

## **mobil.LAB:**

# **Sustainable Mobility in the Munich Metropolitan Area – Designing Mobility Cultures**

A Postgraduate Program at the  
Hans-Böckler-Foundation at the  
Technical University of Munich (TUM), in collaboration with Nuertingen-Geislingen  
University (HfWU)

## Team of university lecturers and their main areas of research

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<p><b>Prof. Dr. Sven Kesselring</b>            Chair of Automotive Industry: Sustainable Mobility            Nürtingen-Geislingen University (HfWU)            Parkstraße 4            D-73312 Geislingen            Tel. 07331.22525            E-Mail: <a href="mailto:sven.kesselring@hfwu.de">sven.kesselring@hfwu.de</a></p>	<p>Sustainable mobility, mobility and            transport sociology, sociology of mobility            and work, governance- und participation            research, social network analysis,            qualitative methods</p>
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# Concept for the Second Funding Phase

## *General objectives for the second phase*

Over the last five years the postgraduate program mobil.LAB has developed a high level of productivity and efficiency. This was not the case from the beginning onwards, instead this productivity and efficiency had to be developed step by step.

Thanks to the intensive dialogue that was built up between the doctoral students and university lecturers from different disciplines, they were able to significantly develop the fundamental concepts of the program. During the entire period work has been carried out on a working paper about the common understanding of “sustainable mobility in the Munich metropolitan area” (this document can be viewed on the homepage).

The postgraduate school mobil.LAB has thus become a place where research into mobility, no longer simply transport planning, is carried out. This should by no means be understood as something that is simply a superficial change. On the contrary, sustainable development is something that requires a profound change of perspective on the part of all those involved (Klein 2014): Due to the need for action caused by increased resource scarcity, climate change, migratory flows and the negative social, economic and ecological consequences of transport loads it is necessary to develop the potential for action of individuals, organisations and whole cities and regions with regard to “a policy of resilience” (Pikcett et al. 2014). A policy whose primary goal is to quantitatively handle the increase of transport operations is not sufficient. The regional and global consequences of the highly mobile and fossil-fuel-consuming lifestyles of capitalist societies cannot be handled by this type of policy alone.

Based on work done so far, various research projects carried out by the applicants, and the current state of science, we view an understanding of mobility as a fundamental principle of modern societies as a central conceptual theme (cf. Canzler 2013; Bonß/Kesselring 2001). Ultimately, mobility in society today constitutes the cultural basis of modern economics and society. These ideas were first mentioned early on by authors such as Karl Marx, Georg Simmel, or advocates of the Chicago School of Socio-Ecology (Park 1925; McKenzie 1921; Lanoy 2015). However, mobility as a “quasi-natural reality” is not unfluencable. Rather, it is subjected to constant social and cultural change, and therefore can also be influenced and designed by politics and society. Thus, using a (predicted) demand for transport as a given input variable for transport planning and as a reason for the building of needs-based infrastructures is no longer in keeping with the times. In integrative mobility concepts the mobility options available should be designed in such a way that the demand for transport should, as a target, comply with the criteria for sustainability (such as regional climate protection targets). For a successful design, it is imperative that mobility in its current complexity is taken into account. Design forms – from government strategies and participation to co-creation and self-regulation – have to be found that enable mobility to be viewed as a socio-technological constellation of a culture that revolves around mobility and thus enable it to be developed further in a successful fashion. In the age of internet, Industrie 4.0 and postfossil mobility

strategies, mobility can no longer be viewed as a concept that simply encompasses transport (Dennis 2013; Schindler et al. 2009). Instead, the idea of “several mobilities” (Urry 2000; Sheller 2015) should be used as a starting point and mobility should not be reduced so that it refers to the phenomenon of transport alone. Against this background, sustainable mobility policies will become a „project“, how to develop strategies that ensure mobility without the consequences that an excessive use of automobiles brings with it. Concretely, this means that the conversion of the automobile industry into a mobility industry must be enforced and planning and development processes must be initiated, through the joint collaboration of economy, society and politics, so as to enable multimodal mobility at both local and regional levels (Canzler 2015)<sup>1</sup>.

The specific quality of the work taking place as a part of the program consists of critically examining the developments and regional features of the Munich region so as to be able to use it as an example. However, above all the work taking place delivers a qualified foundation for political-planning, industry-political and trade union strategies for the sustainable development of mobility in the Munich metropolitan region – and beyond. Mobil.LAB therefore plays a role in the implementation of science into practice as well as the application of research. The Munich metropolitan area is used as a case study and is provides both an exemplary local study as well as a comparative study with national and international references. The Munich region, with its prosperous economic and scientific development has a special social responsibility to develop innovative solutions for solving global challenges, while, at the same time working out special features and similarities with regard to political-planning and industrial-political consequences.

This potential of the program to contribute to the regional safeguarding of mobility and the development of new labour market potential (in the automobile and transport sectors, the supply industry and new service areas and service providers in the mobility sector –keywords: multimobility, sharing-strategies- etc.) has been widely acknowledged in Munich. Therefore, as well as content-related specifications and creating a new emphasis for the program, the goal is also to intensify the school’s networking so as to increase the employability of the program’s fellows. The partnership between the TUM and the HfWU provides a special element, especially due to the involvement of the German institute for the automotive industry and its excellent business connections.

A central element of the reorientation of the post-graduate school is our reaction to the fact that the mobility landscape and especially the mobility economy change at a rapid pace. Last but not least, the Volkswagen crisis will additionally speed up this process. Overall, we expect that **the radical change of the transport and mobility economies** will result in a key branch of the German economy having to practically reinvent itself. Examples of this are the increasingly offered, and in demand, mobility services that are based on sharing and using instead of owning, the major debate surrounding electric mobility and the fact that sharing-strategies are increasingly being heralded as the future of (auto-)mobility.

Using accessibility research as an example it can be shown how this change is reflected in mobility research and in the program. In the designs for a “car-friendly

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<sup>1</sup> cf. also Banister 2008; Geels 2012; World Business Council for Sustainable Development 2004.

city” (Reichow 1959), the physical adaptation of an urban space to the technical object, the car, was the main focus. However, for an ecological and socially sustainable mobility policy, humans and not objects must be the strategic points of reference. The “human scale” as the Danish architect Jans Geels refers to it, is what is of importance here.

Building upon the already existing work into accessibility research (Wulfhorst, 2008; Büttner et al. 2014; Wulfhorst et al. 2015) the development of multimodal transport networks is taken into consideration in combination with location development. The ideas for this have been designed and developed in the successful European COST campaign “Accessibility Instruments in Planning Practice” (cf. [www.accessibilityplanning.eu](http://www.accessibilityplanning.eu)).

In a sustainable mobility strategy, transport not only serves as a utilitarian safeguard for accessibility to goods and services for individuals and certain groups, but it also represents a significant connecting factor in diverse networks and a space for social integration (cf. Miciukiewicz and Vigar 2012).

Instruments and policies which improve the accessibility of places play a decisive role with regard to the provision of socially equitable and solidarity-based mobility (“mobility justice”; Sheller 2012). This is due to the fact that this involves being able to take part in public life, being able to have the same chances when choosing a place of work as well as social integration and cohesion. The optimisation of a given transport system is only of secondary importance. New priorities must be made with regard to creating sustainable mobility policies (Banister 2008; Rajé und Grieco 2004).

### ***The Current State of Research and Strategic Priorities***

Since the program’s beginning, there has been a significant increase in literature on sustainable mobility. In contrast to when the program was first starting out, the topic is no longer a niche subject and has now become a core area in research (Stern 2015). There is even a “Journal of Sustainability” (Greenleaf Publishing). The economic activity that arose as a result of electric mobility as well as the overall coalescence of mobility and energy and communications topics was of great importance. In particular, the various conferences which members of the program actively helped organise, gave presentations at and took part in discussions at document this (see overview in Chapter 1).

In order to structure this diversity content-wise, we have defined four thematic main focus areas for the second phase, which support the further development and strategic reorientation of the program’s work. In the following, for every main focus area, we will present the current state of research, as well as gaps in this research that will hopefully be able to be filled thanks to making them the subject of possible doctoral dissertations.

The model of a culture of mobility taken from Kihnimhof, Wulfhorst (2013) (see Fig.3) serves as an orientational framework. This model lends itself to this purpose as it

depicts those thematic fields that the program has already built up competencies in with regard to the necessary change towards sustainable cultures of mobility. It serves as a working model and can be viewed, on the one hand, as the continuation of the thematic structure of the first phase (transport systems, travel behavior, culture of transport, transport policies) (cf. Fig.1). On the other hand, it shows that, in combination, political decisions, spatial structures and the social perception of mobility have an effect on cultural circumstances, which structure mobility in practice in modern capitalist societies. In relation to this, the topic of a culture of mobility as a central element of the theory of sustainable mobility is introduced and we estimate that, by the end of the second phase of the post-graduate program, we can present a differentiated and systemised overview of the different interdependencies.

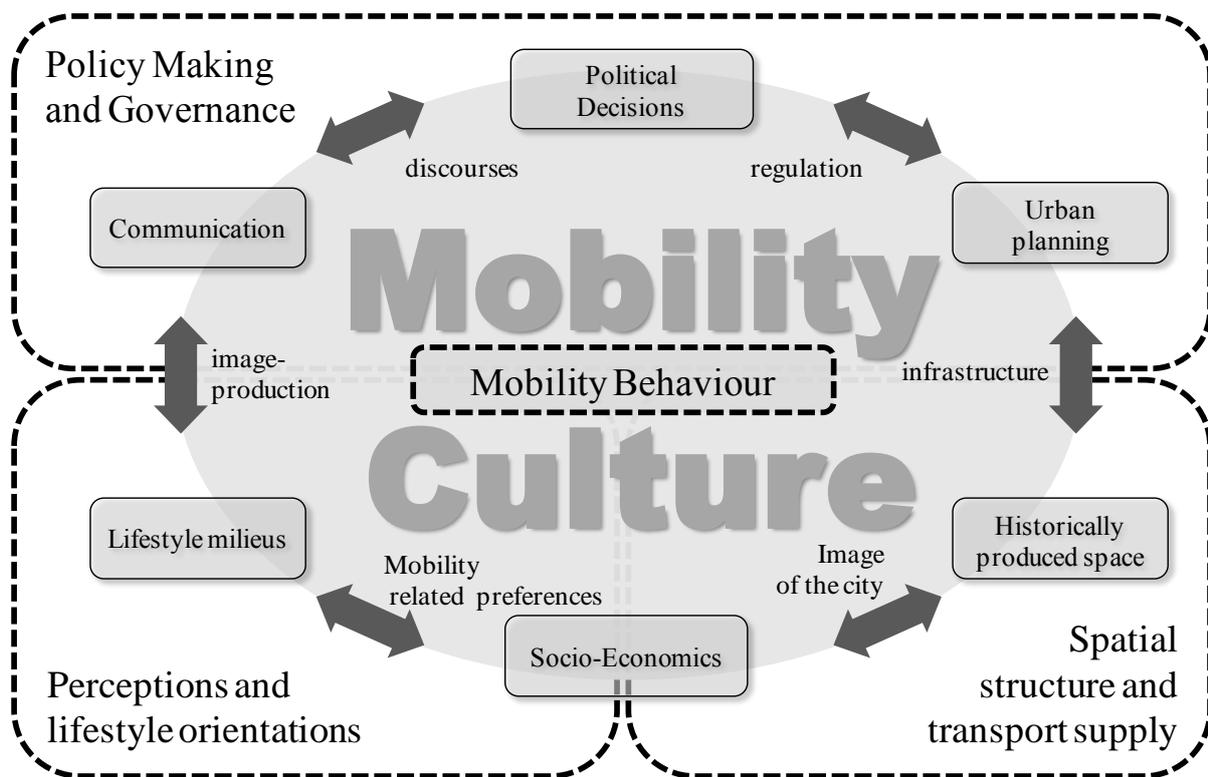


Abb. 4: Culture of mobility as an orientational framework  
(Quelle: Kuhnimhof, Wulfhorst, 2013)

This content-related reorientation of the program is clarified in the following with the help of four thematic blocks:

1. New mobility strategies
2. Mobility action in transition
3. Form transport policies to mobility policies
4. Sustainable cultures of mobility: Elements of an interdisciplinary theory of mobility

In the first section, we will discuss selected approaches for new mobility strategies. In doing so we will cover a spectrum of topics ranging from infrastructural topics relating to accessibility research and the construction and design of transport systems to business models for innovative mobility services such as free-floating car-sharing or operational fleet management. The radical change of the mobility economy

that was already mentioned above is also thematised here with regard to its future sustainability.

The second section deals with social change in the mobility practices of humans, both within and outside organisations. Questions relating to work-induced mobility play a central role. Phenomenons such as mobile work, the design of business trips, changes in commuting between work and home, as well as different job locations are emphasised. Additionally, topics such as the changing mobility practices of youths, the diminishing identity-creating function of cars and general questions relating to technology use and alternative forms of overcoming spatial problems are taken into account (keyword: virtual mobility).

Section 3 is titled “From transport to mobility policies” and decidedly takes up the topic of the structural shift of mobility mentioned at the beginning of this paper. Previous research has shown that at a discursive level the conceptional shift towards policies of mobility is already taking place (cf. Banister 2008; Te Brömmelstroet et al. 2011; Tschoerner 2015; Kesselring 2015; Wulfhorst et al. 2013). We will critically investigate this shift and identify what research is still necessary in a central area for the sustainable development of mobility in the Munich region, but also other regions.

The title of the fourth subject area is „sustainable cultures of mobility – elements of an interdisciplinary mobility theory“. On the one hand, a connection is established to the current theoretical discussion about sustainable mobility and „mobile risk societies“(vgl. Urry 2007, Urry 2011; Kesselring 2009; Banister 2007; Grin et al. 2010; Geels 2012). On the other hand, the concept of a culture of mobility as a research and orientational framework for the development and implementation of sustainable mobility will be taken up and its further development will play a central role in the program. Based on preliminary work carried out in a joint project about “mobility cultures in mega-cities” (Kuhnimhof, Wulfhorst 2013) we have formed the assumption that one cannot talk about “a” culture of mobility, but that, instead, depending on respective contexts, very different cultures of mobility develop and also already exist.

### **New Concepts of Mobility**

The present-day “system that is dominated by automobiles” (Burkart 1994) based on the individual owning of vehicles is increasingly being adapted due to the establishment of alternative concepts of mobility: new forms of propulsion, autonomous vehicles and car and bike sharing platforms, vehicles for last-mile-mobility etc. are indicators of a new, overall significantly more efficient and high-performing system that must be designed so that it is sustainable (LSE Cities and innoZ 2015). Seamless accessibilities, door-to-door connections and the elimination of the need to drive oneself, is propagated as a new type of flexibility, which enables higher productivity while travelling. The vision of a sustainable, safe and efficient multi-modal transport system belongs to the guiding principles behind concepts such as “smart cities” or “smart mobility” (cf. OECD/ ECMT 2007, Hajer und Dassen 2014; Klug 2013, or the current EU Invitation to Tender “Smart, Green and Integrated Transport within the Framework of the Horizon 2020 Research Program) and is, particularly in urban development, a driving force. In a publication by McKinsey the following is stated in relation to this:

“Better utilisation reduces the costs of mobility and enables cutbacks to be made with regard to resources, emissions and space (...). At the same time, road traffic safety is increased. Estimates have shown that the number of road traffic deaths could decrease by more than 90% due to the future concept of mobility (McKinsey 2015: 50).”

Several doctoral candidates have dealt with aspects of this general development using bicycle policies or the discussion surrounding the introduction of electric mobility to Munich as examples (cf. Tschoerner 2015; Le Bris 2015).

Aspects of accessibility play a decisive role in the process and influence mobility behavior in urban regions significantly (cf. Naess 2009, Gerike et al 2013; Büttner et al 2011). A multi-modal, energy-efficient mobility system can only be created if the interfaces – the nodes- between the individual elements and means of transport function as they should. There have been many attempts to develop integrated transport strategies, concrete proposals and plans for the merging of public and individual transport have been developed with great regularity since the 1930s (cf. Meyer 2014). Most of these large-scale attempts have regularly failed due to the fact that the completely different social-technical constellations and networks which have been formed out of different means of transport have not been taken into account (ibid.). The mobility structure shown in figure 4 has historically formed very heterogeneous subsections. Nowadays, highly complex specific networks of infrastructures, regulations, spaces, lifestyles, discourses, but also concrete technologies and their utilisation practices exist for cars, trains, bikes, etc. These local fields of mobility culture and their social-technological constellations must be comprehended in full and ways need to be developed in which convergences can be achieved. Copenhagen is often used as an example of a multi-modal transport system, which has organised the crossovers between bikes, cars and public transport especially well. That this is, however, a specific and historically-determined solution, which was developed due to financial shortages in the wake of World War Two, becomes apparent when it is compared to Stockholm (vgl. Koglin 2013).

This shows that innovative concepts of mobility and infrastructure policies have to be analysed together. Concretely, questions arise as to how transport networks and locations are connected to one another and how, as a result of this knowledge, an integrated spatial development can be designed which complies with the principles of sustainable development. In this context spatial design is the main focus, in particular location development for urban uses at the network nodes of a transport system. In sustainable mobility planning questions relating to the design of social networks, communication networks and, for instance, access to high-speed data networks must also be borne in mind. In this regard, however, it is also important to take the interactions between spatial development and transport prevention into account.

An important element of a sustainable development is the careful handling of the space available as a resource. The mixed and diverse use of a region in locations that are readily accessible due to good public transport connections is a challenge, and therefore a necessary key competence of spatial and urban development in the future. Railbound public transport plays a central role at those points where the train stops so as to be able to transform the region both socially and

from an economic structural point of view, developing or winning back urban space. This “urban generator” function has, up to now, not been researched in a systematic way and, in particular, not in a manner that views the challenges as an interdisciplinary problem, which involves diverse disciplinary cultures of planning, and financing and operational competences. This also involves the public sector’s ongoing, long-term lack of funding resources and the necessity of developing useful and efficient new partnerships – keyword “Public private partnership 2.0” or “3.0” (cf. Wulfhorst 2009; Wulfhorst et al. 2013).

In connection with the program, the dynamics of change and options for the future for the Munich metropolitan region have been investigated and studied in an extensive study carried out by the TUM about “living – working – mobility” (cf. Büttner et al 2014). As well as this, dissertations completed in the mobil.LAB provide starting points from which to expand research into the interactions between cultivated environment, energy and mobility (cf. Ansatz Lebenszyklusbetrachtungen von John E. Anderson).

Other new mobility options are also gaining more and more significance. Developments of individualised mobility services, the increasing distribution of sharing-systems, but also the availability of new vehicle categories such as electric bicycles extend the range of possibilities for meeting different mobility needs in a custom-made fashion. As well as this, further technical developments have also taken place in conventional automobiles such as highly-automated driving. If a driver can lean back and relax while driving his car, then cars become direct competitors of the public transport network and a close link is formed between the two as the latter no longer has the “not-having-to-drive-oneself” advantage.

This development would be unthinkable without the introduction and spread of innovative technologies. The availability of mobile and stationary (micro)computers (keywords here are smart devices and ubiquitous computing) on the one hand, and server- and cloudcomputing structures on the other, make mobility options virtually available and therefore enable greater flexibility the users of mobility services, without their having to be the owner of a vehicle.

A closely connected and important field is that of economic structure, which deals with the changing demands on both internal logistics and the mobility of employees. The effects on purchasing behavior, for example, and the delivery and service journeys connected to it, must be taken into account.

A quantification of the effects of transport and social effects is an exciting and highly topical research question in this context. A subsequent question is one of how social cohesion can be measured and defined.

It is important that dissertation topics in this area concentrate either on regional structures and mobility behavior or on autonomous driving, and, while doing so, always take the social-technological networks and the overall connections of a specific culture of mobility into account. Only by thinking about concrete application areas and the social-technical constellations in which these are embedded, can solutions that can be implemented and used in practice be developed.

Possible dissertation topics in this area are:

- Interactions between innovative mobility options, regional structure and mobility behavior:
  - Analysis of development dynamics through empirical studies, identification of central effect parameters on different scale levels (such as polycentral structure development by the creation of public transport networks, effects of local mobility strategies on regional location/transport quality, ...),
  - Physical and virtual integration of diverse mobility options (car-/bike-sharing).
  
- Basic principles and effects of multi-modal mobility services:
  - Providerstrukturen und corporate networks for implementing networked mobility systems
  - Transformation of automobile manufacturers to mobility providers;
  - Corporate Mobility – What companies require and demand from mobility service providers;
  - Effects of „sharing mobilities“ on individual participation possibilities and social networks.
  
- Highly-automated vs. autonomous driving:
  - The technical basic principles of different vehicle concepts
  - Integration into urban/regional contexts,
  - Analysis of introduction scenarios of highly-automated vehicles (with drivers) or autonomous (self-driving) vehicles
  - Impact analysis on potential patterns of mobility
  - Evaluation of the potentials and risks for different user groups (for example, advantages in comfort for stop-and-go traffic, getting pensioners mobile again: How vehicle technology can make older people with restricted driving abilities more mobile; How the Google car will change how households choose where to live and companies choose where to set up their businesses).

## Mobility Action in Transition

The term mobility action is used in reference to Max Weber's sociological concept of action, because – unlike the more common term travel behavior – it emphasizes the complexity of modern (more reflexive) decision making (Bonß / Kesselring 2001). Transport research often seeks simple “levers”, which make it possible to control people’s behavior. However, those approaches that build on “economic man” have not in fact proved really successful. Human action follows other logics than purely economic and goal-oriented rationales. “Cognitive dissonance” (Festinger 1957) characterizes human actions, and leads to seemingly irrational decisions and practices in transport use. Newer approaches to mobility research therefore say that there are certain “structural stories” (Freudental-Pedersen 2009; Shove and Walker 2010) which determine action. One therefore speaks also of lifestyle orientations and mobility preferences (see. Kuhn Imhof and Wulfhorst 2013). In the changing technological environments in which mobility takes place today (e.g., intelligent transport systems, autonomous driving, mobile telephony and mobile information management, etc.) this complexity is increased even further. Familiar routines are being questioned and, in particular through more flexible processes in the world of work, are becoming the subject of conscious decisions. Those that work on the move, make frequent business trips, commute over long distances, or have to travel between sites, often cannot rely on simple routines. Even those who travel by car to work every day cannot simply assume their actions to be self-evident. While today company employees are confronted with new offerings and mobility concepts (company carpooling networks, job tickets, company mobility management, etc.), mobility has to be justified, and their own movement is in competition with other models.

The thesis here is that we are witnessing a profound transformation in mobility, which is why, for example, the ILO responded in Frankfurt this year with an exhibition with the programmatic title “New World Mobility”. Mobile life and work, according to Elliott and Urry (2010), has been profoundly altered by the fusion of spatial movement and communications, and the penetration of everyday life by mobile technologies. These processes of change can even be observed in the organization of the everyday life of the family; sometimes even a family dinner turns into a “project” that needs to be coordinated and planned using Doodle or Outlook. Although autonomous driving has not yet been fully realized, the discussions about it have changed the social understanding of movement and mobility in space, and have become the object of planning processes in cities (see e.g. Discussion on the Future of Mobility in the Munich Region 2050; Wulfhorst et al . 2014; Kesselring 2015). An advertising slogan such as “The Ultimate Driving Machine” used by BMW in the 1980s and 1990s, would probably not have the same resonance today (see Beckmann 2001 on changing concepts of resonance in advertising).

The emergence of new options in the field of mobility goes hand in hand with an increase in multimodality, and especially optionalities in thinking about mobility. Canzler and Knie (1998) have argued that mobility comes from the head. In this sense, the thinking, i.e., the cognitive landscapes of mobility, are currently undergoing a dramatic change. The emotional relationship with the automobile is subject to enormous changes (Sheller 2004; ifmo 2013). On the one hand, the choice of different modes of transport accompanies the multimodal organization of everyday

life. But in fact it also hinges on an objectification of affirmative relationships that people have to transport. One then no longer simply travels in one's "own" car, but chooses those mobility options that best match the specific case or are most comfortable.<sup>2</sup> Secondly, sustainable mobility actions are "reflexive" (Beck, 1993; 2008), i.e., must be justified because they are the subject of conscious decision-making. Previously, motorists traveled by car and anyone on a bike was a "tree-hugger". Today we are dealing with hybrid or multiple types of mobility. The (former) Munich as well as London mayors have shown that they can also ride a bike to work, and public bicycles are used across the social spectrum by the general public (Sustrans 2015; Cox 2015).

Against this background, the choice of transport and its combinations will also affect the criteria of economic, social, and environmental sustainability. It raises the question whether in the interaction of reflexivity and sustainability, new patterns of mobility will emerge.

There are many indications that social change in social mobility practice will increasingly (but not only) take place in cities (cf. Jensen 2006. Lanoy 2015). Looking at the now extensive literature on mobility action, three dimensions and causes can be systematized:

1. A new multioptionality has emerged because alternative forms of mobility have lost their niche character. Business models and services are economically relevant, and transport networks have been transformed into accessible, resource-efficient, and socially sustainable systems.
2. A fundamental change in the public discourse on mobility has occurred, which is promoted by the development of new services and perception in everyday life.
3. Changes in communications and mobility technology act as a catalyst for these social dynamics.

This is associated with modern lifestyles in the city (part-time jobs, living-apart-together, Airbnb cultures, etc.), the preference of the next generation for "time life balance", the growing significance of private life, and the readiness to consider economic constraints in return for personal quality of life. Exchanging time for money by choosing a relatively slow long-haul bus also stands for a new model of price elasticity. These economic consequences represent new possibilities for individuals. Related questions concern the acceptance of new mobility services and concepts (e.g., privacy concerns).

In addition, changes in mobility styles and values are occurring among the young generation. New technological possibilities allow other forms of experience and perception of space that interact with the aforementioned modified forms of space management and coordination of social relationships and networks. Regarding diverse populations, an important question is whether those who pursue knowledge-intensive activities (keywords: creative class, knowledge-based society) display different mobility behavior and why this is so.

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<sup>2</sup> Cf. works on the so called practice turn, which address the normalization and routinization of everyday actions, and open up a new view of the modifiability of activities like mobility (see e.g., Shove et al. 2012; Dick 2009).

Possible doctoral research topics in this area are:

- Changing work environment(s):
  - Space usage of employees (for example, knowledge workers in the manufacturing and service providing industries, the “creative industries”, and delivery services): What changes result from the interplay of physical proximity and relational proximity to location and mobility needs.
  - What are the implications on the importance of mobility for companies? Contexts in attracting, retaining and repositioning of human capital in the context of entrepreneurial competitiveness.
- Impact of information and communication technologies on mobility practice:
  - The consequences of navigation and information systems on the sustainability of everyday mobility decisions
  - Analysis and spatial visualization of social networks in the metropolitan areas of Munich and Stuttgart
  - Flexible mobility through ICT (also from an historical perspective)
  - Effects on efficiency / time rating (communication, work, etc., while on the move) and sustainability (economic, social, environmental)
  - Consideration of differences between urban and rural areas, young people and seniors
- Changing mobility patterns:
  - Smartphones as new signpost. How apps and tools have changed mobility behavior (or not!); immobile mobility (analysis of Big Data tracking records).
  - How do the “pioneers of sustainability” use the Internet, and how does that affect their daily mobility practice?
- Mapping of changing framework conditions in models:
  - Logit model II: While the traditional Logit model assumes that decisions are taken with limited information, modern means of communication allow almost complete information. A key consideration for mobility decisions hitherto has been journey time, but this is losing in importance to other criteria of time use (online access, comfort, ...); How can this be displayed in decision models?

## **From Transport to Mobility Policy**

One of the main theses of this research program is: The **transformation** of the transport system in a multimodal mobility system is currently underway (see Canzler, Knee 2015 Vannini 2010). This change is necessary but not sufficient in its present form. Coping with the challenge of climate change and the social consequences of the mobilization of modern societies sustainably also requires a paradigm shift in planning and mobility policy to human resources policy in companies. Otherwise the social, ecological, and economic foundations of modern metropolitan areas cannot be permanently maintained. Currently, planning is still dominated by a logic according

to which the continuous growth rates in road, air, and cycle traffic must be reckoned together with the development of transport capacity. Companies will continue to operate according to the logic “More mobility means more sales and thus more prosperity”. Companies with an operational mobility policy based on the principle “meet more, travel less” are still the exception (see Kesselring / Vogl 2010). The developments in vehicle technologies are primarily focused on maintaining the model of distance intensive mobility. Although in public discourse the topic of electromobility is high on the agenda, most patents are still registered for the conventional internal combustion engine. Industry focuses on developing electric motors with a similar range to the conventional automobile. Thus, the opportunity to evolve another concept of mobility based on shorter ranges may be lost. Even economic studies prove that the equation “more spatial mobility = more prosperity” is not only questionable, but to a large extent economically irrational and life-threatening (Star 2015).

Transport is a major contributor to CO<sub>2</sub> emissions in industrialized societies, and so constitutes one of the main starting points for a policy of sustainability (Urry 2013). The necessary paradigm shift is that policy and planning (especially in the functional urban zone of metropolitan regions) interact in realistic and desirable mobility scenarios, rather than relying solely on quantitative (projected) growth in transport (Banister 2008). Therefore, rather than naive optimism about the future, reference to transition research that sees here a possible way out of the existing path dependencies is called for. Existing innovation paths (Meyer 2016) have to be understood in their dynamics and their underlying mechanisms in order to serve as starting points for socio-technological change. A successful transport policy not only requires consideration of the socio-technical constellations of mobility culture, but their active creation and use. In addition to the integration of technology, infrastructure, environment, norms, values, and points of view, it is vital – particularly for the (re)design of mobility policy – that the incentive systems of different organizational and institutional contexts are taken account of. Different stakeholders within the political sphere operate with some very divergent incentive systems in institutional contexts (Meyer 2007). Within transport policy there are a range of different priorities: Promotion of a specific mode of transport, formal correctness of administrative processes, successful economic development, etc. If we add the other stakeholders from the culture of mobility and their integration in socio-technical configurations, the picture is even more complex. But without the specific consideration of these various networks, a new mobility policy cannot succeed. To ensure a sustainable mobility policy, institutional and financial potential must therefore be used more effectively than in the past.

The local and regional level plays a crucial role, since it is here that concrete and context sensitive global and national sustainable development strategies can be implemented. Authors as diverse as Prince (2007), Hajer (2009), Resel et al (2002) argue for institutional innovations. Hajer even calls for a “smart urbanism”, and warns against trusting to technology alone to solve the mobility problems of highly dynamic capitalist urban societies (see. Also Canzler, Knee 2015). Rather, it is a matter of developing regional governance structures, and understanding mobility policy as a common task.<sup>3</sup> Although the monopolistic control paradigm of politics has long since

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<sup>3</sup> This is an essential task, particularly from a trade union perspective. Only if we succeed in reorienting mobility systems and the economy (automotive industry, dealer networks, suppliers, the “new mobility sector”

pushed the transport sector to its limits (Beyme 2007), really convincing alternatives to existing policy, design, and administrative routines are clearly still in their infancy. Therefore, it is one of the research objectives of the PhD program to identify possible ways the topic of sustainable mobility can be understood and addressed as a common task of policy, planning, administration, industry, trade unions, and civil society in the Munich area.

Against this background, Munich is an excellent “laboratory” for “smart urbanism” (Hajer, Dassen 2014) and for innovative mobility policy. Since the 1980s in Munich and the beginnings of the so-called cooperative transport management (KVM), new modes of regional cooperation have been adopted by various stakeholders (see Keller 1992, Kesselring 2001 2015; Wulfhorst et al 2014; Baumann, Stuart 2012; Baumann 2013;. Switzer et al 2013; Tschörner 2015). At the instigation of BMW and the City of Munich, the so-called *Inzell Initiative* was founded in 1995 (named after the place of the first meeting). It brought together a wide range of stakeholders concerned with the future of mobility. Inzell has in fact developed into a regional forum that can find consensual solutions to contentious issues at the regional level. In 2013, a future vision of mobility for the Munich region in 2050 was put forward. The aim of this project was to develop forward-looking and sustainable strategies for the region, and to lay a foundation for further cooperation (see Wulfhorst 2013). Since Munich, like Stuttgart, has a critical mass and density of companies and stakeholders in sustainable mobility, it offers good conditions for an integrated mobility policy. In keeping with a policy of “collaborative planning” (Healey 1997), a remarkable attempt to combine and share regional capacities, expertise, and social responsibility has been undertaken. This puts Munich at the cutting edge if one adheres to the concepts of critical planning theory (Flyvbjerg 2012; Sager 2008; Sandercock 2003), which sees in these approaches a promising way of combining “rationality and power” (Flyvbjerg 1998) and catering to vested interests.

The above considerations also constitute a critical response to the challenge posed by the current United Nations initiatives to define overarching, so-called Sustainable Development Goals. We share the view that in this attempt, the UN underestimates the specific possibilities for regions to substantially determine their own development. Indeed, it seems that once again hope is being invested in top-down management instruments, which, however, fail to take account of the complexity of sustainability policy.

Instead, we advocate development of regional governance models networked across several political levels, which do not simply fall victim to a naive “cockpit-ism” (see Hajer et al. 2015 Sustainability 7, pp. 1651-1660). Research work on the program to date clearly shows that Munich is a region with far-reaching potential for action that goes beyond such models. The central stakeholders rely on a complex but coordinated process of communicative planning. Their goal is to integrate urban development, energy, social, and mobility issues in their interactions (see Tschörner 2015; Kesselring 2015; Wulfhorst et al 2014; Thierstein, Förster 2008).

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with its various products and services from car-sharing through ride-sharing, manufacture of bicycles, load wheels, urban rental systems, to new products such as Segways, scooters, kick boards, etc.), will it be possible in the long run to preserve the jobs in this segment.

Currently the Munich Metropolitan Region is planning to develop an “integrated mobility scheme”. In the second phase, the program can play an important role by introducing ideas and concepts into the current debate for moving previous approaches forward and ensuring they are scientifically sound.

Possible doctoral research topics:

- Development of a multi-level governance model for sustainable mobility in the Munich metropolitan region
  - Comparison with existing planning and policy levels, identification of potential actor networks of business, citizenship and policy / management at the relevant levels
  - Development of strategic development options for land use and transport system
  - Analysis and delineation of functional compartments on different scale levels
- Smart Cities - Smart Mobilities? A critical discourse analysis on the future of sustainable mobility using the example of the Munich metropolitan region (compared to the Stuttgart region and possibly other national / international examples):
  - Demonstrating principles and concepts of sustainable mobility
  - Best practice examples of an experimental mobility policy, comparison of transformation strategies in the light of current support mechanisms
  - Assessment and recommendations for a strategic policy development of sustainable local mobility development
- Integrated planning tools and methods for sustainable residential and mobility development:
  - Analysis of the functional relationship of living, working, and mobility, critical analysis of systematic planning and legal framework for spatial planning versus sectoral technical plans with defined interfaces (international comparison)
  - Opportunities for implementation, and obstacles to innovative residential and mobility solutions in the existing legal framework, assessment procedures, and eligibility conditions
  - Opportunities for further development of the planning policy framework for integrated mobility planning

## **Sustainable Mobility Cultures: Elements of an Interdisciplinary Mobility Theory**

We have up to this point made clear that, in the context of sustainable mobility, a naive control optimism needs to be addressed critically. The question is how possible alternatives to top-down planning and policies might look. Certainly not such that we can simply hope for a comprehensive grassroots movement, or spontaneous change of mobility behavior through a change of values and attitudes. This is as absurd as a purely technocentric alignment of innovation and industrial policies. In particular, so-

called “practice theory” (Reckwitz 2002) has shown that instrumental influences on behavior towards sustainability do not work. Shove (2010) demonstrates that simplifications of complex relationships between behavior, policies, and culturally influenced perceptions are ultimately counterproductive. She therefore calls for a social science-based approach to sustainable transition processes. This implies that policies designed to promote and initiate sustainable mobility developments need to go beyond the dominant ABC paradigm of social change: A stands for attitudes, B for behavior, and C for choice. “Moving beyond the ABC is not simply a matter of changing attitudes and behaviors within policy” (Shove 2010: 1282). It is rather about bringing the ideas and visions implied in people’s lifestyle orientations and culturally shaped perceptions (for which Freudendal-Pedersen coined the term “structural stories” in 2007) into line with social policies and spatial-material structures.

It is also important to analyze how very specific ideas and ideologies of and about mobility are defined and solidified in institutional routines and mobility cultures. Taking the example of operational mobility policies, this is an area that is now relatively well studied (see Millar, Salt 2008; Huchler 2013; Hislop 2013; Goetz et al 2010; Kesselring 2015). In other areas, such as planning, industrial and innovation policy, or in the development of new mobility technologies, etc., such analyses are still lacking.

Supported by the diverse literature and innovative research approaches of cultural studies influenced mobility research (see the overview in Vannini 2010) based on the above considerations (see. Fig. 3 / Fig. 1), we therefore formulate an integrated approach, which puts the term mobility culture at the center in the sense that there will be a differentiation of various sustainable mobility cultures.<sup>4</sup>

The frequently referred to upheaval in the mobility economy is concomitant with a fundamental social change in mobility in the mobile risk society. An expression of this is e.g., the looming loss of importance of the automobile as the central means of transportation in modern society (cf. Tully 2009; 2014). The functional diversification of mobility offers, and the spatial and technical organization of mobility and transport is leading to unprecedented multioptionality for individual, collective, as well as operational and institutional mobility practice. On the one hand, this increases the opportunities for sustainable mobility – especially in urban areas; on the other, it poses profound questions for stakeholders and their mutual cooperation, as well as for political culture and the flexibility of policy, along with its well-established forms of conflict resolution and consensus building (Altvater 2007; Glaser 2007; Kesselring 2007).

Following the model of mobility culture (see Fig. 4), a number of research requirements involved in formulating an approach to an interdisciplinary mobility theory emerge. Ultimately, the following four levels need to be conceptually linked:

1. The level of policy formulation and the political-economic strategy formation (at regional policy level, company level, participation level, etc.).

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<sup>4</sup> cf. also in this regard the preliminary work of the candidates (Wulfhorst, Kenworthy, Lanzendorf, Kesselring 2013).

2. The mobility actions of individuals, but also organizations and institutions (e.g., corporate mobility regime, **individual** mobility decisions on residence, transport, communication, and forms of interaction, etc.).
3. Closely related to 2, the question of the discursive structures that affect mobility actions, i.e., the perceptions and lifestyle orientations of individuals.
4. The spatial structures and mobility services that are affected over a long period by concrete decisions within the prevailing socio-economic conditions, which thus form the historically developed image of the city.

In the attempt to address these issues systematically, theoretically and conceptually oriented research projects are drawn on in conjunction with thematically related case studies.

Envisioned potential doctoral research topics therefore include:

- Mobility cultures for the future of the metropolitan region.
  - Cultural Studies approaches to sustainable mobility research: From the Chicago School to the New Mobilities Paradigm
  - Development of an analytical framework for the study of sustainable mobility policies in the metropolitan regions of Munich and Stuttgart.
  - Demonstrating theory-driven approaches for practical planning and socio-political realignment of sustainable mobility
- The relevance of new mobility theories for planning in mobile risk society.
  - Demonstrating different approaches to economics and business assessment of mobility offers
  - Consideration of the uncertainties of related costs and benefits of measures over time
  - Assessing resilience / vulnerability research for the mobility sector
  - Assessing the significance of normative values for decision making
  - Demonstrating cultural influences on control mechanisms. Risk assessment on the basis of qualitative interviews with experts.

### ***Study Program Accompanying the Second Phase***

The planned research and study program aims to establish an **interdisciplinary network of expertise**, which will help to develop relevant dissertations on sustainable mobility development in the Munich region. In this way, examples from other regions, and from home and abroad will flow into the program to allow a comparative perspective on the work. The engineering and social science teaching environment of the candidates, and the embedding of the program in technological as well as economic and social science orientations of the educational institutions will ensure that interdisciplinarity is lived and experienced in daily research.

Just as in the first phase, the study program will be developed **together with the fellows**. It has already been shown that it is perfectly possible to build an independent research context based on the defined research priorities. Research foci, as well as research contiguities and collaborations between the candidates also play a crucial role in this respect.

Thanks to the alternating launches of doctoral studies, it is preordained that the fellows in the second phase will benefit from the tacit knowledge of the candidates in the first phase. Conversely, it is also intended that the program remains a point of reference and collaboration for the alumni. Beyond loose couplings of individual study elements, specialized work environments are specifically constructed to support the fellows in forming their own research contexts. The most important goal in this sense is to be able to complete doctoral dissertations successfully within the relevant funding period.

The **collaboration between TUM and HfWU** offers new opportunities for professional and institutional cross-border cooperation. The exchange between scientific methods and practical approaches provides enormous added value for doctoral candidates' skills.

Within the study program, a combination of different teaching and learning methods will be implemented. In addition to the **personal supervision** of doctoral studies by the relevant supervisor, the doctoral program team will provide an **extended discussion and work environment** via both participating professors and the fellows. To facilitate networking with the participating departments at TUM and HfWU, the procedure is that doctoral students with permanent posts and external funding from relevant institutions, and whose research interests and personal suitability allow, can attach themselves to the common structure at the discretion of the doctoral program team.

All doctoral candidates who graduate at TUM are also members of the TUM Graduate School (see [www.gs.tum.de](http://www.gs.tum.de)). This particularly applies to cooperative doctoral procedures with HfWU. It ensures that doctoral candidates are given the best possible structural support in the process of their individual doctoral candidacy, specifically through integration in TUM research and teaching networks, attendance at academic events, the ability to acquire additional "soft skills", financial assistance when abroad, conference participation and English publication services, the need to present their doctoral project in the respective academic community for discussion, for example, through relevant publications, and a feedback session after at least 24 months. Individual supervision and personal mentoring are also agreed in a so-called "supervision agreement".

Based on the experience of the first phase, the accompanying program will continue to have a mix of internal and external events. The following elements are envisioned for an accompanying study program:

## Internal Events:

<i>Name</i>	<i>Content</i>	<i>Frequency</i>
mobil.LAB colloquium (all candidates)	Detailed presentation and discussion of progress of fellows' work	monthly
mobil.LAB meeting (all fellows)	Discussion and decision on organizational and administrative matters	monthly
mobil.LAB retreat (all candidates)	Strategic workshop over several days in the form of seminars	annually
Workshops / seminars locally	Methodological input into: <ul style="list-style-type: none"><li>• Scientific work</li><li>• Empirical social research</li><li>• Quantitative data analysis</li></ul>	as required
Lecture series (German and international experts)	Expert input	quarterly
Think tanks	In-depth discussion with stakeholders from the region, from other regions, and from abroad	

The **mobil.LAB colloquium** has proven to be a key element in the intensive exchange of content. Doctoral dissertations are regularly presented by the respective candidates and discussed in depth – together with supervisors and fellows, or externally invited experts. This proven core element of critical and constructive debate among interdisciplinary perspectives is vigorously maintained.

The organizational issues – which are deliberately separated from scientific exchange – are clarified in a separate **mobil.LAB meeting**, to which all fellows are invited to join the speakers and the program coordinators, to advise and vote on outstanding issues (at the request of individual program participants).

For the strategic direction of the program, in-depth expert exchange, and all-important personal interactions we organize the annual **mobil.LAB retreat**, consisting of seminars that take place over several days always at a new location. This is an important component in the integration of the new doctoral candidates and networking with the existing fellows.

At the HfWU **training in the empirical social sciences** can be undertaken at a specially designed methodology lab. Here teachers and students from different disciplines work together intensively, and the lab is ideally suited for courses, workshops, and seminars.

In addition, the fellows are encouraged to take up methodological and structural issues at appropriate **workshops and seminars**, for example, from those offered by the HBS, or in self-organized formats for the mobil.LAB group.

The **think tanks** offer the existing relevant research and teaching networks of candidates and fellows (e.g., Cosmopolitan Network, IST EduNet, COST, NECTAR, PEGASUS, Membership of the Munich Metropolitan Region, etc.) good starting

points for regional and international networking with the aim of extending a personal invitation to the mobil.LAB.

Scientific Community:

Dialogue with scientists from the region, but also from other regions and at international level is an important element in the progress of each dissertation. The following formats are provided:

International PhD course	Professional exchange and networking	annually
Mobility Culture Workshop	Networking with regional stakeholders	one-off
Methodology colloquium	Methodological input and exchange with other TUM doctoral candidates	monthly
Conference on “Sharing Mobilities”	International conference in collaboration with the DFG research network Cosmobilities	one-off

**International PhD workshops and doctoral seminars** by the candidates are envisioned, either in the context of existing conferences or as an individual events.

A special element of mutual learning envisioned for the 2nd phase of the doctoral program is a “**Mobility Culture Workshop**” in the Munich region. There is close professional and personal contact with numerous stakeholders (BMW, SIEMENS, Munich, MVG, MVV, ...). This network will be used to build on the work of individual fellows to form a creative workshop, in which new ideas for a sustainable design of mobility in metropolitan regions will be developed together. The prospects for Munich will thereby be enhanced by contributions from the metropolitan region of Stuttgart, as well as the inflow of international expertise. The ultimate aim is to develop transferable strategies. The exchange with practitioners will certainly inspire individual scientific work, and, via such a forum, also provide all fellows with the chance to present themselves on the regional employment market.

The existing seminars at TUM, such as the **Methodology Colloquium**, headed by Prof. Alain Thierstein and Prof. Horst Wulf, are open to all mobil.LAB fellows. Here, in addition to the input from individual experts, individual methodological questions can be put forward for discussion.

By the end of 2016, the program will take part in the 12th International Cosmobilities **Conference on the topic of “Sharing Mobilities”**, which will be held in Bad Boll from 30.11.16 to 2.12.16. The conference is organized by the Professor of Automotive Management: Sustainable Mobility at the HfWU (Sven Kesselring) together with the HBS College mobil.LAB, the board of the DFG Cosmobilities research network ([www.cosmobilities.net](http://www.cosmobilities.net)), and the Protestant Academy in Bad Boll. The conference will host about 120 internationally renowned scientists and young

researchers. Invited keynote speakers so far are far Prof. John Urry (Lancaster University), Prof. Mimi Sheller (Drexel University Philadelphia), Prof. Carlo Ratti (MIT Boston), the Baden-Württemberg Minister for Transport, Winfried Herrmann, and Peter Schwarzenbauer (Member of the Board of the BMW Group). The fellows will be jointly responsible for content and organization of the conference. There will be at least one panel on the subject of the college mobil.LAB. The results of the conference are to be published in the journal “Applied Mobilities” (Routledge).

In terms of content, the **Munich Center for Technology in Society as a platform for dialogue** between different research groups is available at TUM. The interdisciplinary TUM.LAB “ASHAD - Automation and Society: Highly Automated Driving” already offers opportunities for collaboration.

Via such research networks and topic-based “sponsorships” of individual doctoral research projects, the fellows are brought into contact with the everyday problems and research strategies among different research groups. This can make a valuable contribution to **solving the challenges in their own doctoral research**.

The fellows are encouraged to use the local regional networks – especially the **HBS scholarship group** itself – to seek an exchange with like-minded partners, and to develop their own personal profile.

In addition to this, the contacts to international networks are exploited. In addition to the above-mentioned publications, a new journal offering a platform for publication and discussion of results from the Graduate School will be launched in March 2016. “Applied Mobilities” published by Taylor & Francis (eds. Malene Freudendal-Pedersen, Kevin Hannam, and Sven Kesselring), is specifically devoted to the topic of interdisciplinary applied research on mobility and sustainability. In addition to social science and planning approaches, it will integrate the topics of technology and design, and publish applied research.

Moreover, an independent **book publication in the series Studies on Mobility and Transport Research (Springer VS)**, bringing together the contributions of the individual fellows, is also envisioned for the second phase of the doctoral program.

### Public Relations

Here, above all, the opportunities for regional cooperation play an important role, which will be further expanded. Regional initiatives, such as the **INZELL-Initiative**, which thanks to the commitment of BMW is enjoying new momentum, or the **EMM e.V.** in which TUM is now represented as member and stakeholder in the metropolitan region of Munich, offer excellent opportunities for dialogue with industry. Furthermore, existing close contacts with the City of Munich, the Munich administrative district, various surrounding communities, the Regional Planning Association, MVV GmbH, MVG mbH, the DGB, the Deutsches Museum, as well as companies in the field of mobility (such as MAN, BMW, Siemens etc.) are being consistently consolidated and strengthened. They provide very good conditions for the development of mutually beneficial doctoral projects (see also the Letter of Support in the Appendix).

In addition to the lecture series “**Verkehr aktuell**” (“**Transport Now**”) the Desutches Museum’s Colloquium “**ÖPNV und Stadtentwicklung**” (“**Public Transport and Urban Development**”) offers another established forum for regional discussion of relevant issues. Completed dissertations will continue to be presented as “**mobil.LAB goes public**” at an evening event open to the public, and – where possible as part of an engaging panel discussion – with the regional community.

The HfWU has extremely well developed contacts with regional and national industry. The **Tag der Automobilwirtschaft (Automotive Management Day)**, which took place this year for the 16th time, testifies to this (see Automobile Week of 4/11/2015). The HfWU has spent many years working closely with the automotive industry, e.g., with Porsche Automotive Campus (<http://www.porsche-automotive-campus.de>). The Institute for Automotive Research is one of the leading institutions in this field, and is highly valued by employees and employers’ representatives. At doctoral level this leads to prime opportunities for collaboration, and individual students can take full advantage of them through internships and employment contracts.

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