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Flow experience influenced by car adjustments

Andre Russ [a,*], Alexa-Sibylla Wagner [a,c], Louisa Liesner [b], Ferit Küçükay [b], Peter Vink [c]

[a] BMW Group, Munich, Germany
[b] Institute of Vehicle Technology, Technical University of Braunschweig, Braunschweig, Germany
[c] Faculty Industrial Design Engineering, Technical University of Delft, The Netherlands

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ABSTRACT

Today's cars offer a variety of possible setting options which have to be chosen by the driver. In order to examine the psychological effect of automatic adjustments in comparison to manual adjustments of the chassis and drive train while driving, a test vehicle was built up and tested in a naturalistic field operation test (nFOT) through various development stages. 207 BMW employees participated in the study focusing on emotional feedback and flow experience. The results were used to improve the function and to start the test scenario again.

The automatic adjustment of the car's setting (driving mode) due to the detection of the intended driving style of the subjects was preferred to the manual adjustments. Additionally, the feeling of safety increased while the level of distraction decreased. Our findings show that in addition to the positive technical aspects of an automatic adjustment, there is also an increase in driving experience, measured by the flow experience and the feeling of safety.

1. Introduction

During the entire product development process engineers ask themselves if the resulting product has an added value to the customer to prevent him from switching to an alternative product instead (Walsh, Klee, & Kilian, 2009). Among other theories products are developed in order to satisfy human needs which could have a hierarchical ranking with the pursuit of the next higher order need after the lower need was satisfied beforehand (Maslow, 1943). If mobility can be associated with a basic need as a simple transport from one point to another, joy and driving pleasure could represent the higher order need of transportation. A study of 4300 German drivers proves that design, performance and road handling to be the most important criteria influencing their decision to buy a car (Christian Krause, 2011). To allow an individual configuration of chassis, drivetrain and gear for creating different driving characteristics, today's premium cars offer customers the possibility to change the driving mode between sportive, comfortable and efficient settings by using control elements. The increasing number of controls within a car could overstrain the driver.

Consumers expect a simple and intuitive access in a world of increasing technology and complexity. Also the automotive industry has also to face an increase in complexity on a functional level as well as in regulations. At the same time the fact that customer needs and value change in society contradicts this urge for simplicity. So, a technological innovation leading to driving pleasure with an optimal level of ease in access and use would be a compromise.

* Corresponding author.

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The driving experience is theoretically described as the flow of information and human–machine communication (Schlick, 2010) or is described as a task orientated systems approach (Schmidtke & Bernotat, 1993) including the environmental influence with a continuous nominal-actual value comparison. Especially tertiary tasks might influence the driver (Bubb, 2000). Another approach, which is used in this paper, is to focus on achieving flow as the ultimate driving experience i.e. driving pleasure. The psychological model of flow theory can be of support in this case. Flow described as the ultimate moment a human is carried away by his task (Csikszentmihalyi, 1975; Kehr, 2004).

Using the compensatory model for motivation and volition by Kehr (2004) a basis was established to analyze implicit motives, explicit motives and subjective capabilities (McClelland & Rumelhart, 1989; Schultheiss & Brunstein, 2010) by combining different theories of motivational psychology. Implicit motives happen subconsciously to subjects only realizable by "affective preferences and implicit behavioral impulses" (Kehr, 2004; McClelland & Rumelhart, 1989) and are "conceptualized as associative networks connecting situational cues with basic affective reactions and implicit behavioral tendencies" (Kehr, 2004). If those implicit motives are overlaid by the explicit motives i.e. values (Atkinson, 1964; McClelland, 1985) or self-attributed determinant of goals (Kehr, 2004; McClelland & Rumelhart, 1989), along with the perceived abilities (Ajzen & Driver, 1991; Bandura, 1977; Vroom, 1964) of the very same person, flow can be a result.

The concurrence of abilities and tasks while driving is a perpetual interplay. As a result an experience of flow is possible with those tasks. This premise is endorsed by Csikszentmihalyi and LeFevre (1989) who proved in a study that driving a car is one of the most important sources of flow experience in leisure situations independent of the respective occupation. Csikszentmihalyi (1997) summed up that the driving task provides neutral results concerning joy and motivation, heightened concentration and abilities are requested so that some people experience flow while driving much more often than any time else in their life.

Falko Rheinberg (1996) studied motorcycle driving and confirmed proves to offer appeals in driving dynamics which can be transferred to car driving.

Csikszentmihalyi (1997) was astonished that driving could be a positive side in life. However driving requires a certain degree of knowledge (handling of a vehicle, traffic rules, etc.). If the activity is deeply internalized, the operation of the vehicle works almost automatically. This is an important prerequisite to clean procedures and flow experience is not interrupted through irritation.

The flow-channel-model of Csikszentmihalyi (1987) (Fig. 1) could be transferred to car driving. If the perceived situational challenges and the abilities of the driver and the vehicle are combined in a balance, flow experience beyond stress and boredom is possible. Those challenges could result from traffic, road conditions or distance. The abilities essential for driving is a combination of the abilities of the driver and of the car. Experience, handling also in difficult situations can be summed up in the driver's abilities. Whereas the abilities of the car depend on various parameters, e.g. tires, engine performance, drivers' assistance systems and drivetrain systems forming the driving characteristics.

An experience is perceived as either joyful or exhausting relative to the driver's evaluation of external situations, the driver's abilities and the characteristics of the car. In a situation A1 (Fig. 1) in which challenges of road and traffic combined are balanced with an adequate level of skills, an improvement of skills would cause an imbalance A2 through increasing capabilities of the driver or the car. Boredom would be a negative result which is often compensated by secondary tasks e. g. operation of radio or Smartphone. A rising level of challenges could cause stress. The driver could lower challenges by reducing speed (Røysamb, 1997) or by using additional Advanced Driver Assistance Systems.

Those processes proceed during a drive permanently and unconsciously. A balanced level between challenges and skills is ideal for experiencing flow and ensuring driving safety.

Is it possible to influence flow experience by the car itself? To examine this question a controller was developed to change settings of chassis and automatic transmission. This function contains a driving style detection for sport and comfort driving. The result is a setup change of the chassis and the drive train in the same way, the driver can do by using the control elements.

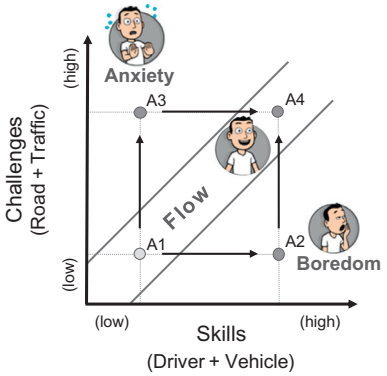

Fig. 1. Flow diagram and PrEmo applied to driving (Csikszentmihalyi, 1987; Desmet et al., 2007).