

Urbane Mobilität in der digitalisierten Welt

TUM Living Lab Connected Mobility

Prof. Florian Matthes – Jahrestagung GI FG Architektur 2016 – 24. Juni 2016

TUM Living Lab Connected Mobility (TUM LLCM)
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www.tum-llcm.de

- 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

U B E R

The world's largest taxi company...
... owns no fleet

The Facebook logo, consisting of the word 'facebook' in white lowercase letters on a dark blue rectangular background.

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



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)



“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 II Port GPS



- **“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?

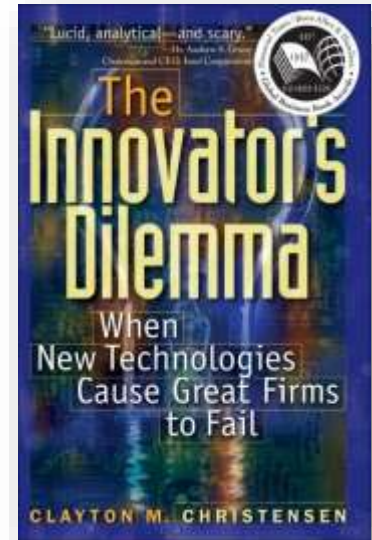
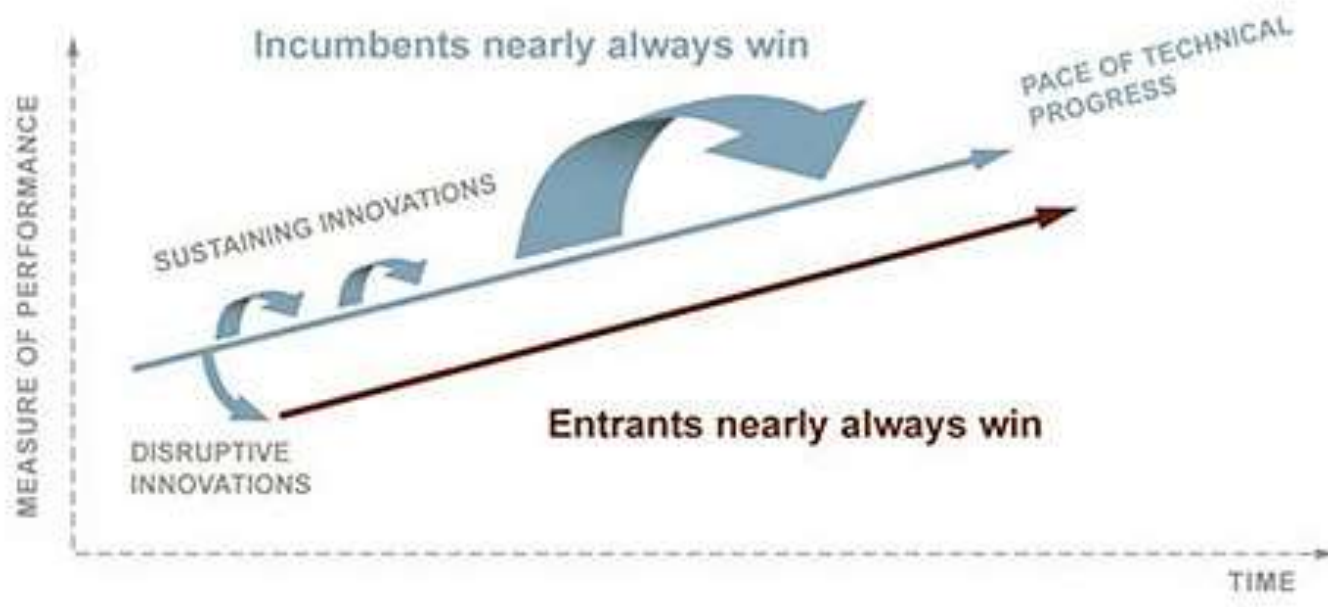
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The innovator's dilemma

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.“

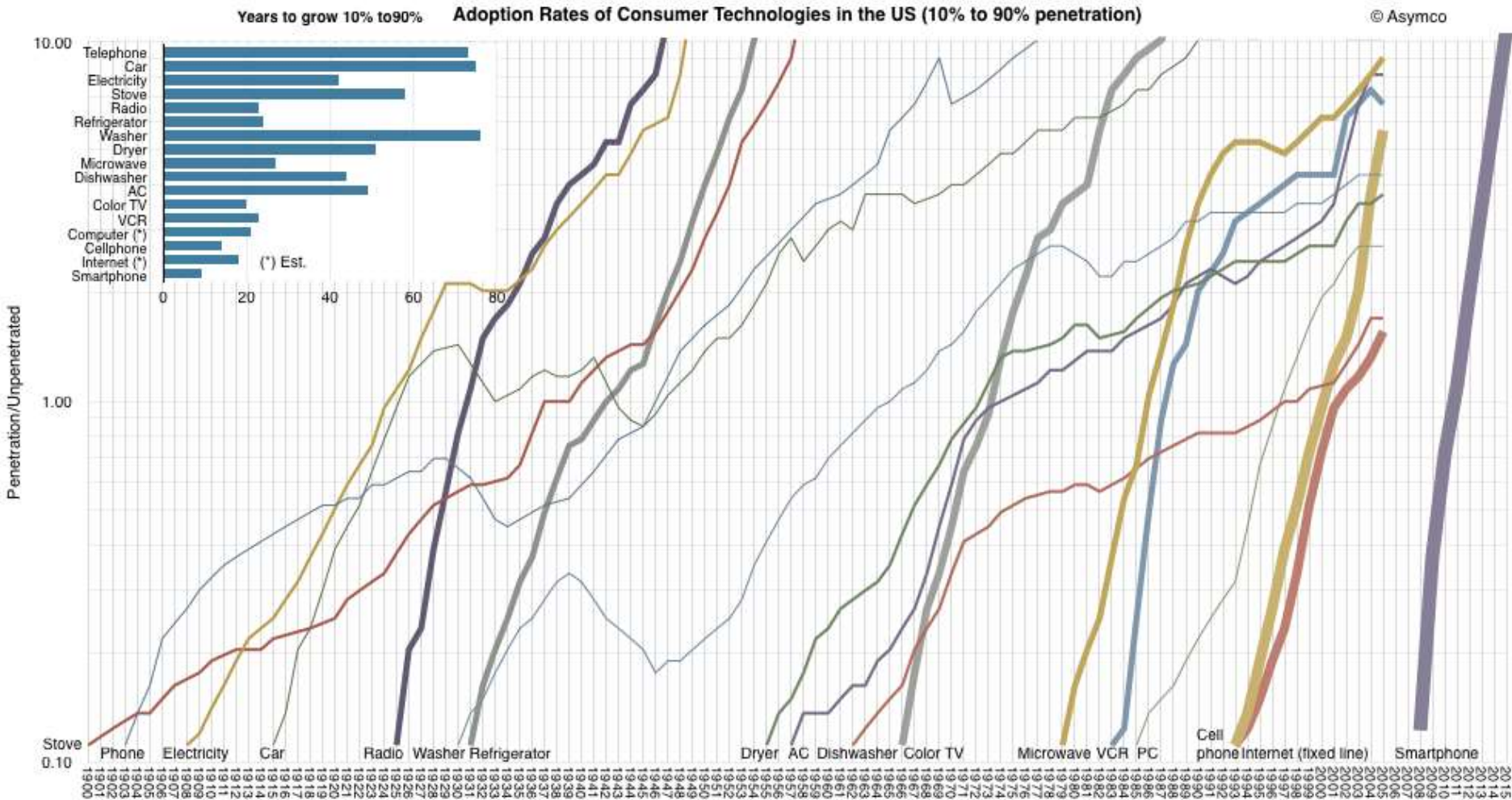


Clayton M. Christensen,
Harvard Business School

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



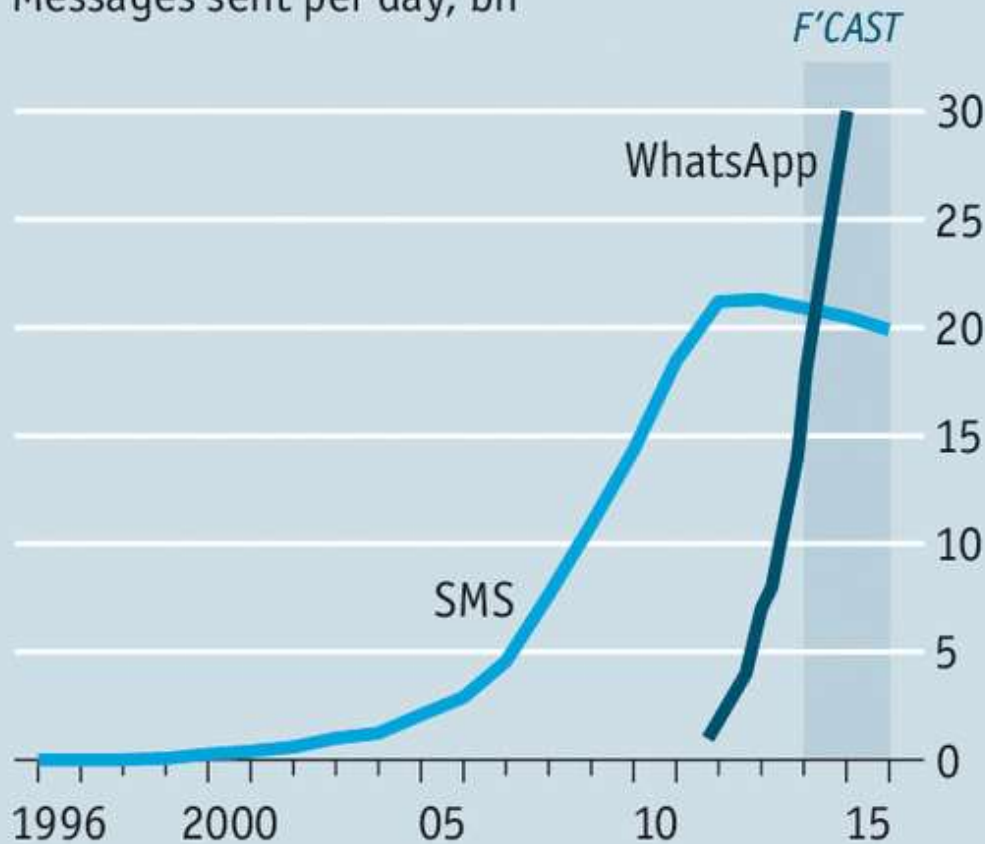
Tablet, Sensors, ...

Example of a disruptive technology

Texting with SMS and WhatsApp

OMG, RIP txt

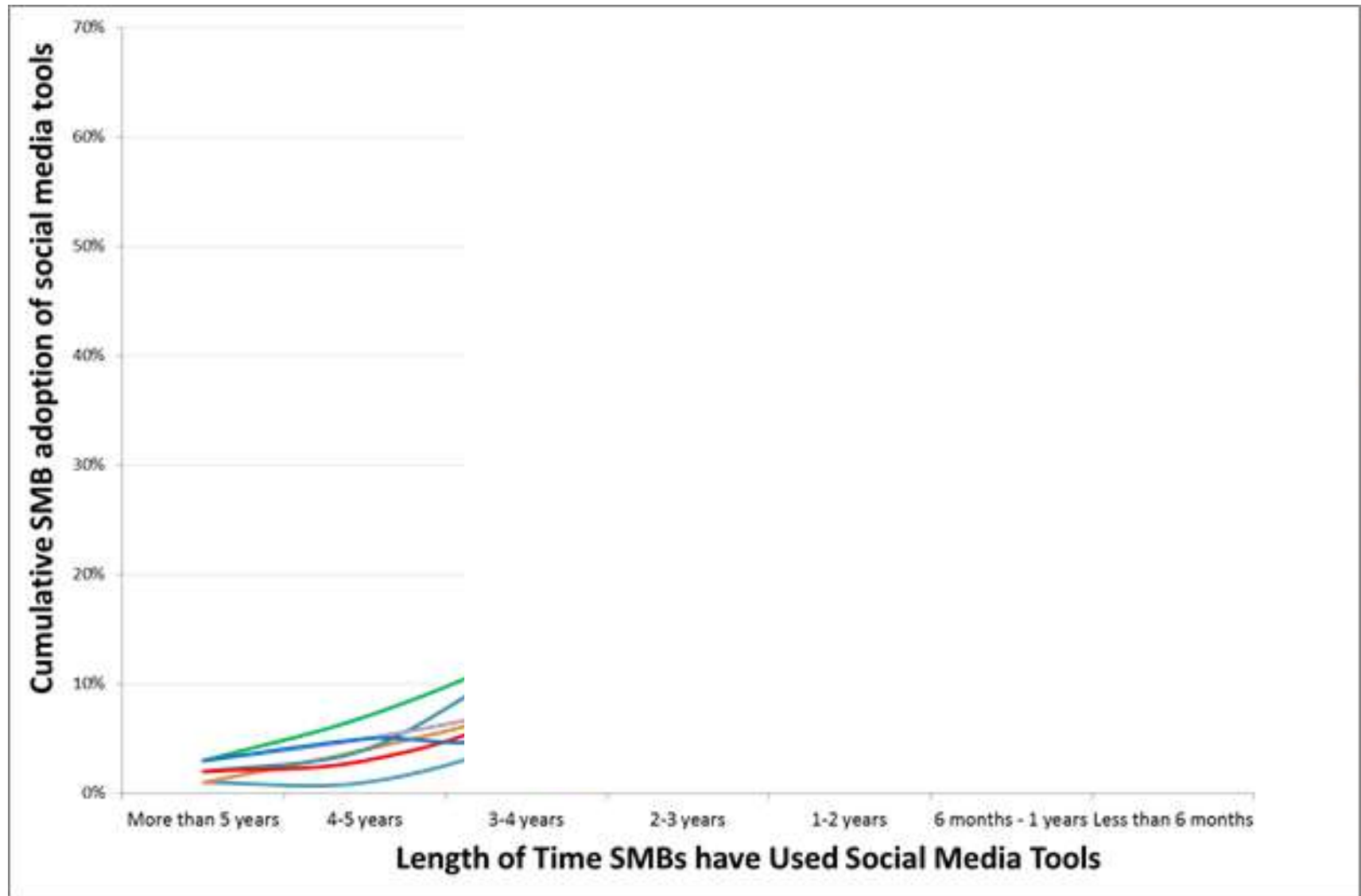
Messages sent per day, bn



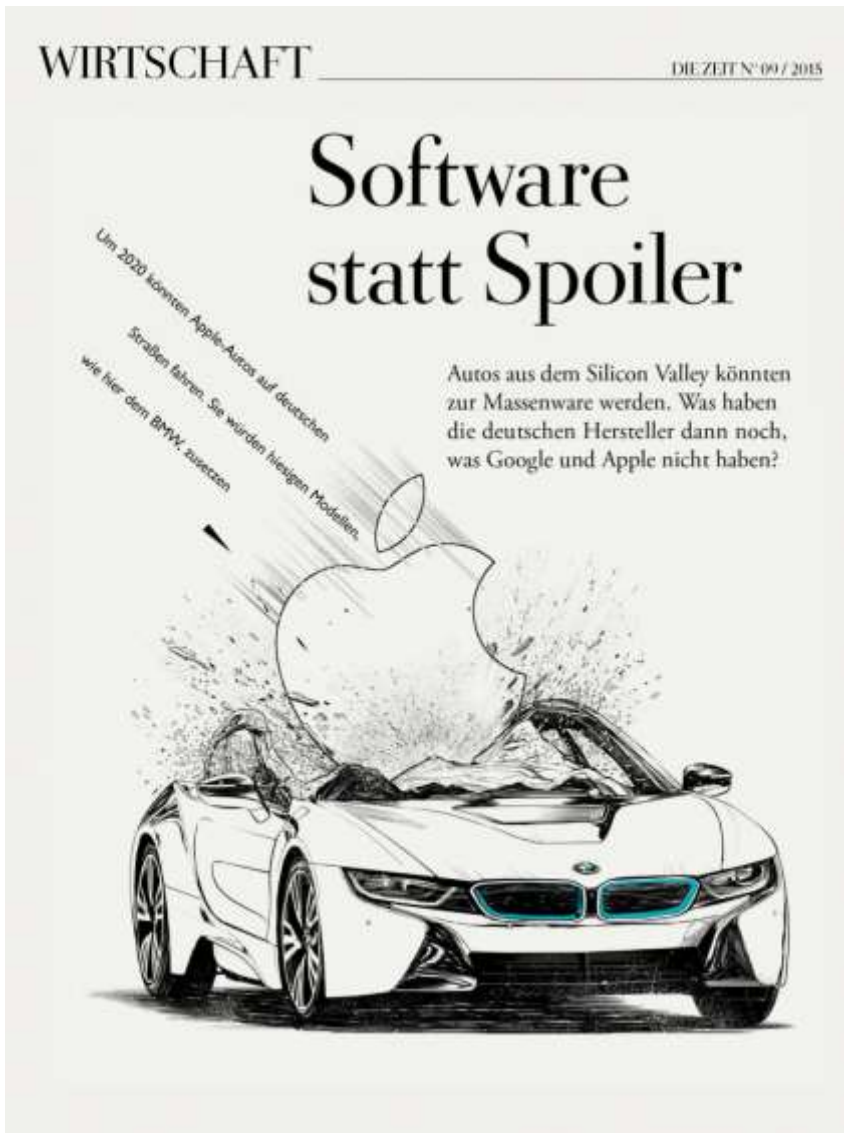
Sources: Portio Research; a16z

Economist.com

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



- Uber

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

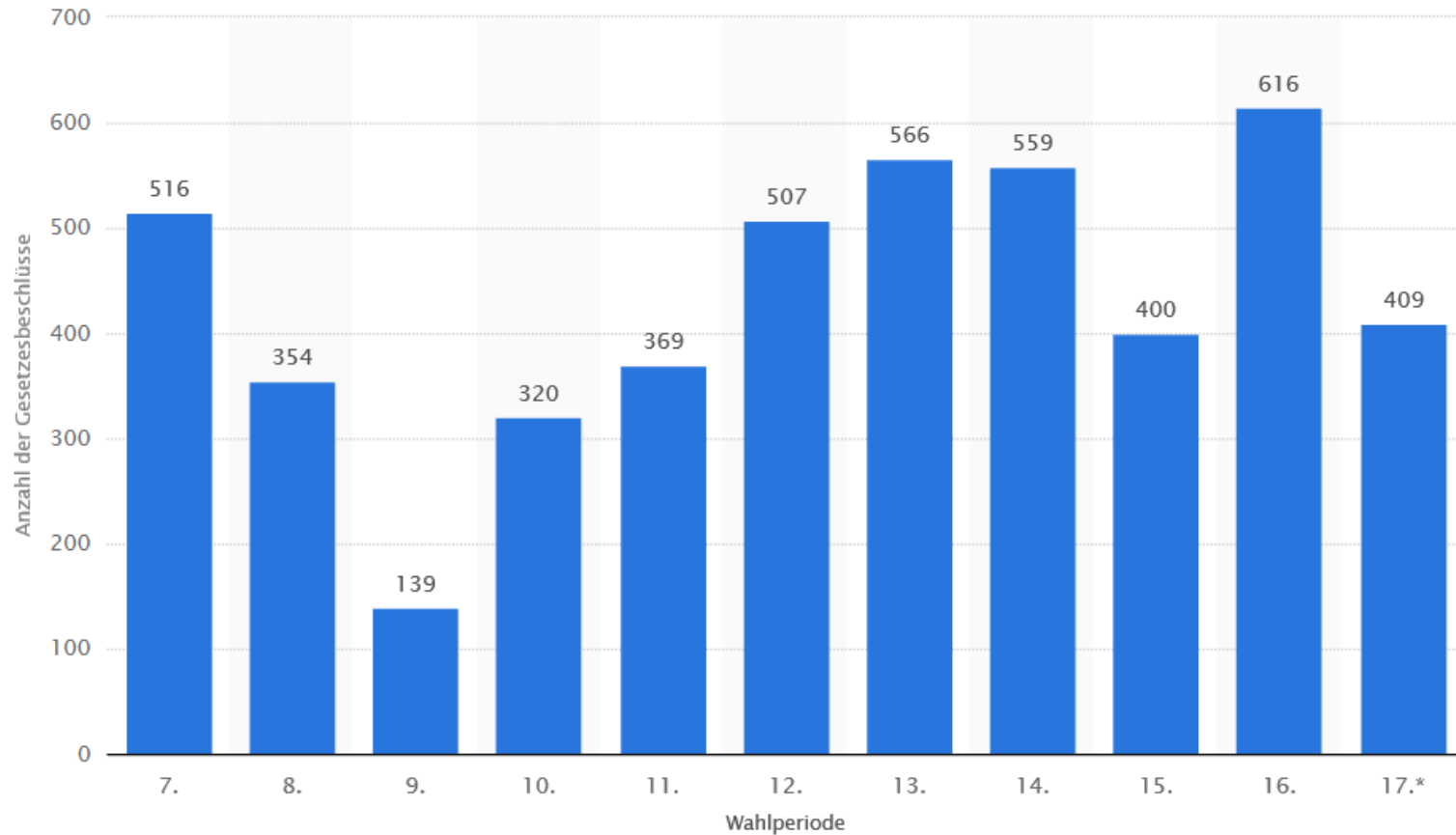
- Google Maps
- Google Android
- Google Analytics
- Google Now

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](#)
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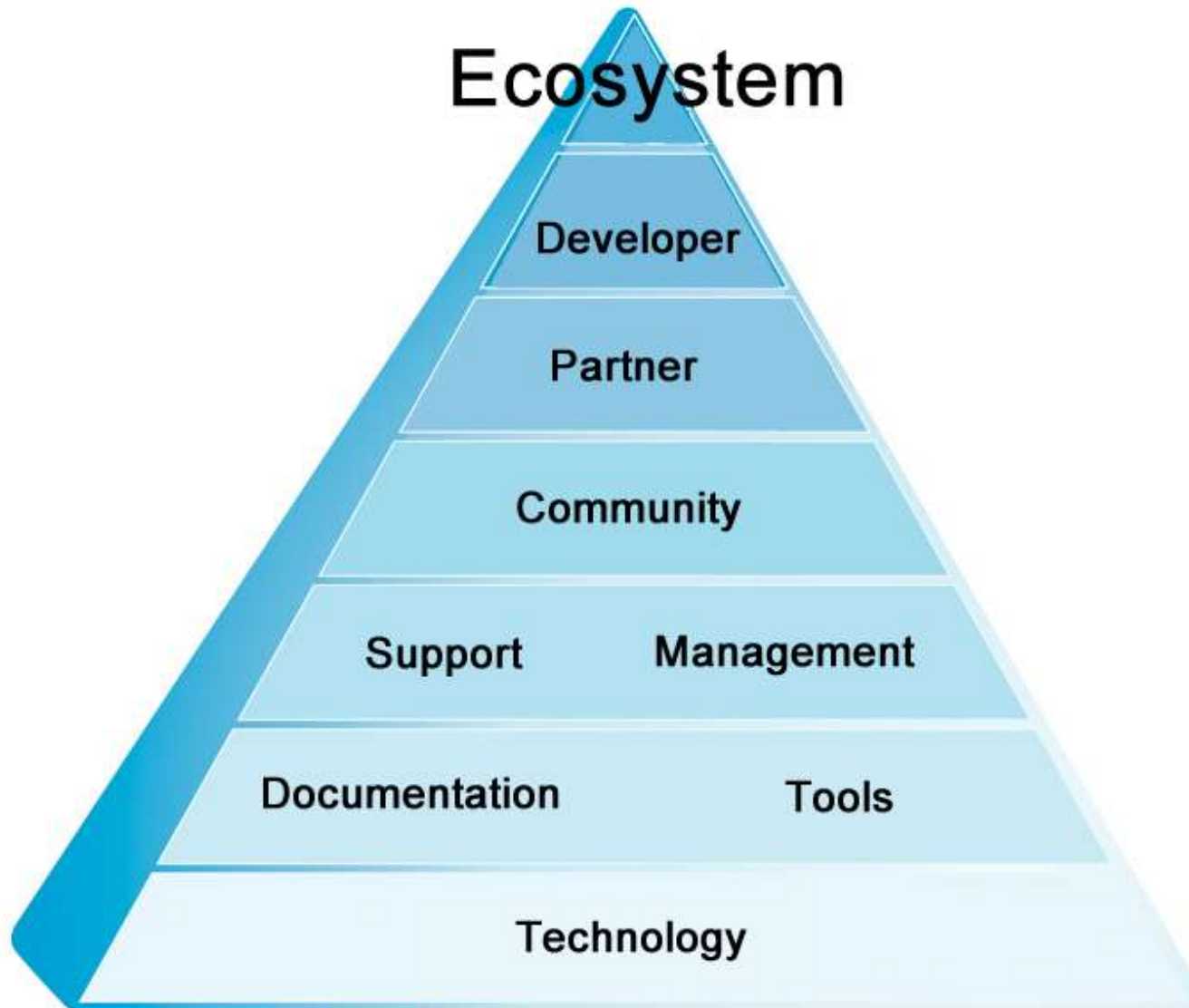
Open ecosystem of mobility-related services integrated in a user-centered way

Klassische Mobilitätsdienstleister



Mobilitätsinformationsdienstleister





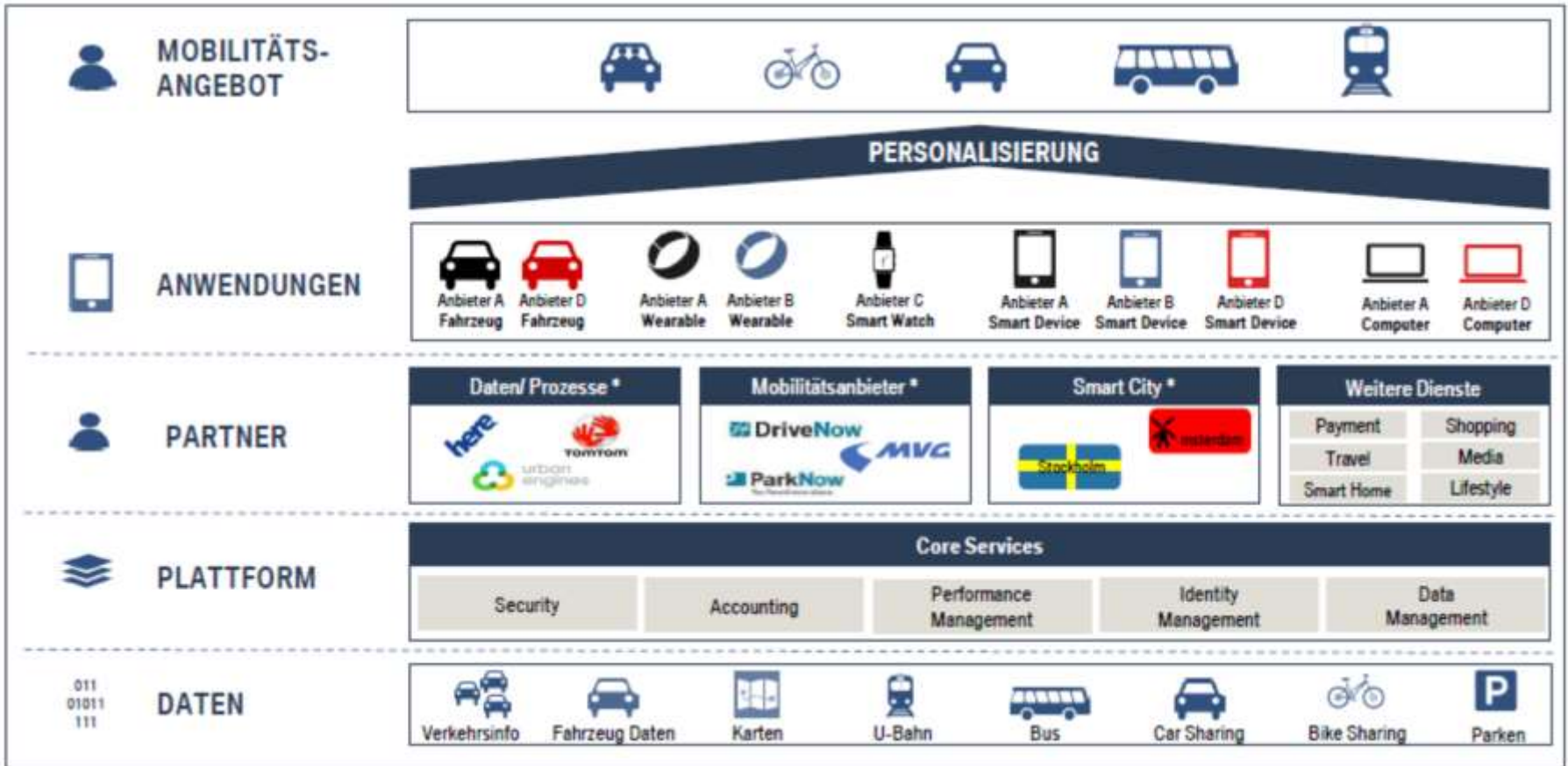
Example: Moovel (Daimler)

Acquisitions and partnerships



Example: Connected Mobility Lab

BMW GROUP, SIEMENS, HERE



* Logos sind Persönlichkeitsrechte

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Exponential organizations

EXPONENTIAL ORGANIZATIONS

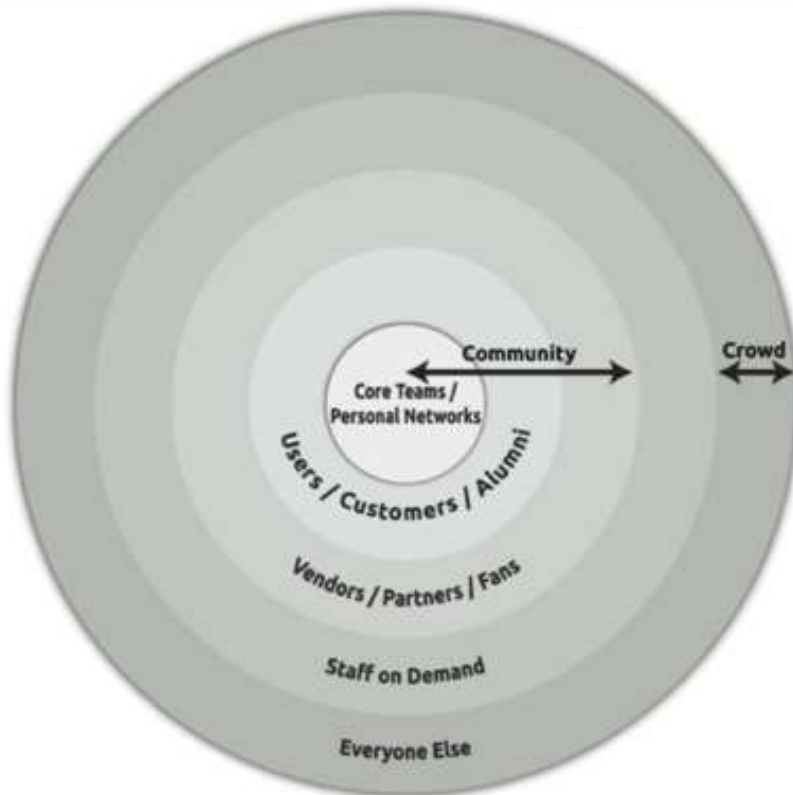
Why new organizations are ten times better, faster, and cheaper than yours (and what to do about it)

SALIM ISMAIL

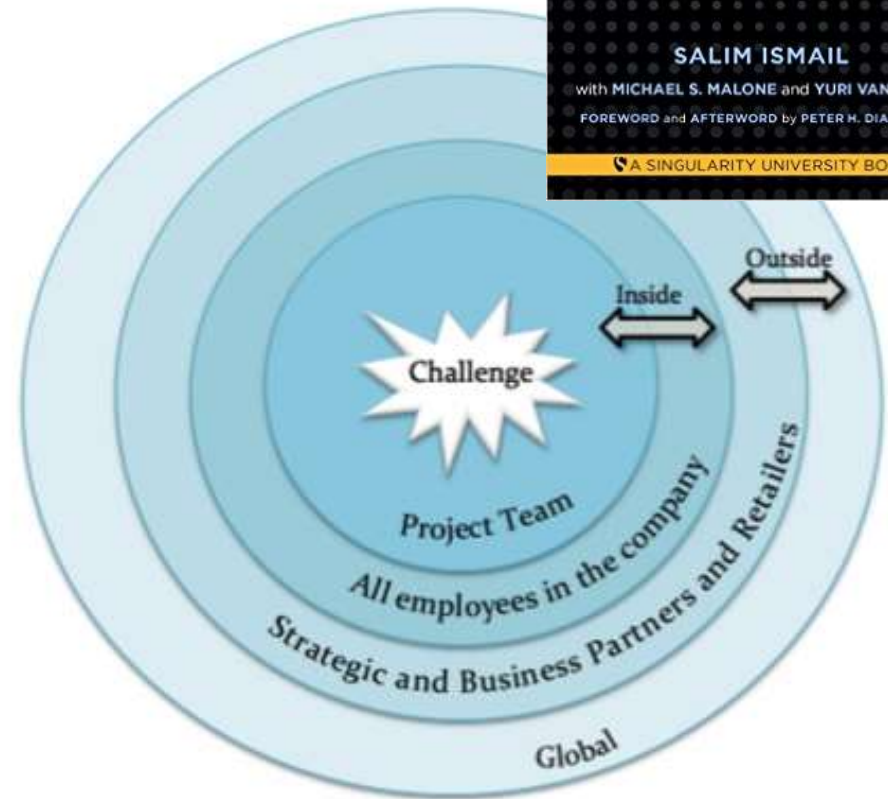
with MICHAEL S. MALONE and YURI VAN GEEST

FOREWORD and AFTERWORD by PETER H. DIAMANDIS

A SINGULARITY UNIVERSITY BOOK



EXO COMMUNITY LAYERS



THE BE-NOVATIVE APPROACH



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
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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

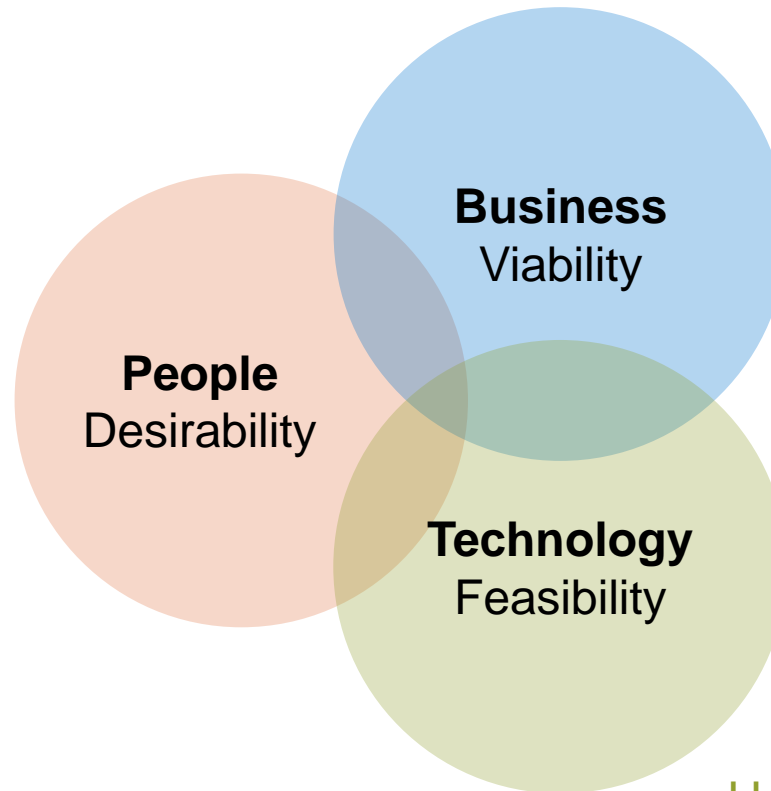
Start-ups, Software & Data Providers, Investors, Big Players, ...

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?



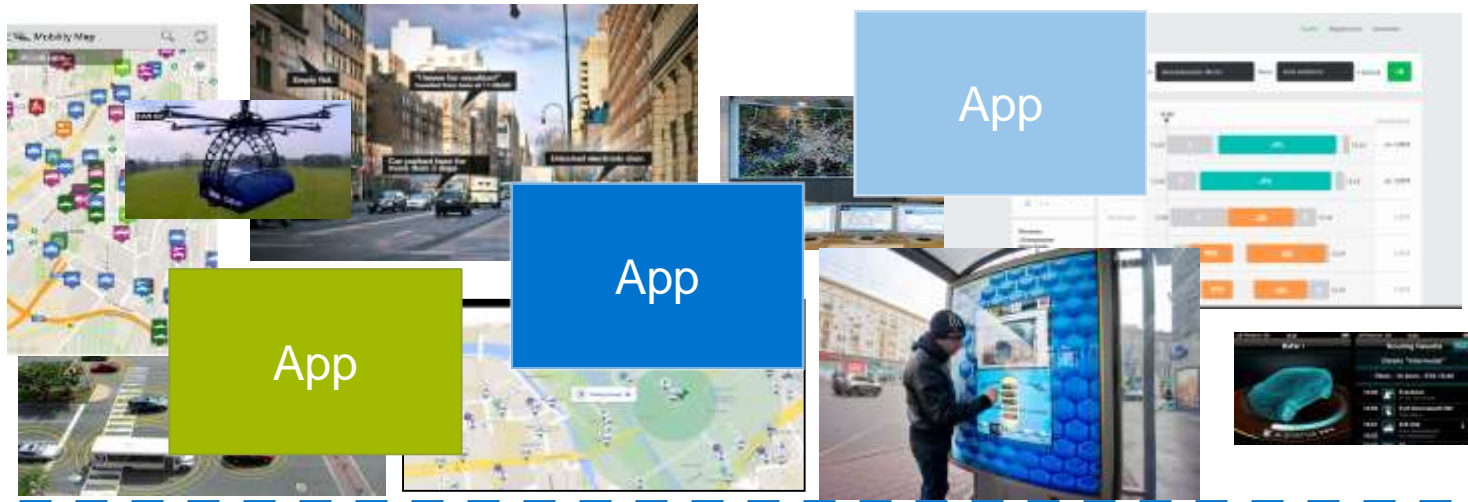
How can we solve it?

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

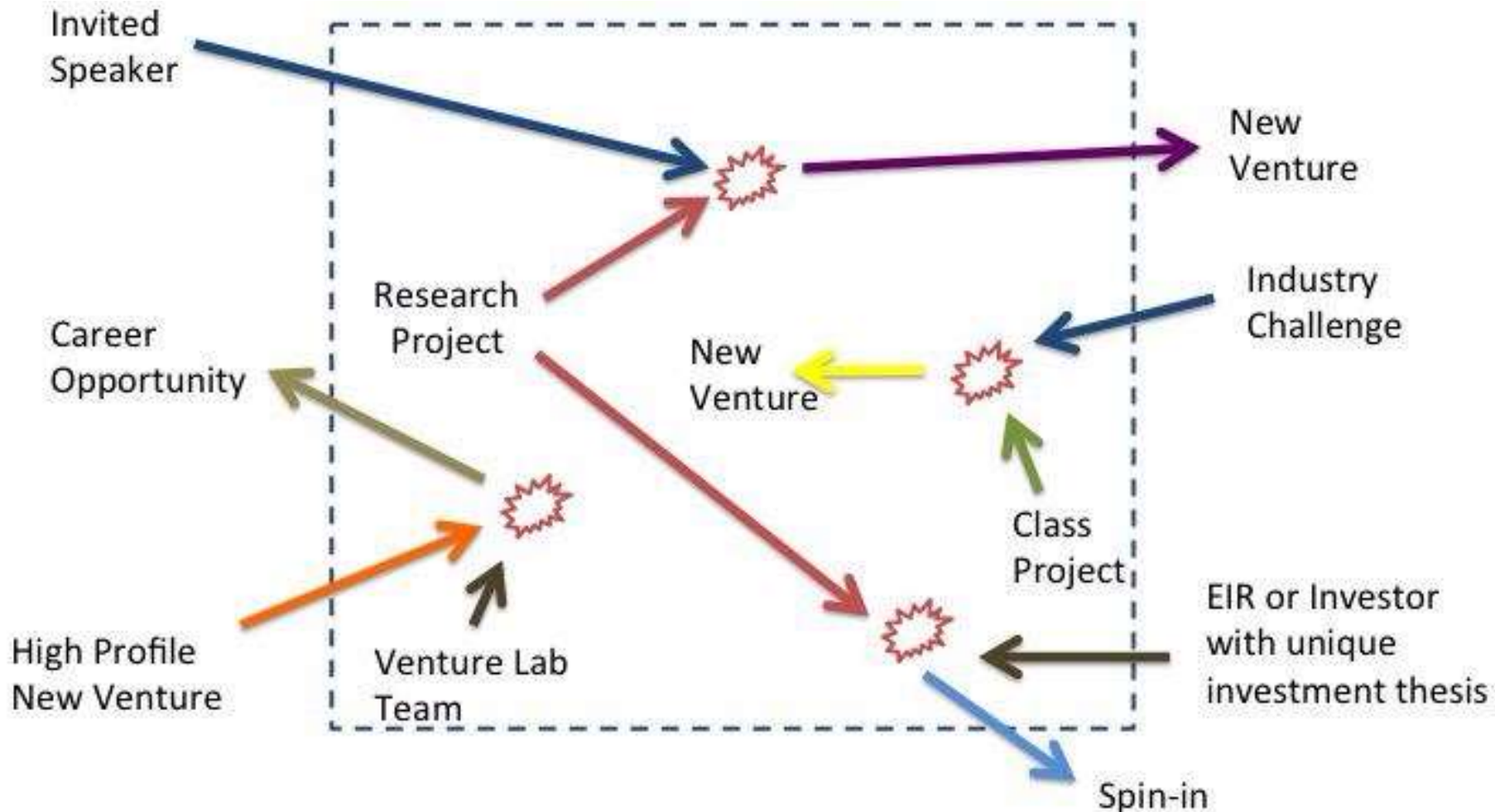

- Bike
Sharing

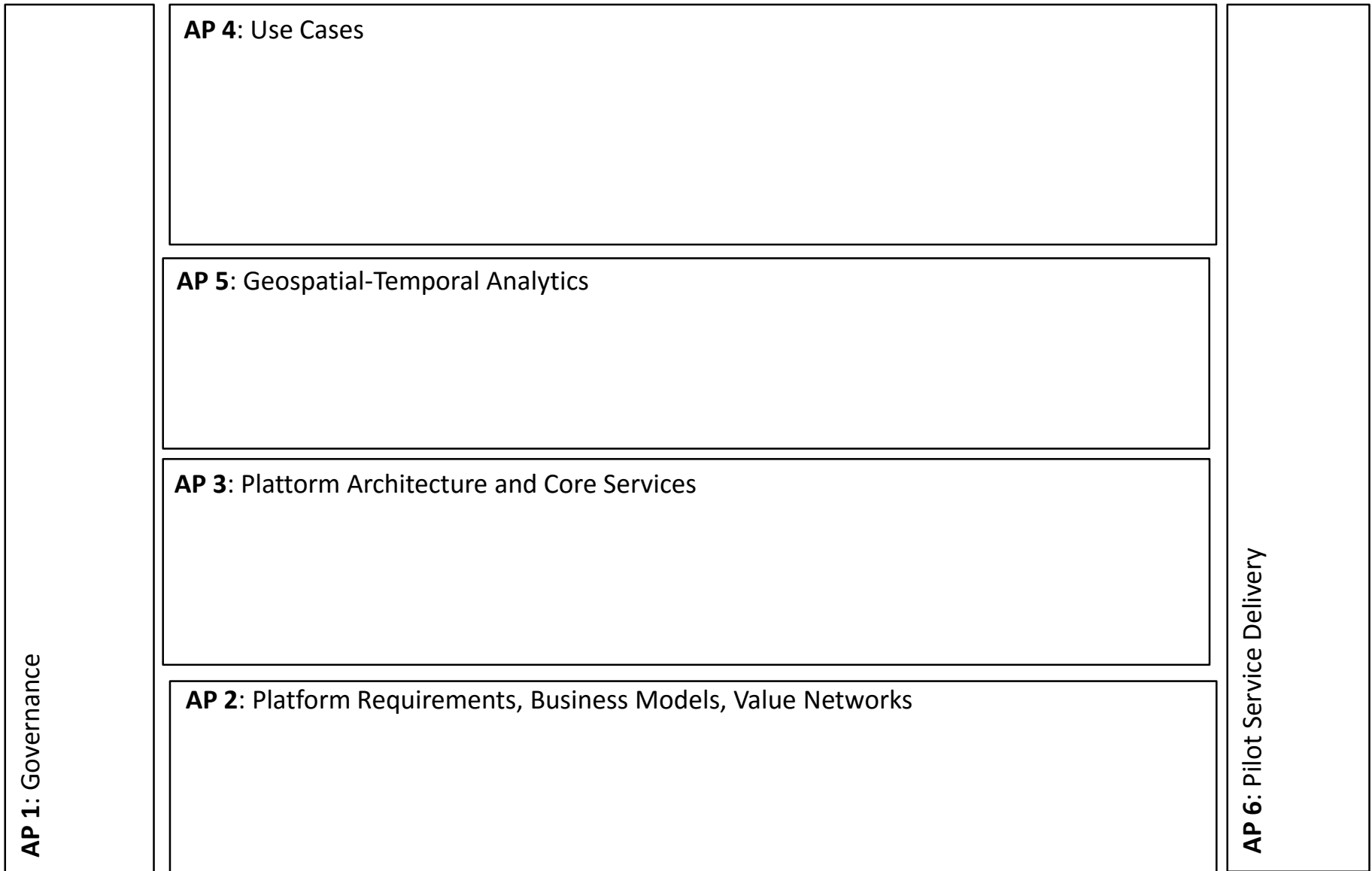

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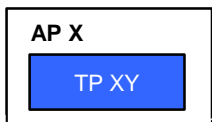
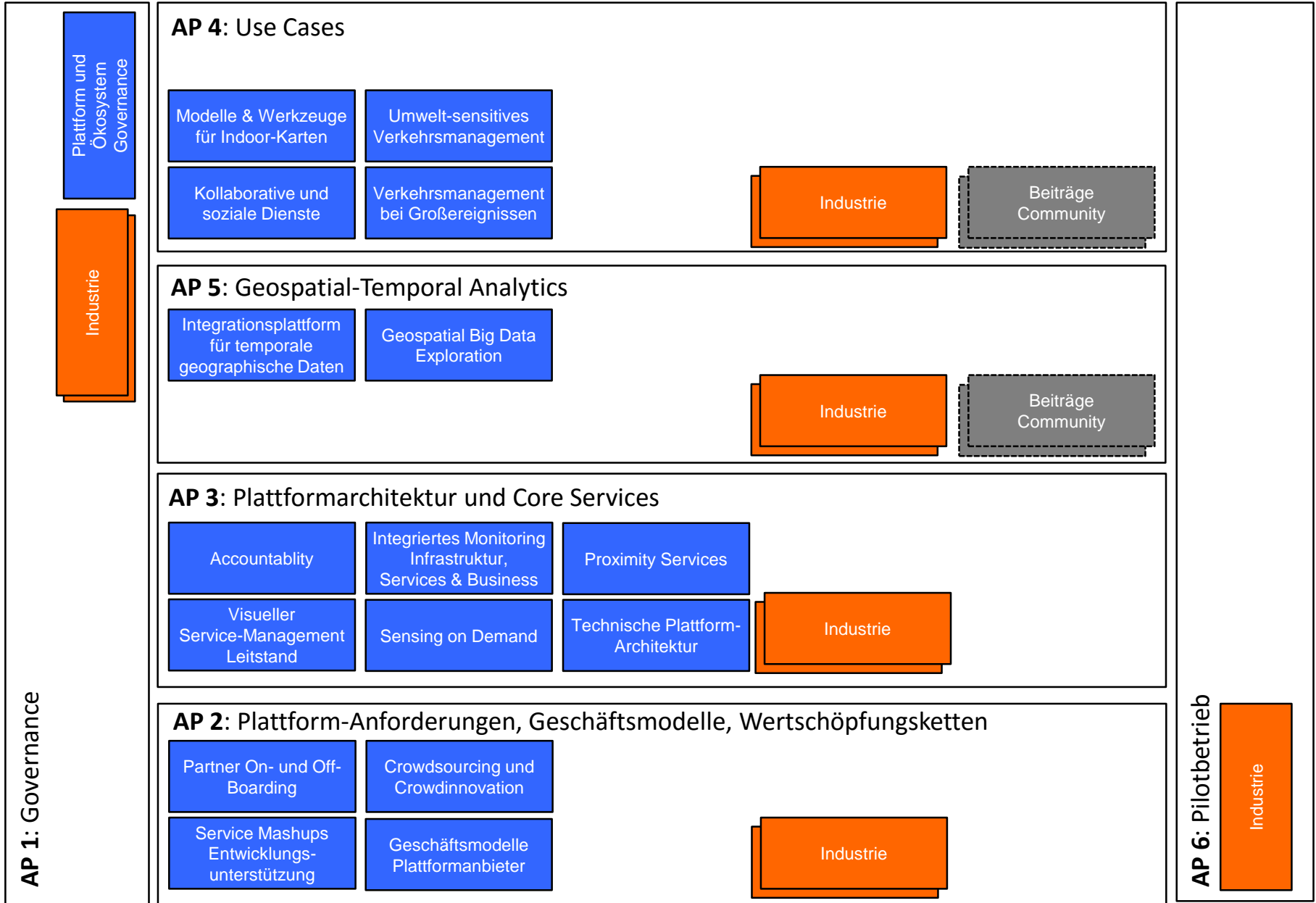

- Parking



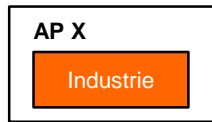
New opportunities created via specifically designed **collision** events



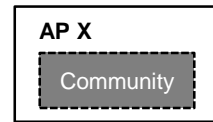




Forschungs-Teilprojekt XY im Arbeitspaket X



Leistung vorhanden oder erbracht durch paralleles IuK Industrieprojekt



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 substantiell geringeren finanziellen, organisatorischen und technischen Aufwand zu entwickeln, zu betreiben und miteinander zu vernetzen.

API: Plattform und Ökosystem Governance

TP1.1 Plattform und Ökosystem Governance

AP4: Use Cases

TP4.1: Modelle & Werkzeuge für Indoor-Karten

TP4.2: Umwelt-sensitives Verkehrsmanagement

TP4.3: Verkehrsmanagement bei Großereignissen

TP4.4: Kollaborative und soziale Mobilitätsdienste

AP5: Geospatial-Temporal Analytics

TP5.1: Integrationsplattform für temporale geographische Daten

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/He5TSAXbxo>


yesterday

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



Learn more and get in contact with us!
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