



ELSEVIER

Contents lists available at ScienceDirect

# Transportation Research Part F

journal homepage: [www.elsevier.com/locate/trf](http://www.elsevier.com/locate/trf)

## Thinking about the history of road safety research: Past achievements and future challenges<sup>☆</sup>

A. Shalom Hakkert<sup>\*</sup>, Victoria Gitelman<sup>1</sup>

Transportation Research Institute, Technion – Israel Institute of Technology, Technion City, Haifa 32000, Israel



### ARTICLE INFO

#### Article history:

Received 9 January 2013

Received in revised form 18 February 2014

Accepted 18 February 2014

#### Keywords:

Road safety research

Evolution

System's approach

Future developments

### ABSTRACT

This paper surveys the developments in road safety thinking and road safety research over the last century. It details the general evolution of safety thinking as it applied to road user behaviour, vehicle and road design. More recently, emphasis has shifted towards a system's approach, both in road safety activities and in road safety research. In terms of the future, more likely scenarios for the near future, a few decades from now, are explored and the implications for future road safety research are discussed. In particular, increasing urban density forces changes in travel modes, with a shift to public transport, more cycling and walking, and, thus, imposes new challenges for road safety research. In terms of vehicle technology, more automation and driver assistance systems are envisaged with an accompanying emphasis on evaluation and research, including the issue of behaviour adaptation. Speeding and population ageing will remain major research areas. Increased interest in techniques for exploring large databases, behaviour indicators and randomised experimentation is expected.

© 2014 Elsevier Ltd. All rights reserved.

### 1. Introduction

Over the last decades, a remarkable decrease in road traffic fatalities was observed in many motorised countries, particularly during the 2000s (COWI, 2010; OECD & ITF, 2011). Substantial progress in reducing road safety tolls was attained in the old developed countries (Western Europe, US, Japan, Australia and New Zealand) but also in other countries that passed through a phase of rapid motorisation since the 1990s (e.g. Eastern European countries). Progress in road safety is usually attributed to the implementation of countermeasures related to infrastructure, vehicle and road user behaviours and examples of those are summarised in best practice manuals (e.g. OECD, 2008; Peden et al., 2004). More rigorous analyses carried out in selected countries demonstrated statistical relations between casualty reductions and road safety engineering measures, improved crashworthiness in cars, compulsory seat-belt wearing, drink-driving interventions, speed enforcement, etc. (e.g. Broughton & Knowles, 2010; Chapelon & Lassarre, 2010; Weijermars & Wegman, 2011). Similarly, the evaluation studies of road safety measures and their systematic reviews (e.g. Elvik, Hoya, Vaa, & Sorensen, 2009a) establish a sound background for future applications of various road injury prevention measures as well as for knowledge transfer to other countries.

In spite of the progress achieved, the road safety problem is far from being solved. Traffic accidents<sup>2</sup> still represent a serious public health problem. According to global estimations, by the year 2030, road accidents will reach fifth place among

<sup>☆</sup> Editor's Note: This paper was invited and peer-reviewed for a special section on History of Traffic Psychology. The special section included a wide range of manuscript styles, from those typical of this journal to other styles just as important for sharing the discipline's history. Authors contributed reasoned viewpoints from experience and literature on where the discipline has come from and where it may be heading, to an investigation of trends and topics in the discipline since the early 20th century.

<sup>\*</sup> Corresponding author. Tel.: +972 4 8293122; fax: +972 4 8225716.

E-mail addresses: [hakkert@technion.ac.il](mailto:hakkert@technion.ac.il) (A. S. Hakkert), [trivica@technion.ac.il](mailto:trivica@technion.ac.il) (V. Gitelman).

<sup>1</sup> Tel.: +972 4 8295132; fax: +972 4 8225716.

<sup>2</sup> "Accident" and "crash" terms are applied interchangeably in this paper as both terms are common in the road safety literature.

the leading death causes in the world (WHO, 2013). Recent data show that over 1.2 million people die annually as a result of injuries from traffic accidents, while another 20–50 million people sustain non-fatal injuries (OECD & ITF, 2011; WHO, 2013). In Europe, an ambitious target of halving the number of road fatalities by 2020 was set (EC, 2010), whilst throughout the world road safety was recognized as one of the urgent issues needing international collaboration (WHO, 2013).

According to recent estimates (OECD, 2008), in spite of a substantial increase in motorisation level over the period of 1970–2005, a more than 50% decrease was observed in the fatality rates of the best performing countries. Concerning the possible contribution of road safety research to that progress, it was demonstrated by Elvik, Kolbenstvedt, Elvebakk, Hervik, and Braein (2009b) that road safety measures based on the findings of research projects have made major contributions to reducing the number of road accident fatalities in Sweden. Among the accident reducing factors that were substantially based on research, were mentioned, for example, the installation of median guard-rails on undivided roads, increased use of child restraints in cars, enhanced neck injury and side impact protection in cars. Schulze and Kossmann (2010), demonstrated the role of road safety research in Germany, by means of establishing road safety management tools that serve for explaining reasons for safety deficits, fitting evidence-based measures, assessing safety impacts of selected interventions and continuously controlling for progress of the national road safety plan. It seems that road safety research played an essential role in the road safety progress attained so far.

The changing environment of the road transport system imposes new challenges on road safety research. As the effect of traditional road safety measures is exhausted, to a certain extent, at least in the developed countries, it can be argued that new approaches are required to reduce the number of road accidents and injuries further. In this context, for example, Johnston (2010), Navestad and Bjornskau (2012), suggest to explore the potential of the “road safety culture” concept coming from the neighbouring fields of public health and occupational safety. In general, more system-based approaches and theories are promoted today concerning road infrastructure improvement, e.g. safety impact assessment (EC, 2010), road safety management (e.g. ISO, 2012) or road safety policy, in general, such as Sweden’s Vision Zero (e.g. Belin, Tillgren, & Vedung, 2012).

Moreover, following the rapid development of in-vehicle electronic devices and intelligent transportation systems, further efforts are needed for systematic evaluation of benefits and dis-benefits of those, with further acceleration of the deployment of systems with proven safety potential (EC, 2010). On the other hand, among urgent safety problems drawing more attention from authorities and researchers, today, can be mentioned, for example, vulnerable road users – pedestrians, motorcyclists and bicyclists, young drivers’ involvement in road accidents, the elderly’s needs (EC, 2010; Wegman, Zhang, & Dijkstra, 2012; Zegeer & Bushell, 2012).

The motor vehicle and motorised transport have been with us for more than a century and during this period major developments have occurred both in vehicle technology and in changes to the transport system. Road safety research started more than eighty years ago, due to the practical needs of dealing with increasing numbers of road traffic casualties. One of the early documented research studies on accident proneness was carried out in 1929 (Farmer & Chambers, 1929). Over the decades, essential changes took place in the road transport systems of the developed countries, including population and motorisation growth, expanding and improving the quality of the transport network and significant improvements in car crashworthiness. The paper will follow some of these changes and the accompanying evolution in road safety research that went along with it, where it is mostly focused on the highly motorised world, i.e. North America, Europe and Australia. Based on a longstanding acquaintance with both road safety thinking and road safety research over a period of about sixty years, this paper presents an attempt to foresee certain directions in future road safety research.

Furthermore, in view of the major changes that are occurring in the transport system over the last decades, such as trends in urbanisation and population density, a shift from four-wheeled individual motorised transport towards more reliance on public transport, increased use of cycling and walking, the fast-going changes in vehicle technologies up to possibly autonomous vehicles, the idea of this paper was to explore the implications of those developments on future road safety research.

When writing about the future, one is always on unstable ground. First, one has to define what future one has in mind. In our case, it is not the Heinlein and Asimov kind of future, a few millennia from now, where we believe that almost anything is possible, limited only by one’s imagination. It is also not the future a hundred years from now. Even then one could think of scientific breakthroughs, natural or human made disasters which could bring about fundamental changes in life, as we know it, and the transportation and communication systems that might go with it. In order to remain somewhat realistic and, hopefully, more accurate, we limit ourselves to the next few decades. Our consideration is not intended to be all encompassing and by its nature presents a somewhat personal view.

## 2. Road safety thinking in the past

### 2.1. Periods of road safety thinking

Before going into future directions of road safety research, it is reasonable to explore the development of road safety (RS) research in the past. Considering the history of RS developments, various perspectives can be found in the literature. Fig. 1 provides an overview of the descriptions of RS history that were found in three sources: OECD (1997), Wegman, Johnston, Kroj, and Pain (2007) and OECD (2008), and set on the same time-line. It should be noted that they reflect mostly the progress of the developed countries.

Download English Version:

<https://daneshyari.com/en/article/897752>

Download Persian Version:

<https://daneshyari.com/article/897752>

[Daneshyari.com](https://daneshyari.com)