

Article

The INPreS Intervention Escalation Framework for Avoiding Overcrowding in Tourism Destinations

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Abstract: Visitor management is one way to avoid or mitigate the negative effects of overcrowding in tourism destinations. Visitor management depends upon a set of interventions aimed at guiding visitors and recommending alternatives. Here, we present a conceptual framework of such interventions using an escalation from information, nudging, pricing, and reservation to stoppage (INPreS). The interventions are discussed against the backdrop of the changing role of destination management organisations (DMOs) in smart destinations, the challenges to DMO stewardship in avoiding overcrowding, and the design considerations between nudging and persuasion.

Keywords: digital visitor management; digital transformation; smart destination; recommender; nudging; covert persuasion



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1. Introduction

Overcrowding in tourist destinations is one of the issues currently being debated in tourism research and practice. Technically, overcrowding exists when tourism flows are larger than the capacity of the place [1]. This maximum capacity is not always easy to establish because the perception of (over)crowdedness can appear before the technical maximum capacity is reached, as has been shown for beaches [2], mountains [3], and cities [4,5].

Visitor management can be one way of avoiding or mitigating the negative effects of overcrowding in tourist destinations. The overarching goal of visitor management is to influence visitor flows so that overcrowding is avoided as far as possible [6]. This central notion has been employed by researchers for several decades, although the types of suggested interventions have varied from “regulation, deterrence and enforcement” [7] (p. 270) to more recent approaches, such as nudging and gamification [8].

Crowding can have several negative effects, such as use-pressure on nature and unnecessary traffic and social stress for the visitors and locals alike. The restrictions associated with the COVID-19 pandemic further intensified the use-pressure on some destinations, especially in natural areas close to large cities [9]. Action to avoid such negative effects is a task for destination management organisations (DMOs) [10].

Unavoidably, the question of interventions suitable for implementing effective visitor management emerges. Visitor management interventions are actions taken with the goal of influencing visitor behaviour in such a way that overcrowding occurs less frequently. Other researchers have suggested implementing “smart solutions” [11] or improving resilience through “real-time responses” [12]. However, a conceptual framework to integrate these approaches is lacking. In this paper, we suggest a conceptual framework along two dimensions—visitor pressure and consumer responsiveness.

The remainder of this paper is organised as follows. After a thorough literature review, we discuss the dimensions and interventions of the framework in depth, and the

potential impact this could have on destination management. A summarising discussion and conclusion appear after this.

2. Literature Review

2.1. *Changing Role of DMOs in Community-Based Destinations*

Destination management organisations used to be primarily viewed as marketing organisations for destinations [13]. The main focus was to increase competitiveness and continuously improve the tourist experience, which in turn was expected to lead to increased visitor numbers and income [14]. This one-sided view has undergone a shift in recent years due to external dynamic challenges and internal demands on the tourism industry. Among other things, the external factors include an increased importance of sustainability [15] and the rapid development of information and communication technologies (ICTs) [16]. One of the internal factors that DMOs have to take into consideration is the importance of integrating residents and their support for tourism in order to have well-functioning and sustainable destination development [17]. In recent times, the need to react appropriately to different crises and to be resilient [18] has caused destinations to redefine their roles. To effectively accommodate these more complex destination demands, it is no longer sufficient to simply work on destination marketing. Contemporaneous DMOs are, therefore, shifting away from destination marketing and management, through destination governance, and to destination leadership, taking up place-making embedded in an actor network [19]. Therefore, there is a growing need for DMOs to adopt new organisational concepts in destination governance. To face future challenges, and to reach individual and collective goals, building networks seems to be a promising approach [10]. As DMOs have specific roles as coordinators, communicators, and networkers [20], they can be regarded as stewards of such networks, which try to balance the needs of all destination stakeholders through a participatory approach [21]. In addition, innovation, leadership, and social and human capital are important characteristics of a modern DMO, especially when it comes to integrating technological infrastructure for a successful smart destination development [22]. In our context, the consideration and use of information and communication technologies, as well as the collection and evaluation of tourism-related data, are prerequisites for the development of smart tourism destinations. Thus, DMO structures need to be fundamentally changed so they can incorporate the benefits of the digitalisation that will provide the best possible tourist experience at the destination [16,23]. To address these challenges, the new fundamental functions of smart DMOs are discussed [24]. Among others things, the installation of a smart tourism infrastructure is one solution that could improve smart tourist experiences.

2.2. *Smart Destinations and Digital Solutions for Overcoming Overtourism Issues*

Smart destinations can be defined as “places utilising the available technological tools and techniques to enable demand and supply to co-create value, pleasure, and experiences for the tourist and wealth, profit, and benefits for the organisations and the destination” [25] (p. 394). Smart solutions and technologies include, for example, ubiquitous public Wi-Fi, big data analytics tools, advanced DMO websites, blogs, apps, QR codes and geotags [26], social media, augmented and virtual reality [26,27], sensor technology, and near-field communication technology [27,28]. These technological components can be transformed into digital services that can enhance the real-life experience of tourists. Examples of this are automated check-in processes and digital payment.

These smart technologies can play a crucial role in optimising strategies aimed at avoiding the negative effects of tourism caused by overtourism [29]. They can be viewed as enablers in developing and implementing such strategies. Many popular cities that struggling with overtourism are now using smart digital solutions to implement mitigation strategies [27] (Table 1).

Table 1. Examples of digital solutions for mitigating overtourism issues in selected destinations.

Destination	Digital Solution	Source
Amsterdam	Crowd Monitoring System Amsterdam (CMSA)—a counting system employing cameras and Wi-Fi sensors	[30,31]
	Public Eye Amsterdam—CMSA mapping of tourist crowding	
	Amsterdam City Card—tourist card providing access to attractions	
Barcelona	Check Barcelona—progressive web app providing static information on places of interest (POI), mobility recommendations, and dynamic information in real time on influxes to the POI, the status of reservations, parking occupancy, and queue information	[32]
Dubrovnik	Dubrovnik Visitors—app for predicting the number of tourists based on cameras, counters, and additional data (weather forecast, number of cruise passengers, etc.)	[29,33]
	Dubrovnik Card—tourist card providing access to attractions	
	Dubrovnik Eye—online tool for reporting problems	
	Rural Dubrovnik—Neretva website—platform for boosting agritourism destinations	
Palma de Mallorca	Welcome Palma—app for the dispersion of cruise passengers, based on data from the Wi-Fi network of the port and the city of Palma	[34]
Wien	Ivie—digital city guide app	[35]

Camatti et al. [29] distinguished three steps for the application of digital solutions to overcome overtourism issues. The first was to calculate the tourism carrying capacity and set its limits. The second involved controlling and gathering data through the use of information and communication technologies and monitoring systems, such as GPS-based tracking, artificial intelligence (AI)-based systems, geotagging, movement data, and big-data analytics tools. The third step was to define and initiate actions and policies for mitigating the overtourism issues, such as demarketing and creating alternative offers [27,29].

The information gathered in the second step can be used for dispersing tourists by informing them about the number of spaces available at an attraction and suggesting alternatives [36]. Strategies for demarketing, managing new attractions, and regulating activities can be implemented through, for example, social network marketing, mobile apps or tourist cards for use at attractions. Other examples include the use of measurement tools and smart technologies to efficiently manage traffic, or the use of augmented and virtual reality to create new tourist experiences [27,36].

2.3. Design Considerations When Influencing Visitors and the Role of Destinations

Several approaches can be used for changing visitor behaviour through digital visitor management systems [37]. These intended behavioural changes must be considered when designing ways of transmitting information to visitors. Nudging is considered to be one of these approaches. It stems from both social psychology and behavioural economics [38,39], and is defined as “an intervention on the choice architecture that is predictably behaviour-steering, but preserves the choice-set and is (at least) substantially non-controlling, and does not significantly change the economic incentives” [40] (p. 343). In digital choice environments, influencing people’s behaviour with the help of user-interface design elements is known as digital nudging [41]. Meske and Potthoff [42] substantiate the definition by adding the essential elements of respecting the freedom of choice without changing the choice options as well as the subtle character of nudging strategies. Furthermore, according to them not only the user-interfaces, but also the way of giving information can be a nudge [42].

In contrast to other approaches aiming at changing visitor behaviour—such as persuasion strategies—nudging can be considered a rather soft paternalism approach. Paternalism is defined as “the interference of a state or an individual with another person, against their will, and defended or motivated by a claim that the person interfered with will be better

off or protected from harm" [43]. Nudges are often considered in the context of libertarian paternalism. This liberty-preserving soft paternalism approach aims at steering people towards a decision that increases their wellbeing while preserving freedom of choice [44,45]. Thus, such soft paternalism is considered less intrusive and less manipulative [44,46] than stronger forms of paternalism. It must also be noted that the recipient's wellbeing is a subjective matter [47]. Furthermore, a nudge can also lead to a decision that promotes a different nudging goal, for example, improving the common good [48].

In research, different categorizations and types of (digital) nudges have been proposed by several authors, e.g., [42,48–50]. These and other authors agree that nudges in a digital visitor management system can, for example:

- Simplify the information and reduce the distraction while maintaining the same choice options;
- Present the information in a specific way with the help of framing mechanisms and highlight specific choice options;
- Rank the choice options in a chosen order;
- (Constantly) remind people which activity they might want or should do;
- Utilize social norms and social influence to show people what others have chosen to do since people often act according to the behaviour of others;
- Use direct and personal recommendations that point out the targeted activity and promote the targeted decision.

The decision of which nudge will be used to influence the behaviour of the visitors should be made with regard to the desired outcome as well as the information behaviour of the visitors [48] and the underlying psychological theories [49]. Therefore, Karlsen and Andersen [48] propose the following several steps to decide on the right nudge: (1) Define the goal; (2) Understand the users; (3) Understand the situation; (4) Select the targeted activity; (5) Select relevant information; and (6) Design the nudge [48]. Afterwards, the nudge needs to be presented and its success needs to be evaluated.

The listed nudging measures respect the freedom of choice of the recipients while also trying to guide them towards a decision that benefits their wellbeing. In the hedonistic tourism context, factors such as pleasure and relaxation should be considered part of the recipient's wellbeing [51]. On top of that, nudges in digital visitor management decision can, at the same time, benefit the destination and promote a more sustainable behaviour. With regard to tourism, the nudging approach is, therefore, considered to be a useful tool for sustainable development [39] in destination management [52]. This is because customer centricity is a deeply inherent value in tourism, and is particularly practised in the field of hospitality management. Therefore, for a DMO it is important to consider the following two conditions: "no reduction in the quality of the vacation experience for the tourist, and no increase in cost for the business implementing the intervention" [51] (p. 9) when implementing a nudge-based digital visitor management.

2.4. Recommender Solutions for Tourist Destinations and Digital Visitor Management

Recommender systems can be defined as "software applications that help users to find items of interest in situations of information overload" [53] (p. 105). Against the backdrop of the rapid development of ICT, combined with the increased use of machine-learning methods, recommender systems are increasingly being used in tourism. In a tourism context, recommender systems, usually displayed via smartphone apps [8], websites [54], chatbots [55] or other mobile applications, can help to provide (personalised) information on tourist destinations, activities, and points of interest, or can help to reduce disinformation. Smart solutions are needed to mitigate negative crowding effects at tourist destinations (see Section 2.2) and to balance tourist flows at tourist destinations. In the context of digital visitor management, digital recommender systems can provide both forecasts of the future occupancy of a specific location and alternative destinations in addition to visit/do-not-visit recommendations.

When it comes to trip planning, tourists require a vast amount of information [56]. Compared to classic route recommendations using digital tools (e.g., Google Maps), oriented towards pure time and cost assessments, the personal preferences of tourists have to be considered when dealing with tourist activities, such as city tours or hiking trails [54]. Consequently, recommender systems, which are hyper-personalised in terms of communicating with their users (e.g., via WhatsApp), are promising because they are rated much better than passive applications [57].

Web applications for trip planning were already being employed when recommender systems began to be used in tourism [54], and recommender solutions are now being used in trip planning [58]. However, recommender solutions can generally be used in all types of tourism, including urban tourism [59] and cultural tourism [60], and in every phase of the trip, with the tourists' need for a personalized service (e.g., transport, attractions) being high [61]. However, efficient tourist recommender systems have to consider the context they are being applied to, and should be designed accordingly. Tan et al. [62] used the acronym "TILES" (i.e., temporal, identity, location, environment, and social) to describe the categories of tourists' most important information needs and requirements [62].

However, to our knowledge, despite the elaboration of theoretical frameworks for such systems [56,63], there are currently no acceptable solutions that work in practice [8,36]. Although there are already systems that can guide the user through graphical interaction, such as smartphone apps, or give passive support, as seen in route planners, these do not reflect the idea of a recommendation system for digital visitor management. In particular, there is no AI recommender that can provide information on how frequented certain POIs are, based on sensor data, that could practically tackle overtourism issues. Nonetheless, empirical evidence shows that it is possible to use recommender systems in tourism to guide tourists to less visited places that have been recommended by a DMO without exacerbating the tourist experience [57].

3. Conceptual Framework

As outlined above, visitor management is one way to avoid or mitigate the negative effects of overcrowding at tourist destinations. Visitor management depends upon a set of interventions in order to guide visitors and recommend alternatives.

Against the backdrop of (a) the changing role of DMOs in smart destinations, (b) the challenges of DMO stewardship implement digital visitor management and recommender systems and (c) the design-related and ethical considerations when using nudging or persuasion mechanisms, this conceptual framework elaborates on an escalation of interventions, ranging from information, nudging, pricing, and reservation to stopping (INPREs) (Figure 1).

The main goal is to give researchers and practitioners orientation as to which interventions are available and what the possible consequences of employing them might be. The framework stems from a number of applied research projects both in protected and non-protected areas, ranging from alpine to maritime landscapes, and from rural to urban environments. It considers practical management measures taken before, during, and after the COVID-19 pandemic, categorises them and assesses their potential impact. However, the framework is not based on results from empirical evaluation because these results do not exist. It is, therefore, also meant to be a guideline for future evaluation.

The framework uses two axes. The horizontal axis quantifies visitor pressure (VP), which is a property of the destination that can be measured in the number of visitors (N_v) per time (t) or space (s) unit, weighted by the designated capacity (DC). A given number of visitors passing within a short period of time results in a higher visitor pressure than the same number of visitors passing over a longer period of time. A given number of visitors occupying a small area will result in a higher visitor pressure than the same number of visitors occupying a larger area. Additionally, a given number of visitors in a space designed for large numbers (e.g., a stadium, an open-air theatre or a music venue) leads

to lower visitor pressure than the same number of visitors in a place not designed for large numbers.

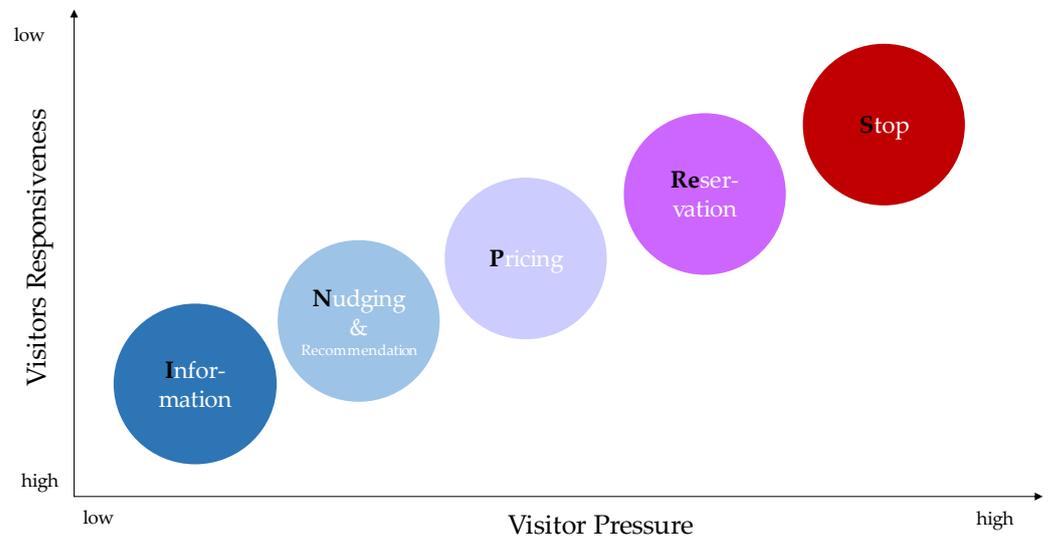


Figure 1. INPreS escalation framework.

The *VP* can, therefore, be operationalised as follows:

$$VP = \frac{N_v}{t \times s} \times \frac{1}{DC}$$

The second axis is less straightforward to operationalise. It assesses the probability that visitors will react to the various types of intervention. This can be described as the visitor's responsiveness to interventions [64] or readiness to change [65] their intended behaviour. It can be interpreted as a function of motivation, ability, and prompting, as in Fogg's model [66], but we suspect that there are more relevant variables available than are used in Fogg's model. Responsiveness to visitor management interventions (R_{vmi}) can be operationalised as a function of openness (O) to information, receptiveness (Rec) to digital media, and crowding perception (CP) in situ. Openness can be triggered by experiences with such systems and is positively related to responsiveness, as is receptiveness to digital media. Lastly, the perception of the crowding situation is also positively related to responsiveness (the more the perceived crowding, the greater the responsiveness).

$$R_{vmi} = O \times Rec \times CP$$

Within these two axes, we can arrange five types of interventions—information, nudging, pricing, reservation, and stop.

Information here is neutral. It includes information on actual, maybe even real-time, visitor frequencies at relevant spots, but does not give recommendations or guidelines. Responsiveness to this kind of intervention needs to be quite high to produce any effect, and this kind of intervention would work best in a setting with actual or expected low visitor pressure.

If responsiveness is low and visitor pressure high, a second escalation step can be used—nudging and recommendation. What nudging is and how it is different from persuasion has been discussed in a previous section. In our framework, it is crucial to understand that nudging is not neutral (similarly to persuasion), but uses a choice design to change behaviour. The possible implementations of nudging mechanisms and related concepts were discussed in Section 2.3.

One step further up the escalation ladder are pricing interventions. Pricing is not restricted to putting a price tag on a limited resource, such as a parking lot, a seat in a funicular or a slot in some other sort of attraction. It can also include mechanisms known as yield or revenue management [67] in the hotel and airline industries, with a few examples in destination management [68,69]. These mechanisms adapt the price to the actual or expected demand volume. Apart from its regulating function, one main advantage of the pricing intervention, compared to a situation without a price tag, is that it brings additional funding to the destination.

The penultimate possible intervention is reservation. As opposed to booking, a reservation does not necessarily include a payment, although in most cases reservations are not cost-free. Reservation promises to be a very effective means of intervention because only visitors with a reservation can access the area in question, while those without a reservation will be turned away. Visitors put in effort; for example, by using a mobile phone to see if capacity is available or will become available. The downside is that reservations need physical infrastructure for access control and digital infrastructure to handle reservations. It could be argued, however, that after three years of the global COVID-19 pandemic, reservations have become common for many services and most visitors are accustomed to the digital processes involved.

The last step in the escalation ladder is to stop any access to the area or even the entire destination. As opposed to a reservation mechanism, stopping does not occur in a planned way, but is instead an emergency procedure. Examples include police road blocks on snowy winter days in the mountains or sunny summer days at the lake. Obviously, due to their unplanned manner, such stoppings are a nuisance for all parties involved—the destination because it is flooded with visitors, the police because there are extra resources needed, and the visitors because they do not arrive at their destination. Therefore, stopping should be avoided by using other forms of intervention down the escalation ladder.

4. Discussion and Conclusions

The implementation of digital recommender systems in community-based destinations is a difficult task in itself. The INPreS escalation framework is intended to help find a suitable level or intervention.

In contrast to corporate destinations, such as cruise ships and theme parks, where the implementation of such systems is much more straightforward due to entrepreneurial top-down decision-making processes and the often already existing smart destination ecosystems, the task for community-based destinations is much more complex. One of the reasons for this is the diversity of the stakeholders.

Different stakeholders have varying forms of interest in digital visitor management systems (Figure 2). Nature protection agencies usually focus on the conservation of (unspoiled) nature and species, biotope protection or environmental education. They see visitor management as a means of sensitising towards and informing about vulnerable areas or blocking access to these areas. This perspective can often, although not exclusively, be found in protected areas, such as national parks, nature parks, and biosphere reserves.

Emergency services have a different perspective. For them, visitor management is mainly used to prevent accidents. This can be necessary when hiking trails are flooded, biking trails blocked or skiing areas threatened by avalanches.

Finally, tourism agencies, such as DMOs, usually have a quality of experience (for visitors) and quality of life (for inhabitants) in mind. They tend to view visitor management as a way to improve these qualities or to balance the two qualities against each other.

The position of tourism agencies in this context is somewhat weaker than that of the other two players. Destination management as a public service is usually not required by law. Municipalities or other administrative bodies usually finance destination management, if at all, as a voluntary task. By contrast, the other two stakeholder groups have a legal order to protect nature or prevent accidents. Therefore, it is easier for a national park authority or a police agency to use the last step in the INPreS escalation ladder—stopping access.

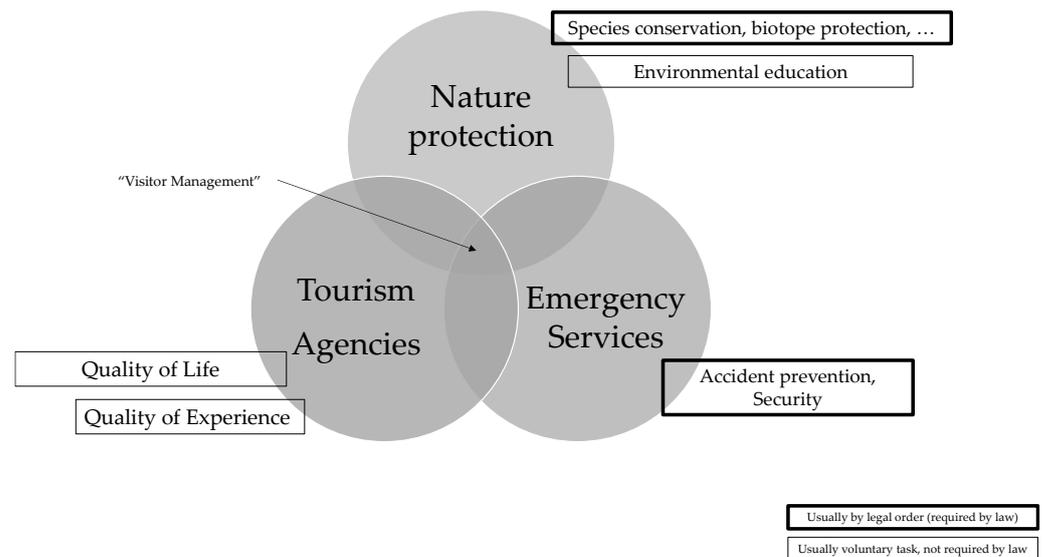


Figure 2. Different stakeholders with different perspectives on visitor management.

The moderate types of intervention, such as nudging and recommendation, pricing and reservation, are approaches that must be implemented and tested for destinations on their way to becoming smart destinations. The forms of intervention proposed here are obviously different depending on the type of destination. For an already highly frequented parking lot at a destination, an alternative can usually be proposed quite easily, whereas this is much more difficult for a standalone edutainment centre in a rural area. Therefore, the POI, as well as the spatial characteristics of the destination, play a decisive role in the implementation of the INPREs. In city destinations, for example, it is usually easier to offer visitors thematic alternatives, whereas stopping is easier to implement in rural areas with only one access point to a mountain lake. The different recommendations should, therefore, be considered while bearing in mind the thematic, spatial, and temporal alternatives for each particular destination, and default settings should be established for POIs. The recommender can then collect further data based on usage, and improve these initially deductively introduced alternatives.

However, some debates have come up regarding the ethical justification of interventions such as nudging since the methods often deal with a lack of transparency, with people possibly not being aware of being influenced as well as fear of manipulation, e.g., [8,39,40,50,70]. Therefore, using intervention strategies in the context of digital visitor management, it is necessary to evaluate which strategy would be both ethically justifiable and of greatest use to the destination, its tourism stakeholders, and the tourists.

Further implementation challenges arise from visitor responsiveness. So far, it is uncertain how many visitors, especially day-trippers, inform themselves before they travel and, if they do inform themselves, if they do so primarily about the weather rather than visitor capacity.

Recommender systems for digital visitor management, as we understand it, currently face the challenge of not being able to respond to the specific needs of tourists in a personalised way. Rather, it is essentially a matter of providing and processing information about crucial points at destinations in such a way that potential guests and residents alike can inform themselves about the capacity and possible alternatives. This can be, for example, (progressive) websites of destinations, smartphone applications, information terminals, social media or captive portals of free W-LAN services. Thus, it is currently not important to be able to provide different information to tourists than to day-trippers because the users are unknown. For the future, we see two possible ways out of this dilemma of personalisation. One is to collect the data of the users who use the recommender. This could be achieved, for example, via website or social media tracking methods, via on-site surveys

or with the help of qualitative interviews about the desired alternatives of different target groups and their travel behaviour. Another possibility is with the operators of smartphone apps that have wide coverage (e.g., hiking and cycling apps), which already know the general preferences of the users, and therefore, can recommend individualised route alternatives. The latter is usually not available to destinations, which is why user-nonspecific information on capacity and alternatives will remain for the foreseeable future.

Future research should validate the conceptual framework proposed here using empirical data from tourist destinations. Particular emphasis should be placed on the spatial diversity of tourist destinations, such as urban, rural, and marine environments.

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