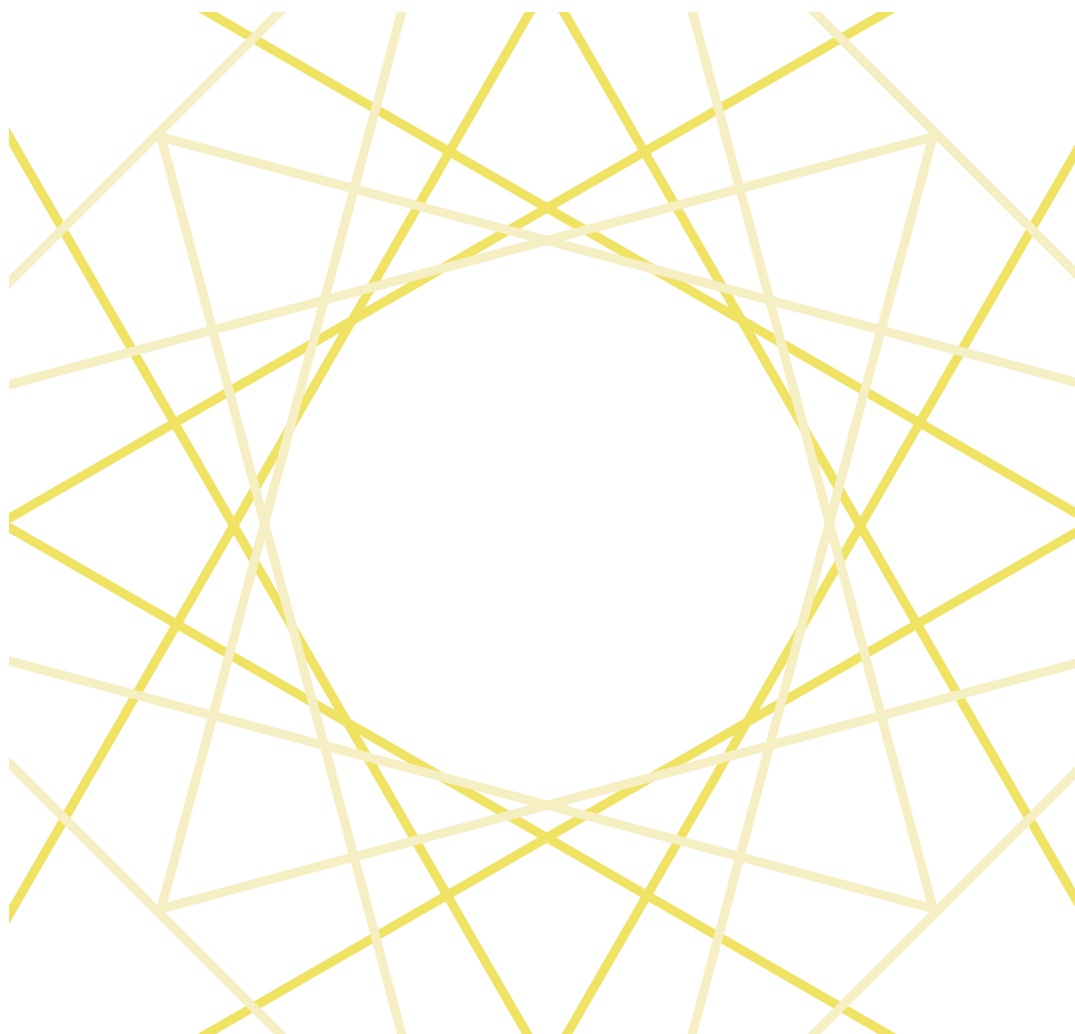


Touristic signage on German Autobahns

Perception and reception of touristic roadside signage



Abstract

There is an ever-increasing number of touristic brown signs on German Autobahns. According to the Guidelines for Touristic Signage, these are supposed to both provide information on destinations of touristic interest and to give directions to the locations in question. However, whether or not they are actually noticed by drivers, whether drivers can remember these signs and the Points of Interest (PoI) shown on them, and whether they influence the drivers' decision-making behaviour have as yet not been scientifically investigated. For the first time, an online survey now provides information on the answers to these questions.

Keywords

Touristic signage, brown signs, awareness, memory, decision-making behaviour, Autobahn, tourism

Imprint

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Introduction

With the help of touristic brown signs, travellers on Autobahns are supposed to be informed about sights, cities and landscapes (Points of Interest, PoI) past which they are travelling. The signage, which has existed in Germany since 1984, is regulated [25] under the Road Traffic Act and the Guidelines for Touristic Signage (figure 386.3). It points out destinations that are either visible from the Autobahn or are in principle less than 10 km (as the crow flies) from an Autobahn junction. In exceptional cases, linear distance may be further afield than this and more than two signs may also be erected between two nodal points. These signs typically feature a symbolic representation of touristic attractions or geographical objects accompanied by a short description (see Figure 1) [13].

Figure 1: Sample sign



Despite extensive research and information from various institutions, there are as yet no studies on the awareness, memory and/or decision support of brown signs. For this reason, the aim of this study is to find out to what extent travellers are aware of the touristic brown signs on German Autobahns, to what extent they stick in the memory and if decisions are made based on these factors. To examine this, it will be investigated whether there are any dependencies between memory and the frequency of use of Autobahns, how many drivers have previously exited the Autobahn on at least one occasion to spontaneously visit a Pol depicted on one of these signs, the length of journey that they are willing to put up with to do this, as well as whether or not they consciously visited one of the depicted Pol at a later date.

Current status of research

Various approaches to the topic can be found in academic literature. The focus here is on signage when approaching or leaving the destinations visited, but this investigation also encompasses airports, leisure facilities, hotels and national parks. It addresses such factors which can influence how the signage is comprehended, for example such as age, level of education, driving experience or gender [10, 30]. However, also taken into consideration are the driver's gaze behaviour [4], their information retention and the design of signposting which is derived from this [15]. So, for example, it was investigated whether text or symbols are easier to understand on signs, the influence that colours have on people's awareness of the signs or how much time is available to read the signs.

Tourism-related studies consider such things as the awareness and comprehensibility of street signs among (international) tourists [9, 29] or whether tourists misunderstand traffic signs in unfamiliar surroundings and (unconsciously) contravene local laws [6]. As well as these, there are studies that investigate touristic information signs as regards their comprehensibility [23], satisfaction with the signage [3], their significance as regards the marketing of destinations [2, 25] and observations on the effectiveness of the signage [12]. There are also studies on the significance of traffic signs for the process of planning and obtaining information for journeys. So, using the example of Canada, the USA and Norway, the extent to which signs can motivate motorists to take unplanned routes or engage in additional activities (in addition to travelling to their actual destination) was investigated [7].

To sum up, it can be stated that (touristic) signage has been the subject of academic research for years, but that up to now there have been practically no academic articles on the awareness of them, on decision-making behaviour and on the recollection of (touristic) traffic signs among car drivers.

Definitional and theoretical principles

Cognitive processes are people's thinking activities that take place as internal events (e.g. deciding, noticing) [16]. According to the prevailing view of cognitive processes, a system that communicates between input stimulus and behaviour can be understood as an information-processing system [18].

Awareness can encompass objects, processes and relationships and is taken in with the sensory organs. "Awareness is a system of information processing. Using this system both environmental stimuli which are experienced and inner signals are decoded. In this way they take on a meaning (information content) for the individual and are processed together with other information to form an internal picture of the environment and the self." [20]

Under the term memory, the information processing approach refers to the ability of an organism to take in information, to save it and to recall it when required [16]. The ability to use information at a later time involves three cognitive processes: encoding (representation in the memory), retention (the maintenance of encoded information over a specified length of time) and remembering (recalling saved information at a later time) [11]. At present, several models of memory have been distinguished, where a distinction has been established between short-term (working memory) and long-term retention [28]. The long-term memory is in turn distinguished according to different types of saved content. On the one side is the storage of acquired structures for the control of physical and linguistic behaviour (procedural memory, mainly behavioural routines) and the conceptual structures (semantic memory, verbalisable knowledge about the world) derived from these. On the other side is the storage of experienced events which are embedded in terms of space and time in the episodic memory (personal experiences). Episodic remembering always involves the special connection to the self, specific phenomenal re-experiencing and temporal classification [1].

A decision is a cognitive "(...) process of choosing between alternatives, the selection of particular alternatives and the rejection of other options." [16] Decisions begin as processes and are manifested as actions in the real world [26]. Decision-making behaviour is differentiated according to the extent to which it is cognitively controlled (see Figure 2). While

habitual behaviour affects everyday behaviour, impulsive decisions are characterised by rash action which is unplanned and subject to little intellectual control (intuitive decisions) [17]. Extensive decision-making behaviour (“true decisions”) describes a comprehensive and, for the most part, conscious problem-solving process. Ultimately, for limited decisions, experiences already exist from which predominantly fixed decision-making criteria result [21].

Figure 2: Dominant psychological processes in decision-making behaviour

Type of decision	Dominant processes		
	Emotional	Cognitive	Reactive
Extensive	x	x	
Limited		x	
Habitual			x
Impulsive	x		x

This study investigates visual awareness and episodic memory. It focuses on the remembering (i.e. the retrieval of stored information about the brown signs) as well as the behaviour (i.e. cognitive decisions, primarily impulsive decisions to spontaneously exit the Autobahn because of a sign). As well as this, extensive decision-making behaviour (e.g. for future plans) and limited decisions (e.g. for repeat visits) are also relevant.

Methodical principles

For this study, an online survey was carried out via a respondi AG panel between 21 and 28 June, 2019. The population of the survey were German-speaking internet users between the ages of 18 and 75 living in private households who regularly or occasionally drive or are a passenger in a private car, motorbike and/or camper van, and who had driven on a German Autobahn within the previous twelve months. According to an online study by ARD/ZDF, 63.3 million Germans (76.5%) had an internet connection in 2018, while 53.2 million Germans use the internet on a daily basis [14]. In 2018 there were 41.37 million private households in Germany [8]; 78.4% of all people had a car at their disposal in 2017 [5]. This means that there are approx. 32.4 million households in Germany with access to a private car.

The sample is – under the restrictions of a quoted online sample described below – representative (confidence level: 95%, margin of error 3%) of German households who have a car available in the household ($n = 1,100$). For the sample design, the characteristics of age, gender and origin (Nielsen Region) were used. For a quota sample like this, an attempt is made to create representativity by constructing the sample based on quotas with which known characteristic distributions in the population are simulated. The basic assumption is that a sample that reflects the known characteristic distributions in the correct ratio should also be representative for unknown characteristic distributions. This assumption is contentious in scientific discussion. As only people with internet access were able to partake in the survey, and of those then only people who were members of the panel, certain income brackets, occupational categories or the like may be over or underrepresented. Cited as a significant argument for the representativity of samples like this is that they have been tried and tested in the field and are quicker and more cost-effective than random sampling. In the current case, a quota sample had to be used as there is no complete register of the population which would have allowed for a truly random sample to be taken. Further disadvantages of these kinds of samples are described in literature, such as the panel effect, for example [24]. The results must be interpreted while taking these limitations into account.

Presentation of results

Initially, the results on awareness and remembering are presented in order to subsequently elaborate on decision-making behaviour, satisfaction with the touristic brown signs and desires for their further development.

Awareness

More or less all respondents state that they notice the touristic brown signs on German Autobahns either as a driver and/or passenger (see Table 1). Drivers notice the brown signs slightly more frequently than passengers, but on the other hand slightly more drivers than passengers state that they forget the signs soon afterwards.

Table 1: Awareness of brown signs (Multiple answers possible; n = 1,100)

Awareness	Percentage	Awareness	Percentage
Yes, always as the driver	28.2 %	Yes, always as a passenger	28.9 %
Yes, usually as the driver	35.7 %	Yes, usually as the passenger	25.5 %
Yes, occasionally as the driver	16.4 %	Yes, occasionally as the passenger	11.8 %
Yes, as the driver, but I forget them soon afterwards	9.4 %	Yes, as the passenger but I forget them soon afterwards	4.0%
No, I don't notice them	4.0 %		

As long as brown signs are noticed, they can be discussed with fellow passengers (if there are any). More than two out of three people (70.2%) have already discussed them at least once with fellow passengers, while almost one in three (30.7%) even discuss them regularly (see Table 2).

Table 2: Discussion of touristic brown signs with fellow passengers (n = 1,100)

Discussion	Percentage	Discussion	Percentage
Yes, often during the journey	30.7 %	Yes, after the journey	2.2 %
Yes, infrequently during the journey	32.4 %	No, because I am (almost) always on the road alone	9.1 %
Yes, up to now just once during a journey	4.9 %	No, it hasn't come up before	20.7 %

Memory

Two out of three people (66.4%) state that they can remember touristic brown signs and the Pol pictured on them, with almost one in four (23.1%) being able to immediately give examples. The majority of those who can generally remember the brown signs state that they can remember two to three signs (59.6%). Only a small number of respondents can remember more than five (6 to 10 signs (2.7%) or ten signs (1.5%).

Regarding the question of whether the interviewees are able to remember the brown signs at all (i.e. immediately, after spending a while thinking about it, or not at all), the frequency with which they use the Autobahn evidently plays a role. If you carry out a Chi-squared test¹ for stochastic independence, the result is significant at $p < .001$. It can thus be assumed that the two characteristics “Frequency of Autobahn Usage” and “Memory of Touristic Brown Signs” are not stochastically independent from one another. A correlation between the time spent on the Autobahn and the ability to remember the brown signs is assumed (Chi-squared (10, $N = 1,100$) = 34.878, $p < .001$). Where applicable, this can be traced back to the learning theory of delayed forgetting, according to which a stimulus, when repeated, is slower to be forgotten – something which also applies to the “learning of informative (not of emotional) advertising messages.” (Kroeber-Riel/Gröppel-Klein 2013, p. 456) Within the group of respondents who are able to remember at least one sign, no further correlation between the frequency of usage of the Autobahn and the specific number of remembered signs can be established (Chi-squared test for stochastic independence (10, $N = 730$) = 10.459, $p = .401$).

Decision-making behaviour

Many stakeholders hope that more visitors can be attracted to the Pol in question with the aid of touristic brown signs. It is therefore of interest whether and how the brown signs influence decision-making behaviour.

Spontaneous behaviour

Just over one in six (17.1%) of those surveyed has already spontaneously exited the Autobahn at least once because of a touristic brown sign, to visit the Pol shown on the sign. The majority of these respondents had made at least one of these spontaneous visits within the past year (87.2%). On average, a depicted Pol was visited 1.9 times (sd 2.2 adjusted for one outlier)² – thus, not many visits per year are registered. The possibility of a correlation between the capacity for remembering and spontaneously exiting the Autobahn was also investigated. For this, a χ^2 test for stochastic independence was carried out, and this produced a significant result ($\chi^2(2, N = 695) = 41.448, p < .001$). It can therefore be assumed that the two variables are not independent of one another. To explain this effect, a variety of approaches present themselves. So, for example, better awareness of the signs may encourage an increased willingness to exit the Autobahn, previously taken trips may improve the future awareness of the signs, or the increasing concentration of signs may contribute both to exiting the Autobahn more often and to a higher recognition rate. Further investigations are needed to determine whether or not one of these explanatory approaches holds true.

With regards to the maximum travel time, it is noticeable that two out of three interviewees (65.4%) are not prepared to spend more than half an hour on travelling, with 8.0% being willing to drive for 10 minutes, 29.2% for 20 minutes and 28.2% for 30 minutes at the most. Only a few test persons would accept longer travel times (see Table 3).

Table 3: Maximum journey time (approximate) to spontaneously visit Pol (n = 188)

Journey time	Percentage	Journey time	Percentage
Up to 10 min	8.0 %	Up to 50 min	3.7 %
Up to 20 min	29.2 %	Up to 60 min	14.4 %
Up to 30 min	28.2 %	1 hour or more	14.9 %
Up to 40 min	1.6 %		

Later visits to depicted Pol

As well as being visited after spontaneously exiting the Autobahn, the depicted Pol may also consciously be visited at a later time, or the intention may be made to visit them in future. While almost every tenth person (8.9%) states that at least once on a return journey they made a visit to a Pol that they had noticed on a brown sign on their outward journey, a little over a third of respondents (35.5%) state that they visited a Pol at a later date. The potential for future visits is relatively high: almost two out of three respondents can see themselves visiting a Pol in future. However, it should be borne in mind that most of those surveyed answered “Yes, possibly” (38.3%) and “Yes, probably” (17.8%). On the other hand, a certain proportion (6.2%) are “Very sure” that they want to visit a tourist attraction, city or landscape depicted on a touristic brown sign in the future. 30.8% answered “No, probably not”, while 6.9% answered “No, definitely not”.

Satisfaction and desires for the future

Most of those surveyed are “satisfied” (51.6%) or “very satisfied” (13.7%) with the range of touristic brown signs on German Autobahns; overall satisfaction equates to 2.26 (sd 0.767) (see Table 4). However it is apparent that opinions on the importance of the signs are less positive. Statements veer towards “somewhat/somewhat” or “(very) unimportant” with a mean of 2.58 (sd 1.011).

As well as satisfaction and importance, the question of whether the number of touristic brown signs in Germany should be increased, decreased or kept the same in the view of those surveyed was also investigated. The majority (51.1%) state that the overall number of signs

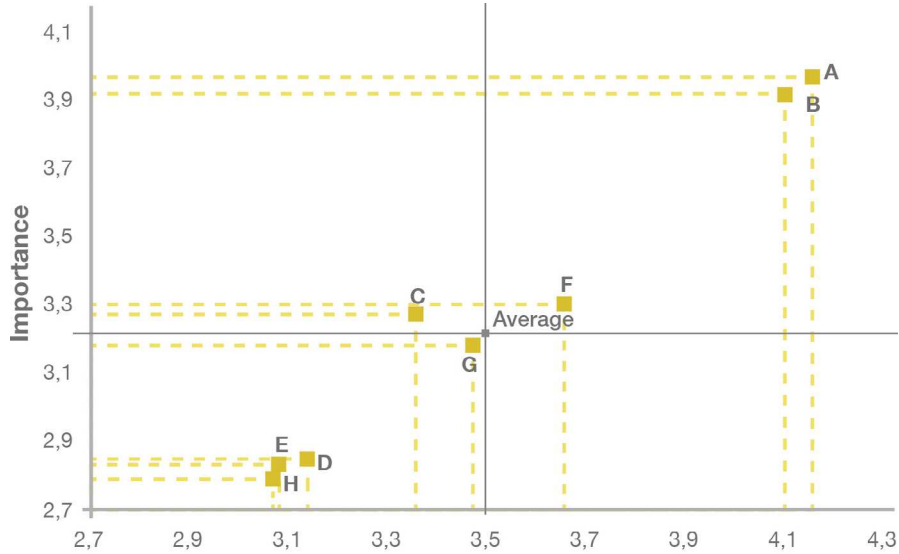
should be kept at the current level, while 40.1% desire an increase in the overall number. Just slightly fewer than one in eleven (8.8%) think that the overall number should be decreased.

Table 4: Satisfaction with and importance of brown signs (n = 1,100)

Satisfaction	Percentage	Importance	Percentage
Very satisfied	13.7 %	Very important	12.6 %
Satisfied	51.6 %	Important	38.2 %
Partly	30.7 %	Partly	32.9 %
Unsatisfied	2.8 %	Unimportant	11.3 %
Very unsatisfied	1.1 %	Very unimportant	5.0 %

The eight ideas at the end of the survey on how to further develop the brown signs can be divided into three groups. The first group encompasses two suggestions which are directly correlated with the signs themselves (see Figure 3). This involves the addition of the distance to the Pol (in km), as well as the specification of the corresponding Autobahn exit. Three ideas can be assigned to the second group: two technological developments (website and app with information on the Pol) as additional offerings, and also bilingual signs. These have been rated as of average interest and importance. Three further suggestions have been rated as of less interest and importance: a more unique design, a revision of the colour scheme and the limiting of the signs to public facilities.

Figure 3: Suggestions for the further development of the brown signs



	Suggestion	Importance	Percentage
A	Addition of the distance to the Pol (in km)	4.16	3.96
B	Specification of Autobahn exit to visit Pol	4.10	3.91
C	Signs in German and English	3.36	3.27
D	Provision of a more unique design (e.g. colour choice, layout)	3.14	2.85
E	Revision of the colour scheme	3.08	2.83
F	Website with info, photos, links etc. to the individual Pol	3.66	3.29
G	App with info, photos, links etc. to the individual Pol	3.48	3.18
H	Inclusion of only public Pol on signs	3.07	2.79
	General mean	3.50	3.26

Conclusion

It can be initially observed that the brown signs are noticed by more or less all respondents and for most of these they stick in the memory to some extent at least. As well as this, behavioural effects can be noted in the majority of interviewees. As assumed, based on a brown sign a Pol is more likely to be visited afterwards on the return journey, during a future journey, or the sign is used as inspiration, i.e. the effects are deferred. In such a case, the signs themselves are not always the sole catalyst for trips, rather they are one of many factors. A discussion about the brown signs during the journey takes place relatively often. Because of this it is also to be assumed that decisions on visiting a Pol (spontaneously or later) are often not made alone. This question was not explicitly investigated, however there are several studies that look into the important role of (marriage) partners and family members [19]. Practical recommendations can be derived from the results. The respondents notice the brown signs and can remember them. In addition, they lead to behavioural effects. If, at the place where they make their decisions (e.g. when at home using the internet, brochures etc.) the tourists encounter motifs they have seen before (be they designs, drawings or pictures), it can be assumed for the most part that they will remember these motifs. For the observed memory effects it cannot be assumed that the people surveyed paid particular attention to the signs or that they intended to memorise the signs when driving past. Rather, they were probably “encoded” casually, below the attention threshold. This is consistent with a host of results from research into advertising effects, whereby advertising even has an effect if it is casually and unconsciously observed [11]. It can therefore be recommended to touristic decision-makers to integrate the visuals on the brown signs into marketing campaigns.

In future a way of further developing the brown signs may be to link them with technological components, i.e. to digitize them. This would make it possible to develop a website and/or app with information, photos, links etc. on the individual Pols. When driving past a Pol, an app could also automatically provide further information if the appropriate setting is activated on a smartphone. An alternative possibility would be GPS-based reward points schemes involving signs and the associated rewards – similar schemes already exist in hiking regions [22]. This approach is being employed by a company called MAQNIFY, with audio clips, related links and information available for all brown signs in Baden-Württemberg (www.erlebnis-guide.info).

¹ The Chi-squared test for stochastic independence tests two characteristics (such as age cohort membership and car ownership) for stochastic independence. For this purpose, the actually observed frequencies are compared with the frequencies to be expected if the characteristics are completely independent.

² sd = standard deviation, a statistical measure of the dispersion of a characteristic around the center of a distribution

References

- [1] Anderson, J.R. (2013): Kognitive Psychologie – German Edition published by J. Funke, 7th Edition, Berlin/Heidelberg.
- [2] Bade, M. (2006): Marketing entlang der Autobahn, in: Heinritz, G./Lentz, S./Tzschaschel, P. (Ed.): Nationalatlas Deutschland – Leben in Deutschland (Volume 12), Leipzig, p. 130-131.
- [3] Ballantyne, R./Hughes, K./Weiler, B./Moscardo, G. (2008): Tourists' use of road-side signage: A Case Study of the Great Southern Route, Gold Coast/Queensland.
- [4] Beijer, D./Smiley, A./Eizenmann, M. (2004): Observed Driver Glance Behaviour at Roadside Advertising Signs, in: Transportation Research Record: Journal of the Transportation Research Board 1899(01), p. 96-103.
- [5] BMVI – Bundesministerium für Verkehr und digitale Infrastruktur (Ed.) (2018): Verkehr in Zahlen 2018/2019, Berlin.
- [6] Choocharukul, K./Sriongvikrai, K. (2017): Road Safety Awareness and Comprehension of Road Signs from International Tourist's Perspectives: A Case Study of Thailand, in: Transportation Research Procedia 25, p. 4518-4528.
- [7] Dahl, T.I./Dahl, L./Dalbakk, J.-A./Langseth-Eide, B.E. (2015): The Sign Language of Road Trips: Guides to Authentic Cultural Learning and Understanding?, in: Proceedings from the International Adventure Conference 2015, 09 - 11/09/2015 in Sheffield, England, p. 21-22.
- [8] Destatis – Statistisches Bundesamt (2019): Bevölkerung und Erwerbstätigkeit: Haushalte und Familien – Ergebnisse des Mikrozensus 2018, Wiesbaden.
- [9] Dudek, C.L./Huchington, R.D./Trout, N./Chester, D. (1996): International Tourist Guidance Needs and Understanding of Selected Guide Signs in Florida. Transportation Research Record 1550, p. 37-47.

- [10] Färber, B./Färber, B./Siegener, W./Süther, B. (2007): Aufnahme von Wegweisungsinformationen im Straßenverkehr – AwewiS, Bremerhaven.
- [11] Felser, G. (2015): Werbe- und Konsumentenpsychologie, 4th Edition, Berlin/Heidelberg.
- [12] Findlay, C./Southwell, K. (2004): ‚I just followed my nose‘: understanding visitor wayfinding and information needs at forest recreation sites, in: *Managing Leisure* 09(04), p. 227-240.
- [13] Forschungsgesellschaft Straßen- und Verkehrswesen (Ed.) (2008): Richtlinien für die touristische Beschilderung (RtB), Cologne.
- [14] Frees, B./Koch, W. (2018): ARD/ZDF online study 2018: Zuwachs bei medialer Internetnutzung und Kommunikation, in: *Media Perspektiven* 9/2018, p. 398-413.
- [15] Gao, X.W./Podladchikova, L./Shaposhnikov, D./Hong, K./Shevtsova, N. (2006): Recognition of traffic signs based on their colour and shape features extracted using human vision models, in: *Journal of Visual Communication and Image Representation* 17(04), p. 675-685.
- [16] Gerrig, R.J. (2018): *Psychologie*, 21st Edition, Hallbergmoos.
- [17] Gigerenzer, G. (2007): *Gut Feelings. The intelligence of the unconscious*, New York.
- [18] Hagendorf, H. (2011): Wahrnehmung, in: Hagendorf, H./Krummenacher, J./Müller, H.-J./Schubert, T. (Ed.): *Wahrnehmung und Aufmerksamkeit – Allgemeine Psychologie für Bachelor*, Berlin/Heidelberg/New York, p. 13-30.
- [19] Kozak, M. (2010): Holiday taking decisions – The role of spouses, in: *Tourism Management* 31, p. 489-494.
- [20] Kroeber-Riel, W./Groeppe-Klein, A. (2013): *Konsumentenverhalten*, 10th Edition, Munich

- [21] Kuß, A./Tomczak, T. (2007): Käuferverhalten – Eine marketingorientierte Einführung, 4th Edition, Stuttgart.
- [22] Lück, M./Gross, S. (2016): Stamp books in the Harz Mountains, Germany – fun not just for children, in: Richins, H./Hull, J. (Ed.): Mountain Tourism – Experiences, Communities, Environments and Sustainable Futures, Wallingford, p. 58-66.
- [23] Neill, J.M./Hurwitz, D.S./Olsen, M.J. (2016): Alternative Information Signs: Evaluation of Driver Comprehension and Visual Attention, in: Journal of Transportation Engineering 142(01).
- [24] Schnell, R./Hill, P.B./Esser, E. (2013): Methoden der empirischen Sozialforschung, 10th Edition, Munich.
- [25] Steinecke, A. (2013): Management und Marketing im Kulturtourismus: Basiswissen – Praxisbeispiele – Checklisten, Wiesbaden.
- [26] Völker, R. (2018): Wie Menschen entscheiden – Anspruch und Wirklichkeit, Stuttgart: W. Kohlhammer GmbH.
- [27] Weinberg, P. (1994): Emotionale Aspekte des Entscheidungsverhaltens. Ein Vergleich von Erklärungskonzepten, in: Forschungsgruppe Konsum und Verhalten (Ed.): Konsumentenforschung, Munich, p. 171-181.
- [28] Wentura, D./Frings, C. (2013): Kognitive Psychologie, Wiesbaden.
- [29] Yan, L./Lee, M.Y. (2014): Tourist Perceptions of the Multi-Linguistic Landscape in Macau, in: Journal of China Tourism Research 10(04), p. 432-447.
- [30] Zhang, T./Chan, A.H.S. (2013): Traffic Sign Comprehension: a Review of Influential Factors and Future Directions for Research, in: Proceedings of the International Multi Conference of Engineers and Computer Scientists (IMECS 2013), Vol II, 13.-15.03.2013, Hong Kong.