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Traffic Safety Culture – A New Paradigm For Road Safety?

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Abstract

The cultural approach to traffic safety is a new research perspective which has emerged recently, especially in the US. It is part of the safe systems approach in recent safety research. The project ‘TraSaCu’, which received funding from EU’s Horizon 2020 RISE program and still runs until February 2018 takes up the concept of safety culture which is well established in organisational safety research and applies it to the open realm of road traffic and road safety. In the course of the project a theoretical model has been developed and the traffic safety culture of selected countries has been analysed to demonstrate the concept of traffic safety culture in an applied manner. Existing large-scale survey data on attitudes, perceived norms and self-reported behaviour have been used to statistically extract four scales that are suitable to describe cultural dimensions. Furthermore, factors which determine deliberate (un)safe behaviours and their potential to be changed in favor of higher levels of safety were identified.

Keywords: traffic safety culture; road safety culture; attitudes; norms; behaviour;

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1. Introduction

Building on work in occupational safety by Hale and Hovden (1998), Özkan and Lajunen (2011) claimed that traffic safety evolved in a sequence of four periods: The first period focused on the physical structures and environmental conditions in terms of technical safety measures, the second period put traffic psychology center stage and shifted emphasis on behavioural and individual factors, the third period was concerned with ergonomics and sociotechnical systems and the fourth age deals with culture. Culture, then, is a factor in its own right, standing alongside with infrastructure, human factors and ergonomics. About the same time, Johnston (2010) argued that the safe systems and systems management approach, being the most advanced approach to traffic safety at that time, must be complemented by a cultural approach which can address the question under which conditions the notion of safety pervades different components of a complex system (Johnston, 2010).

Culture plays a double role in the mediation between social systems and individuals: patterns, Parsons (1951) argues, must be institutionalized in the rules and roles that constitute the core structure of interaction systems and they must be internalized by individual actors in order to become part of their cognitive and emotional structures. If these two processes take place in a balanced way, individuals are more likely to experience institutionalized expectations of behaviour as legitimized moral obligations, rather than as strained coercion. Moreover, they may interact in a smooth and efficient manner, as mutual trust prevails that the other will stick to common rules and that plans of action which take the other's reactions into account may be carried out as projected.

Culture, however, is anything but a well-defined concept and the same holds true for the concepts of safety culture and traffic safety culture (Zhang et al., 2002). After more than a decade of theoretical discussion since the late 1990s (e.g. Guldenmund, 2000; Pidgeon, 1998), some efforts have been made to operationalize safety culture (Girasek, 2012) or to synthesize different approaches (Edwards et al., 2013). The strategic concept with reference to traffic safety are the values to which interaction partners feel committed when they make decisions and translate their goals into activities. Using the concept of value commitment for understanding traffic culture has very pragmatic reasons as it is part and parcel of a well-known definition of traffic safety culture given by the US department of transportation which defines it as the shared values, actions, and behaviors that demonstrate a commitment to safety over competing goals and demands (USDOT, 2011). In this perspective, values are cultural objects defined as conceptions of the desirable. A value-pattern defines a direction of choice, and consequent commitment to action (Parsons, 1968). Value-patterns, however, are abstractions which must be carefully distinguished from their realization, e.g., in terms of individual attitudes or social institutions. Parsons' understanding of culture as a problem of value commitment, therefore, is a sound theoretical starting point to link our discussion with current issues of traffic safety culture.

2. Methodology

The approach to traffic safety culture that was elaborated by the Austrian Road Safety Board in a large EU-Horizon 2020 funded project entitled "TraSaCu" (Traffic Safety Culture and the Safe Systems Approach – Towards a Cultural Change Research and Innovation Agenda for Road Safety). The project brings together expertise in engineering as well as in the sciences of human action from 13 academic and non-academic organizations from nine countries (AL, AT, EE, FI, GR, NL, TR, US, XK), in order to develop a comprehensive framework of traffic safety culture that is useful for practical work in road safety as well as for academic research. Traffic Safety Culture shall be established as a paradigm for research and action alongside with the other three approaches of engineering, human factors and socio-technical systems which can be treated as paradigms as well.

The project started from the definition given by the USDOT and conceptualized value commitment by the double-perspective on internalizing and institutionalizing values. This perspective implies that the traffic system can be interpreted as a fully-fledged social system in which an interaction order (Goffman, 1983) is institutionalized at the level of traffic situations and in which a set of roles is provided that organizes interaction processes: On the one hand, the institutional arrangements were analyzed (research, legislation, enforcement) that translate safety values into rules and norms, on the other hand the process of internalization of values was addressed by distinguishing different levels of individual value commitment. The values of safety, to be sure, are key issues in the three paradigms of technical safety, human factors, and socio-technical systems as well, but only in the fourth or cultural paradigm which treats culture as a system of action in its own right the ways are put center stage by which these values can be institutionalized in systems of interaction and internalized by its members in order to get *priority over other goals and demands*.

Both of these two approaches, the institutionalization and the internalization perspective, are broad in scope and formulated at a very abstract level of generalization. However, they constitute a useful frame of reference to shape a research and working agenda for traffic safety culture. The remainder of this article gives an outline of how this framework is applied to empirical work that has been carried out in the course of the TraSaCu-project.

3. Results

In this section we briefly present approaches and results of selected tasks of the TraSaCu project which are not necessarily interrelated. However, both outlined topics deal with aspects of the traffic safety culture (TSC) paradigm. Therefore, method and results are presented together for each of the 'subprojects'. Each is presented in detail in deliverable 3.2 and 3.3, respectively, of the TraSaCu project.

3.1. Model on Culture Specifics: Using survey data on traffic safety relevant attitudes for a better understanding of Traffic Safety Culture

In the course of the TraSaCu project, this complex and multifaceted construct TSC was narrowed down and quantified to a certain extent (Brandstätter et al., 2017). To this end, two large-scale cross-country survey data on road traffic related attitudes, perceived norms and self-reported (un)safe behaviour were used in order to carve out cultural specifics by means of statistical analysis. These surveys are thematically centred around e.g. driving under the influence, speeding, distraction, enforcement and traffic safety measures. One dataset is from the SARTRE 4 project (Cestac & Delhomme, 2012), which surveyed in 19 European countries, and the other dataset originates from the more recent survey ESRA (Torfs et al., 2016), conducted in 17 European countries, which has used similar items as SARTRE. These sets of data haven been analyzed multiple times but hardly explicitly in the context of TSC.

The list of items used in SARTRE was screened and grouped upon face validity to four scales which reflect aspects of TSC. The four resulting scales are:

- Safety Concern (*e.g. How concerned are you about road accidents?*)
- Regulation Proneness (*e.g. How much would you be in favor of automated cameras for red light surveillance?*)
- Risk Taking (*e.g. Over the last month, how often have you driven a car after having drunk even a small amount of alcohol?*)
- Perceived Norm (*e.g. How often do you think other car drivers break speed limits?*)

The derived scales were eventually tested against their internal consistency which resulted in Cronbach's Alphas between 0.6 (Safety Concern) to 0.8 (Regulation Proneness). Furthermore, the four scales were successfully replicated within the ESRA dataset. In a next step, the four dimensions of safety culture were contextualized with factors known or assumed to influence a nation's crash statistic: GNP, levels of motorization (cars by population), sanctioning (alcohol sanctions, speeding tickets) and alcohol use in general. A multiple regression model was used to estimate the corresponding relationships on aggregated country levels. The number of fatalities by population was thereby interpreted as a function of one of the four safety scales and one of the context variable.

This approach was chosen since previous trials to analyze the data by means of factor analysis, structural equation models, discriminant analysis and an overall regression model didn't yield satisfying outcomes.

As for GNP, it was found that only Safety Concern had an influence on fatality rates. Exposure seems to strengthen Perceived Norm whereas it has no effect on Risk Taking and Regulation Proneness. Similar results were found when analyzing sanctioning and alcohol use in general.

3.2. Internalizing safety: Alterable factors to improve traffic safety culture at an individual level

The aim of this task was to identify factors which determine deliberate (un)safe behaviours and their potential to be changed in favor of higher levels of safety. More precisely, it was intended to give a systematic outline in terms of a list of factors that can be addressed by a TSC framework in order to enhance safety at the individual level. While this is usually subject to social psychology, it was aimed at approaching the topic from a more sociological perspective and integrate psychological and sociological elements, respectively.

The underlying idea was to look at individuals as ‘systems of action’ (Parsons, 1951) which are shaped by roles in context. In that regard, roles are institutionalized expectations of behaviour that constitute social systems. In the course of socialization, roles are internalized and become part of a person and its identity. They influence the willingness and intention to act on basis of sets of beliefs of:

- what can be done (perceived control)?
- what shall be done (norms),
- and to which extent will plans lead to positive or negative results (attitudes).

Safe or unsafe behaviour and decision making can be the result of three different internal or psychological systems of action and decision making:

- System 1: fast and intuitive decisions which are not intentionally planned but which are a product of the flow of situations and individual openness to opportunities.
- System 2: reasoned action and decision making which evaluates consequences of courses of action.
- System 3: internalized values which constitutes an ethos of safety denoted by the concept of mindfulness.

Guided by safety as an internalized moral standard, a set of corresponding attitudes and control over automatized habits, deliberate behaviour is neither a result of rational calculus nor of opportunity but of self-orientation. The derived hypothesis is: the more safety patterns are internalized, the more action is based on heedfulness or mindfulness, that is on feelings to meet personal standards and not on identification and compliance with significant others and situational factors.

By considering (psychological) theories and models such as the Theory of Planned Behavior (Ajzen, 1991), the Prototype Willingness Model, a list of factors associated with explaining behaviour was derived and matched with one of four scales which we have described in the previous chapter. Furthermore, these factors were assessed with respect to their relevance for behavioural change in the context of road safety; examples are indicated where specific fields of application have been identified in the literature. Table 1 give an overview of these factors and related characteristics.

Table 1. List of factors and their relevance for behavioural change.

Factors shaping behaviour	Functional Dimension (Bauer et al., 2016)	Example for Application	Relevance for Behavioural Change (high, medium, low)
Factual attitudes	Safety concern	Driving under influence	High (together with emotional attitudes)
Emotional attitudes	Safety concern	Driving under influence	High (together with factual attitudes)
Implicit (vs. explicit) attitudes	Risk taking	Helmet use	High
Personal norm	Regulation proneness	No specific example	High
Sanctions	Regulation proneness	No specific example	High
(Internal controls)	Risk taking	No specific example	Low
Past behaviour	Risk taking	Speeding	High
Negative vs. positive images	Perceived norm	No specific example	Negative: High/positive low – negative images more effective than positive images

Willingness	Regulation proneness	Drowsy driving	High
Safety ethos	Safety concern	No specific example	High
Mindfulness	Risk taking	No specific example	High

Findings indicate that negative prototypes and norms are easier to influenced than the positive self-image. Some research conducted in the course of the TraSaCu project suggest that these findings are related to culture, not only to individual factors. A future traffic safety culture research agenda would have to identify areas and mechanisms of institutionalization of cultural patterns as well as situations and mechanisms of internalization.

4. Conclusions and limitations

In this paper we just gave some descriptions of the current state of conceptual development and empirical work. Empirical TSC research programs, including surveys and qualitative studies have not been conducted in Austria. We still rely on secondary data. As one of the research questions was how constructs relevant in the context of TSC can be extracted from survey data, the limitations have to be mentioned. The two surveys – SARTRE and ESRA – were not constructed in the light of the concept of TSC, although the research interests were partly similar. Even though, data is available for many European countries, statistical analyses such as regression models ideally require a larger sample size. The aim of re-analyzing these data, however, was to establish constructs by which TSC can be measured. They can be refined and tested by using other, especially more realistic data like road safety observations. The results therefore, should be interpreted with caution in the light of the tentative purpose with reference to exploring the dimensions of TSC.

Notwithstanding, one broad conclusion that can be drawn is that the Perceived Norm plays an important role for the institutionalization and the internalization of safe behaviour – which is in line with theoretical constructs of TSC. Overall, it can be concluded that secondary survey data are useful to scrutinize certain components of TSC.

Is TSC a new paradigm for road safety? The answer is yes and no. Safety culture is a component of traffic safety work since its beginnings. But putting culture, the values which prioritize safety over competing goals and demands center stage, has implications for practical work which open directions for innovation and further development.

At the individual level of internalizing safety culture, the fact must be taken into account, that safety measures must be effective even for traffic participants whose consciousness concerning safety is not well developed. That is why surveillance and enforcement are still important. Beyond the level of compliance to which these measures refer, the other levels should be developed. Identification is not only important for teenagers who follow admired peers, but also for the everyday driver, and heedful traffic behaviour as institutionalized in high reliability organizations, should be the linchpin for a well-developed safety culture. We believe that progress in safety performance, which is quite high because of the high levels of technological, infrastructural and system safety, can be made if safety attitudes are developed beyond the level of compliance.

At the institutional level, safety culture should become a well-established normative idea (and in this sense: a perceived norm) in diverse fields of human action: politics, economy etc. Without constructing a culture of safety and establishing safety as a value, internalizing and prioritizing safety at the individual level is hardly to obtain.

By the end of the project in February 2018 all project results will be available. An action framework for implementing traffic safety cultures in road safety programmes will be elaborated, timely for the next wave of Road Safety Strategies 2020-2030 in Europe. The project results will help to demonstrate the potential of the TraSaCu approach to identify meaningful improvement strategies beyond traditional road safety measures for reducing crashes and their consequences.

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6. References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211. doi:[http://dx.doi.org/10.1016/0749-5978\(91\)90020-T](http://dx.doi.org/10.1016/0749-5978(91)90020-T)
- Bauer, R., Delli, G., Dhrami, K., Janku, E., Lajunen, T., Makris, V., Özkan, T. & Schlembach, C. (2016). Coutry reports. Deliverable 2.2 of the H2020 project TraSaCu.
- Brandstätter, C., Furian, G., Schlembach, C. & Kaiser, S. (2017). Model on Culture Specifics. Using survey data on traffic safety relevant attitudes for a better understanding of Traffic Safety Culture. Deliverable 3.2 of the H2020 project TraSaCu.
- Edwards, J., Davey, J., & Armstrong, K. (2013). Returning to the Roots of Culture: A Review and Re-Conceptualisation of Safety Culture. *Safety Science*, 55, 70-80.
- Cestac, J. & Delhomme, P. (2012). The SARTRE 4 Survey: European Road Users' Risk Perception and Mobility. Public Imprim, Lyon.
- Girasek, D. C. (2012). Towards operationalising and measuring the Traffic Safety Culture construct. *International Journal of Injury Control and Safety Promotion*, 19(1), 37-46. doi:10.1080/17457300.2011.603147
- Goffman, E. (1983). The Interaction Order: American Sociological Association, 1982 Presidential Address. *American Sociological Review*, 48(1), 1-17. doi:10.2307/2095141
- Guldenmund, F. W. (2000). The nature of safety culture: a review of theory and research. *Safety Science*, 34(1-3), 215-257. doi:[http://dx.doi.org/10.1016/S0925-7535\(00\)00014-X](http://dx.doi.org/10.1016/S0925-7535(00)00014-X)
- Hale, A. R., & Hovden, J. (1998). Management and culture: the third age of safety. A review of approaches to organizational aspects of safety, health and environment. In A.-M. Feyer & A. Williamson (Eds.), *Occupational Injury: Risk, Prevention and Intervention* (pp. 129--166). London: Taylor & Francis.
- Johnston, I. (2010). Beyond "Best Practice" Road Safety Thinking and Systems Management - A Case for Culture Change Research. *Safety Science*, 48, 1175-1181.
- Kuhn, T. S. (1962). *The Structure of Scientific Revolutions*. Chicago and London: University of Chicago Press.
- Özkan, T., & Lajunen, T. (2011). Person and Environment: Traffic Culture. In B. E. Porter (Ed.), *Handbook of Traffic Psychology* (pp. 179-192). London, Waltham (MA), San Diego (CA): Academic Press.
- Parsons, T. (1951). *The Social System*. New York: The Free Press.
- Parsons, T. (1968). On the Concept of Value-Commitments. *Sociological Inquiry*, 38(2), 135-160. doi:10.1111/j.1475-682X.1968.tb00679.x
- Pidgeon, N. (1998). Safety culture: Key theoretical issues. *Work & Stress*, 12(3), 202-216. doi:10.1080/02678379808256862
- Schlembach, C. & Kaiser, S. (2017). Internalizing Safety: Alterable Factors to Improve Traffic Safety Culture at the Individual Level. Deliverable 3.3 of the H2020 project TraSaCu.
- Torfs, K., Meesmann, U., Van den Berghe, W. & Trotta, M. (2016). ESRA 2015 – The results. Synthesis of the main findings from the ESRA 2015 survey in 17 countries. ESRA project. Brussels, Belgium: Belgian Road Safety Institute.
- USDOT. (2011). *Safety Culture: A significant driver for safety in transportation*. Research Paper Prepared for the US DOT Safety Council. . Retrieved from Washington, DC: Zhang, H., Wiegmann, D. A., von Thaden, T. L., Sharma, G., & Mitchell, A. A. (2002). Safety Culture: A Concept in Chaos? *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, 46(15), 1404-1408. doi:10.1177/154193120204601520