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eMobility: Opportunities and Challenges for Telecom Operators**

Research Context and Objective

eMobility benefits to society, environment, and economy are expected to be substantial (Schaefer et al. 2009; Sperling, Gordon 2010) as the car of the future is expected to be connected (1) with other objects such as other means of transport, building, traffic lights, and the like ('Internet of Things'), (2) with smart power grids to serve electric vehicles using electric power instead of gas ('Vehicle-to-Grid'), and (3) with entertainment and communication providers (e.g. Freymann 2011, Heitmann 2010). Hence, telecommunication companies are discovering 'eMobility' offerings as a new area of growth.

In this paper, we categorize eMobility solutions and analyze their business potential for one telecom operators or just telcos as one stakeholder group in the larger value chain or value grid (e.g., Porter 1998). We aim at contributing the opportunities provided to telcos and the challenges they face in the field of eMobility.

Conceptual Background and Research Approach

Taking eMobility as growing and relevant field for granted, we build on Teece's framework of dynamic capabilities (Teece et al. 1997, Teece 2007; see also Winter 2003) to investigate the situation of telecom operators. Thereby we extend Teece's framework from the individual enterprise as unit of analysis to a group of stakeholders, here telcos. Teece specifies three dynamic capabilities necessary to sustain long-run superior performance especially in fast paced new technology environments. They are the capacity to *sense and shape* opportunities and threats, the capacity to *seize* opportunities, and the capacity to *enhance, combine, protect or even reconfigure* one's intangible and tangible assets.

Conducting our research, we first screen publicly available studies and research reports. We then propose a taxonomy of eMobility solutions. We use the taxonomy to analyze eMobility solutions from the perspective of telcos. To that end, we then apply Teece's framework and assess the opportunities and challenges arising for telcos for each eMobility category. While focusing on telcos as a stakeholder group, we back our analysis with several country or company specific examples of analysis.

Contribution and Future Research

Most eMobility solutions are still in their infancies and the roll-out of eMobility solutions may be considerably delayed by end-consumers' limited willingness to pay. Nevertheless, the field of eMobility has been at the core of many European and global research and telecom initiatives. Similarly, our research is ongoing and part of a larger research initiative so that in we can offer only a status report and an early assessment of the field of eMobility by telcos.

Our analysis shows that a massive roll-out of eMobility solutions in the sense of the Internet of Things (cars connected to other cars, infrastructure, etc.) is expected to offer large business opportunities for

telcos. The main challenges for telecom operators in this category seem to be organizational readiness for the shift to co-developing instead of driving a market.

Electric vehicles are expected to also open sizeable business opportunities for telcos. In addition of vehicle-to-grid solutions, the still low range of electric vehicles points to the need for detailed navigation, for instance to available charging stations. However, business opportunities for telcos are linked to the diffusion of electric cars, where rapid take-up is unlikely. We find the main challenge in telecom operators balancing between competing or collaborating with energy suppliers for being in charge of 'e'services about to develop between the grid and the vehicles.

In-car entertainment (music, video) and user communication (phone, messages) – likely to have the largest number of end-consumers short term – the continued upgrading of mobile broadband networks makes those solutions with Internet connectivity increasingly attractive for customers. Such solutions require the smallest capability changes for telcos. The main challenges seem to lie in embedding mobile devices and applications in an in-car environment, to be driven by car manufacturers and user acceptance of innovative business / pricing models (see also Jarvenpaa, Loebbecke 2009).

While we have underlined the relevance of work on eMobility, we are aware that academic rigor and theoretical grounding need further development. Hence, we suggest ongoing and future research may to pursue three main trails: Firstly, we suggest further feeding qualitative and quantitative data sets into the eMobility categories and sub-categories to strengthen analytical approaches. Secondly, with growing insight on technological developments and requirements, we propose to reflect changes foreseen in the telecom sector more thoroughly against the innovation and dynamic capability literature in order to derive change readiness and business model potentials for the telecom segment as a whole. Thirdly and finally, we suggest developing measurement scales for supporting individual telcos in their decisions how to invest in the eMobility field and how to reconfigure their assets accordingly.

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