Mobilität in der digitalisierten Welt

Impulsvortrag

TUM Living Lab Connected Mobility (TUM LLCM)
Faculties of Informatics and Civil, Geo and Environmental Engineering
Technische Universität München, Germany
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

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)
“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.”
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

Samsung Connect Auto

Android 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?

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

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

![Graph showing adoption rates of various consumer technologies in the US.](image-url)
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
Competition by strong customer-focused digital players

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

Klassische Mobilitätsserviceleister

Mobilitätsinformationsdienstleister
Marketplaces, platforms and their ecosystems
Example: Moovel (Daimler)

Acquisitions and partnerships
Example: Connected Mobility Lab

BMW GROUP, SIEMENS, HERE

MOBILITÄTSANGEBOT

PERSONALISIERUNG

ANWENDUNGEN

PARTNER

PLATTFORM

DATEN

*Logo und Prozesse sind inhaltlich irrelevant
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Exponential organizations
### Examples for potential project partners

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

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<th>NAVVis</th>
<th>eemobility</th>
<th>Carly</th>
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<td>TESLA</td>
<td>Die Bahn</td>
<td>DB</td>
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A human-centered design thinking approach

The main questions to be answered

Which problem of whom do we solve?

How can we solve it?

How do we provide our solution in a sustainable manner?

People
Desirability

Business
Viability

Technology
Feasibility

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
TUM Living Lab Connected Mobility (TUM LLCM)
Principles for the collaboration with industry partners

Shared Vision
- Digital Transformation (Smart Mobility, Smart City, Smart Energy, …)

Shared Goals
- Open, internationally competitive mobility platform
- Re-usable and scalable mobility services
- Living ecosystem of small and medium-sized service providers and services users
- Innovation leadership, time to market

Common Interests & Needs
- Business Models, Business Eco Systems, On/Off-Boarding, Architecture & Interface Evolution, Geospatial Analytics, Legal Aspects, Collaboration, …

Complementary Viewpoints and Skills
- State of the art / state of research, transformation / innovation

Common Approach
- Iterative, incremental, early feedback and synchronization points (quarterly, yearly)

Good Neighborhood
- Short distances, people exchange and established networks in Munich
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)

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 Lanatnaier
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

Alexander van Renen
Integrationsplattform für temporale geographische Daten

Varun Pandey
Geospatial Big Data Exploration
Project organization

AP 1: Governance

AP 2: Platform Requirements, Business Models, Value Networks

AP 3: Platform Architecture and Core Services

AP 4: Use Cases

AP 5: Geospatial-Temporal Analytics

AP 6: Pilot Service Delivery
**AP 1: Governance**

- Plattform- und Ökosystem Governance
- Industrie

**AP 2: Plattform-Anforderungen, Geschäftsmodelle, Wertschöpfungsketten**

- Modelle & Werkzeuge für Indoor-Karten
- Kollaborative und soziale Dienste
- Umwelt-sensitives Verkehrsmanagement
- Verkehrsmanagement bei Großereignissen
- Leistung vorhanden oder erbracht durch paralleles IuK Industrieprojekt

**AP 3: Plattformarchitektur und Core Services**

- Accountability
- Integriertes Monitoring Infrastruktur, Services & Business
- Visueller Service-Management Leitstand
- Sensing on Demand
- Technische Plattform-Architektur
- Geschäftsmodelle Plattformanbieter

**AP 4: Use Cases**

- Integrationsplattform für temporale geographische Daten
- Geospatial Big Data Exploration
- Industrie
- Beiträge Community

**AP 5: Geospatial-Temporal Analytics**

- Integrationsplattform für temporale geographische Daten
- Geospatial Big Data Exploration
- Industrie
- Beiträge Community

**AP 6: Pilotbetrieb**

- Sensing on Demand
- Technische Plattform-Architektur
- Industrie
- 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 bundelt.

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.

AP1: 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 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/HeST5AXbxo
yesterday
Minister berichten über die Gründung des Zentrums https://t.co/C4dG2AVTaa #news https://t.co/1cCO
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