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Location-based services in tourism: An empirical analysis of factors influencing usage behaviour

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Abstract

This contribution focuses on tourists' usage behaviour of Location-Based Services (LBS) during their vacation. LBS represents technologies that localise a user's mobile device (Turowski & Pousttchi 2004: 73) to offer services and content based on the user's current geographical location (Egger & Jooss 2010: 21; Frey *et al*. 2015: 124). In vacation spots tourists find themselves in a situation characterised by increased information and service needs (Link & Seidl 2008: 56). Given that, LBS are considered to be promising services in the tourist industry (Egger & Jooss 2010: 21). In order to make use of the entire potential of LBS in tourism, the following key question needs to be answered: *Which factors influence tourists' usage behaviour of LBS and which possibilities can be derived for tourism providers and destinations?* To answer its research question, this empirical study follows a deductive approach using UTAUT2, a popular technology acceptance model. The findings show a high usage rate of LBS in vacation and indicate that especially performance expectancy, effort expectancy as well as hedonic motivation influence the rate of usage. Considering these main causes, we derive theoretical implications as well as valuable clues for tourism management in practice.

Keywords**:** *Location Based Services, Transition, Potentials for tourism providers, Localisation, Technology Acceptance*

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Introduction

In recent years, digitalisation has been the subject of some major changes; especially the usage of mobile devices has increased significantly (Lu, 2017; Parasuraman *et al*. 2017). The possibilities of mobile internet

usage allow completely new kinds of applications on smartphones. A prominent example are apps tracking a user's location. These 'Location-Based Services' – in short 'LBS' – are technologies that enable the consumption of content related to the user's current location (Egger & Jooss, 2010: 21). This allows for various areas of application for LBS, like real-time traffic, navigation, travel services, emergency services, location-based advertising and marketing (Jagoe, 2003: 3) as well as gaming and entertainment (Xu, 2007: 5). LBS have spread rapidly in the last few years (Scassa & Sattler, 2011: 107) and are also expected to have a high future potential (Basiri *et al*. 2015: 274, Bowen III *et al*. 2010: 208). They are considered to be a potential "new means to promote and live the tourism experience either before or during the experience itself" (Pedrana, 2014: 753). Therefore, we expect by investigating this technology in the context of tourism, we will be able to generate valuable insights for tourism providers. Since LBS are a relatively new kind of technology (Fronhofer & Lütters, 2012: 293), few studies have so far analysed the acceptance of LBS in tourism (Frey *et al*. 2015: 123), which is going to be the focus of this contribution.

Objectives

This paper aims to investigate factors that influence tourists' usage behaviour of LBS and to derive resulting possibilities for tourism providers and destination managers. To reveal the potential of LBS in this context, this contribution aims to answer the following key question: *Which factors influence the tourists' usage behaviour of LBS and which possibilities can be derived for tourism providers and destinations?* Previous research in this field has already examined LBS usage in the tourism destination Wörthersee (Frey *et al*. 2015) and in Switzerland (Beier & Aebli, 2016). In order to study the LBS usage behaviour, a survey was conducted in the destination Greetsiel, located right at North Sea shore in Germany. This research is based on key findings from the previously mentioned studies and provides additional insight into tourists' LBS usage behaviour by comparing LBS usage during, and outside of vacations, and it is based on a technology acceptance model, which was adjusted specifically for the touristic context in order to include and examine further situational factors. This adjusted technology acceptance model is a modified version of the UTAUT2 (Venkatesh *et al*. 2012) which was used here to investigate relevant influences of the LBS usage intention in tourism.

Theoretical Background

To gather a basic understanding of the subject, the tourists' general electronic media usage during vacations needs to be discussed and the term ‚location-based service' has to be defined. Subsequently, the potential of location-based services in tourism is going to be addressed.

Electronic Media usage during vacation travel

The creation and further development of the internet as well as its accessibility has been transforming the tourism industry since the early 1990's (Xiang *et al*. 2015: 244). Especially the new possibilities, that arise from mobile media usage, have already been subject to some research, since they allow for new travel experiences which can add significant value to the tourists' holiday activities (Beier & Aebli, 2016: 549), culminating in an ontology-based matchmaking to provide personalised recommendations for tourists (Grün, *et al*. 2017; Kremer & Schlieder, 2014: 268), confronting with chat-based recommendations (Nguyen & Ricci 2017: 17), or with strategically created visitor flows using mobile data for an analysis (Baggio & Scaglione, 2017). For example, social media usage during vacations leads to the new situation of visitors becoming producers of information (Parra-López *et al*. 2012:176f.), as they "assist consumers in posting and sharing their travel-related comments, opinions, and personal experiences, which then serve as information for others" (Xiang & Gretzel, 2010: 179). Consumer generated content – which sometimes simply includes usable tracking data as well (Asakura & Iryo, 2007: 684) – also influences other potential tourists' travel planning (Parra-López *et al*. 2012: 176) and therefore creates new possibilities for the tourism industry. Another type of mobile tourism service considered to be an important factor transforming the tourism industry are applications that generate value by location-

awareness or provide interactive maps (Schmidt-Belz *et al*. 2003). Given this background geotagging inspires researchers all over the world since the beginning of the century (Forer & Simmons 2002: 173ff., cf. the contributions to Arnberger, *et al*. 2002), for the characteristics of geotagged data provide "a new method for tourism and hospitality researchers to analyse tourist movement and behaviour" (Wong *et al*. 2017: 43), at which the possibility of big data usage nowadays is of special concern (Chareyron *et al*. 2014). Several studies already focussed on geodata concerning different destinations (cf. Dickinger *et al*. 2008; cf. Crampton et. al. 2013) – interestingly they often concentrate on photo-sharing services in combination with localisation (cf. Donaire *et al*. 2014; Da Rugna *et al*. 2012: 347; cf. Crandall *et al*. 2009: 761; Cao *et al*. 2010: 2274; Xu *et al*. 2015). A current overview of all research topics and approaches concerning geotagging research in tourism is contributed by Wong and colleagues (2017). Probably one of the most sophisticated approaches coming with geotagging and tourism is the use of finite Markov chains for modelling spatio-temporal movement of tourists – which could be used to enhance forecasts (Xia *et al*. 2009: 1544).

This paper specifies on the tourists' usage of these location-based services during vacations. What exactly classifies as LBS and how they can be put to use will be clarified in the following.

Location-Based Services

A uniform understanding of the term ‚location-based service' has not yet been established (Bauer *et al*. 2008: 207; Basiri *et al*. 2015: 274). For example, Turowski and Pousttchi (2004: 73) set the focus of LBS on the service's technological abilities to track a user's current location, while Spiekermann (2004: 10) and Bauer *et al*. (2008: 207) define LBS pointing out their purpose of providing an added value for the user by providing information associated with the position. Unni and Harmon (2003) with reference to Jagoe (2003) and Mitchell and Whitmore (2003) describe them as "services that are enhanced by and depend on the user's position", stressing the interdependency between user-location and the related information. Furthermore, some definitions prioritise the location's essentiality for the service, while others only include services using real-time location tracking (Basiri *et al*. 2015: 274). However, despite these different emphases in their definitions, researchers agree on certain substantial features that characterise LBS (Bauer *et al*. 2008: 208). Based on these, LBS can be defined as services identifying the geographical position of a user's mobile device and providing the user with personalized information based on this position (Frey *et al*. 2015: 124; Martin *et al*. 2010: 3). These services are made available by electronic communication technologies – usually mobile networks (Turowski & Pousttchi, 2004: 73). By connecting the location with associated information, LBS are generating an added value for the user (Bauer, 2008:207; Spiekermann, 2004: 10). Another characteristic of LBS is their feature of personalisation by associating localised information with the context users are connected to (Jagoe, 2003: 82). This definition of LBS shall hereinafter apply for this contribution.

The localisation of the mobile device is usually determined through satellite-based networks or cellular-based techniques (Christmann *et al*. 2012: 26). For satellite-based localisation the GPS (Global Positioning System) technology has become the standard due to its global coverage (ibid. 26) and its integration into smartphone electronics (Göll *et al*. 2010: 28). GPS is especially suitable for accurate position determination outside of closed rooms (Turowski & Pousttchi, 2004: 74).

Another type of localisation technology are small wireless transmitters, so-called beacons. These can be attached to certain objects in the environment and exchange information with smartphones in a radius of up to 30 meters (Altpeter, 2017: 11). Beacons are based on the proximity specification in the network technology 'Bluetooth Low Energy (BLE)' (Gast, 2014: 9), and they "transmit identification information that applications can use to identify the type of space the beacon is installed in" (ibid. 10). Therefore, beacons are particularly suitable for indoor navigation solutions as in shops, malls or museums for example.

LBS in tourism – a special potential

In tourism and hospitality – a worldwide economically growing industry (Suárez Álvarez *et al*. 2007: 453) – the importance of customer satisfaction and loyalty has significantly increased (Bogner, 2006: 1). Moreover, online marketing is becoming a higher priority in customer acquisition and customer loyalty for tourism companies (Wasserek, 2011: 3; Pan & Li, 2011). Due to the steady development of internet technology allowing for personalisation and analysis of the customers' personal data, a specific understanding of the tourism destination image is becoming a more important factor for online marketing in general (Pan & Li, 2011: 150). The touristic distribution landscape has always been subject to constant changes, due to its business or industry environment also undergoing a constant change (Čavlek, 2013: 191). The increasing number of smartphone users has been an important part of this change (Frey *et al*. 2015: 123). In 2015 the worldwide number of smartphone users already amounted 1,86 billion and in 2020 it is expected to reach 2,87 billion (internetdo.com 2015).

Nowadays the mobile internet can be accessed from almost anywhere (Lehner, 2002: 19), opening new possibilities for the usage of LBS. This leads to potentials the tourism industry could benefit from (Frey *et al*. 2015, 134). According to Kramer and colleagues (2009: 123) LBS are capable of significantly enhancing the tourists' leisure experience, while Egger and Jooss (2010: 21) call LBS promising services for touristic relations. Examples for the wide range of applications using LBS in tourism include the planning and booking of trips, guides for events and museums, information on events and points of interest, shopping, location-based marketing, public transport and more services related to an unfamiliar environment (Pedrana, 2014: 758; Wasserek, 2011: 14; Orehovački *et al*. 2009: 111). Apps that offer these kinds of services for tourists are for example the hotel booking and rating apps 'Booking.com', 'Trivago' and 'TripAdvisor', the car rental app 'Sixt', the 'Louvre Museum Guide', and to be more specific concerning a selected destination the 'Innsbruck'-app, which offers several location-based services for tourists combined in one app.

To make use of the previously described advantages of LBS in tourism, the key question that needs to be answered is: How can tourism providers use the potential of LBS for themselves to stand out among other content providers that they have to compete with (Egger & Jooss, 2010: 22) and to eventually generate an added value for users (Frey *et al*. 2015: 134)? Therefore, this contribution's research interest is to give tourism providers valuable clues for the optimisation of LBS for their needs

LBS in tourism – state of research

In the next section we want to give an overview over previous studies in the field, that were providing tourism suppliers with recommendations for action regarding LBS.

In her study about possible implications of LBS for tourism destinations, Pedrana (2014: 761) comes to the conclusion that destination management organisations need to offer "a unique source of information" in order to be effective. Furthermore, she points out that the collection of data may cause problems due to users' privacy concerns but may also be very valuable to create personalised services (ibid. 761). In order to further clarify the effects of privacy concerns, they are investigated in our study as well. Egger and Jooss (2010: 23) conclude their investigation by stating that the development of new business models is the key to long-term success for tourism providers.

Further studies in this field have examined LBS usage behaviour of tourists in the destination Wörthersee in Austria (Frey *et al*. 2015) and tourists' usage of mobile applications in Switzerland (Beier & Aebli, 2016). Some essential findings of the study by Beier & Aebly (2016) were as follows: Mobile applications are perceived as a kind of information technology by most tourists, which is why patterns of information technology usage are expected to also apply for mobile apps. Employment was revealed to be positively related to the tourists' frequent use of mobile applications, whereas age was shown to be of negative influence. Gender, however, did not turn out to be

significantly influencing usage. They concluded their study by stating, that "future studies should analyse more detailed influences on the use of concrete kinds of mobile apps in tourism" (Beier & Aebli, 2016).

The study by Frey and colleagues (2015: 134) concluded that the "successful use of LBS in the Wörthersee region depends on the factors that influence customer's intention to use, actual use and ultimately acceptance of LBS". Moreover, they pointed out, that tourism institutions' efforts for future improvements should focus on improving networks and the customised experience while using LBS (ibid. 134). Lastly, their study revealed the technology acceptance model UTAUT2 to be "the most suitable model in order to […] carry out the empirical research about the acceptance of LBS in tourism destinations" (ibid. 134). Out of these previously mentioned studies, only Frey and colleagues (2015) follow an approach based on a technology acceptance model as in our case.

Our research, which was conducted in a different touristic region is taking these findings and future research suggestions into account. It attempts to build upon these insights by using an adjusted version of the UTAUT2 model, that also covers the tourists' data privacy concerns while using LBS (Zhou *et al*. 2012: 140), and furthermore includes other tourism-related situational factors. In the following chapter, this newly created research model will be described in detail. Further new investigation of this study includes the comparison of LBS usage behaviour during and outside of vacations.

Research Model

A popular research approach regarding the adoption of new technologies is to focus on the user's technology acceptance (Chuttur, 2009:1; Venkatesh *et al*. 2003: 427). To visualise the influences on the users' technology acceptance, the presentation as a model is well suited. Over the years several different technology acceptance models have been developed, however the Unified Theory of Acceptance and Use of Technology (UTAUT) is considered to be one of the most sophisticated (Williams *et al*. 2015; Frey *et al*. 2015: 126). It combines eight prominent models of the acceptance research in information technology and aims for a synthesis of these models to establish a basis for a unified view of user

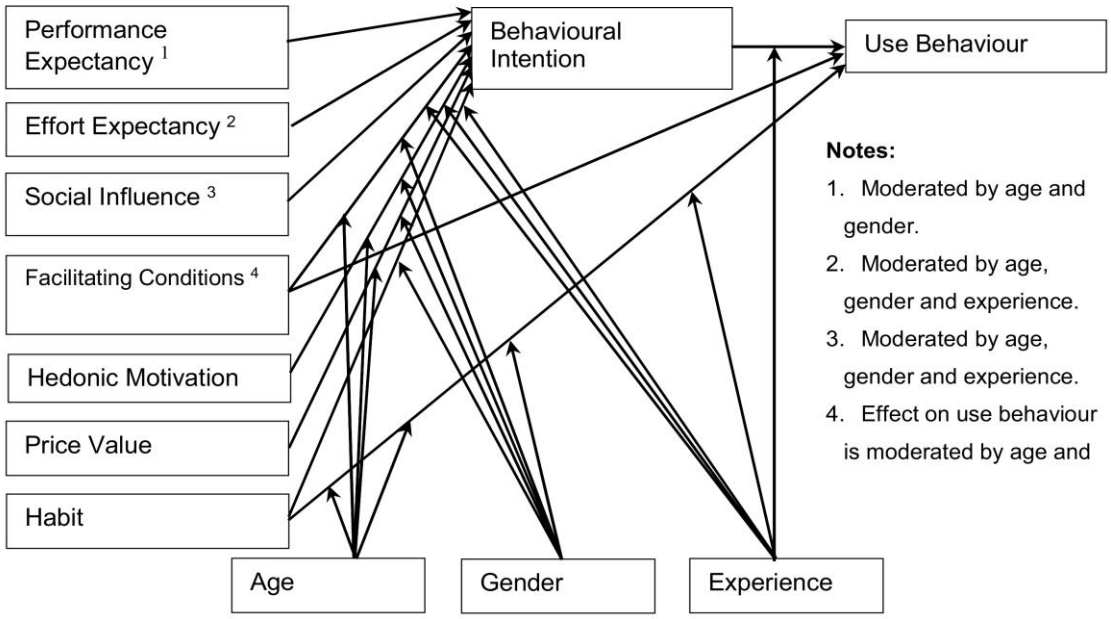

Figure 1. *UTAUT2 (own presentation based on Venkatesh et al. 2012, 160)*

acceptance (Venkatesh *et al*. 2003: 425f.). In 2012 an extended version of this model – the UTAUT2 – was developed, which also focused on consumers instead of organizations (Venkatesh *et al*. 2012: 171). The following figure illustrates the UTAUT2 model:

The UTAUT2 depicts *behavioural intention* and *use behaviour* as dependent variables and the constructs *Performance Expectancy*, *Effort Expectancy*, *Social Influence*, *Facilitating Conditions*, *Hedonic Motivation*, *Price Value* and *Habit* as their determinants (Peris & Nüttgens, 2011: 91; Venkatesh *et al*. 2012: 160). Venkatesh and colleagues (2003: 447ff.; 2012: 161) define the independent variables as follows:

As shown in Figure 1, the influences of these constructs on the dependent variables are affected by the moderators *age*, *gender* and *experience*.

The UTAUT2 was already proven to be suitable in the case study conducted by Frey and colleagues (2015: 134). It is also the basis for the research of this paper, however slightly modified to better fit the tourism context: Two out of the seven independent variables were removed, a new one added. The independent variable *price value* is not part of this adjusted model, because of the clear dominance of apps financed by advertising (Bauer *et al*. 2008): Most of the applications are free to download. The percentage of free downloadable applications that are related to tourism and leisure management might even be higher, since those apps are mainly provided due to marketing reasons. The variable *habit* was excluded from the model in the context of tourism for the reason, that one would have to address two kinds of habits: first the habits in LBS and digital media use in everyday life, second the habits while traveling and vacation. These might differ in the intensity as well in the quality. Since we also cannot be sure about interactions, we exclude the construct to prevent unnecessary complexity. The new independent variable in this model is *privacy concern*. In many cases the localisation can lead to concerns about the users' privacy (Warwitz, 2016: 71) and may have a negative impact on the trust in the service providers (Zhou, 2012: 140). Especially the so-called user profiling – the creation of a personal profile, needed for personalisation functions of LBS-apps – often raises privacy concerns (Jagoe, 2003: 83). Hence, the variable *privacy concern* shall be defined as the extent of the user's concern on personal information disclosure while using the technology (Zhou, 2012: 140).

Furthermore, this adjusted model replaces the moderator *experience* with *formal education* due to education playing an important role in the adoption of new systems (Lin *et al*. 2013: 1123), and being a demographic feature like *age* and *gender* (Jung *et al*. 2012: 208). Two additional moderators were incorporated in this

Table 1*. Independent variables of the UTAUT2 (own presentation based on Venkatesh et al. 2003: 447ff.; 2012: 160)*

Performance expectancy	The degree to which an individual believes that using the system will help him or her to attain gains in job performance.
Effort expectancy	The degree of ease associated with the use of the system.
Social influence	The degree to which an individual perceives that important others believe he or she should use the new system.
Facilitating conditions	The degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system.
Hedonic motivation	The fun or pleasure derived from using a technology.
Price value	The price value is positive when the benefits of using a technology are perceived to be greater than the monetary cost.
Habit	The extent to which people tend to perform behaviours automatically because of learning (Limayem *et al*. 2007: 705).

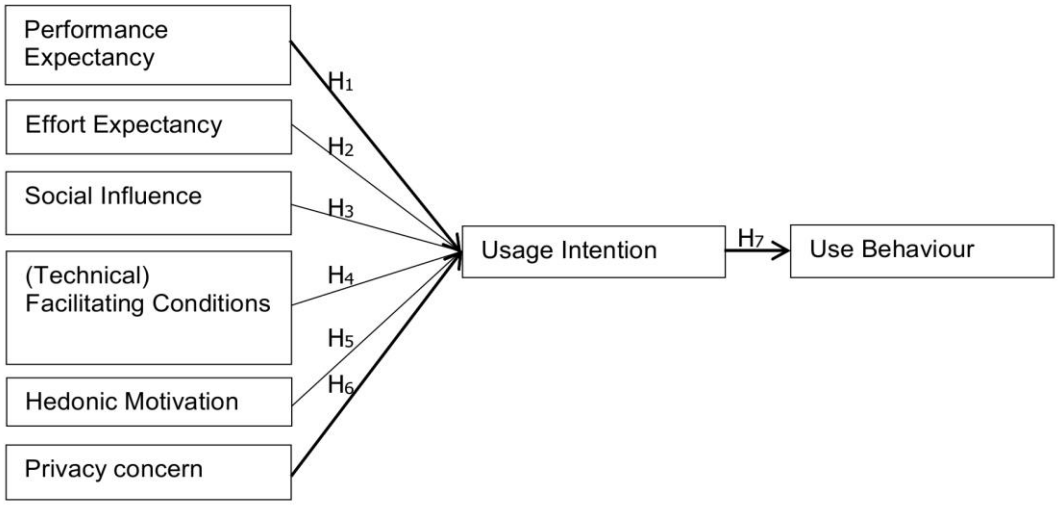

Figure 2. *UTAUT2 adjusted for LBS in tourism (own presentation based on Venkatesh et al. 2012: 160*

adjusted version of the UTAUT2 to reflect on the tourism subject matter: the *length of vacation* which, according to Vitoratos (2015: 220), has an impact on the tourists' LBS usage and the *accompaniment during the vacation*, which is often related to the demographic feature 'marital status', as it may determine whether an individual travels as a single, couple or family (Freyer, 2011: 89), and is a key criterion for tourist behaviour. The following figure illustrates this modified version of the UTAUT2:

To monitor whether the effects of *age*, *gender*, *education*, *length of vacation* and *accompaniment* on the influence intention and behaviour, they are included in the model as control variables. Their key feature is to prevent distortions in the observed relationships by extraneous variables not linked to the tested hypotheses (Spector & Brannick, 2011: 288).

Assuming that there is a particularly high demand for orientation during vacations (Link & Seidl, 2008: 56) and LBS can help the user with exactly this task (Christmann *et al*. 2010: 166), the following hypotheses were derived from the modified UTAUT2 based on previous studies and literature as well as definitions given in table 1:

H_1: The performance expectancy has a significant positive influence on the LBS usage intention in tourism. (Zhou, 2012; Christmann et al. 2010)
H_2: The effort expectancy has a significant positive influence on the LBS usage intention in tourism. (Xu & Gupta, 2009; Yun et al. 2011)
H_3: The social influence has a significant positive influence on the LBS usage intention in tourism. (Venkatesh et al. 2003; Zhou, 2012)
H_4: Technical facilitating conditions have a significant positive influence on the LBS usage intention in tourism. (Bauer et al. 2008; Thompson et al. 1991: 129)
H_5: The hedonic motivation has a significant positive influence on the LBS usage intention in tourism. (Venkatesh et al. 2012)
H_6: Privacy concern has a significant negative influence on the LBS usage intention in tourism. (Zhou, 2012; Xu & Gupta, 2009)
H_7: The usage intention has a significant positive influence on the LBS use behaviour in tourism. (Venkatesh et al. 2012)

Methodology

In order to examine the seven proposed hypotheses and eventually gain insights into the tourists' LBS usage behaviour, an empirical cross-sectional study is part of this research. This study was carried out as a quantitative survey with a questionnaire covering questions to make all the model's constructs measurable.

Empirical Setting

The area chosen for the data collection with a questionnaire was the fishing village Greetsiel, located at the coast in the north of Germany close to the Dutch border. It is part of the community of Krummhörn in the Aurich area of Lower Saxony and known as a typical East Frisian fishing village. Due to its original and natural atmosphere Greetsiel is attracting many tourists since ages. With nowadays about one million day guests and 400.000 overnight stays per year (Ubl, 2013), it proved to be an ideal location for the survey. Greetsiel only has 1.500 inhabitants, however in summer the number of people is about three times as large.

Greetsiel is heavily characterised by tourism and therefore an ideal location for this study. Due to the vast range of tourist offerings and attractions in this area, including nature, culture, sports and water (IHK, 2015: 20), tourists with very different interests could be interviewed. As a result, the survey's findings covered a particularly large number of aspects regarding tourist interests. The centre of Greetsiel also proved to be a suitable place for the interviews, because its port and other sights attract a particularly large number of tourists. Further reasons why Greetsiel was a suitable place for the chosen method are to be found in chapter 5.3.

The questionnaire

The questionnaire served as this research's empirical data collection tool, querying relevant items for every construct in order to make the respective variables measurable. The majority of the questionnaire consisted of closed questions with answer possibilities given in the form of five-point Likert-scales, ranging from *strongly agree* to *strongly disagree*. Each item was derived from existing literature to ensure validity.

The Performance Expectancy was covered by questions regarding three items: The user's perception of the app's usefulness (Davis *et al*. 1989: 997; Venkatesh *et al*. 2003: 447), the facilitation of the holiday (Beier & Aebli, 2016: 551) and the support with accomplishing a personal goal (Bagozzi, 2007: 249). Examples for these kinds of questions were "Do you perceive LBS as generally useful?" and "Do LBS make your holiday easier?" among others.

The Effort Expectancy was measured with questions about the following items: The easy learnability (Davis *et al*. 1989: 998; Venkatesh *et al*. 2003: 451), the intuitive usability (Venkatesh *et al*. 2003: 450) and potential difficulties with the app (ibid. 450) with questions like "Is the usage of LBS clear and simple for you?" and "Do you consider the LBS usage to be easy/intuitive?" among others.

The social influence was operationalised by questions about the social environment's grade of influence on the usage (Gerpott & Berg, 2011: 268), as well as positive experiences and favourable reviews by friends, family and media articles regarding the service quality (Bauer *et al*. 2008: 211). Exemplary questions for this construct were "Are positive experiences of related persons with LBS important to you?", "Do you seek advice in relevant media reports before using LBS" and others.

In the field of technical facilitating conditions, items characterising the user's mobile device were addressed. A mobile device is required for the usage of LBS (Martin *et al*. 2010: 3). Therefore, it firstly was important to clarify whether the participant owns a mobile device. Secondly, the participants had to specify the operating system installed on it. Current research revealed significant differences between different operating systems' user-friendliness (Chien *et al*. 2014: 75), and also indicated possible conflicts of interest between the supplier of the operating system, the smartphone manufacturer and the mobile service provider, finally affecting user-friendliness (Göll *et al*. 2010: 32). Other factors that were queried for this item included the data volume, phone reception and battery runtime (Otieno *et al*. 2018: 7; Egger & Jooss, 2010: 15f.; Göll *et al*. 2010: 29).

The hedonic motivation is primarily determined by the user's emotional state (van der Heijden 2004) and the general happiness (Venkatesh *et al*. 2012: 163) while using new technologies. Questions regarding these two subjects covered this item in the questionnaire. Questions in this category were for example "Do you perceive LBS as a burden?" and "Do LBS improve your quality of life?".

Table 2. *Measurement construction*

Construct	Cronbach's Alpha	Number of Items	Items
Performance expectancy	0.815	3	LBS are generally useful. LBS help me accomplishing personal goals. Using LBS makes my holiday easier.
Effort expectancy	0.820	5	Using LBS is clear and understandable. I consider the LBS usage to be easy/ intuitive. Using LBS is easy to learn. Using LBS needs some effort. Using LBS is complicated.
Social influence	0.710	3	Positive experiences of related persons are important to me. I obtain information about LBS through experience reports in the media. I seek advice in relevant media reports before using LBS.
Facilitating conditions	0.750	6	My data volume is sufficient for LBS usage. My mobile network is sufficient for LBS usage. My device is fast enough to run LBS. My battery runtime is sufficient for LBS usage. I am able to download, install and use apps on my own. I am able to change my device's location settings.
Hedonic motivation	0.727	6	I perceive using LBS as a burden. Using LBS gives me pleasure. Using LBS gives me satisfaction. Using LBS improves my quality of life. Using LBS is indispensable for me. I feel joy using new technologies.
Privacy concern	0.861	4	Too much personal data needs to be entered for LBS usage. Third parties can easily get access to my personal data while using LBS. LBS providers can easily misuse my data. LBS providers can't be trusted.
Behavioural intention	0.854	3	I intent to use LBS in my next holiday. I plan to use LBS in my next holiday. I assume to use LBS in my next holiday.

The users' attitude towards the data security of LBS was measured with questions about the following items: The handling of the users' personal data, including possible abuse for advertising and consumption purposes (Zhou, 2012: 140; Gerpott & Berg, 2011: 272), the safety of personal data (Warwitz, 2016: 69) and the overall trust in the app's company (Jagoe, 2003: 83). For this construct, questions like "Do you feel like you have to enter too much personal data to use LBS?" and "Do you think third parties can easily get access to your data, while using LBS?".

The behavioural intention was operationalised with questions about future plans (Bratman, 2009: 411), and the estimated likelihood regarding LBS usage during following vacations, like "Do you intend to use LBS in your next vacation?".

Lastly, the dependent variable 'use behaviour' was covered by questions about the frequency of use during vacations. The questions were "How often do you use LBS while not on vacation?", "How often do you use LBS during this vacation?", "Have you been using LBS during a previous vacation?" and "Where do you use LBS during your vacation?" among others.

Before answering questions about their demographics as the final part of the survey, the participants were also able to highlight LBS-apps they were using from a list of sixteen popular LBS-apps at the time and indicate

whether they use these during or outside of vacations.

In order to test the reliability of the constructs' data and results acquired by these operationalised constructs, Cronbach's alpha was used. This coefficient measures the internal consistency of a scale or test with a number between 0 and 1 (Tavakol & Dennick, 2011: 53) where a value higher than 0.6 is usually considered acceptable. The following table depicts the used items as well as the results of the applied Cronbach's alpha test:

The constructs *Performance expectancy*, *Effort expectancy* and *Privacy concern* have a high consistency. The values for *Hedonic motivation* and *Behavioural intention* are okay, while the internal consistency of *Social Influence* and *Facilitating conditions* is still acceptable. All constructs meet the study's requirement of a satisfactory reliability.

Method of choice: interviews during vacation
The chosen method for the data collection was a self-completed survey, in which tourists were given questionnaires to fill out. In this form of passer-by interview, the population of the survey is related to the location of the interview (Scholl, 2014: 29). This survey variant can be conducted in a pedestrian passage (ibid. 29) as in this case, where the participants could be interviewed at the port of Greetsiel – the village's centre. Passer-by interviews focus on persons being interviewed in public spaces (Friedrichs & Wolf, 1990: 46). Since Greetsiel's port is the village centre, this is where the interviews were conducted. During the main tourist season, from August 7th to August 10th, 2017 the questionnaires were handed to tourists in this area. In order to obtain a sample as representative as possible, attempts were made to only ask every third tourist to fill out a questionnaire. This procedure was intended to guarantee a similar chance for every element of the reference population to get included in the sample before the beginning of the selection process (Kromrey, 2009: 282). It was decided not to make a prior stratification of the sample, due to tourism constantly being affected by demographic change in an unpredictable way (Bernini & Cracolici, 2015; Metzler & Paesler, 2010: 70). While approaching people in the chosen area for the interview, we also asked them first, whether or not they were a tourist. The first question of the questionnaire – 'Are you a tourist?' – was also supposed to ensure that only participants of the relevant target group would fill out the questionnaire.

Using this method, a sample of 133 tourists was able to participate in the survey. To calculate the minimum sample size, Tabachnik and Fidell (2013: 159) as well as Green (1991: 499) suggest using the formula $N \geq 104 + m$, whereas m represents the number of independent variables. Thus, the minimal sample size N = 110 was exceeded, indicating a sample large enough to investigate the independent variables' influences on the dependent variable (Tabachnik & Fidell, 2013: 159).

Sample
Before the detailed data evaluation was carried

Table 3. *Characteristics of the sample*

Sample Size	**133**		
Gender		*Possession of a smartphone*	
· Male	49.6%	· Yes	87.2%
· Female	45.9%	· No	9.8%
· no indication	4.5%	· no indication	3%
Age		*Possession of a tablet*	
· Mean	41.83 years	· Yes	49.6%
· ≤ 30	20.3%	· No	47.4%
· 31-40	24.1%	· no indication	3%
· 41-50	22.6%		
· 51-60	19.5%		
· 61-70	8.3%		
· no indication	5.2%		

out with regression analyses, t-tests and variance analyses, several simple frequency counts were made to get a better understanding about demographic aspects of the study's participants. The following key figures give an overview about the tourists' demographic data:

The sample consisted of 48 percent women. The participants had an average age of 41 years (SD=14,2) with an age range between 14 and 70 years. Most of them reported to be short time visitors who stayed between one and three days in Greetsiel.

Data analysis

LBS usage behaviour – frequency counts

The implemented frequency counts were also able to reveal more specific aspects about the tourists' LBS usage during and outside of vacations. The key figures below provide a summary of the tourists' demographic data, technical equipment, LBS knowledge and expectations of LBS as well as their overall usage intention and frequency of LBS usage.

Table 5 and Table 6 show the distribution of the usage intention and the frequency of the actual usage behaviour. We can see, that the polled

Table 4. *LBS usage behaviour and expectations*

Previous knowledge about the term 'LBS'	
· Yes	27.1%
· No	64.7%
· no indication	8.2%
Expectation of LBS usage during vacations (multiple answers possible)	
· optimal information for the current location	77.9%
· always retrievable information	58.8%
· information on offerings/ events near me	51.9%
· information on offerings/ events near me	51.9%
· comfort	40.5%
· personal information	13.7%
· push messages	9.9%
· nothing of the above	5.3%

Place of LBS use during vacations (multiple answers possible)	
· outdoors	83.1%
· holiday apartment	66.1%
· restaurants/cafés	26.3%
· public transport	16.1%
· stores	11.0%
· events	5.9%
Previous LBS usage during a vacation	
· Yes	56.4%
· No	38.3%
· no indication	5.3%

Table 5. *LBS usage intention*

	strongly agree	agree	neutral	disagree	strongly disagree	no indication
'I could imagine using LBS during my next vacation.'	22.6%	42.1%	21.1%	5.3%	4.5%	4.4%
'I intend to use LBS during my next vacation.'	18.8%	39.8%	20.3%	10.5%	6%	4.6%
'LBS usage will affect my future vacation activities.'	12.8%	27.1%	26.3%	18.8%	9.8%	5.2%

Table 6. *Frequency of LBS usage*

Frequency of LBS usage outside of vacation	
· daily	9.8%
· several times a week	35.3%
· once a week	12%
· several times a month	14.3%
· once a month	8.3%
· several times a year	8.3%
· never	9.8%
· no indication	2.2%

Frequency of LBS usage during vacation	
· daily	27.8%
· several times a week	42.9%
· once a week	8.3%
· less than once a week	6.8%
· never	12%
· no indication	2.2%

tourists are in general open to the idea of using LBS in their vacation.

In addition, the table shows that nearly 60 percent use LBS at least once per week in their everyday life. During vacation, this number raises up to nearly 80% of the polled who say that they use LBS at least once a week. This finding is in line with the assumption, that there is a special need for information during travel and vacation.

Further findings concern individual apps used by the tourists. Even though the questionnaire provided 16 answer possibilities covering popular LBS-apps, the majority of the participants stated to use Google Maps and several weather apps frequently. Both kind of apps are used by about 90% during and 85% outside of vacations. The location-sharing feature of the WhatsApp messenger is used by approximately 60% of the tourists both during and outside of vacations, while Facebook's location-sharing feature is used by roughly 25% during and outside of the vacation. 30% of the participating tourists indicated to use the 'Deutsche Bahn'-app during their vacations, while only 18% of them stated to use it outside the vacation in their everyday life. Other queried apps were each used by less than 15% of the tourists, which is why they will not be discussed further here.

Influences on LBS-usage – multiple regression
The data evaluation was done using the statistics software IBM SPSS Statistics 22 after the questionnaires' data was entered in a data set and the sample was checked and cleaned of outliers and values that did not seem plausible. Moreover, questions that were formulated negatively now had to be inverted, to be able to appropriately include these constructs as well (Kevala & Moosburger, 2012: 80). To analyse the relation of the constructs' data covered by the questionnaire and the usage intention, a two-stage multiple linear regression analysis was carried out. Using this method, it was possible to include the control variables in a first, the independent variables in the second step. The following table shows the results of this regression analysis:

As shown in table 1, the UTAUT2 model is suitable for this study. The adjusted R^2, a measure of goodness of fit, indicates that the

Table 7. *Overview of the influences on the usage intention of LBS in tourism*

Predictors	**Usage Intention**			
	Model 1		**Model 2**	
	b	β	b	β
Age	0.006	0.086	0.002	0.036
Gender	-0.007	-0.004	-0.035	-0.019
Education	-0.074	-0.125	-0.025	-0.042
Length of vacation	-0.082	-0.061	-0.017	-0.013
Accompaniment	0.166	0.131	0.044	0.034
Performance Expectancy			**0.506*** **	**0.467*** **
Hedonic Motivation			**0.296***	**0.217***
Effort Expectancy			**0.304***	**0.207***
(Techn.) Facilitating Conditions			0.127	0.090
Privacy concern			-0.106	-0.084
Social Influence			0.041	0.031
R^2_{adj}	-0.010		0.538	
Δ R^2			0.548***	

Basis N = 133; method: Multiple two-step regression (inclusion);
*p ≤ .05; **p ≤ .01; ***p ≤ .001;
age: metrical; gender: 0=female, 1=male; education: 1=lowest stage, 6=highest stage; length of vacation: 1=shortest, 3=longest; accompaniment: 1=lowest number; 5=highest number
Performance Expectancy, Effort Expectancy, Social Influence, (Techn.) Facilitating Conditions, Hedonic Motivation, Privacy concern: mean index: 1=strongly disagree, 5=strongly agree.
Model 1: F(5, 99) = 0,802; p = 0,551; Model 2: F(11, 93) = 12,007; p = 0,000
Durbin-Watson-test = 1,657; minimum tolerance = 0,488

usage intention's value can be calculated by the independent variables by 53,8%. The performance expectancy, effort expectancy and hedonic motivation were proven to be significant predictors of the usage intention of LBS in tourism, with the performance expectancy even being a highly significant predictor. As expected, none of the control variables turned out to have a direct influence on the usage intention. The hypotheses H_1, H_2 and H_5 are supported, while H_3, H_4 and H_6 in turn are to be rejected.

In order to test hypothesis H_7, a second regression analysis had to be applied, verifying the usage intention's influence on the use behaviour. This time the usage intention served as an independent variable. The following table depicts the results of the second regression analysis:

Table 8. *The usage intention's influence on use behaviour of LBS in tourism*

Predictor	**Use Behaviour Model 1**	
	b	β
Usage Intention	0.843***	0.654***
R^2	0.428***	

Basis N = 133; method: Simple one-step regression; *p ≤ .05; **p ≤ .01; ***p ≤ .001;
Usage Intention: mean index: 1=strongly disagree, 5=strongly agree.
Model 1: F(1, 127) = 95,161; p = 0,000

The results of the second regression analysis show that H_7 is also supported. As proposed by the UTAUT2-model, the usage intention turns out to be a significant positive predictor of the use behaviour in tourism.

The influence of previous LBS usage - Comparisons between case groups

Additionally, comparisons between different case groups were conducted as part of the statistical evaluation, to reveal differences in LBS usage behaviour in varying demographic and touristic characteristics. These comparisons were done using t-tests for independent samples and single factor variance analyses and are based on the following assumptions derived from previous research in this area and carried out using t-tests for independent samples.

Our questionnaire included a yes/no question about the LBS usage in previous vacations, which was suitable for testing with the t-test. This question can be assigned to the construct 'habit'. Even though the adjusted UTAUT2 model for this study did not include this construct, it is part of the original UTAUT2 as a predictor of the usage intention (Venkatesh *et al*. 2012: 158f.). An applied Welch's t-test between the two resulting samples revealed that there was indeed a significant difference between tourists who already have used LBS during a previous vacation (M=2.249, SD=0.82) and those who haven't (M=2.86, SD=1.09); t(85.02)=-3.41, p=0.001. Tourists who used LBS before on a vacation have on average a generally higher usage intention.

Furthermore, tourists' usage intention, classified by their LBS usage outside of vacations, was compared, based on the assumption that habit plays an important role for the technology acceptance (Venkatesh *et al*. 2012, 158f.). Indeed, a variance analysis indicated highly significant differences between these subsamples, F(6, 122)=8.16, p<0.001. The Scheffé post hoc test revealed that these differences exist on a significant level between tourists who never use LBS outside of vacation (M=3.73, SD=1.08) and tourists who use LBS several times a month (M=2.48, SD=0.90) or more often.

Different types of vacation were assumed to cause significant differences in the tourists' LBS usage intention, due to media in general usage varying between different vacation types (van Raajj & Francken, 1984). An analysis of variance however did not prove the vacation type to affect the usage intention significantly, F(3, 125)=0.01, p=0.998.

Results and contributions

Using the conducted analyses, theoretical model assumptions could be tested with hypotheses and different subsamples were compared regarding their LBS usage in tourism.

With the first analysis, a multiple linear regression analysis, the adjusted UTAUT2 was proven to be a suitable model for this study. The Usage Intention of LBS in tourism is significantly influenced by the tourists' performance expectancy, effort expectancy and hedonic motivation in a positive way, since hypotheses H_1, H_2 and H_5 were supported. The performance expectancy turned out to be the strongest predictor with a highly significant influence. Significantly positive influences of the social influence and technical facilitating conditions, as well as a significantly negative influence by tourists' privacy concerns however could not be evidenced – hypotheses H_3, H_4 and H_6 were not supported. Furthermore, a direct influence of the control variables on the usage intention was not detected, proving their function as extraneous variables not directly connected to the hypotheses (Spector & Brannick, 2011: 288).

In a second regression analysis, the usage intention was proven to be a strong positive predictor of the actual usage of LBS in tourism, as assumed in our adjusted UTAUT2 and hypothesis H_7, which was supported. All in all, four out of the seven proposed hypotheses were supported.

Furthermore, a comparison between different case groups also gave insights into factors that determine LBS usage in tourism. Using t-tests for independent samples and single factor variance analyses the following significant differences were found out: Tourists who already used LBS before during a vacation have a higher LBS usage intention than those who haven't. Tourists who use LBS each day outside of their vacation have a significantly higher usage intention during vacations than those who don't.

Lastly several simple frequency counts provided further insight in tourists' LBS usage: The most common expectation regarding LBS turned out to be that optimal information should be easily accessible at all times. The personalisation feature was only relevant for a remarkably low number of the interviewed tourists. Tourists mainly seem to use LBS outdoors, but also quite often in their holiday flats. The most frequently used LBS-apps from the queried list of apps were Google-Maps and weather apps. Location-based features in social networks and messenger services also play an important role for many users in tourism. There were no differences in the number of users for the queried individual apps worth mentioning. While 87% of all participants stated to own a smartphone, only about 50% of them stated that they own a tablet. Android turned out to be the most widespread operating system on both kinds of devices.

Discussion of theoretical implications

With these new insights, the question arises, how the results are to be explained. Thus, an interpretation based on existing literature follows below:

The performance expectancy turned out to be the most significant determinant of LBS usage intention in tourism. The performance of the service seems to be of particular importance for tourists. On vacation, tourists find themselves in a situation characterised by special needs for certain information and services (Link & Seidl, 2008: 56). These special needs become apparent in the study's findings. Furthermore, services in the tourism industry have to clearly communicate their value, be easy to use, should have a solid profit model and need to be embedded in a web of relationships between customer, service provider and destination (Egger & Jooss, 2010: 23f.). These high demands are reflected by the results of the evaluation: The lower the perceived effort while using LBS-apps, the higher the tourists' usage intention. Thus, the ease of use of LBS is expected by tourists. Another interesting fact is the tourists' expectation of LBS usage being associated with fun and pleasure. Due to the previously mentioned situation-related increased information and service needs in tourism, one could assume a minor role of hedonic motivation in this case. However, tourism is an activity associated with pleasure-seeking (Goossens, 2000) and is known to promote and foster hedonic behaviour in general (Gnoth, 1997: 285). Therefore, a similar association with the use of LBS in tourism is not surprising. The data security concerns not being a determinant factor for the usage intention in tourism on the other hand was particularly remarkable, since privacy

concerns have been identified as important factors having a negative impact on the overall success of new technologies and LBS in particular (Zhou, 2012: 140; Fritsch & Muntermann, 2005: 156; Bowen III *et al*. 2010: 208). An interpretive approach for this non-significant influence is yet again provided by the special situation in which tourists find themselves during vacation. According to Mertens (2006: 416) the trend can be observed, that in important areas of life a conflict of objectives between data protection and other interests often causes the privacy concerns to get pushed back. A conflict of objectives in tourism is often the case, due to tourists being in an unknown environment but still relying on features of LBS (Link & Seidl, 2006: 56). The expected consequence is privacy concerns playing a subordinate role in tourism, which is confirmed by this study's findings. Technical facilitating conditions not being a significant factor for tourists' LBS usage can be explained the same way: The special service needs seem to outweigh expectations of perfect facilitating conditions while using LBS in tourism. The social influence's non-significant influence on usage intention on the other hand is expected to be caused by distortions in the results, which are described in detail in the section 'limitations'. Lastly, the LBS usage intention was proven to be a strong predictor of the LBS use behaviour in tourism.

As expected, direct influences of the control variables age, gender, education, length of vacation and accompaniment were not indicated by the regression analysis. However, comparisons of case groups with t-tests and single factor variance analyses revealed some interesting differences in LBS use behaviour:

Tourists who already used LBS before during a vacation have a higher LBS usage intention than those who haven't. Tourists who use LBS each day outside of their vacation have a significantly higher usage intention during vacations than those who don't. Again, a habitual behaviour seems to be the cause here, since successful use of LBS in everyday life situations will likely result in a repetition of this usage (Limayem *et al*. 2007: 715).

Discussion of practical implications

LBS offer many potentials for the tourism industry. The key to success for tourism providers is to distinguish themselves from their competition by generating added values for potential customers (Frey *et al*. 2015: 134). To achieve this, it is crucial for them to realise the importance of tourists' acceptance of LBS (ibid. 134).

According to this study's findings, the usage intention of LBS in tourism depends on three essential conditions: The application has to help the tourists simplify their activities during vacation; it should be as easy to use as possible and be considered user-friendly; furthermore, using the application has to be perceived as fun. These are basic expectations of LBS users in tourism, which is why it should be made sure that these three conditions apply for new touristic location-based applications.

No attempts to focus on a specific gender or tourists' age, level of education, length of vacation or accompaniment should be made, though, since no differences regarding these characteristics were found. Another practical implication would be to try to directly increase knowledge in tourism destinations, for tourists who already used LBS before during a vacation tend to have a higher LBS usage intention than those who haven't. In order to attract tourists as users of specific LBS applications, exploring ways to earn customer loyalty outside of vacations is recommended, since LBS usage intention in and outside the vacation were revealed to show significant parallels. The survey results also further confirmed Google Maps' clear market leader position among map services (Haucap & Heimeshoff, 2013: 56). Developers of applications characterised by more than a navigation feature should therefore consider not to rely on own interactive maps, but to make use of the feature of 'Google Maps API' to integrate Google Maps into their app (Boulos, 2005: 3). In this context, another approach for the success of LBS in tourism becomes apparent: LBS applications incorporating existing structures like Google Maps' layers, or simply merging other information, can be particularly valuable for tourists and also go hand in hand with the most common expectation of LBS in tourism –

optimal information on the current location. Lastly, referring to the findings of this study's frequency counts, some further conclusions could be drawn: It should be taken into account that tourists expect LBS to be comfortably usable while walking around outdoors, which is why it should be made sure, that the applications meet these expectations. Further findings of the survey suggest an integration of social network features like location-sharing functions via Facebook and WhatsApp. Due to the dominance of Android operating systems, closely followed by Apple's iOS, it may be advisable to release touristic LBS applications first on Android systems and, if it proves to be successful, for Apple devices next.

Limitations

Despite great diligence in the methodology, data acquisition and evaluation, it should be noted that this study had certain limitations. First, a larger sample size would be preferable for a stepwise regression (Tabachnik & Fidell, 2013: 159). Furthermore, the data for the construct Social Influence indicates biased results which can be traced back to the effects of social desirability. Social desirability "refers to the respondents' tendency to admit to socially desirable traits and behaviours and to deny socially undesirable ones" (Krumpal, 2011: 2028). The UTAUT2 model was modified to fit the scope of this research and therefore the results may differ from a research design using the original UTAUT2. In the field of the chosen evaluation procedure, using a structural equation model instead of conducting two separate regression analyses might have improved the accuracy of the results – a previous study by Rau & Ehlers (2017) however showed that these two methods' results will only differ very slightly. A further limitation results from this study's rather general approach: The usage intention can differ between different various LBS applications and depends on each application's individual usability. This factor could not be further investigated, because it would have gone beyond the scope of this research.

Conclusions and further research

This research was able to reveal important determinants for the usage intention of LBS in tourism and derive practical implications for tourism providers.

Summarising this study's findings, it can be said that tourists expect LBS to find a balance between delivering optimal information on their current location and an easy usability. Next to practical implications, this study was also able to reveal further research approaches: Research of Venkatesh and colleagues (2012), and Limayem and colleagues (2007) show that the construct 'habit' might play an important role after all. Thus, future research might address this part of the technology acceptance model – in particular the difference between the 'everyday habits' and the 'vacational habits' in terms of media and technology and the interaction of these two.

Like the inclusion of 'habit', further future research possibilities also result from this study's limitations: Future studies should preferably be based on a larger sample size. To capture additional interdependencies, demographic and tourism aspects should be included as moderators, rather than control variables (Venkatesh *et al*. 2003: 432ff.). It should also be a goal of further research to try to reduce the effects causing biased results for the construct 'social influence' by a more cautious formulation of the appropriate questions or an alternative examination of this construct.

These many research approaches can be traced back to LBS being a relatively new technology (Fronhofer & Lütters, 2012: 293) and due to the steady and rapid further development of LBS (Raper *et al*. 2007: 6). A result of this constant further development, LBS can always only be optimised to the extent depending on the current state of technology. Therefore, research in this area can also be expected to stay relevant in the future.

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