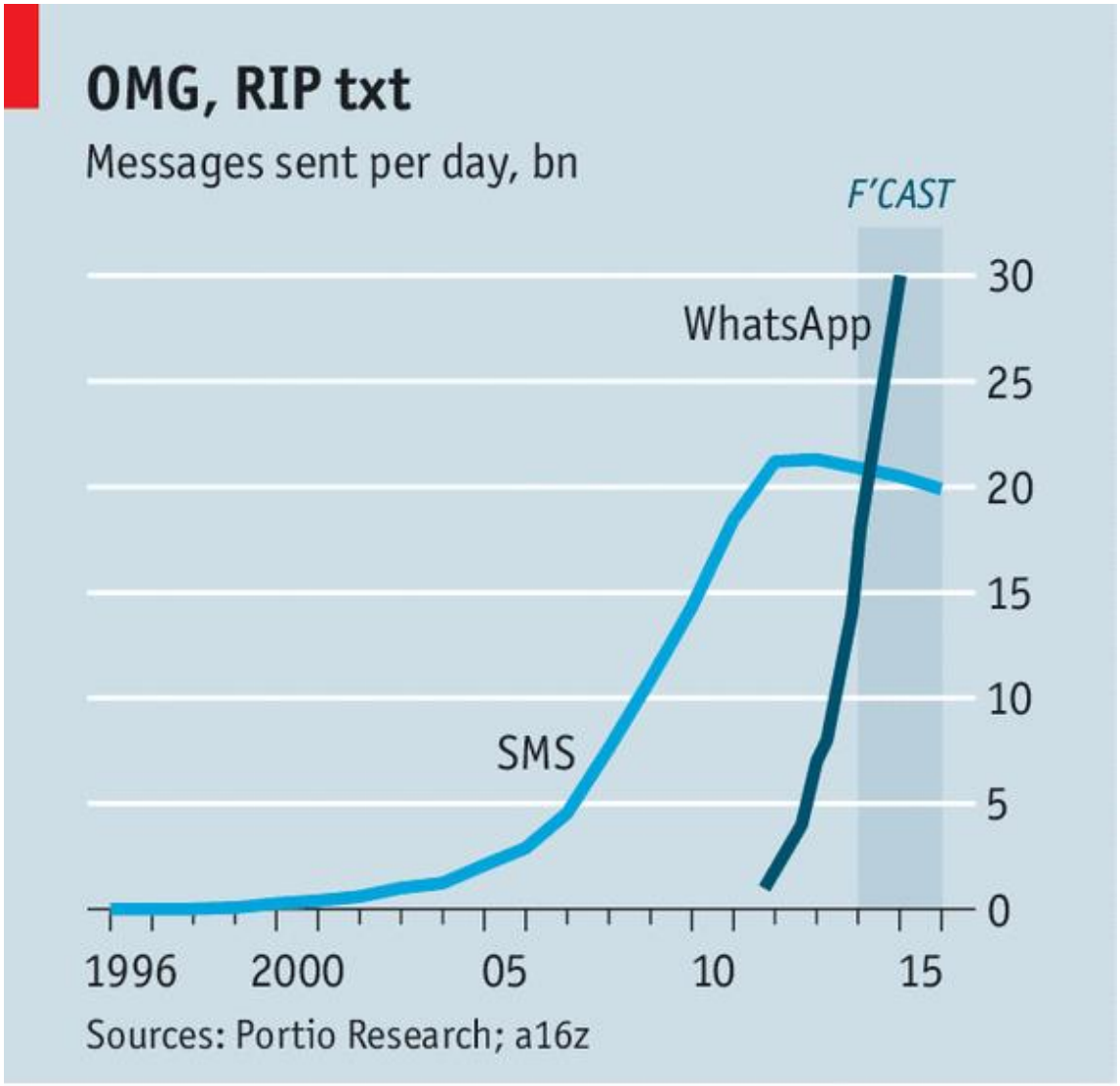
Accelerating adoption rates for new technologies



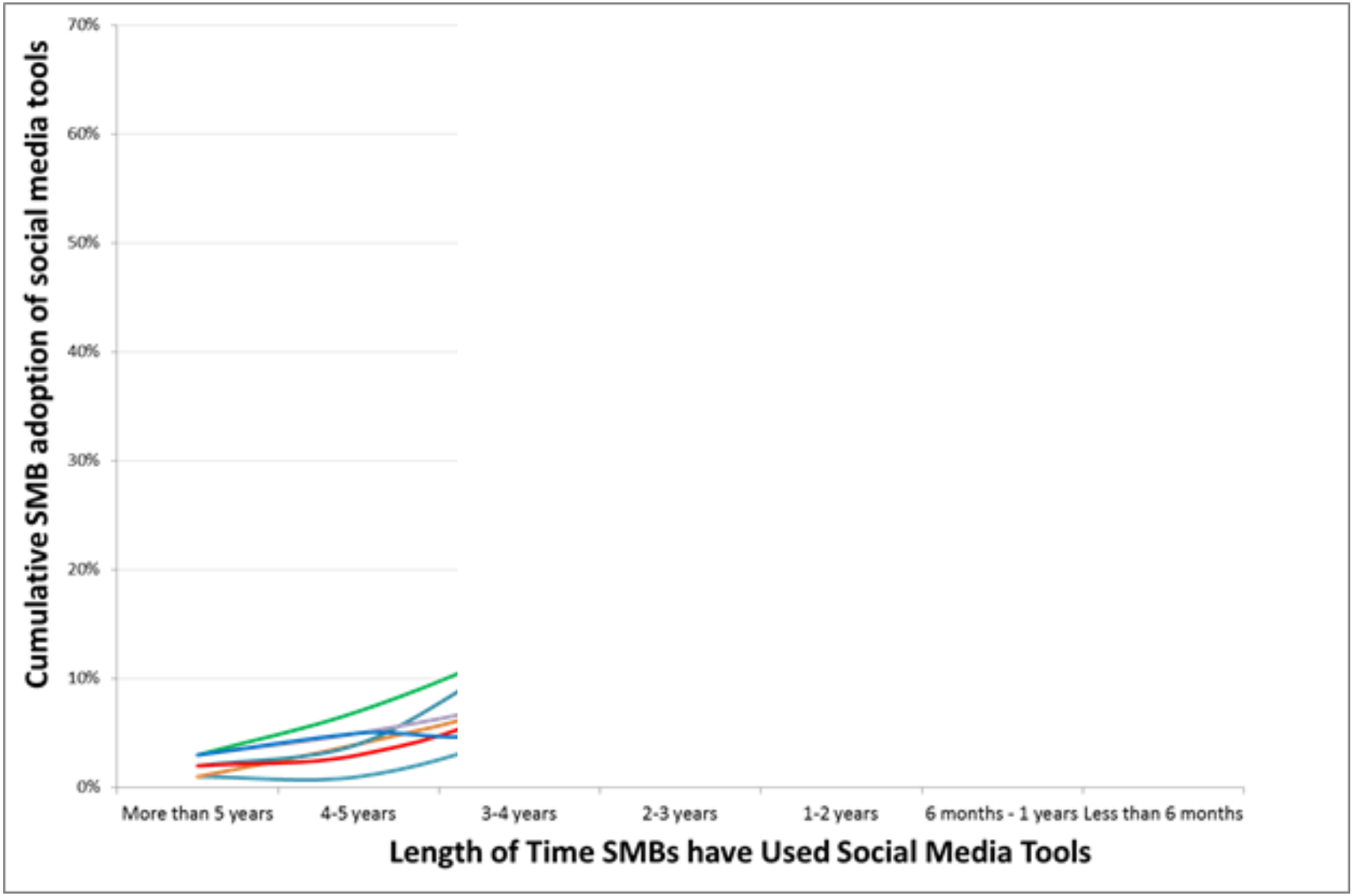
Tablet, Sensors, …

Example of a disruptive technology

Texting with SMS and WhatsApp



Exponential growth starts inconspicuously, and humans are not used to reasoning about non-linear processes.



Source: *2012 Small and Medium Social Business Study, SMB Group*

Competition by strong customer-focused digital players

WIRTSCHAFT DIE ZEIT N° 09 / 2015

Software statt Spoiler

Um 2020 könnten Apple-Autos auf deutschen Straßen fahren. Sie würden hiesigen Modellen, wie hier dem BMW, zusetzen

Autos aus dem Silicon Valley könnten zur Massenware werden. Was haben die deutschen Hersteller dann noch, was Google und Apple nicht haben?

- Uber

- Apple Maps
- Apple Siri
- Apple Passbook
- Apple Wallet
- Apple Watch

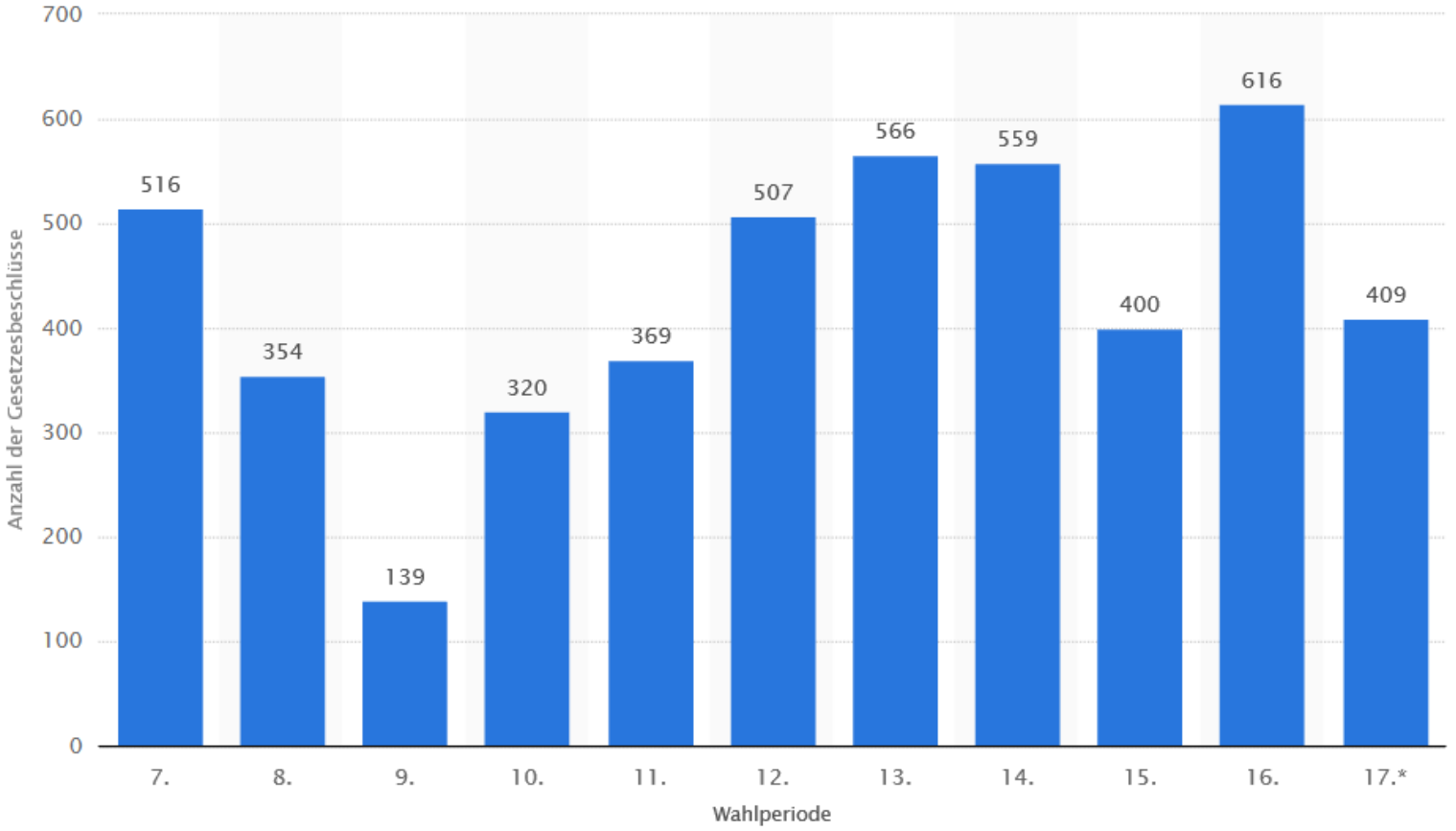
- Google Maps
- Google Android
- Google Analytics
- Google Now

Highly fragmented mobility markets

- **Culture:** Car sharing in Munich vs. Berlin vs. Mexico City
- **Infrastructure**: Urban vs. rural areas
- **Mobility demands:**
  - School kids, students
  - Families
  - Tourists
  - Business travelers
  - Elderly people
  - Handicapped people
  - Enterprises
  - Cities & public services (police, fire brigade, medical doctors, …)
- **Legislations: EU, US, China, …**
  - Privacy, liability, financial risks

The legal complexity of international markets keeps growing.

Anzahl der vom Bundestag verabschiedeten Gesetze von 1972 bis 2013 (7. Wahlperiode bis 17. Wahlperiode)



Weitere Informationen:
Account freischalten

Quelle:
Account freischalten
© Statista 2014

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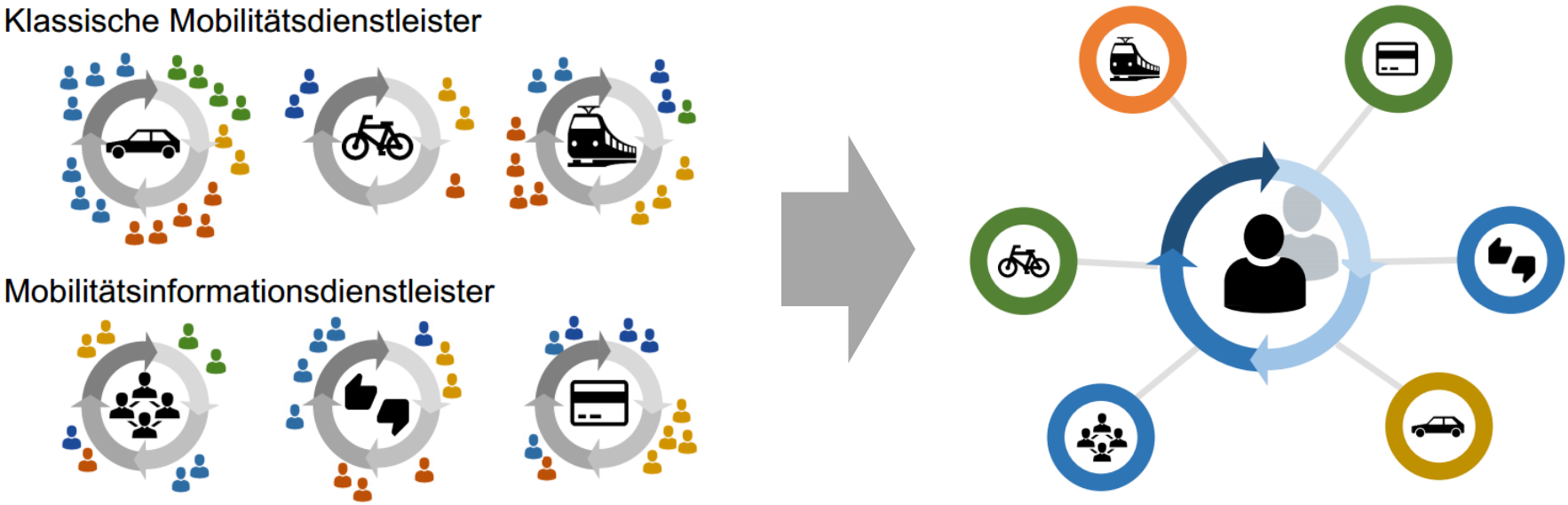
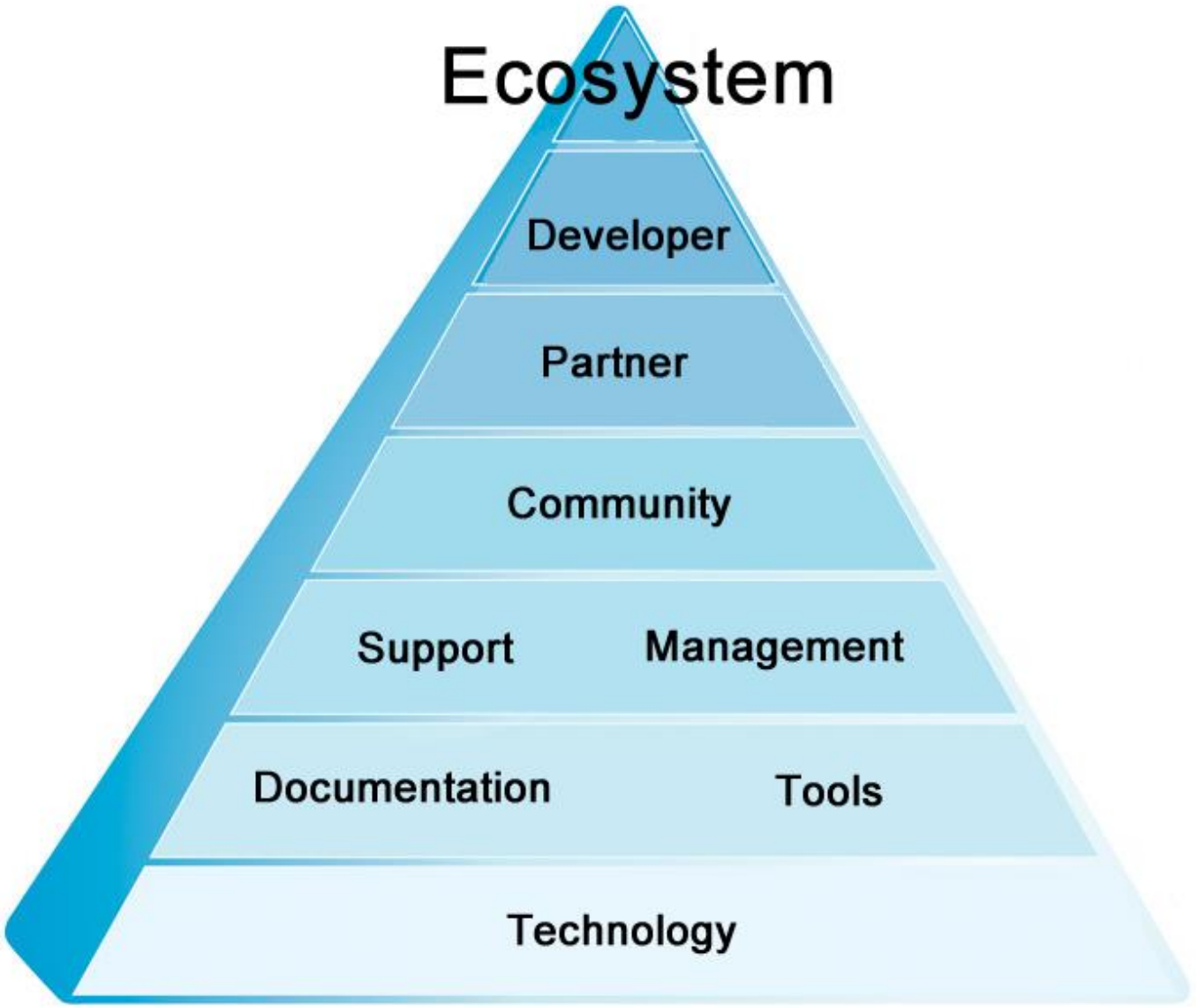
Open ecosystem of mobility-related services integrated in a user-centered way



Marketplaces, platforms and their ecosystems

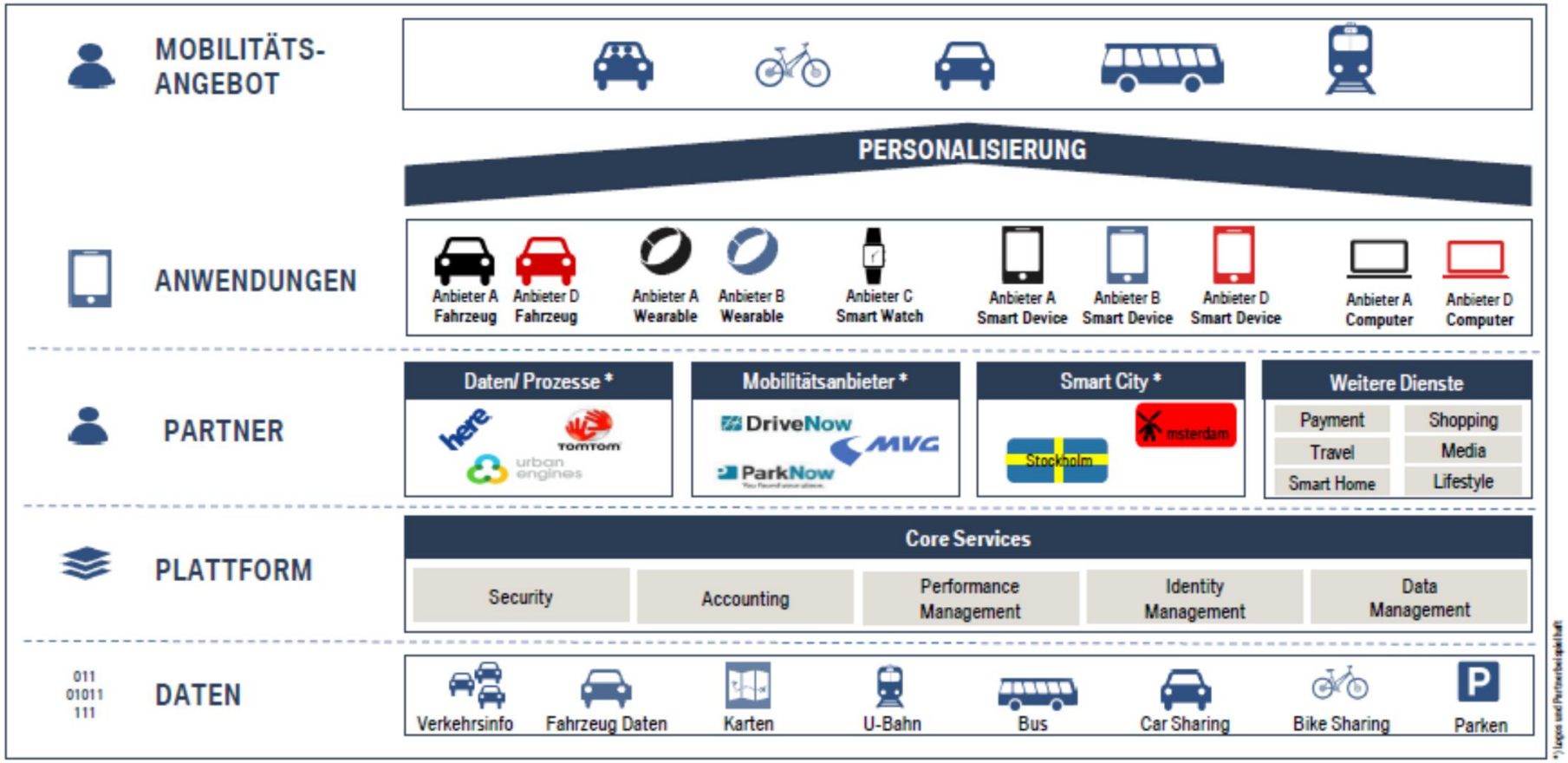


Example: Moovel (Daimler)

Acquisitions and partnerships

Example: Connected Mobility Lab

BMW GROUP, SIEMENS, HERE



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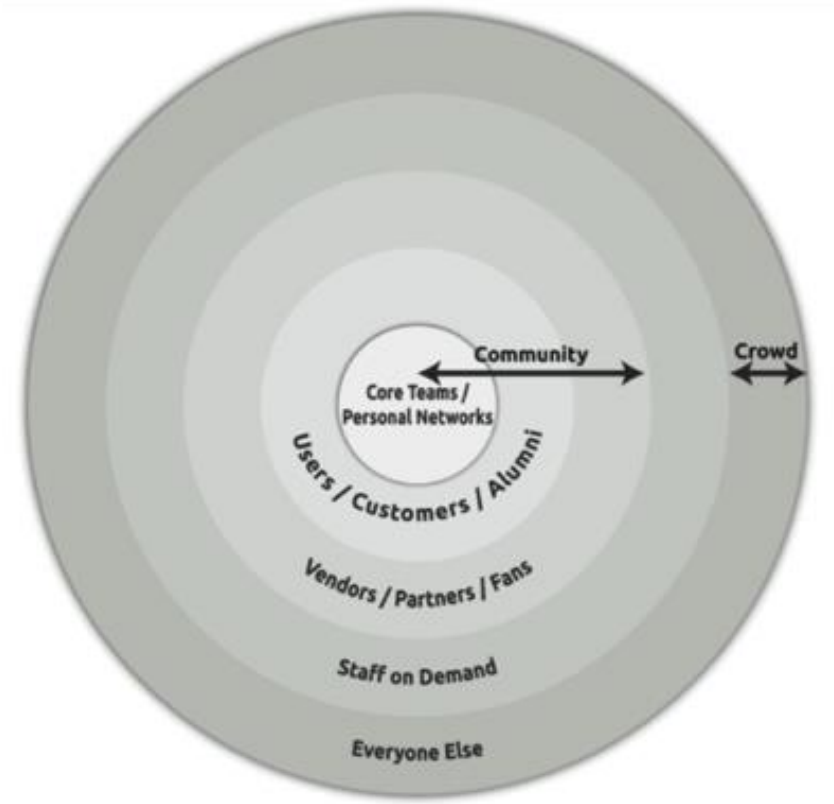
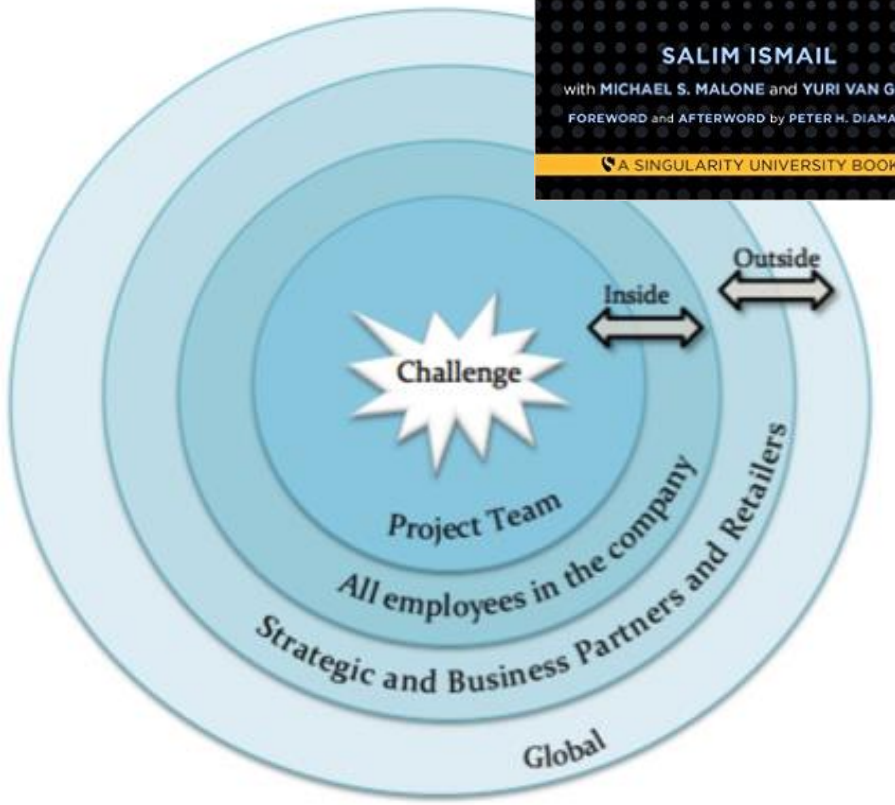
Exponential organizations



EXO COMMUNITY LAYERS



THE BE-NOVATIVE APPROACH

Senior researchers

Prof. Dr. Dr. h.c. Manfred Broy
Software- and Systems Engineering Research Group

Prof. Dr. Fritz Busch
Lehrstuhl für Verkehrstechnik

Prof. Dr. Alfons Kemper
Lehrstuhl für Datenbanksysteme

Prof. Dr. Helmut Krcmar
Chair for Information Systems

Prof. Dr. Florian Matthes
Lehrstuhl Software Engineering for Business Information Systems (sebis)

Prof. Dr. Jörg Ott
The BMW-endowed Chair of Connected Mobility

Dr. habil. Christian Prehofer
Software- and Systems Engineering Research Group

Prof. Dr. Alexander Pretschner
Lehrstuhl für Software Engineering

Prof. Dr. Johann Schlichter
Lehrstuhl für Angewandte Informatik – Kooperative Systeme

Junior researchers (postdocs & PhD candidates)

Ömer Uludag
Plattform & Ökosystem Governance

Felix Michel
Partner On- &Off-Boarding

Anne Faber
Crowdsourcing & -innovation

Tanmaya Mahapatra
Service Mashups Entwicklungsunterstützung

Aenne Schweiger
Geschäftsmodelle Plattformanbieter

Dr. Kristian Beckers
Accountability

Dr. Prachi Kumari
Accountability

Jörg Landthaler
Integriertes Monitoring Infrastruktur, Services & Business

Martin Kleehaus
Visueller Service-Management Leitstand

Vittorio Cozzolino
Sensing on Demand

Michael Haus
Proximity Services

Dr. Ilias Gerostathopoulos
Technische Plattform-Architektur

Georgios Pipelidis
Modelle & Werkzeuge für Indoor-Karten

Nihan Celikkaya
Umweltsensitives Verkehrsmanagement

Eftychios Papapanagiotou
Verkehrsmanagement bei Großereignissen

Daniel Herzog
Kollaborative & soziale Mobilitätsdienste

Andreas Kipf
Integrationsplattform für temporale geographische Daten

Varun Pandey
Geospital Big Data Exploration

Examples for potential project partners

Start-ups, Software & Data Providers, Investors, Big Players, …

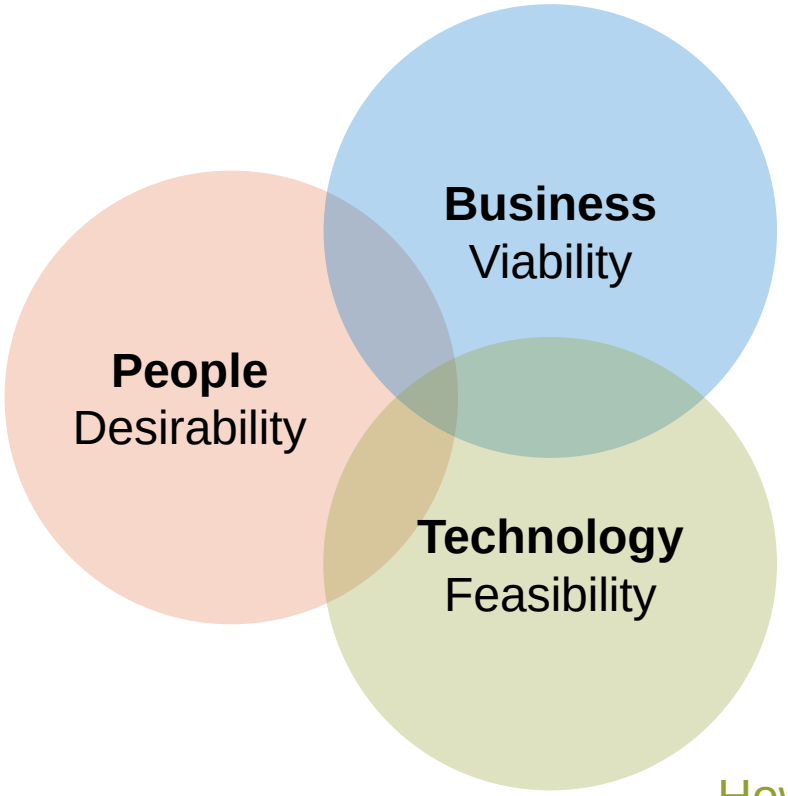
SMARTLANE	NAVVIS	mobility	Carly CONNECTED CAR	H · M	SHARE	FlixBus
Fleetster	VIMCAR	flinc	MILEWAYS	rent-a-guide	Map and Route	unu
ally	moovel	MyTaxi	Bla Bla	DriveNow	UBER	CAR 2GO
MVG	MVV	Landeshauptstadt München				
MCIR	ZD.B ZENTRUM DIGITALISIERUNG. BAYERN	CDTM	Digital Accelerator	SCE STRASCHEG CENTER FOR ENTREPRENEURSHIP	unternehmertum Center for Innovation and Business Creation at TUM	WERK 1
msg systems	iteratec KOMPETENZ, DIE ENTLASTET	SYRACOM THE BUSINESS AND IT ARCHITECTS	MHP A PORSCHE COMPANY			
DAIMLER	Volkswagen	TESLA	Die Bahn DB			

A human-centered design thinking approach

The main questions to be answered

How do we provide our solution in a sustainable manner?

Which problem of whom do we solve?

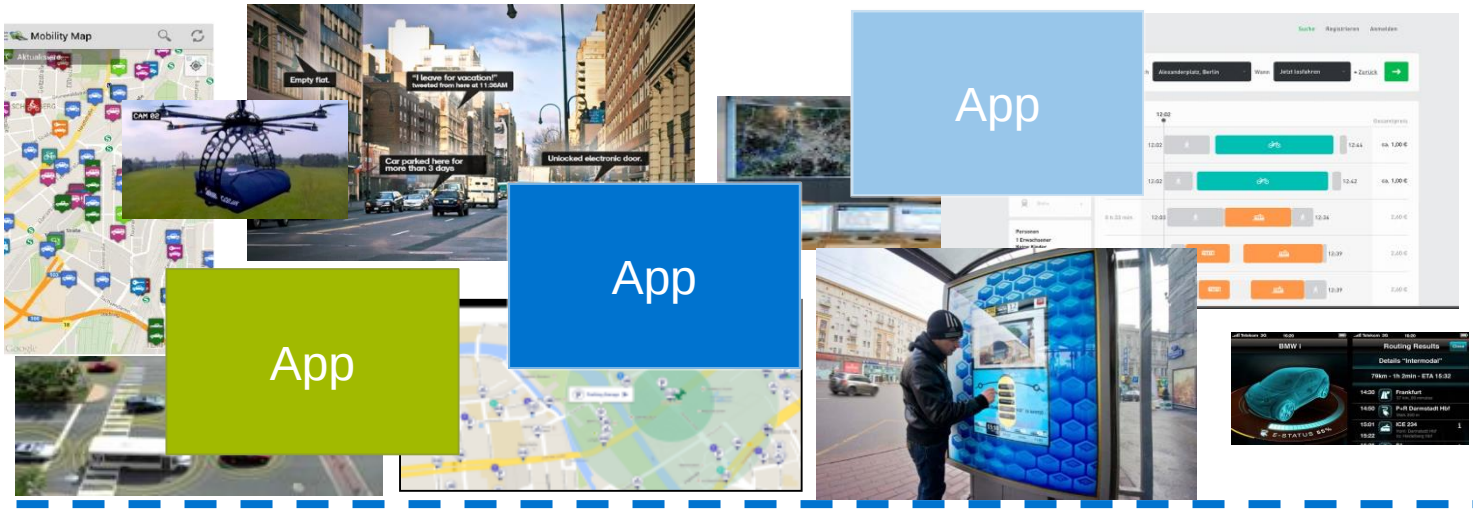


How can we solve it?

We are looking for solutions which are desired, feasible and viable!

Crowd-Innovation and Crowd-Sourcing

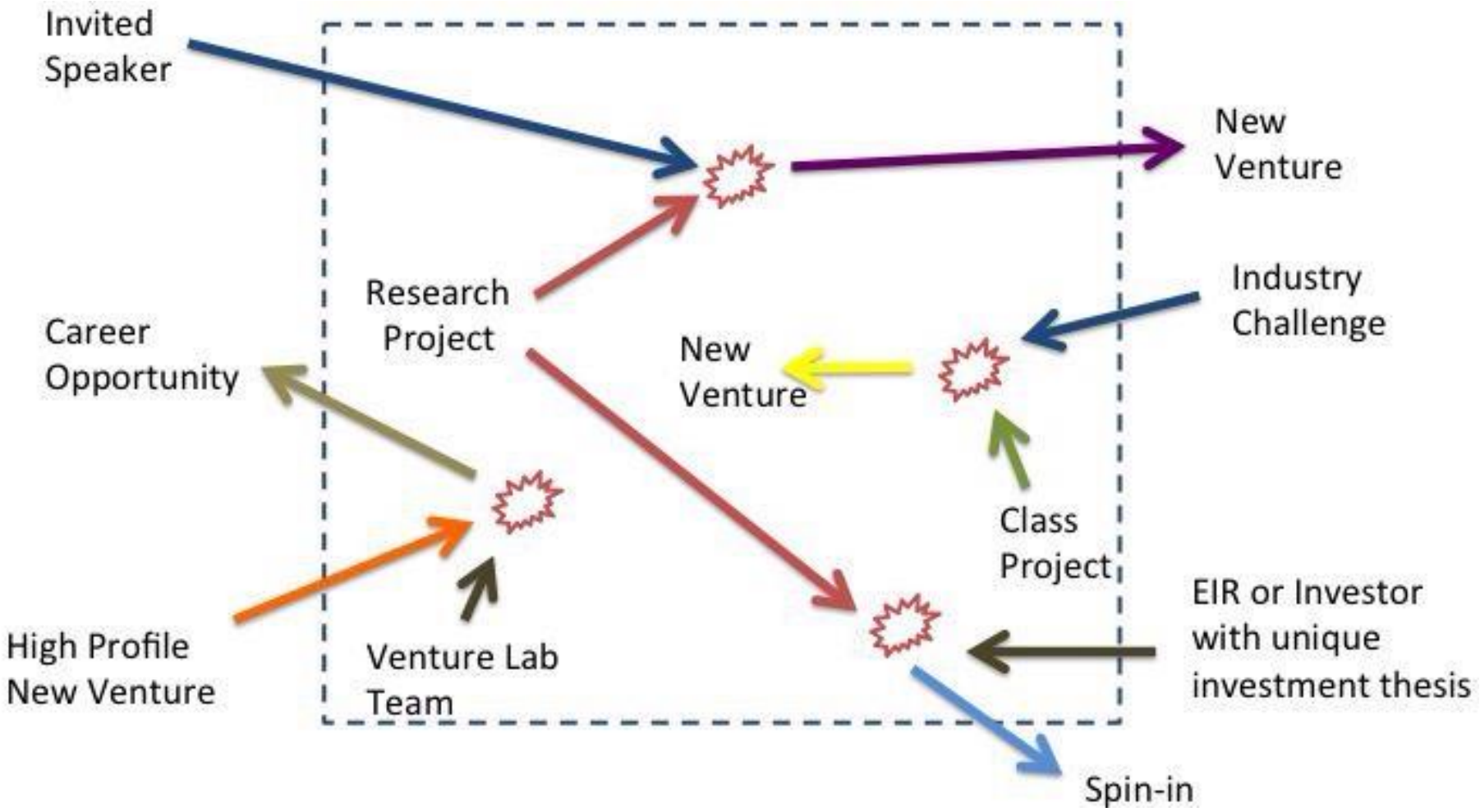
School Kids, Taxi Drivers, Business Travelers, Disabled People, Elderly People, …
Mobility and Information Demands, Contexts (planning, meeting, traveling, accounting)



LIVING LAB
TEST REGION MUNICH

Traffic Flow Detection | Floating Car Data | Traffic News | Public Transport | Long-Distance Transport | Sensors | Car Sharing | Bike Sharing | Bike Sharing | Parking | …

New opportunities created via specifically designed collision events



Project organization

AP 1: Governance

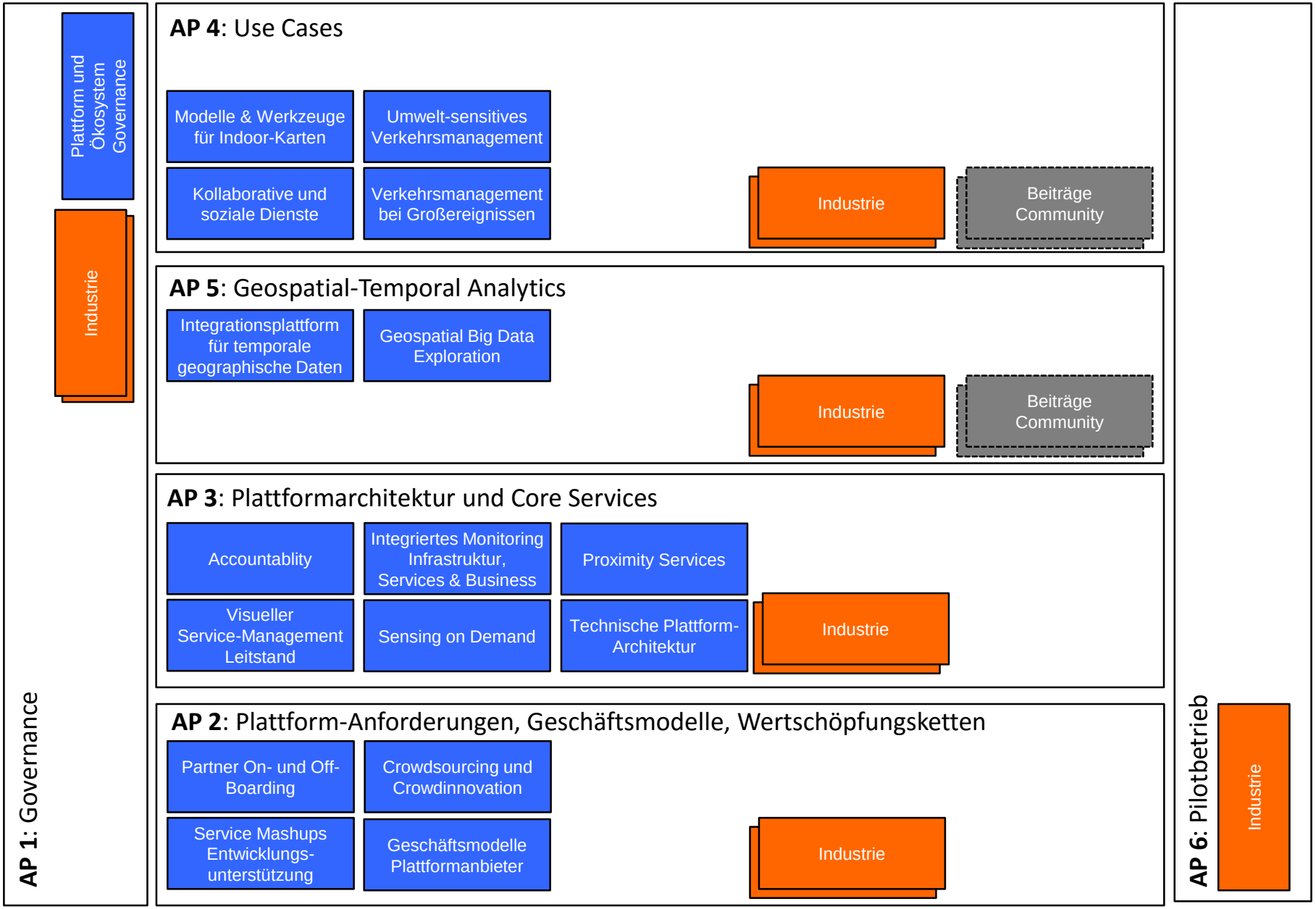
AP 4: Use Cases

AP 5: Geospatial-Temporal Analytics

AP 3: Plattorm Architecture and Core Services

AP 2: Platform Requirements, Business Models, Value Networks

AP 6: Pilot Service Delivery

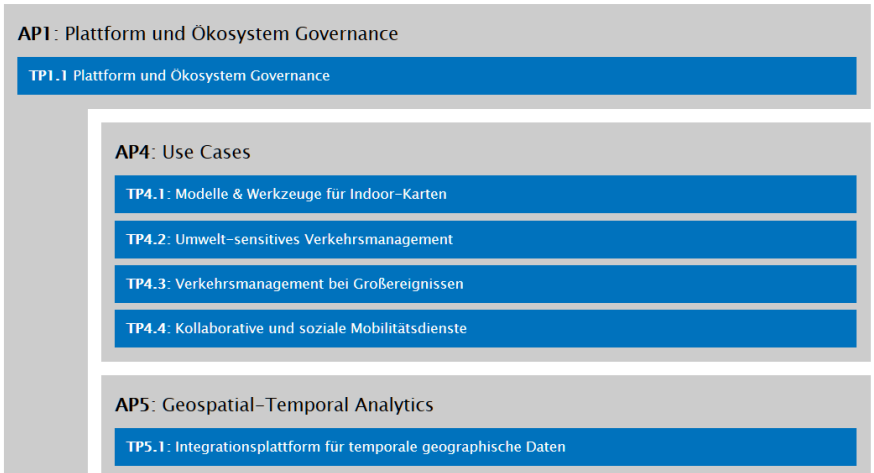

Plattform und Ökosystem Governance
Industrie
AP 1: Governance
AP 4: Use Cases
Modelle & Werkzeuge für Indoor-Karten
Umwelt-sensitives Verkehrsmanagement
Kollaborative und soziale Dienste
Verkehrsmanagement bei Großereignissen
Industrie
Beiträge Community
AP 5: Geospatial-Temporal Analytics
Integrationsplattform für temporale geographische Daten
Geospatial Big Data Exploration
Industrie
Beiträge Community
AP 3: Plattformarchitektur und Core Services
Accountablity
Integriertes Monitoring Infrastruktur, Services & Business
Proximity Services
Visueller Service-Management Leitstand
Sensing on Demand
Technische Plattform-Architektur
Industrie
AP 2: Plattform-Anforderungen, Geschäftsmodelle, Wertschöpfungsketten
Partner On- und Off-Boarding
Crowdsourcing und Crowdinnovation
Service Mashups Entwicklungs-unterstützung
Geschäftsmodelle Plattformanbieter
Industrie
AP 6: Pilotbetrieb
Industrie
AP X
TP XY
Forschungs-Teilprojekt XY im Arbeitspaket X
AP X
Industrie
Leistung vorhanden oder erbracht durch paralleles IuK Industrieprojekt
AP X
Community
Beiträge der Plattformnutzer bzw. Community (kleine und mittelständische Unternehmen)

PROJEKT

Die deutsche Automobilindustrie steht vor großen Herausforderungen durch neue Mobilitätskonzepte, digitale Geschäftsmodelle und starke internationale Wettbewerber bei digitalen Mobilitätsdienstleistungen (Google, Apple).

Zur Unterstützung der digitalen Transformation im Bereich Smart Mobility und Smart City fördert der Freistaat Bayern das TUM Living Lab Connected Mobility, ein interdisziplinäres Forschungsprojekt, das die Kompetenzen der TU München in den Bereichen Informatik und Verkehrsforschung bündelt.

Das Ziel des Projekts ist es, innovative Beiträge zum Design, zur Architektur und zur skalierbaren Realisierung einer offenen herstellerunabhängigen digitalen Mobilitätsplattform zu leisten. Die Plattform wird in enger Zusammenarbeit mit führenden Industriepartnern entwickelt und bietet kleinen und mittelständischen Unternehmen einen Marktplatz, um digitale Mobilitätsdienstleistungen mit substanziell geringeren finanziellen, organisatorischen und technischen Aufwand zu entwickeln, zu betreiben und miteinander zu vernetzen.



EVENTS

Vortrag zum Thema Mobilität in der Digitalisierten Welt, 19. April 2016

Vortrag zum Thema Das TUM Living Lab Connected Mobility, 9. März 2016

Vortrag zum Thema Eine offene digitale Mobilitätsplattform für den Großraum München, 7. März 2016

Vortrag zum Thema Digital Transformation of Urban Mobility, 24. November 2015

Vortrag zum Thema The TUM Lab Living Connected Mobility, 14. Oktober 2015

NEWS

BMW's future in the world of driverless cars: Planning a 'complete overhaul' to compete with Google and Tesla #news https://t.co/He5T5AXbxo

yesterday

Minister berichten über die Gründung des Zentrums https://t.co/C0dG2AVTaA #news https://t.co

Learn more and get in contact with us!
www.tum-llcm.de

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