Knowledge Pool

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Preface

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Chapter 1

Introduction

This work gathers and defines essential concepts related to automation and digitalisation of transport system together with the description of their impact, both negative and positive on **individual**, **systemic** and **economy level**. This knowledge pool is driven by the fact that automation and digitalisation are progressing quickly, although not uniformly across all areas within transport context. Therefore, to understand spectrum of possibilities that they bring, it is necessary to explain key concepts, demonstrate their level of maturity and current market penetration, and finally assess their impact on different levels. Given this approach, the page of each topic contains the following elements:**definition** of the phenomenon, **key stakeholders** who are the main parties responsible for and affected by the given technological development. Then, we include two subsections on **current state of art in research and practice**. The former one summarizes the most recent research in a given topic while the latter explains the current stage of implementation of given technology in the real world. Further, section named **relevant initatives in Austria** covers the leading initaitives within given topic and potential for Austrain actors. Moreover, we provide the summary table of the impacts of the concept on selected **sustainable development goals** (SDGs). Beyond, to provide an objective measure of technology maturity within each topic we include so-called **technology readiness scale** (Willismson & Beasley, 2011) and **societal readiness scale**, as described below:

Finally, we provide a list of **outstanding questions** and **links to additional sources** on the topic.

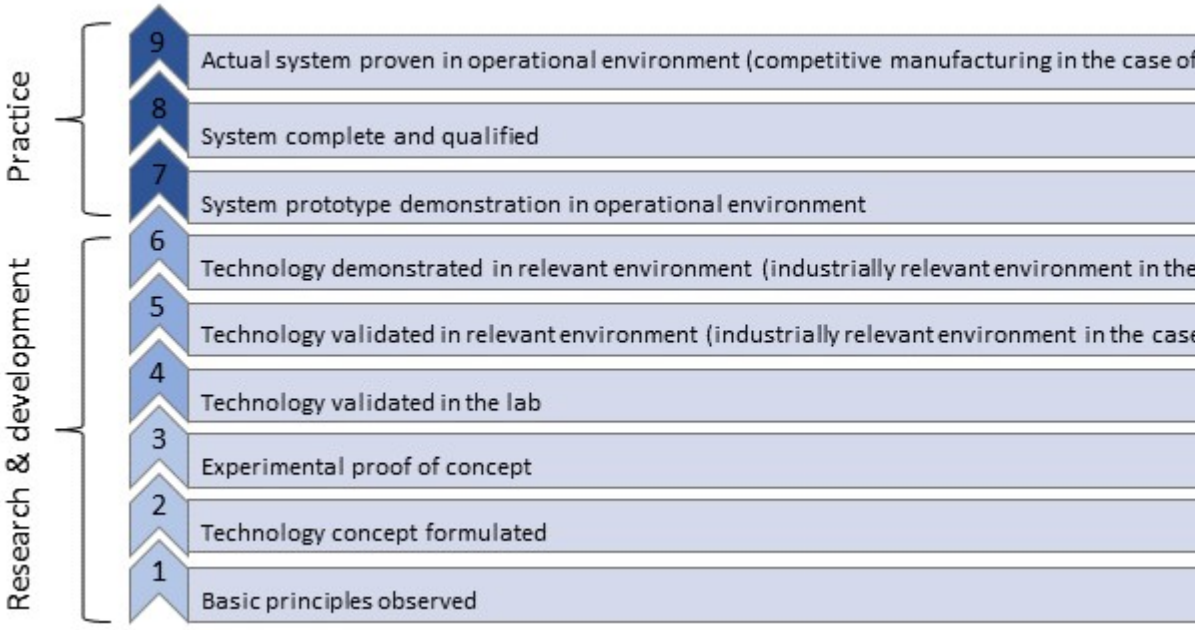

Figure 1.1: Technology readiness scale

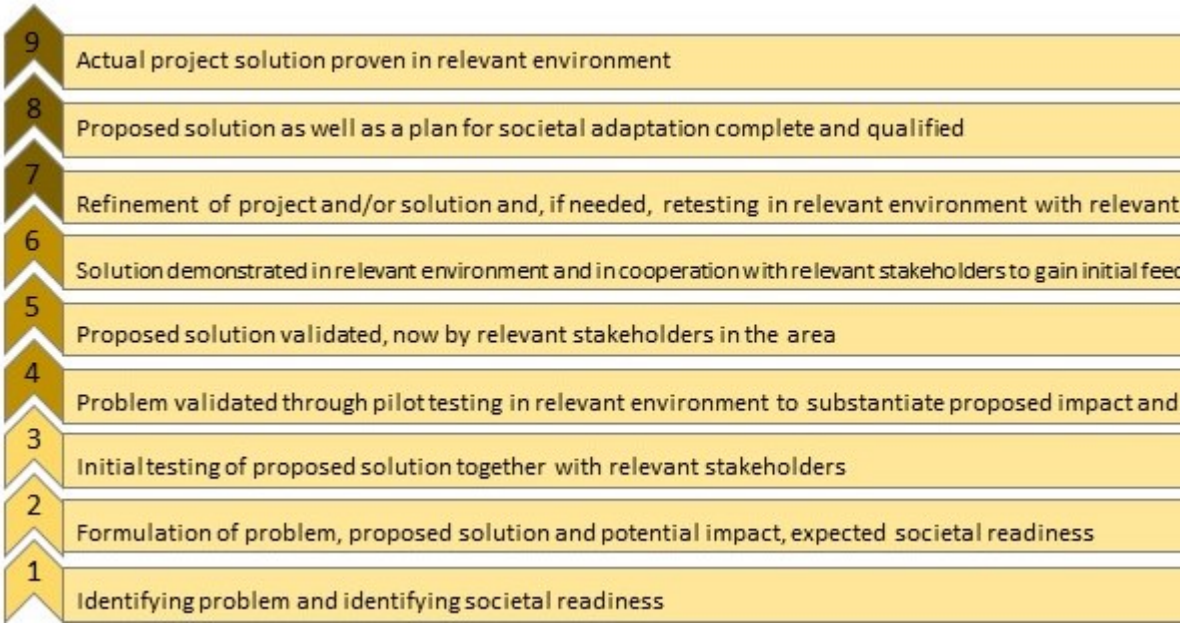

Figure 1.2: Societal readiness scale

Chapter 2

Physical road infrastructure

2.1 Dedicated lanes for connected and automated vehicles (CAV)

2.1.1 Synonyms

AV-dedicated lanes, *dedicated corridors*

2.1.2 Definition

Dedicated lane for connected and autonomous vehicles features additional infrastructure or sensors to increase the reliability of Advanced Driver Assistant Systems (ADAS). Only automated driving vehicles are allowed to drive on these lanes. The typical applications include cooperative and adaptive cruise control based on sensors with the infrastructure, lane keeping, fuel use optimization and road pricing possibilities (Broek et al., 2011). The introduction of dedicated lanes for CAV is expected to have direct consequences on the traffic flow on the highways and a nearby road network. In particular, a study conducted in Singapore showed that dedicated lanes on the highways can reduce travel time of CAVs by approximately 25% (if the saturation on the lane is not reached) at the cost of a delay for conventional cars of approximately 7%, due to the reduced capacity (Ivanchev et al., 2017). They were also demonstrated to have a positive effect on fuel consumption. Moreover, the throughput, defined as a number of vehicles passing through the road in a given time interval, increased as a result of introduction of dedicated lanes for AVs (Kumar et al., 2020). This effect, however, was associated with a decrease in throughput of smaller roads due to the preference of AVs for highways because of time savings, which in turn can result in time loss for conventional cars. What is more, the benefits from

increased capacity of AV-only lanes can be further amplified through setting a higher speed limits for these lanes (Ye & Yamamoto, 2018). With respect to the demand for different road types the study found that the introduction of dedicated CAV lanes will increase the demand of conventional cars for major road (but smaller than highways) and minor roads as a substitution for more congested highways due to the dedicated AV lanes. In contrast, study by Chen et al. (2016) showed that the implementation of CAV dedicated lanes has a potential of maximizing traffic capacity on these lanes in a mix-traffic context while having effectively no impact on conventional traffic capacity. Further, in order to use efficiently CAV dedicated lanes, which may be underutilized at the early stage, it is proposed to allow conventional cars to enter the AVs-only lanes after toll payment. This solution stems from currently operational across the world High Occupancy Vehicle (HOV) lanes. This joint approach is claimed to improve the throughput of individual road as well as enhance system-wide flow distribution within the network (Liu & Song, 2019).

2.1.3 Key stakeholders

- **Affected**: Conventional Cars' Drivers, Car Manufacturers, Insurers
- **Responsible**: Road Infrastructure Agencies, Local and National Governments

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