

# Innovative Tourism Services as a Key Factor for a Successful Smart City

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**Abstract - Starting from state-of-the-art best practices and the Trento experience, this white paper aims to define the needs, behavior and expectations of integrated and connected tourism industry service providers, describing innovative service concepts, patterns, trends and requirements to support the development of these services.**

## I. INTRODUCTION

This white paper focuses on describing innovation patterns, activities and strategies a smart city should implement to develop an integrated tourism ecosystem and support the experience of tourists. The paper starts from the assumption that a city, as a tourist destination, already offers a set of specific touristic products.

The main aim of a smart city in the tourism domain is to enable tourists and citizens easy access to services, information and places: the access and the entire experience must be coherent, unitary and seamless. In this regard, technology has only a (necessary) facilitator role: it is an enabling platform for user-centered smart services. The target users of these services are tourists and operators.

The City of Trento represents a good starting point both as a test bed for analysis and a showcase of best practices.

## II. CONTEXT

Consumer attitudes and behaviors have become increasingly “digital”, “social” and “service experience” oriented in recent years. This is common both for tourists and local residents of a smart city. For this reason “guest” is preferred instead of “tourist.” In many cases, citizens are like “guests” of the smart city and they share with tourists many of the same services, needs and expectations. As the tourist is a temporary citizen of the smart city, the citizen is sometimes a temporary tourist. In this regard, the smart city should be an enabling platform for activities that guests are able to develop. According to Luca De Biase, an urban space can be defined as smart if it “is an integrated network that connects individuals and to whom leaves the freedom to interpret their ability to generate added value, reducing transaction costs

and enhancing individual activities.” What needs to be built is “a layer that integrates and makes interoperable the various connecting systems inherited from the past (money, transportation, communications, etc.) and those to be built (sensors, security, privacy)”, even if the smart city “is not concerned with applications, but with the possibility for citizens to invent it” [1].

Among consumers with internet access (in 2013) [2]:

- 91% ordered at least one good or service online and used a web search engine as the first source for searching information and planning travel and holidays.
- 42% used a mobile device (smartphone, tablet, etc.) for getting information, planning and booking (this figure was 33% in 2012);
- 68% conducted online research before deciding on a holiday destination.



Fig. 1 The 5 stages of the tourist experience according to Google’s “The 2013 Traveler Eurobarometer” [2]

The internet is essential for the guest throughout every stage of the tourist experience process [3].

During the dream and the search steps:

- 62% follow friends and colleagues' recommendations;
- 61% use the internet as their main information source;
- 39% use TV as their main information source;

During the planning of the holiday, in the search and the book steps:

- 80% use the internet as the main tool;
- 49% of consumers follow friends and colleagues' recommendations;
- only 28% make decisions based on advertising and marketing materials;

During the experience at the destination:

- 58% use online sources for evaluating and selecting activities and services;
- 40% digitally create and share brand new content (reviews, photos, etc.).

These data describe a new type of guest: the "smart guest". Unfortunately, a great number of cities do not take advantage of this scenario. Instead of fully embracing the smart city paradigm to extend smart services to everybody, cities often rely on only this new type of guest. Cities currently require guests to be smart, aiding them in becoming smart guests. This approach causes guest inclusion issues.

### III. CHARACTERISTICS AND TRENDS

A truly integrated local tourism ecosystem relies on the quality of its actors' connections. Services offered by the smart city should allow, support and enhance interactions (e.g., communication, information, payment) between guests, tour operators, Destination Management Organizations (DMOs) and public institutions. These interactions together affect and drive the needs, the expectations and the behavior of each actor. The design of digital services must start from these distinctive elements to intercept real opportunities to add value to the tourist experience. The following paragraphs present an overview of the distinctive characteristics and trends that relate to participants in the tourism industry.

#### a) *Guest (tourist and citizen)*

Smart city stakeholders should stop considering tourists and citizens as two completely detached user typologies—the majority of their basic needs are very similar and the high level service paradigms are mostly the same. It is better to describe both as active "guests" within a smart space, the city. The main service paradigms that answer these needs are finding, discovering, personalizing, suggesting, sharing, and creating content.

#### **Finding**

One of the basic needs of the guest is the possibility of finding what he wants and when he wants it in the easiest way possible. Smart city services and tech infrastructures must support, as much as possible, the IWIIWWIWI (I Want What I Want When I Want It) user paradigm [4].

#### **Discovery**

When a guest arrives in a new destination for the first time, he usually already has some generic information about the destination. This information represents a partial and biased knowledge of what a destination can offer. Using different channels, the smart city should be able to establish services to enable the guest to discover what the destination offers.

#### **Suggestion**

Time is a precious and limited resource for the guest and, for this reason, he wants to get the best he can from his tourist experience. A guest's average length of stay is getting shorter year after year in the EU. According to the Trento municipality, 2.5 days is the average time spent by a guest in Trento. The smart city should be equipped with systems able to reduce tourist downtime: digital adaptive services suggest detours, best attractions and activities according to the specific individual characteristics, local context, environment and events (e.g., heavy traffic congestion, long queue at the museum entrance, closed road due to an avalanche, lack of snow on ski slopes, bad weather at the seaside). Other digital services can improve delivery time and enhance a specific experience by reducing the impact of pain points: online check-in and digital access items (digital ticket or key) are just two examples applicable both to the hotel and airlines sector. Today, services providers are starting to anticipate what a customer might want and act on it, using smart design and data mining, before the user clicks a button.

#### **Personalization**

Each guest is a person with individual characteristics (needs, expectations, preferences, etc.). Each guest wants certain products and experiences instead of others. The smart city should be able to intercept, collect and analyze differences between guests to provide personalized services and trigger the right set of actions for each of them. In this regard, social networks (Facebook, Twitter, Tripadvisor, etc.) are a great source of information, and crawling/scraping data from them could support better business intelligence and marketing decisions [4].

#### **Sharing**

In the smart city ecosystem, a guest is more than a mere service user: he also represents a source of information, services and even goods for others, within the sharing economy paradigm. High value information, such as preferences, reviews and suggestions, is spread continuously over different digital channels and services on the web. The digital platform allows locals to share their knowledge (e.g.,

authentic experience at [www.lookals.com](http://www.lookals.com)), resources (e.g., a place to stay at [www.airbnb.com](http://www.airbnb.com) or [www.couchsurfing.com](http://www.couchsurfing.com)) and activities (e.g., giving a ride at [www.blablacar.com](http://www.blablacar.com)). Local smart communities (or smart mobs [5] that are sharing the same space-time context) can potentially fill gaps and lacks in the local administration in terms of long tail services and monitoring activities.

### Content Creation

The sharing paradigm goes beyond these examples and allows the guest to become a producer of personal content. These multimedia items, called peer content, are spread over digital channels to a guest's peers. He assumes an active, central and strategic role in the communication of the tourist destination, becoming its ambassador (e.g., [www.pleens.com](http://www.pleens.com)).

#### b) Tourist operators

Tourist operators include every local actor that provides goods and services directly related to the destination experience to the guests. The following paragraphs describe the most important needs and trends in this category.

### Digitalization

Product digitalization is one of the most important steps in creating a truly integrated tourism ecosystem. If a good, service or event does not exist on digital channels, it does not exist at all for the guest (or it is overtaken by other digitalized products). For the same reason, digital communication increases the importance of product digitalization. In the last decade, operators have delegated these strategic processes and the control of related services (e.g., advertising, booking) to Online Travel Agencies (OTA) (e.g., [Booking.com](http://Booking.com), [Expedia](http://Expedia.com)). OTA earns approximately 15% on each transaction operated on behalf of operators (e.g., booking a room). Operators need open booking platforms for sales disintermediation to regain control of their product. Digitalization is the first step in developing innovative services able to offer a real "integrated experience."

### Reputation monitoring

Product digitalization, even through OTA and review sharing platforms (e.g., [Tripadvisor](http://Tripadvisor.com)), emphasizes the central role of online reputation, especially for an experience-centered sector such as tourism. In the social media arena, comments flow on many different digital channels: reviews websites, Facebook, Twitter, WhatsApp, etc. Guests leave their digital footprints continuously during every phase of their tourism experience. Operators are in need of tools to collect and analyze these data (e.g., [www.travelappeal.com](http://www.travelappeal.com)) to both manage their reputation and understand their guests' feedback.

### Proximity marketing and Internet of Things (IoT)

The guest experience in the smart city takes place in a real space. It is important to maintain a coherent and balanced interaction between physical and digital components with the appropriate UX. In the next few years, proximity technology (e.g., Bluetooth transmitters, indoor positioning Wi-Fi tracking, GPS) will deeply impact this relationship. Digital services will be able to activate new ways of interaction between guests, operators and public institutions to share information, offers and coupons, trigger actions, activate payments and collect data. Everything will be based on the guest position, behavior and profile (e.g., Explora Museum guide, [www.explora-museum.com](http://www.explora-museum.com)). ABI Research estimates that over 30 billion personal and ambient devices [6] (e.g., wearables, nearables, domotic sensors) will be connected to the Internet of Things by 2020. Nearables are becoming ubiquitous right now as traditionally non-digital businesses integrate this type of devices into their services. For example, Starwood Hotels and Resorts introduced virtual doors, made unlockable via smartphone [7].

### Smart payment system

The booking, purchase and, especially, the payment activity represent critical points for smart city guests; sometimes they become a pain point in the tourist experience. Consumers carry less cash and use more electronic forms of payment. More than two-thirds of US consumers carry \$50 or less on a regular basis, 9% of them do not carry any cash at all [8], 39% of consumers use banking apps every day and 78% of them use such apps at least once a week [9]. In the last decade, a great number of companies have tried to intercept this consumer's evolution and drive the related innovation by offering different solutions, from a single self-standing product to complete product-service system. Recently, after years of failures, brand new solutions, both from large companies (e.g., Apple Pay) and emerging startups (e.g., LoopPay), have become promising in terms of user's adoption and satisfaction.

### Integrated experience

"Connecting services is more about building an ecosystem comprised of relevant services, rather than creating a one-stop shop" [4].

"Since guest is always in flux, the chances of his experience being disrupted are much higher: when the trip ends in the middle of watching that thrilling in-flight movie or when the guest expects his in-store experience to know his past purchases and style preferences in the same way an online site would. As digital experiences across devices become more fragmented, there are four types of gaps that we need to address:

- the gap when we lose our bandwidth,
- when we move between devices,
- when we're handed over between different services
- when our digital data has changed and needs to be updated" [4].

Operators should support a flawless movement between different services. The guest should be able to have a solid, integrated and coherent tourist experience. “Leading edge companies are examining what their users are doing before and after using an app, not just when their app is open. Airbnb is extending their offering—providing a “local companion” service and now a lifestyle magazine—likely because the frustration of specialized, unlinked services is most felt when users are traveling. Why is a customer’s literal journey so segmented between transportation, accommodation, and recreation, and why does travel require several apps? SNCF, France’s national state-owned railway company, is working to reduce this with a whole journey approach, providing door to door service with private cars at either side of the user’s train travel” [4].

Strategic services to support the creation of a real integrated experience include

- dynamic packaging platform / cross-selling platform that allows operators to offer an integrated and connected package of products and services (e.g., [www.travelmesh.it](http://www.travelmesh.it));
- open marketplace of tourist products and services.

#### c) *Local institutions and Destination Management Organizations*

The governance of the city as a tourist destination is managed by the local government institution (e.g., the city council, in collaboration with representative organizations) and the DMO. As the first is responsible for the local legislation, projects and resources management, and the second is responsible for the tourist products design and coordination and destination marketing, they need to collaborate to offer a true smart experience to their guests. The main aspects they need to focus on are as follows.

#### **Infrastructure development**

Infrastructure, especially those that support digital connectivity, are strategic for enabling and supporting smart city tourist services. Of course, different levels of complexity and cost infrastructure connect to different governance levels. Fiber backbones and 5G networks involve national and regional government and high-level decision makers, whereas free Wi-Fi directly involves local government, municipality and citizens.

Other strategic smart infrastructure at the local level is linked to a guest’s mobility needs and includes physical spaces, sensor, actuators and digital platforms. One supports individual vehicle mobility by monitoring traffic flows, parking availability and temporary configurations. Another smart infrastructure is focused on the management of and information about public transport system (local trains, bus system, bike sharing, etc.). It is vital for the smart city to interconnect these infrastructures to offer data, information and services to the guests (and developers) as a single mobility ecosystem.

#### **Data accessibility and enable services**

Local government, institutions and municipalities should support bottom-up service development by

- Applying standards for interoperability
- Opening data
- Opening integrable services

#### **Data monitoring, analytics and business intelligence**

Giving and gaining access to data enable the collection of a huge volume of information, statistics and just-in-time data. The analysis of these aggregate data, within the big data paradigm, allows a deep understanding of the smart city ecosystem and enables more conscious decisions by local actors, who are also in the tourism domain. Examples include

- collecting and analyzing data to support stakeholders’ decision making processes;
- collecting and analyzing data to trigger adaptive configuration of the smart city environment;
- service and system integration (e.g., electronic toll collection system functions, such as Telepass, extended for park and congestion charge paying);
- destination reputation monitoring.

#### **Tourist actors training and participation**

Guests are the main actors, the protagonists of the smart city ecosystem. For these reasons they need to be involved through

- Participatory governance
- Participatory communication
- Education and training

### IV. TECHNOLOGICAL CHALLENGES AND OPPORTUNITIES

In the digital age, citizens within a city are connected to each other and to the city. To become smart, a city needs to integrate technology infrastructure within the urban environment to facilitate this communication.

In the next years, within the IoT paradigm [10], there will be billions of connected devices (also called smart objects) connected to each other in an internet-like architecture. These devices will communicate with each other and exchange information, enabling wide interaction among things and people. Smart objects are typically equipped with a microcontroller (or microprocessor for not constrained devices), a wireless interface for communication, sensors and/or actuators. These interconnected tools are already able to perform interesting functions, which are also applicable for tourism:

- smart displays allow one to discover new content by simply getting close to the display using augmented reality techniques;

- different sensors located around the city define the comfort (e.g., thermic) of specific areas and suggest the "best/healthy" one;
- geo web services are sent with push notifications if the user is in the vicinity of a service (i.e., near a historic monument or a particular store selling items of a personal interest).

The Internet Protocol (IP) has been widely envisioned as the true IoT enabler [11] as it permits the full interoperability among heterogeneous objects. For this reason, the development of local infrastructure to connect all of these devices to a network that supports IP protocol is strategic. This could happen both by increasing the number of public access points connected to free internet services in the smart city and by opening existing connections of public establishments such as hotels, restaurants or shops to guests.

The IoT paradigm includes different standard protocols such as COAP (Constrained Application Protocol) [12], MQTT (Message Queue Telemetry Transport) and HTTP (Hypertext Transfer Protocol). These protocols allow strong interoperability and integration between different services and devices. If they are used according to different RFC, they can create a standard network of services on which one can also add third party services that can communicate with the infrastructure already present. A huge advantage is that the IoT provides, from CoAP, service discovery (SD) as the procedure used by a client to learn about the endpoints exposed by a server. A service is discovered by a client (in many cases the guest) by learning the address that references a resource in the server namespace.

A crucial issue for robust applications, in terms of resilience to changes and the feasible deployment of smart objects, is the availability of mechanisms that minimize the need for human intervention for the configuration of newly deployed objects. In fact, the RESTful [13] paradigm is intended to promote software longevity and independent evolution, which are both extremely important aspects of IoT applications deployed on smart objects that are expected to stay operational for long periods of time (e.g., years).

Self-configuring service and resource discovery mechanisms should take into consideration the different scopes that these operations might have within a local scope and within a global (large-scale) scope.

These protocols and elements are part of a standard recognized by several international organizations. This allows greater integration of external devices and applications of third-party devices that industry participants want to take part in the life of the city. If a citizen wants to create a new service and make it available to others, he simply has to follow the guidelines defined by the standard

and thus is directly connected to the network created by the smart city.

Another key factor is opening access to data for developers and citizens using specific APIs. If a public databases does not allow interfacing to web services, the administration should consider the development of middleware. This would also allow the development of auto-generated data stream services viewable through the web.

All of the factors explained before represent the precondition for the development of a "distributed governance", a paradigm in which the different actors within the smart city can participate actively in the life of the city itself. In this paradigm,

- The government and the public administration provides the infrastructure to interconnect all of the actors involved in the city but can also provide useful data to improve some services, such as traffic, weather, emergencies, etc.
- The operator can take part by offering targeted services to its activities, so that the guest can be involved actively in it and discover different services through marketing and gamification mechanisms.
- The guest is the first user of these services, but he can also provide important information for the administration and help it make the best decision.

## V. CONCLUSIONS

Since the beginning of the internet revolution brought digital connection and web access to a great part of the world's population in the early '90s, tourism has been one of the most influenced and, at the same time, influential domains in terms of digital driven innovation. Online booking, resource management, social reviews, web marketing and reputation monitoring are only a few examples of this reality. Moreover, the distinction between citizen and tourist is becoming less evident. Designing for the tourist now means designing for the citizen too. For this reason, it is strategic for every tourist city to craft its design with a user-centered approach focusing on guests' needs, behaviors and expectations and moving from a technology-driven innovation to open and user-driven innovation. Currently, the guest, seen as both citizen and tourist, has a renewed central role in the smart city. At the same time he is an influencer in the way he affects government and peers' decisions, a maker in that he creates communicative contents, and a service provider in that he share resources and information. Moving from these assumptions, it is strategic for every city that aspires to become smart to invest in innovative tourist services, tools, platforms and moreover, in all the technology, approaches and (open) standards that allow their implementation.

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