How Smart is your Tourism? Designing a Maturity Model for Lesser-Known Mountain Resorts

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Abstract—The development of smart cities has brought enormous benefits for the improvement of services such as transport, energy, online public services and the monitoring of their use. At the same time, in the context of tourism, the concept of smart destinations also offers advantages in mountain resorts, for example by facilitating customer journeys of tourists who discover the region, by enhancing their stay through the use of smart technology and by providing them with accurate and tailored information. However, it seems that only the very high-end mountain destinations have benefited from these advantages. Indeed, becoming an intelligent destination requires significant investment, digital expertise and a culture of innovation. In this research, we are looking at small, lesser-known Swiss mountain destinations for which going "smart" is currently challenging. In this article, we present a new tool for diagnosing "smart" maturity which, thanks to information and communication technologies, enables us to focus above all on the weak links that significantly affect the customers' journeys (e.g. missing the last shuttle after skiing in order to be able to return to their hotel). Applying this tool will enable such destinations to identify ways to become a smart destination that are adapted to their scale and characteristics and that will allow them to remain competitive towards more established and larger destinations.

I. Introduction

The word "smart" is nowadays commonly associated with a large range of objects, spaces or living environments. From smart phones to smart homes and from smart cities to smart villages, the use of technology and data combined is generating an intelligence that if well used is potentially able to enhance our life and ecosystems. Tourism is no exception and the notions of smart tourism and smart destinations are today well-established trends appearing as priorities of many regions and policies around the world. Nevertheless, what makes a destination smart and even more important what are the steps to take to earn this status remains rather undocumented. Moreover, current scientific literature mainly concentrates on smart cities and well-known tourism centers, underlining a lack of research focusing on peripheral (mountain) destinations.

The aim of this paper is therefore to propose a maturity model dedicated to lesser-known mountain destination that would enable to evaluate the degree of smartness of a tourism destination, to compare it with other destinations based on similar indicators and finally to recommend an action plan to improve its ranking towards its peers. The model as presented relies on six dimensions embracing business operations as well as the customer experience in order to include all structures, procedures, and stakeholders a tourist destination relies on. It is essentially the customer experience dimension that has been adapted to our case and in particular to the notion of customer journey, which to our knowledge makes this model original. It therefore encompasses operational aspects related to the management of the destination as well as aspects that are directly perceivable by the tourists and that affect their experience of the destination and their satisfaction towards their stay.

This paper represents the fire stage of a research that will involve three Swiss destinations that will be analyzed using the proposed model. These destinations are lesser-known mountain resorts located in the periphery of well-established Swiss tourism centers. Contrary to the tourism centers, those peripheral destinations register less 100'000 overnight stays per year.

As the approach is essentially theoretical, the paper relies primarily on an in-depth literature review and is organized as follows. In Section II, we present the link between the results of research on smart cities and smart destinations. In Section III, we focus on the notion of the "smart divide", which means that in terms of the level of "smart" maturity, the resorts are not equal. In Section IV, we describe the main characteristics of the 6C's maturity model. In Section V, we show how we developed and adapted the sixth dimension (i.e. customer experience) of the 6C maturity model for the case of lesser-known mountain resorts.

The originality of the new model is that the sixth dimension is directly linked to the visual representation of the customer's journey and therefore includes pre- and post-stay elements where weak points are generally found. It is on these specific weak points that we intend to use the concept of smart destination to make the customer's journey more fluid. Finally, in Section VI, we conclude and provide directions for further research. In particular, we are already conducting quasi-experiments in a few mountain resorts to test our new maturity model. This should then enable us to apply smart destination solutions directly to the weakest links in the customer's journey to improve overall customer satisfaction.

II. From Smart Cities to Smart Destination

Smart tourism derives from the concept of smart cities and embeds the opportunities offered by digitalization and new technologies to add value to the tourist experience as well as the management of destinations. Seen as part of a smart

economy, it uses technologies to develop new ways of collaborating and creating value that contribute to innovation, entrepreneurship, and competitiveness [1]. Current studies on smart tourism identify two main fields of innovation: data management and customer experience [2]. The amount of data generated by tourists before, during and after their trips keeps increasing, requiring an analytical power that only AI can provide. Destinations currently labelled as smart are those able to create an ecosystem capable of analyzing this data for the benefit of their visitors and this capacity is seen as a key condition for any destination to remain competitive. On the other hand, smart and connected products are more and more at the heart of the tourist experience, adding value and increasing satisfaction.

Consequently, in smart tourism destinations, the roles of DMOs, suppliers and visitors change substantially compared to traditional tourism destinations. For example, the different actors are dynamically interconnected via a technological platform for instant exchange [3]. This integrated platform has multiple touch points, which are accessible through end-user devices that create and facilitate real-time experiences and contribute to a more effective management of tourism resources at the micro and macro levels of a destination [4]. Sheehan, Vargas Sánchez, Presenza, and Abbate outline the most important differences between the characteristics of traditional and smart tourism governance and DMOs [5]. While traditional DMOs pay attention to concrete actions especially of a commercial nature, DMOs in smart tourism destinations focus on interactions among various actors. Moreover, traditional DMOs create standardized products and apply one-way marketing. DMOs in smart tourism destinations, however, co-create value and products and customize them. Among the advantages of ICT are demand forecasting, process automation, crisis management and efficiency gains [6].

From a consumers' perspective, ICT can serve to anticipate tourists' needs by making recommendations regarding their choice of touristic activities before and during their stay. New technologies can enhance the tourists' on-site experiences by offering valuable information and customized services. Another function is to enable tourists to share their experiences using social media and to support the decision-making process of other travelers [7]. From a systems perspective, traditional tourism destinations are understood as stable configurations, that means as closed systems with defined borders that include a set of actors who has been defined a priori. Smart tourism destinations in turn are dynamic, open systems of adaption and self-production with fuzzy boundaries. Hence, their behavior is rather complex and chaotic contrary to the rather simple behavior of traditional tourism destinations. Moreover, traditional tourism destinations are predictable and controllable with linear dynamics, which brings about a known cause-effect relationship. Smart tourism destinations are characterized by a fluid reality based on nonlinear dynamics and very limited predictability. While for traditional tourism destinations access to information is limited and often delayed, smart tourism destinations have real time access to large amounts of information. The difficulty however, is to select the relevant information [5].

Femenia-Serra & Ivars-Baidal investigated if and how different smart destination measures transform destination management and marketing processes as well as tourists' experiences [8]. By analysing the case of Benidorm, a mass destination on the Costa Blanca having the ambition to become the first smart destination in Spain, they found that it is crucial to combine connected and disconnected spaces, as not all customers are always pleased about technological solutions. Therefore, it is essential to employ a user-centric design when implementing smart solutions. As to destination management, they underline that smart solutions can facilitate decision-making, improve knowledge and innovation, and contribute to the public image.

When exploring the geographical distribution of smart tourism initiatives and their initiators and aims, China, South Korea and Spain are prominent examples where the governments promote the creation of smart tourism destinations. While it is the aim of the Chinese and South Korean governments to build the technological infrastructure for smart tourism, projects in Europe are often rooted in smart city initiatives, such as in Copenhagen, Vienna, Helsinki, Barcelona, Amsterdam or Vienna [3], and concentrate rather on "innovation and competitiveness and developing smart end-user applications that support enriched tourism experiences using already existing data combined and processed in new ways" [6]. Australia focuses on smart governance and more particularly on open data [6].

Among the most prominent and radical examples of smart cities is New Songdo City in South Korea. It is a completely planned and newly built city that was created by land reclamation in the Wadden Sea on the west coast of South Korea with a holistic smart city approach. One of the principal goals of the master plan is to achieve a high quality of life for its inhabitants by creating a green and sustainable city. Based on the data stemming from connected public and private spaces and implemented by the enterprise Cisco, resource efficiency measures are derived. Examples are traffic lights that switch according to the traffic volume or lighting that turns on depending on the presence of a person in a private apartment [9].

SEGITTUR, the Spanish State society for the management of innovations and touristic technologies, presents in his "Smart Destinations report" different best practice examples of smart tourism in Spain, among them Barcelona that is known for its mobility efficiency, Malaga for its eco-efficiency criteria, but also peripheral island destinations, such as El Hierro that was the first smart island in the world [10]. A good example of smart technology facilitating the customer experience is a "virtual tour guide powered by cognitive technology and IBM Cloud", that accompanies and advises visitors of Lanzarote.

While some research is available on the subject, the scientific literature on smart destinations remains rather young and limited in volume. There is still clearly a need to define what makes a destination smart and even more important what are

the steps to take to earn this status. In their recent review of smart tourism research, Mehraliyev et al. [11] have defined several future research directions based on gaps they have identified throughout the literature. They conclude that there is lack of established method to evaluate the level of smartness of tourism businesses and destinations and to analyze the consumer experiences brought by smart tourism, which is specifically what our maturity model is aiming for. Moreover, the use of smart technologies as a potential means to face the specific challenges of peripheral tourism destinations is largely under-researched as there is no study currently available on this subject.

III. THE DIGITAL DIVIDE

Although many smart tourism destinations initiatives can be identified worldwide, it may prove difficult to become a well-functioning ecosystem due to the complexity of the tourism sector [12]. This is especially true for peripheral regions that often depend to a large extent on tourism in both developing and developed countries. Those regions face the risk of being left behind due to an ever-growing digital divide at various levels (motivational, informational, physical) between them and their more adaptable (urban) counterparts[13].

Many peripheral tourism regions are characterized by a "predominance of small- and medium-sized companies, lack of leadership, lack of a culture of collaboration, […] difficulties for innovation and the presence of proprietary software which make interoperability difficult from the point of view of the destination" [14]. Their DMOs do not have enough capacities to manage the various ICT possibilities. They lack capacities to invest, to access and to control information that could be transformed into valuable knowledge. Hence, those tourism destinations are not part of the global digital tourism ecosystem, which is dominated by huge technological and tourism operators. It seems indeed to be very difficult for them to overcome those structural challenges to become a smart destination. Ivars-Baidal, Celdrán-Bernabeu, Mazón, and Perles-Ivars [14] underline that the differences between the management of destinations will increase even more, "favouring those with more agile organisational structures, more prone to public-private collaboration and better equipped in terms of economic and human resources". This means that urban environments have a competitive advantage compared to peripheral regions due to a better access to ICT infrastructure, as well as economic and human resources.

However, smart solutions could also be a chance for those peripheral tourism destinations to overcome their problems, e.g. by strengthening collaboration. However, it seems to be of utmost importance to employ technologies in a way that corresponds to the needs of a destination. Smartness is not only about technology, but especially about the smart use of it in accordance with the objectives and resources of a destination [14]. Moreover, peripheral regions dispose of unique natural and cultural resources, which makes them particularly interesting for tourists whose needs and travel preferences have changed over time towards a more

sustainable and authentic way of travelling and experiencing the host countries. By proposing products that engender a unique and authentic experience for tourists, they have a huge potential to be competitive in the globalized world. The smart use of ICT by providers and consumers could help peripheral regions to better manage the whole customer journey and to increase its fluidity by employing smart solutions to the pain points that are typical for peripheral regions, such as a lack of public transport [15] and to create appealing customer-centered offers. Smart tourism seems to be especially interesting for those regions, when ICT is used in a sustainable way, creating benefits at the economic, social and environmental level, for tourists and residents alike [16].

It is the aim of the model below to analyze the current level of smartness of destination and in the context of our research of given peripheral regions in particular in order to find solutions that help them to become more digitally mature and remain competitive.

IV. THE 6C'S MATURITY MODEL

The development of maturity models has been traditionally linked to the increasing presence of technology in business environments. A maturity model has therefore a very pragmatic objective: to diagnose the level of advancement of a business regarding the use of technology and build on its conclusions to find ways of improving its operations and performance. While the use of maturity models was first adopted by the Information and Technology (IT) industry, it is nowadays becoming increasingly common for a broad range of economic sectors to use such an approach for one main reason: digitalization. Indeed, digitalization is seen as a phenomenon that will not only revolutionize the economy as a whole and the way business is conducted but will also require major efforts for businesses to successfully manage this transformation rather than be endangered by it.

Consequently, and while some are still purely designed for the IT industry, maturity models have today a more generic nature and include technological as well as strategic indicators in order to assess the level of advancement and success of businesses and organizations to manage the digital transformation [17], [18].

A digital maturity model has a dual purpose, which is as mentioned to assess the level of maturity or in other words digital transformation of an organization as well as to compare the level of transformation of this organization against its peers. A high level of digital maturity is seen in this perspective as a competitive advantage and thus as a necessary condition for this organization to prosper. However, the emergence of generic models for digital maturity does not mean that technology on its own drives a digital transformation. On the contrary, strategy rather than technology is the main driver of such transformation and a maturity model should therefore capture strategic elements through its indicators [17]. Technology being a mean rather than an end is also the approach adopted for maturity models

not directly focusing on digitalization but rather on process management [19], on product development or on performance measurement [20].

As argued, the concept of smart destination relies heavily on the way a destination embraces digitalization to transform and improve the services it provides to its visitors. Such transformation may affect the way the destination structures and manages its operations, how it commercializes and distributes its services as well as how it designs the experiences and stays it proposes to its clientele. A smart destination is therefore not solely about the technology it uses but more importantly about how technology is integrated into its business model and how this integration is supported by its main stakeholders: the destination management organization, the local tourist sector and the tourists.

The proposed model aims therefore at incorporating key aspects relevant to evaluate the level of smartness of a destination. It goes beyond being solely a digital maturity model by assessing the smartness of a destination defined as a business and operative model and by adopting a strategic as well as client-focused perspective. 6 dimensions compose this model, which have been developed based on insights from the collaborative, transformation management and smart tourism literature [2] [21] and adapted to the characteristics and particularities of a tourism destination (see Table I).

Berghaus & Back [21] identified typical stages of a digital business transformation process based on empirical data and created a digital maturity model that includes the following nine dimensions: Customer Experience, product innovation, strategy, organization, process digitization, collaboration, information technology, culture & expertise and transformation management at the enterprise level. At the level of a tourism destination, Femenia-Serra & Ivars-Baidal [3] studied by taking the case of Benidorm as an example, to what extent smart strategies and solutions improve destination management, marketing and tourists' experiences. They identified different measures Benidorm has taken to become a smart destination distinguishing between management and marketing measures on the one hand, and solutions for an enhanced tourism experience by subdividing the customer journey into a pre-trip, during the trip and post-trip stage, on the other hand. The different smart solutions from practice include e.g. social media marketing, destination apps, the presence of a smart tourist office etc. They found that it is of utmost importance to take into consideration the needs of customers and their attitudes towards technology, as not all the visitors are technology-savvy. Therefore, it is crucial to consider the different target groups of the tourism destination when assessing its degree of maturity.

Based on this literature, we elaborated 6 criteria dimensions, which are: culture, connectivity & controlling, customer relationships, communication, commercialization and finally customer as main criteria for a smart tourism destination.

TABLE I. 6C'S MATURITY MODEL WITH ADAPTED CUSTOMER DIMENSION

Culture: assessing innovation readiness	Awareness about risks and opportunities of digitalization
	Presence of a digital innovation strategy
	Availability of budget for digital innovation
	Availability of know-how and human resources for digital innovation
	Presence of hiring and training strategy for digital innovation
Connectivity: assessing data management and infrastructure	Presence of strategy and guidelines for well-functioning IT infrastructure and data protection
	Presence of strategy and guidelines for data protection
	Use of digital solutions for management of services and internal communication
	Use of digital solutions for management of external communication
	Use of digital solutions/digital hub for management of partnerships
	Presence of teleworking and cloud-based IT infrastructure
	Collection and use of user-generated data
	Collection and use of device-generated data
	Collection and use of transaction data
	Use of data analytics and benchmarking
	Presence of KPI for digital marketing strategy and online reputation
Customer Relationship: assessing CRM management	Presence of web-based customized communication with guests
	Use of social media for customer relationships
	Use of targeted marketing campaigns through social media and web
	Presence of smart solutions available during the stay
	Use and management of online reputation
Content: assessing digital marketing & communication strategy	Multilingual websites and online communication
	Presence of a digital marketing strategy
	Regular maintenance of online content
	Well-functioning website
	Website and distribution channels designed for effective online referencing
	Accurate online description of the organisation and its services
Commerce: assessing distribution channels	Presence of multi-channel dynamic pricing strategy
	Up-to-date online booking system
	Online booking system well-functioning and optimized for direct bookings
	Digital solutions for automation of internal workflow
Customer: assessing experience design and value co-creation	Ability, to merge customer data from different sources
	Ability to align the digital offers with customer needs
	Presence of destination app
	Presence of smart tourist office
	Presence of free WIFI for guests
	Presence of a webcam
	Presence of interactive map
	Presence of smart cards
	Presence of digital hub
	Presence of guest community platform
	Use of smart solutions in accommodations
	Presence of tools for experience co-creation
	Use of smart solutions in attractions/activities and for personalized offers (e.g. gaming app)
	Use of smart solutions in transportation (e.g. transport control system)
	Use of technology for enhancing the guest experience
	Use of Big Data for enhancing the guest experience
	Use of geophysical data for enhancing the guest experience

The model looks at how the destination approaches innovation and the use and integration of digital technology in its operations, how its management structure and strategy support such integration, how technology is used to enhance the customer experience and how data is used by the destination to measure and improve its performance and services. As per Table.1, the 6Cs maturity model includes indicators for each of its 6 dimensions that together enable a comprehensive assessment of the destination. Those different criteria and indicators were presented to 4 tourism experts from the practice and adapted according to their comments. A preliminary list of indicators was also empirically tested on a few Swiss mountain destinations as part of an applied research project.

The measurement of all the indicators is based on a ten stage Likert scale with 0 meaning "not fulfilled at all", 5 corresponding to "moderately fulfilled", and 10 to "very well fulfilled". We argue that the choice of a relatively fine-meshed scale will help better evaluate subtle transformations of a destination regarding the maturity degree from one year to another e.g. The following example serves as an illustration of the different grades where a destination can be situated according to one of the criteria. In this case, it is the criteria indicator "Presence of a digital innovation strategy" of the criterion "Culture".

TABLE II. DESCRIPTION OF THE INDICATOR "PRESENCE OF A DIGITAL INNOVATION STRATEGY" OF THE CRITERIA "CULTURE" AND THE MEANINGS OF THE DIFFERENT SCORES

Description of the indicator	Opportunities and risks related to digital trends are addressed by management and a strategy for their implementation is developed.
Score 01	No strategic objectives have been defined for digitalisation Digitalisation is not a topic in the management of the company.
Score 05	Digitalisation is dealt with superficially in the strategy. The management is concerned about digitalisation but without any obligation or particular constraint.
Score 10	Concrete objectives for digitalisation are part of the overall strategy The Board of Directors sees digitalisation as an opportunity and supports initiatives/projects in its favour.

We are aware of this method not being without limitations, as the assessment is qualitative and rather subjective. The different scores will be evaluated by conducting interviews with the managers of the different tourism destinations to define their current stage, also in comparison to other similar destinations. The different indicators will need to be tested and adapted continuously by applying them to several destinations with the aim of uniformising and quantifying the grades given to the different indicators once a sample of destinations have been analyzed.

V. A MATURITY DIAGNOSIS OF LESSER-KNOWN RESORTS

The 6C's maturity model for smart tourism destinations will be first applied through a pilot project involving 3 Swiss tourism destinations: the Gruyères region, the "Val d'Anniviers" and the Conches Valley. As shown through the review of existing studies on smart cities, the label "smart" is usually attached to cities having a strong culture of innovation and the means to foster it and continuously invest in technology. Peripheries on the other hand do usually not benefit from such attributes and are therefore much more challenged to transform themselves into smart living environments. This potential for a digital divide discussed earlier on is also applicable to tourism destinations where smart destinations are usually well-established and economically well-sourced while lesser-known and more peripheral destinations are until now lagging behind.

A driving force behind the development of the 6C's maturity model is therefore to allow peripheral destinations such as those selected for the pilot project to diagnose their stage of development in order to identify priorities for successfully managing their digital transformation and consequently establishing themselves as smart destinations. Such an objective is obviously linked to a risk of digital divide and lack of competitiveness that peripheral destinations are currently facing. The model will also allow to identify areas of development to prioritize and adopt solutions that are feasible and adapted to the context of these destinations.

The application of the model into an empirical context has been structured around the blueprint of a customer journey (see Figure 1) representing the experience of a tourist and its 3 main stages: pre-stay, stay and post stay. The design of customer journeys as a mean for peripheral destinations to earn a status of smart destination will therefore incorporate the 6 dimensions of the analytical model. These dimensions will serve to identify first barriers and gaps followed by solutions that will be prototyped through quasi experiments in all three destinations. The pilot project merges therefore the use of a maturity model with a service design approach [22] in order to define relevant solutions for peripheral destinations to succeed in their transformation into a smart destination.

Principles of service design will also be adopted to prototype through quasi-experiments the solutions that will be defined through the application of the model on existing destinations.

The way the model will be adopted to diagnose the level of smartness of a destination is presented next as an analytical grid including for illustration purposes some generic problems and good practices commonly associated with the concept of smart destination.

What is new in our 6C's maturity model shown in Table II is the last dimension called Customer. In the description elements that allow to diagnose this last dimension all the points are indeed linked to touchpoints of the customer journey that we have created and presented in Figure 1. While the customer experience is emphasized on the model, it

nevertheless also encompasses indicators specific to the internal operations of the destination, its promotion through digital channels as well as its attributes and readiness for innovation as an ecosystem is made of various stakeholders. As the typology of stakeholders engaging in tourism development vary greatly from one destination to the other, the diagnosis phase will also include for each destination the production of a stakeholder map. This means that our maturity model tool enables us to offer targeted intervention and to develop smart destination benefits that are adapted to the context of each destination without implying too high costs. The feasibility of the intervention and its adaptation to the scale and resources of the destination will therefore be of particular importance when defining solutions to adopt and investment to make.
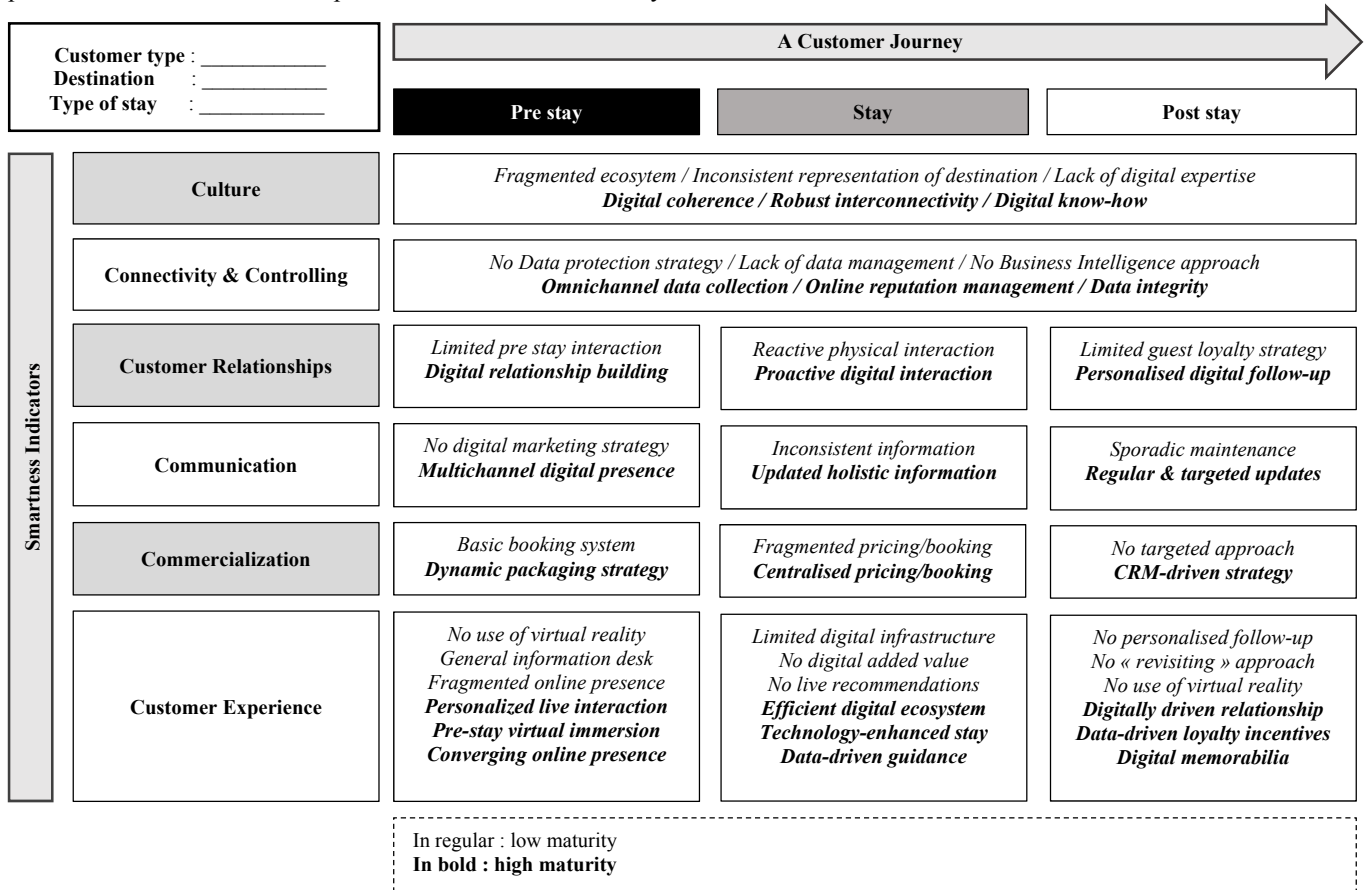
Customer type : _____ Destination : _____ Type of stay : _____	A Customer Journey		
	Pre stay	**Stay**	Post stay
Culture	*Fragmented ecosytem / Inconsistent representation of destination / Lack of digital expertise* **Digital coherence / Robust interconnectivity / Digital know-how**		
Connectivity & Controlling	*No Data protection strategy / Lack of data management / No Business Intelligence approach* **Omnichannel data collection / Online reputation management / Data integrity**		
Customer Relationships	*Limited pre stay interaction* **Digital relationship building**	*Reactive physical interaction* **Proactive digital interaction**	*Limited guest loyalty strategy* **Personalised digital follow-up**
Communication	*No digital marketing strategy* **Multichannel digital presence**	*Inconsistent information* **Updated holistic information**	*Sporadic maintenance* **Regular & targeted updates**
Commercialization	*Basic booking system* **Dynamic packaging strategy**	*Fragmented pricing/booking* **Centralised pricing/booking**	*No targeted approach* **CRM-driven strategy**
Customer Experience	*No use of virtual reality* *General information desk* *Fragmented online presence* **Personalized live interaction** **Pre-stay virtual immersion** **Converging online presence**	*Limited digital infrastructure* *No digital added value* *No live recommendations* **Efficient digital ecosystem** **Technology-enhanced stay** **Data-driven guidance**	*No personalised follow-up* *No « revisiting » approach* *No use of virtual reality* **Digitally driven relationship** **Data-driven loyalty incentives** **Digital memorabilia**

Smartness Indicators

In regular : low maturity
In bold : high maturity

Fig. 1. 6C's Diagnosis tool

VI. CONCLUSION

The aim of this research is to apply the principles of smart destinations to lesser-known, peripheral mountain resorts. Indeed, the latter resorts do not have many means and resources to become complete smart destinations. On the other hand, by targeting a few aspects of the customer journey which today present typical vulnerabilities, we aim to demonstrate through a new model of 6C's maturity that the principles of smart destination can nevertheless offer advantages while remaining completely cost-effective. For example, the risk of missing the last shuttle after skiing could be mitigated by sending a reminder notification to geolocated skiers telling them that they can finish their coffee and swiftly reach the shuttle bus stop on time.

The present research is exploratory, and the corresponding contribution is therefore at this stage essentially methodological. The development of a maturity model that is industry-specific will allow to evaluate the relevancy of such approach. Moreover, its application on lesser-known peripheral destinations will test its relevancy as a development tool for such destinations to plan their investments and define their priorities in terms of digitalization. The research strategies for the near future include interviews with destination managers to test the different indicators. We also intend, in subsequent research, to conduct quasi-experiments [23] to validate the fail points identified in the process and the improvement solutions that we intend to design for Val d'Anniviers and Conche Valley, our partners for prototyping these solutions and assess their relevancy. The solutions and indicators will be adapted according to test results.

Once the pilot study involving the three regions above will be finished, its conclusions will serve to engage more partner destinations into the project and to test its validity in different contexts to ultimately cover a range of destination types and geographies within Switzerland as well as abroad.

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