Ground Breaking Technologies in Tourism

Project No. 617540-EPP-1-2020-1-IT-EPPKA2-CBHE-JP
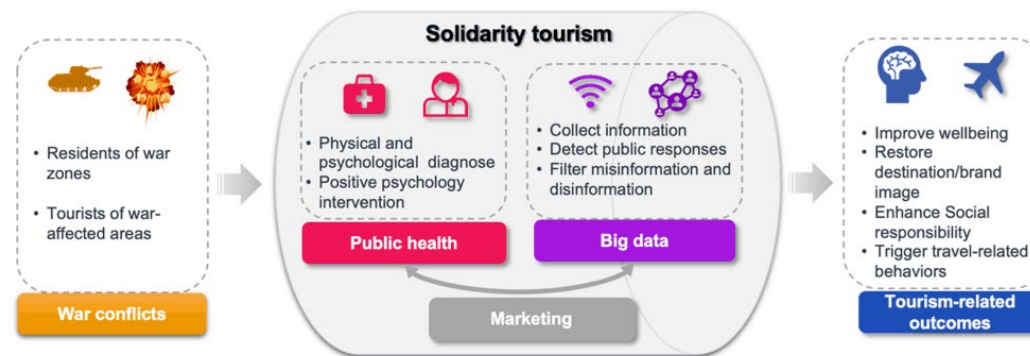
Prepared by: Prof. A. Kaklauskas, Vilnius Gediminas Technical University, Vilnius, Lithuania

Sustainability in Tourism

Sustainable tourism is a concept that covers the complete tourism experience, including concern for economic, social and environmental issues as well as attention to improving tourists' experiences and addressing the needs of host communities.

Sustainable tourism is often separated in 3 sub-categories:

- Responsible tourism: Tourism that minimizes environmental damage and carbon footprint.
- Solidarity tourism: Tourism that aims to develop territories and help local communities.
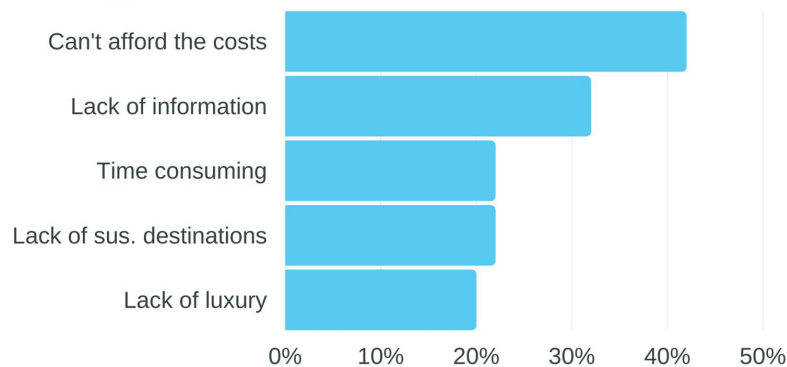- Fair tourism: Tourism based on the principle of fair trade.

Sustainability in Tourism

Characteristics of Sustainable Tourism:

- Benefits Local Economic Development
- Ensures Tourism Development Benefits Both Community and Environment
- Meets Both Profitability and Viability
- Becomes Part of the Local Culture
- Reinvests in the Local Region

The key to sustainable tourism is to:

- Protecting the environment, natural resources, and wildlife
- Providing socio-economic benefits for communities who live in tourist destinations
- Conserving cultural heritage and creating authentic tourist experiences
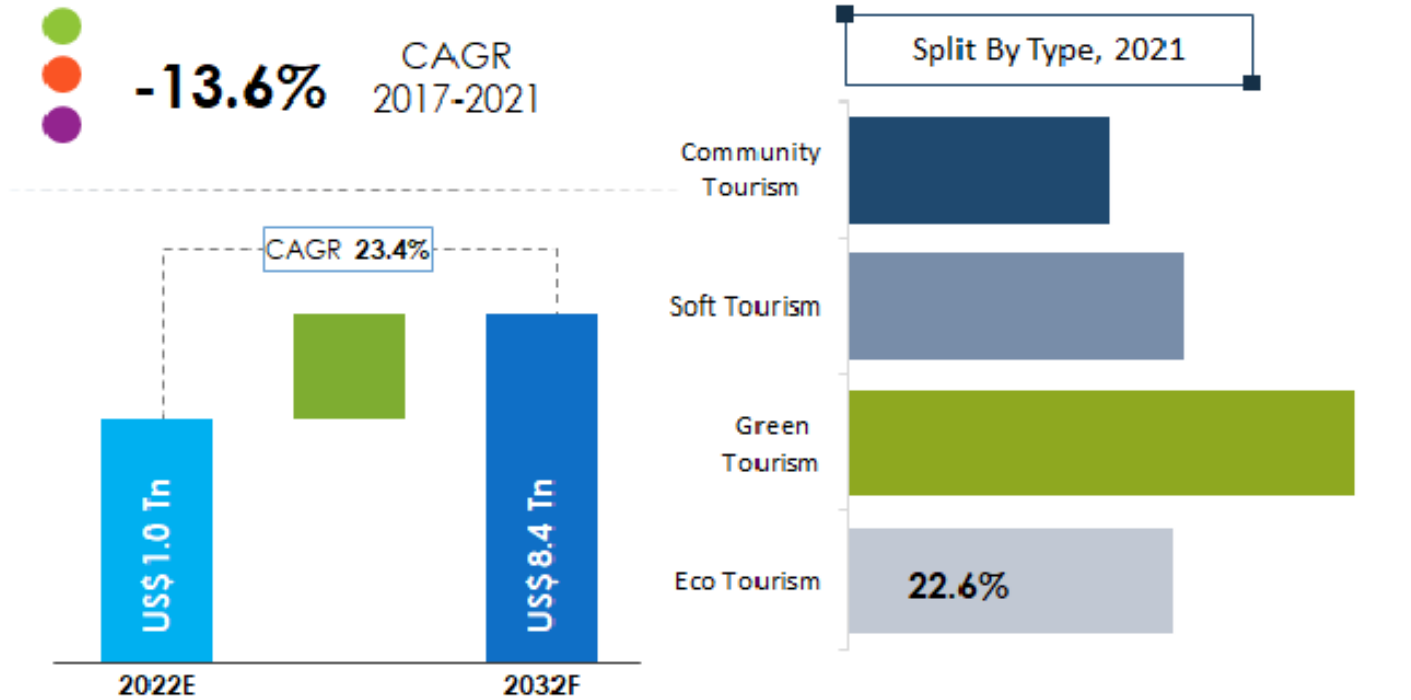
Sustainability in Tourism

- The sustainable tourism market size will surpass US$ 1.0 Trillion in 2022. Between 2022 and 2032, the market is expected to exhibit a compound annual growth rate (CAGR) of 23.4%. The share of the global sustainable tourism market in the parent market (travel and tourism industry) is estimated to be at 2%-5%.

Obstacles for sustainable tourism

Global Sustainable Tourism Market Analysis 2022-2032

-13.6% CAGR 2017-2021

CAGR 23.4%

US$ 1.0 Tn — 2022E
US$ 8.4 Tn — 2032F

Split By Type, 2021

Community Tourism
Soft Tourism
Green Tourism
Eco Tourism — 22.6%

Source: Future Market Insights

Note: Market shares not depicted as per actual scale - only for illustration purposes

Tourism 5.0

- In this digital age, talking about traveling and tourism brings to mind how convenient technologies have made everything easier for us. From booking to check-out, everything is technological based. Artificial intelligence in the tourism and travel sector has already created a hugely significant change. With Tourism 5.0, we are going to experience the best of travel and tourism.

- Tourism 5.0 is another term for the same trend of growing use of Big Data, Artificial Intelligence, Cloud Computing, Sustainable energy, and other high-tech computer technologies to generate demand and improve services for consumers across different industries.

4.

TOURISM 5.0

MAXIMISING THE USE OF DIGITAL TECHNOLOGY
- Digital platforms for more effective marketing
- Digitalisation of business
- Increased business efficiency and new jobs

MEET UP: SMART TOURISM 5.0

Urban Tourism 5.0

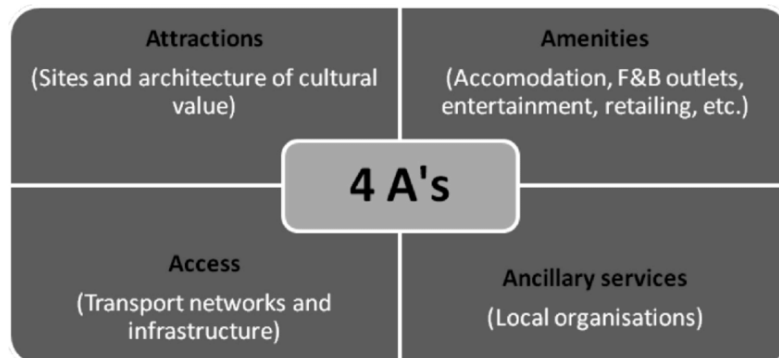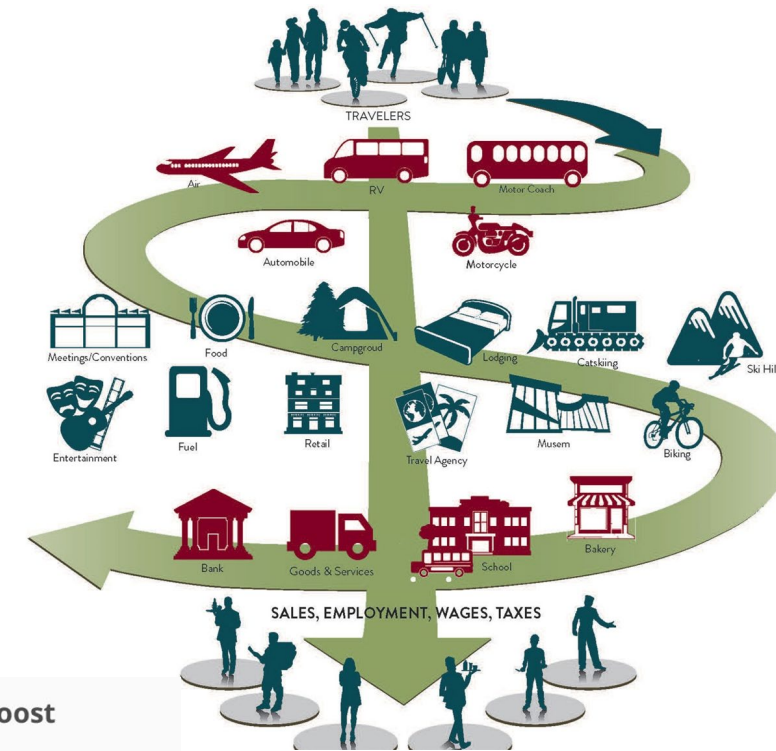You. Smart. Thing., Landmrk, Imagemakers and Oodl

Methodology of Tourism

- The basis of the methodology of project management in tourism is the analysis of the needs of tourists in the target market and capabilities of tourist operator to satisfy them by using methods of observation, comparison, intuition, logic, applying the tools of marketing management.

- There are six major components of tourism, each with their own sub-components. These are: tourist boards, travel services, accommodation services, conferences and events, attractions and tourism services.
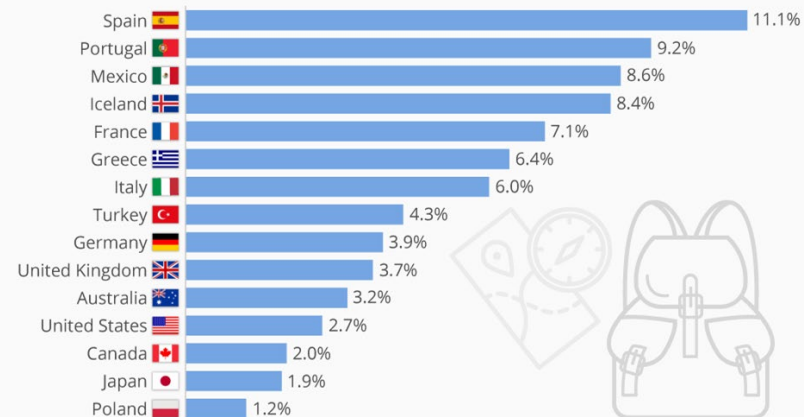
Methodology of Tourism

- The tourism components 4As (Accommodation, Access, Amenities and Attractions) are the ones that tourism managers should consider in the development of the destination and ensure that all components are best suited with the quality and requirements of visitors

- Tourism offers great opportunities for emerging economies and developing countries. It creates jobs, strengthens the local economy, contributes to local infrastructure development and can help to conserve the natural environment and cultural assets and traditions, and to reduce poverty and inequality.


Attractions	Amenities
(Sites and architecture of cultural value)	(Accomodation, F&B outlets, entertainment, retailing, etc.)
4 A's	
Access	Ancillary services
(Transport networks and infrastructure)	(Local organisations)

Where Tourism Gives The Biggest Economic Boost
Tourism as a percentage of GDP in selected OECD countries (2016)*

| Country	%
Spain	11.1%
Portugal	9.2%
Mexico	8.6%
Iceland	8.4%
France	7.1%
Greece	6.4%
Italy	6.0%
Turkey	4.3%
Germany	3.9%
United Kingdom	3.7%
Australia	3.2%
United States	2.7%
Canada	2.0%
Japan	1.9%
Poland	1.2%

Methodology of Tourism

- There are three major measures of actual demand. These include (i) Tourist Arrivals, (ii) Tourist days / Tourist nights and (iii) Amounts Spent. The number of people arriving at tourist destinations is a popular measure of tourist demand.
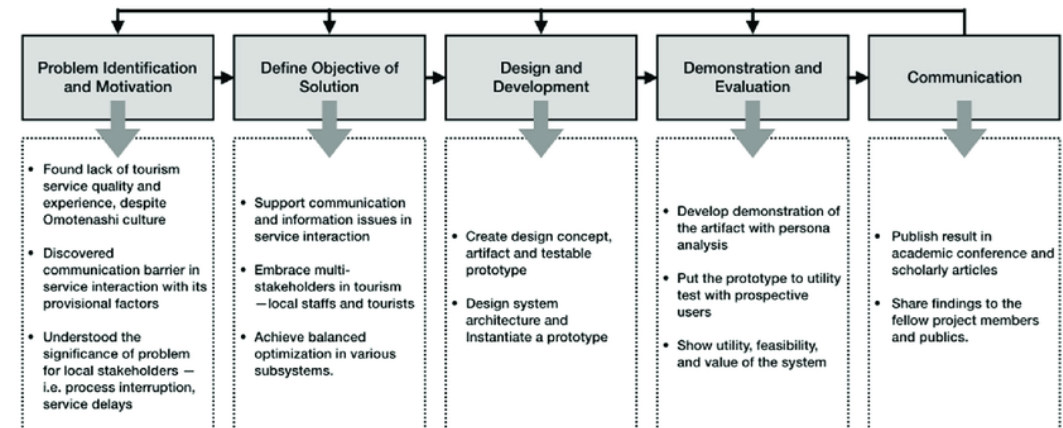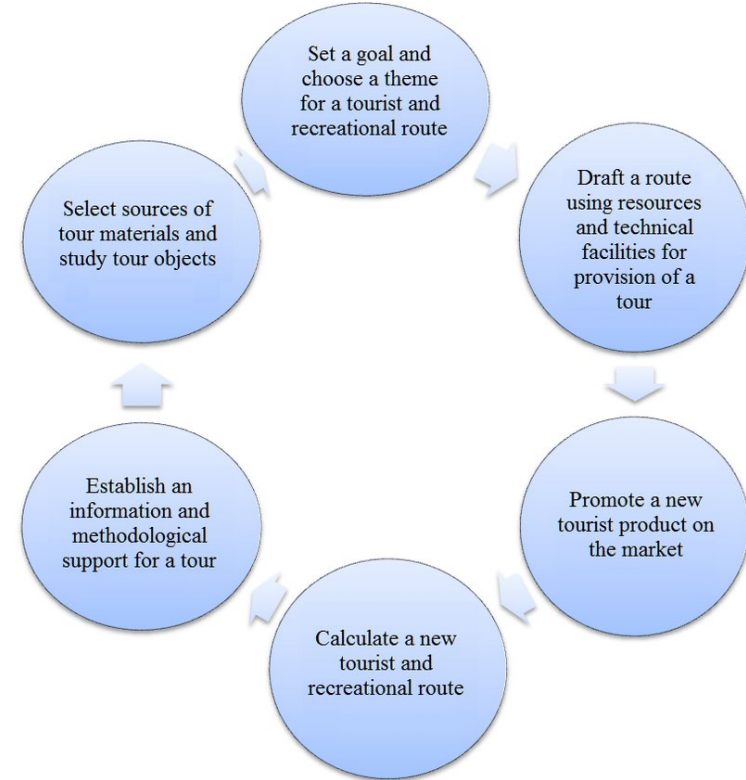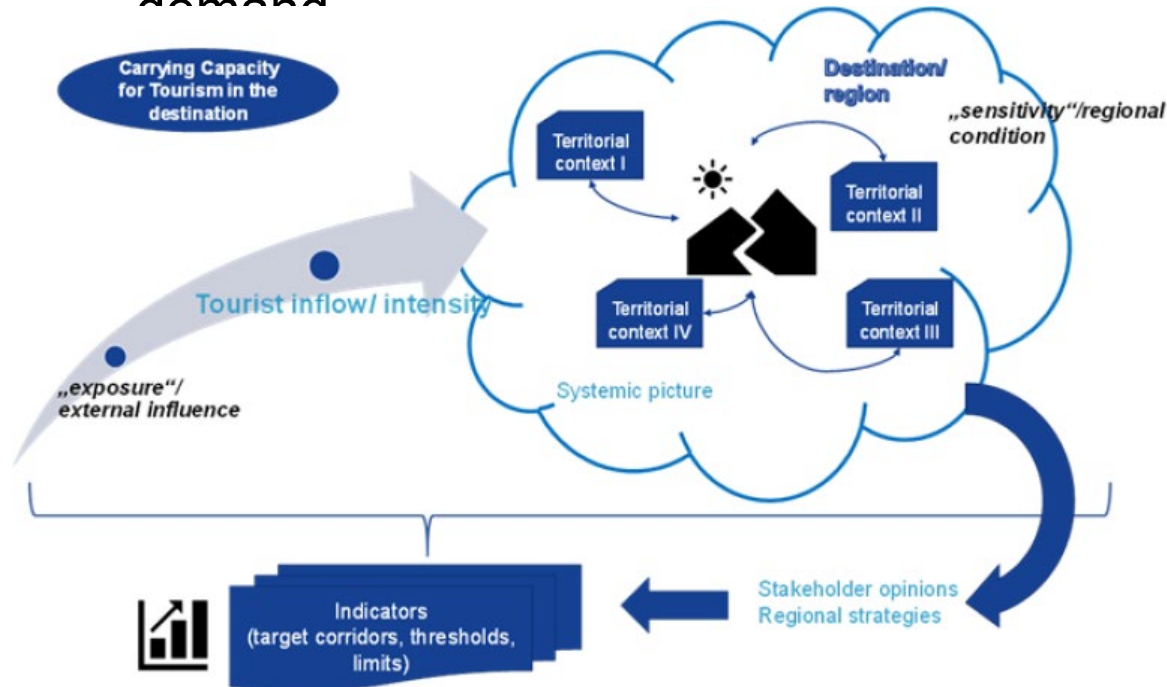
Artificial Intelligence in Tourism

- Artificial intelligence can help travelers plan trips, book flights, and get personalized recommendations. AI-powered features can also help airlines, hotels, and travel agencies update the cost of services in real-time.

- AI data allows tourism businesses to focus on improving the customer's visit as much as possible and guaranteeing an experience of maximum value, with more personalized and differentiated attention than ever, thanks to all the intelligent information travelers can collect.

- AI-powered chatbots and virtual assistants will allow hotel staff to interact with guests in real-time and provide personalized recommendations and assistance. Smart room technology integrated with AI can provide guests with a more comfortable and convenient stay.
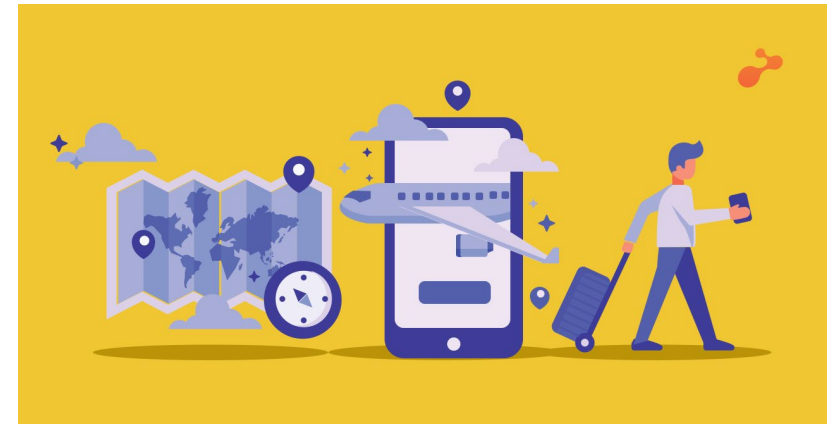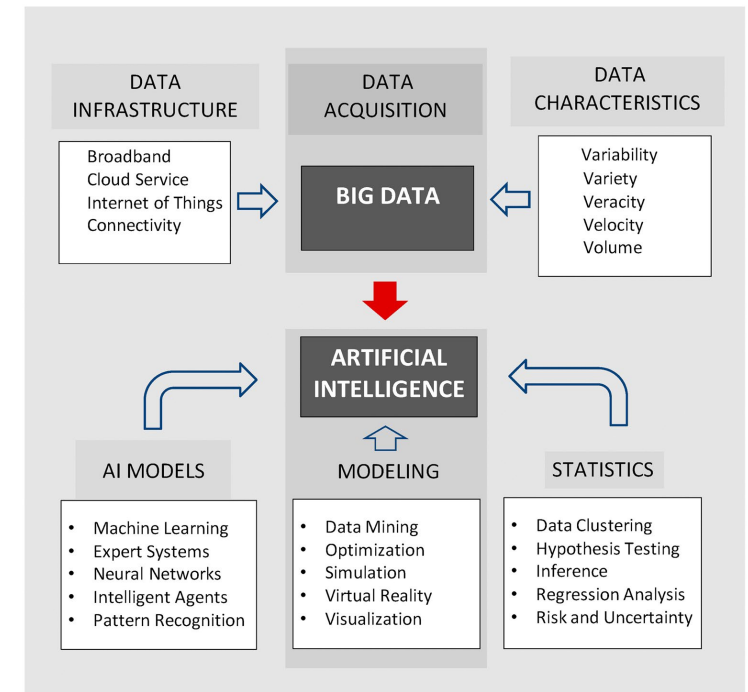
Artificial Intelligence in Tourism

The **challenges** of AI in the tourism industry:

- A lack of data literacy among tourism operators exacerbates challenges. Most professionals lack skills in data collection, statistical analysis, machine learning operations and ethical AI design.

The **future** of AI in the travel industry:

- Travel industry players are excited about predictions that AI could add around $1 trillion extra to the global tourism industry by 2025. This is expected to be delivered via new AI-enabled features like automated customer service, smart marketing targeting, voice- and facial recognition, and better demand management.
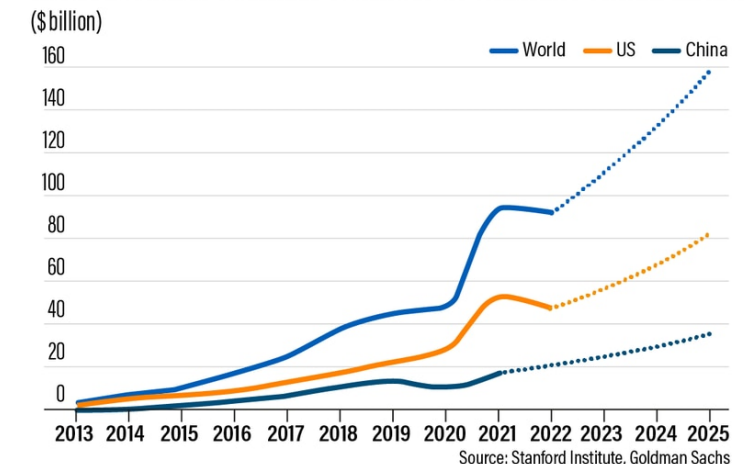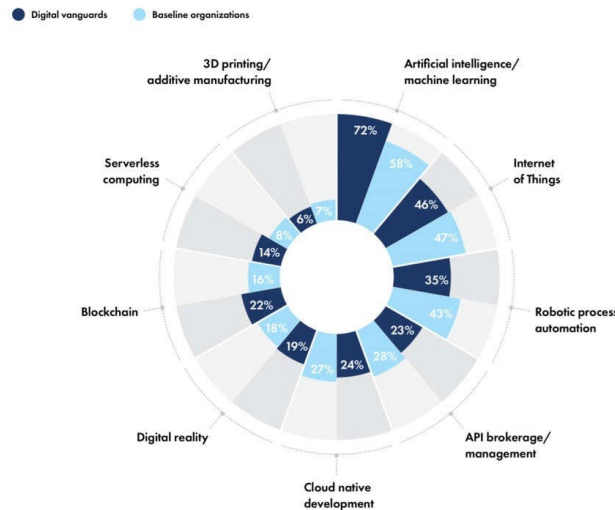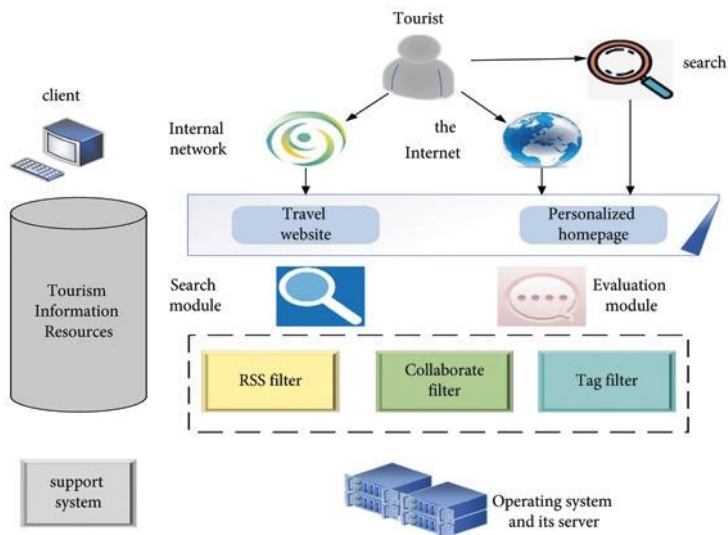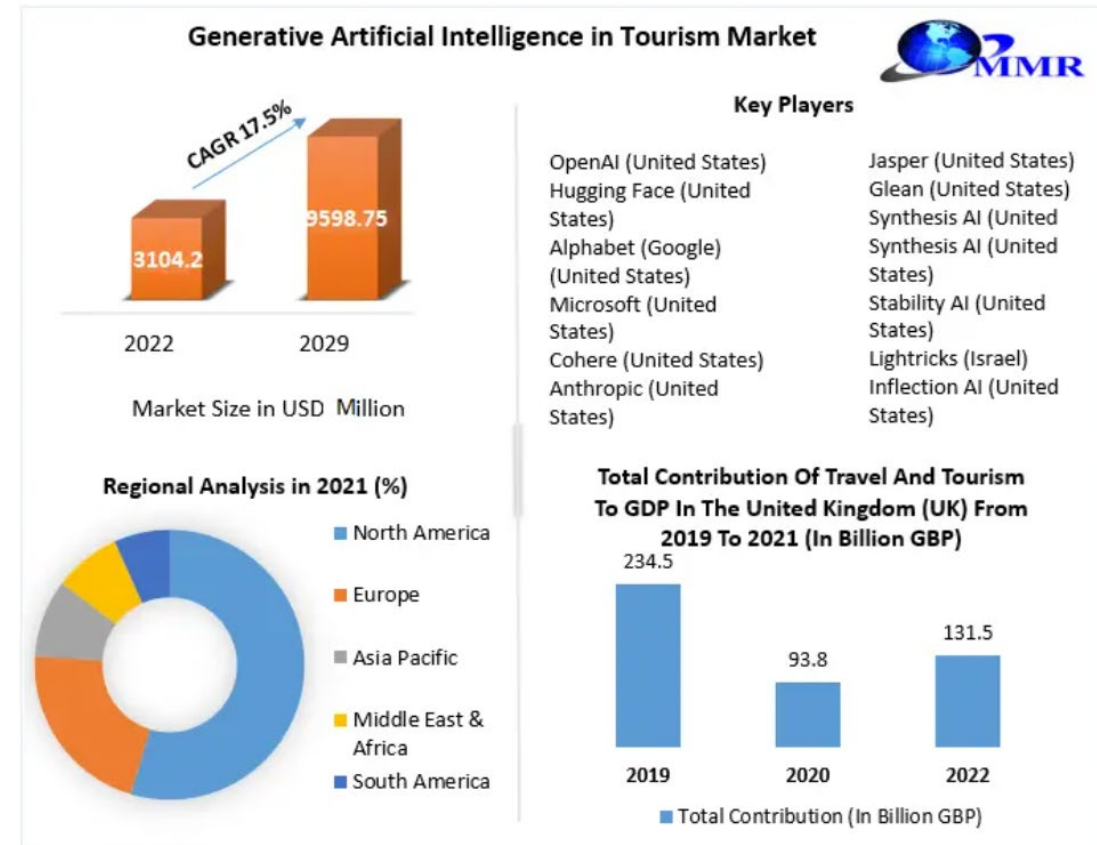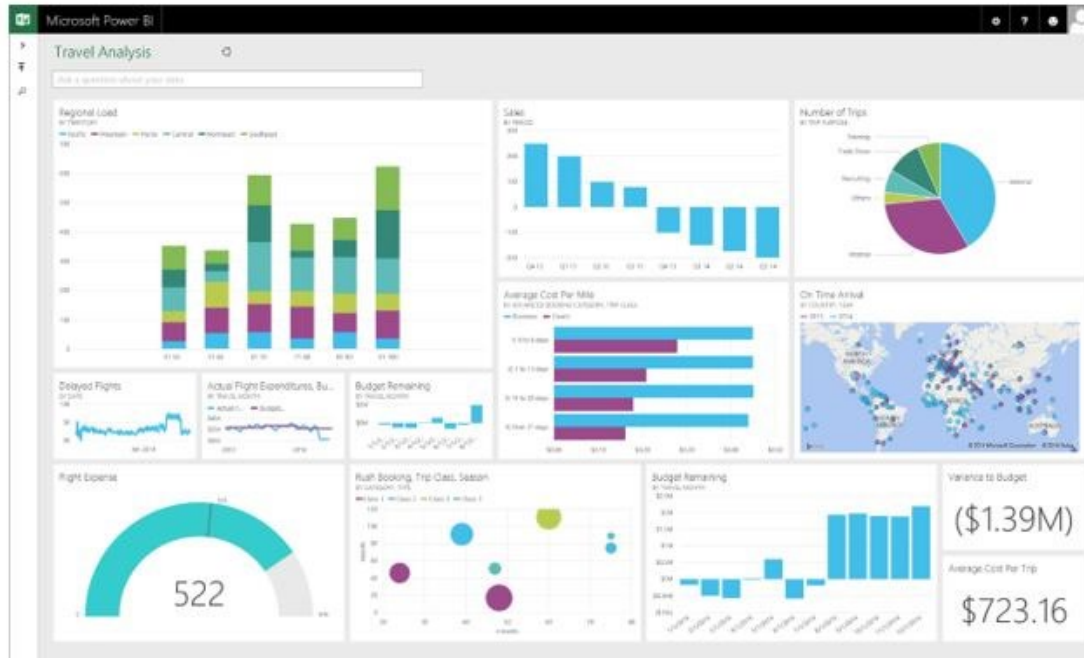
Artificial Intelligence in Tourism

- The Global Generative Artificial Intelligence in Tourism Market size was valued at USD 3104.20 Million in 2022 and the total Generative Artificial Intelligence in Tourism revenue is expected to grow at a CAGR of 17.5% from 2023 to 2029, reaching nearly USD 9598.75 Mn.

Analytics in tourism

Internet of Things in Tourism

VILNIUS TECH
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PICASP
Erasmus+ Project

Co-funded by the
Erasmus+ Programme
of the European Union

- IoT is a major part of smart tourism, as it provides vital data to improve the tourist experience. IoT sensors can be placed throughout the city, especially in the tourist areas, and capture the movements and interactions with tourist attractions, museums, restaurants, parking lots and more.

- When IoT is combined with technologies such as user mobility and data analytics, it brings a new paradigm in hospitality. IoT enables organizations to: Improve guest experiences by offering new amenities, services and a unique digital experience to differentiate from the competition.
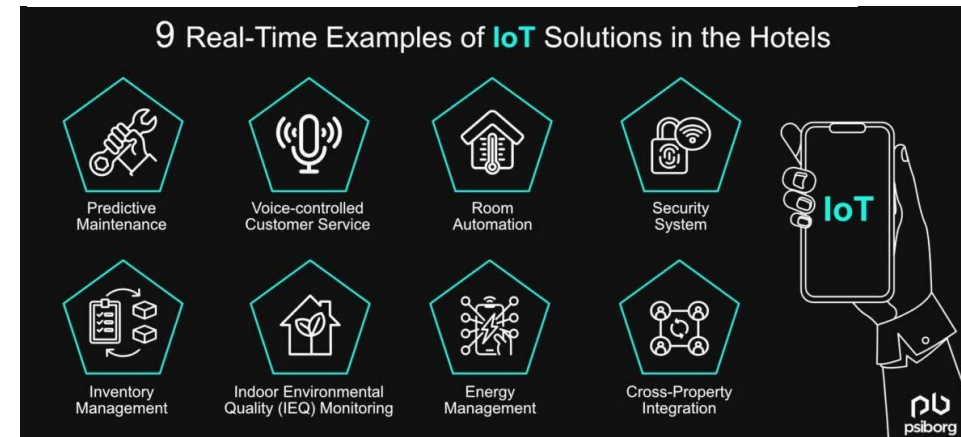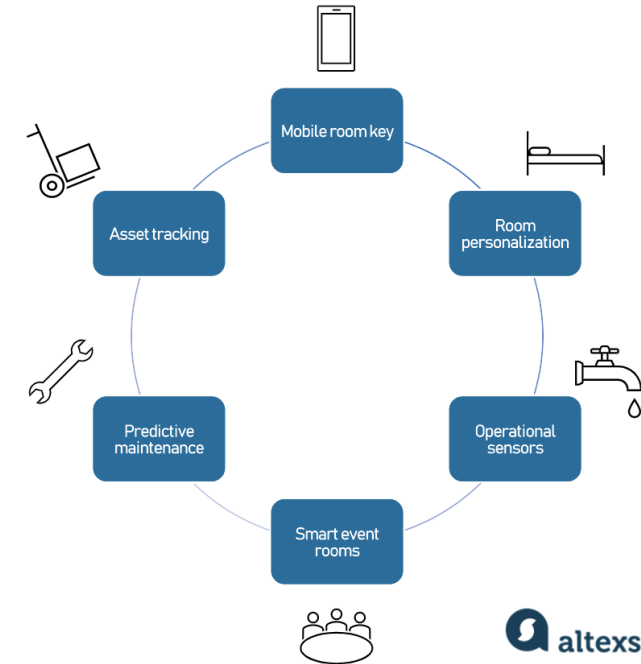
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TECH
Vilniaus Gedimino
technikos universitetas

PICASP
Erasmus+ Project

Internet of Things in Tourism

SMART HOTEL APPLICATIONS
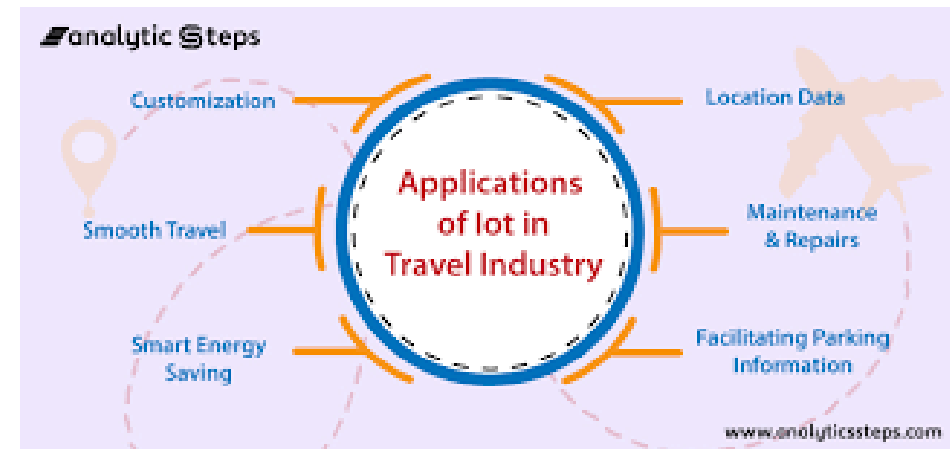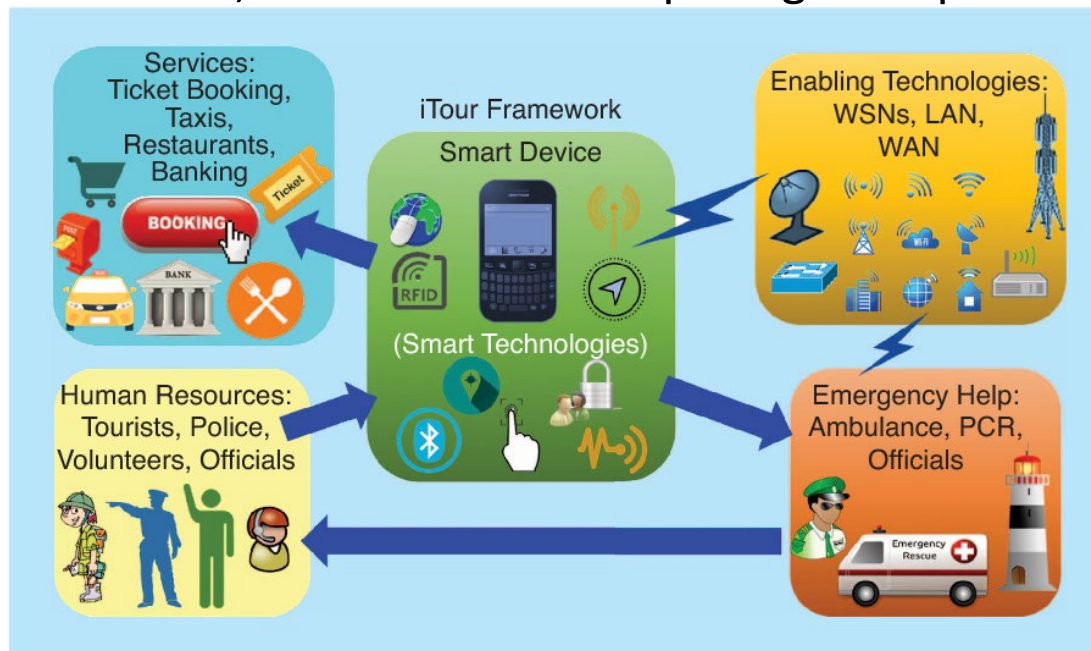
One of the most widespread uses of IoT technology within the travel industry has been enabling a greater degree of personalization within hotels. On flights, and this is primarily provided by enabling customers to control more appliances or services through a centralized device, such as a tablet or even their phone.

IoT solutions for hotels are providing increased comfort and well being to the guests:

1. No more check-in and check out queues.
2. Find the way easily to restaurants and other amenities with in-house navigation.
3. Customized offers/food as per guest's cuisine choices.
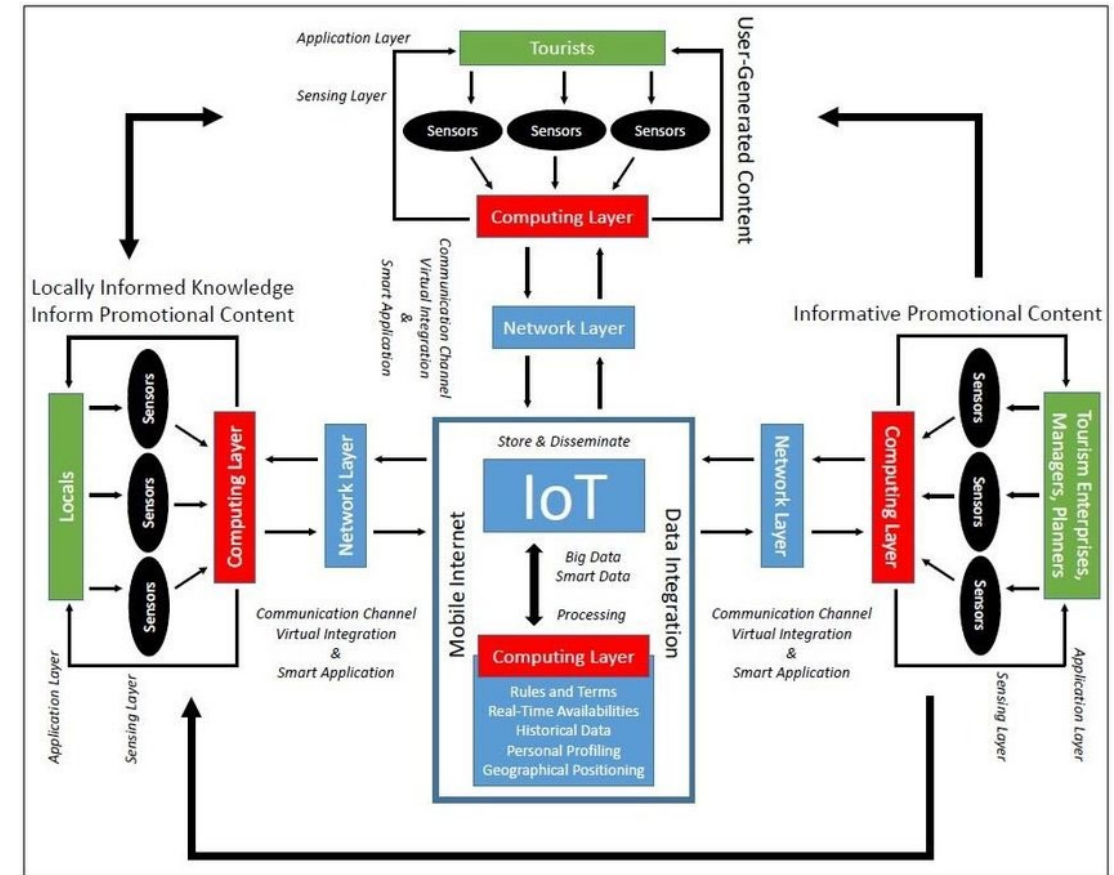4. Room settings personalized as per the guest's liking.

Mobile room key

Asset tracking

Room personalization

Predictive maintenance

Operational sensors

Smart event rooms

altexsoft

9 Real-Time Examples of IoT Solutions in the Hotels

Predictive Maintenance

Voice-controlled Customer Service

Room Automation

Security System

Inventory Management

Indoor Environmental Quality (IEQ) Monitoring

Energy Management

Cross-Property Integration

IoT

psiborg

Internet of Things in Tourism

U.S. IoT analytics market, by vertical, 2014-2025 (USD Billion)

1.23 1.51

2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025

- Manufacturing
- Energy & Utilities
- Retail & E-commerce
- Healthcare & Life Sciences
- Transportation & Logistics
- Others

Airlines getting ready for IoT

86%
IoT will present clear benefits in the next 3 years

71%
Our organization understands the concept of IoT

67%
IoT presents clear benefits today

37%
We have budget allocated for implementation of IoT
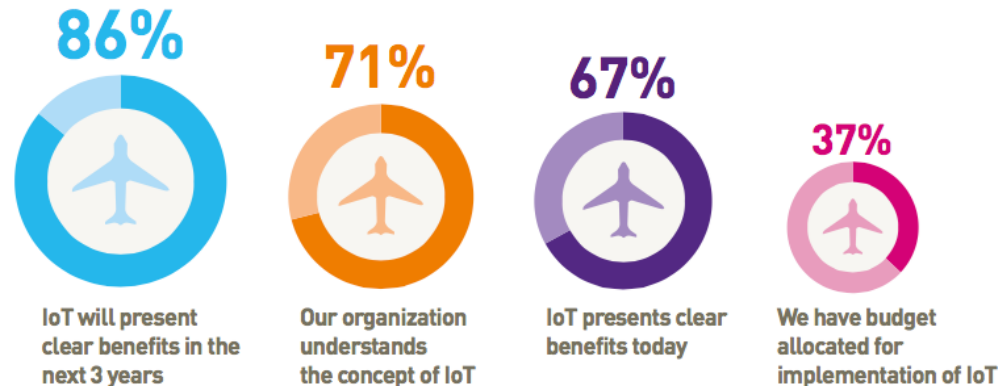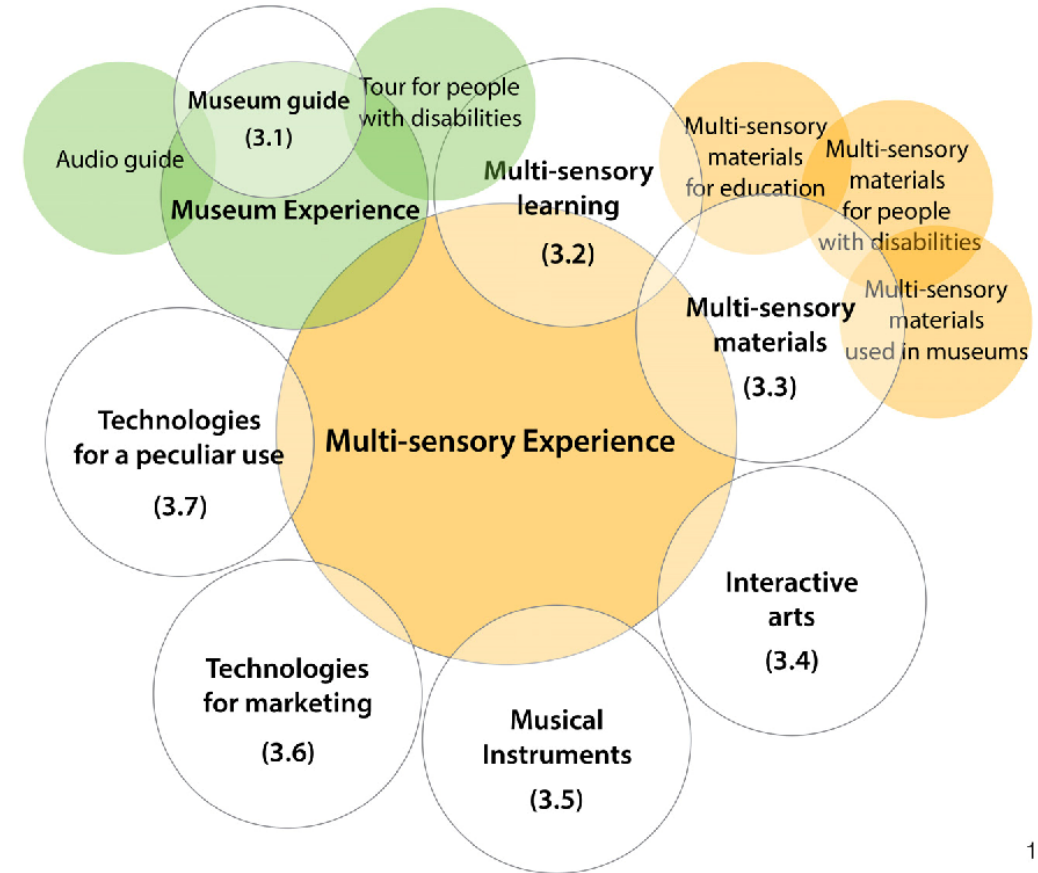

Model of the data flows from the Internet of things to applications supporting tourism

Sensory experience in museum

Museum Experience Model

Personal context
1. Motivation and expectations
2. Prior knowledge and experience
3. Prior interests and believes
4. Choice and control

Sosial context
5. Within-group sociocultural mediation
6. Facilitated mediation by others

Physical context
7. Advance organizers
8. Orientation to the physical space
9. Architecture and large scale environment
10. Design of exhibits and interpretation and content delivery
11. Reinforcing events and experiences outside the museum

personal context

social context

physical context

Museum Experience

Audio guide

Museum guide (3.1)

Tour for people with disabilities

Museum Experience

Multi-sensory learning (3.2)

Multi-sensory materials for education

Multi-sensory materials for people with disabilities

Multi-sensory materials used in museums

Multi-sensory materials (3.3)

Technologies for a peculiar use (3.7)

Multi-sensory Experience

Interactive arts (3.4)

Technologies for marketing (3.6)

Musical Instruments (3.5)

Smart Tourism

Ambient Intelligence (AmI) Tourism

- Internet of Things
- Internet of Everything
- Fifth generation mobile network (5G)
- Radio Frequency Identification (RFID)
- Mobile devices, smartphones and wearables
- Applications or Apps (along with APIs)
- Cryptocurrency and Blockchain
- Sensor and beacon networks
- Pervasive computing
- Gamification
- Analytical capabilities supported by Artificial Intelligence (AI) and Machine Learning (ML)

PUBLIC SECTORS

INFORMATION — SERVICE

VISITORS — RESIDENTS

Transportation
Accommodation
Gastronomy
Ancillary Service
Attraction

Service: Healthcare, Entertainment, Education, Safety
Infrastructure: Mobility, Building
Land: Environment

Smart Tourism
Smart City

INFORMATION — SERVICE

PRIVATE SECTORS

Transit 1:30min 120m
Hotel ★★★★ 40m
Grocery Store ★★★ 30m
Restaurant ★★★★ 25m

NicoElNino/Shutterstock.com

Smart Tourism

Tourism Smart Systems

- Smart tourism aims to develop information and communication infrastructure and capabilities in order to improve management/ governance, facilitate service/product innovation, enhance the tourist experience, and, ultimately, improve the competitiveness of tourism firms and destinations.

- The goal of smart tourism is to improve the efficiency of resource management, maximize competitiveness and enhance sustainability through the use of innovative technologies. Therefore, more and more destinations are joining this modernization of their operations, from payment methods to various interactive activities.
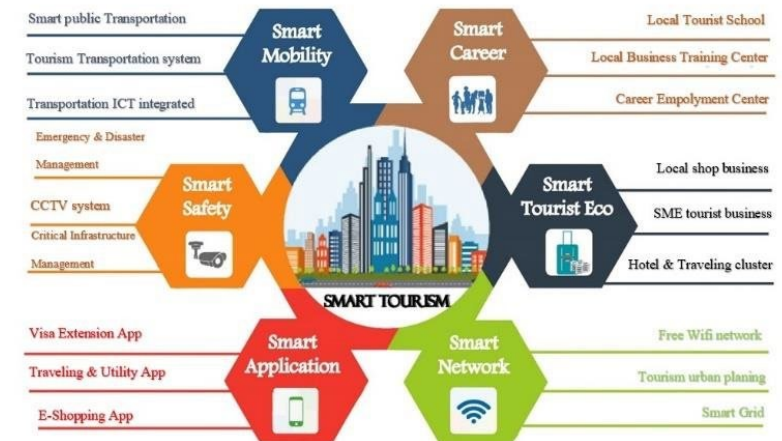
Tourism Smart Systems

The communication must be able to provide personalized services and real-time information for making smart decisions. Three specific smart tourism tools are mobile applications, augmented reality, and near-field communications.

One destination that is leading the way with their smart tourism industry is China, whereby tourists can use their phones to do simple tasks such as pay for taxis, order meals, check queue times and read information on the destination or attraction that they are visiting through a supplied QR code.

A smart tourism destination is based on four main concepts:

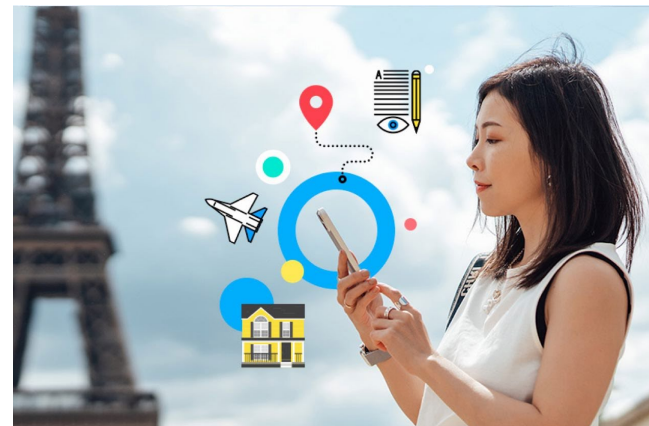- Technology.
- Innovation.
- Accessibility.
- Sustainability.
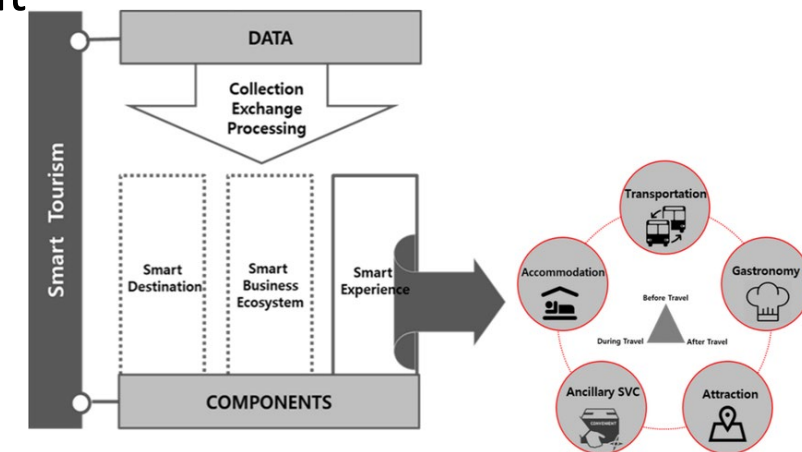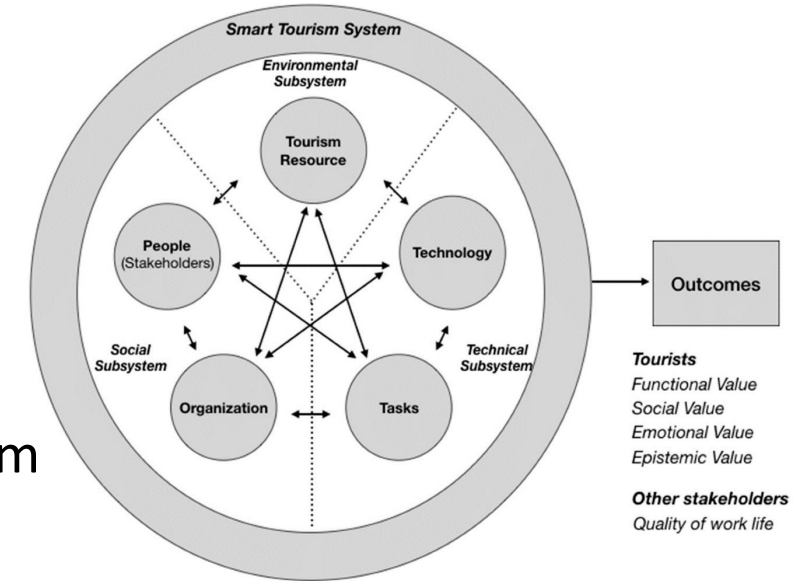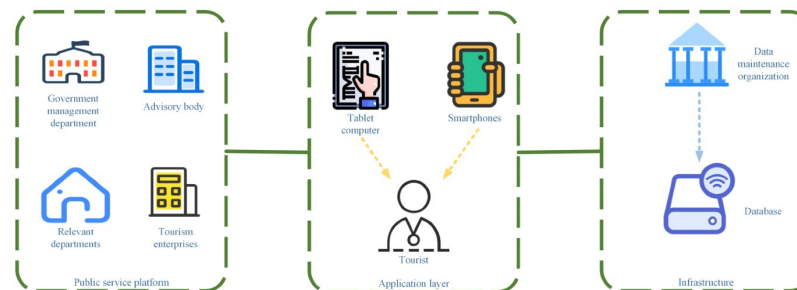
# Tourism Smart Systems
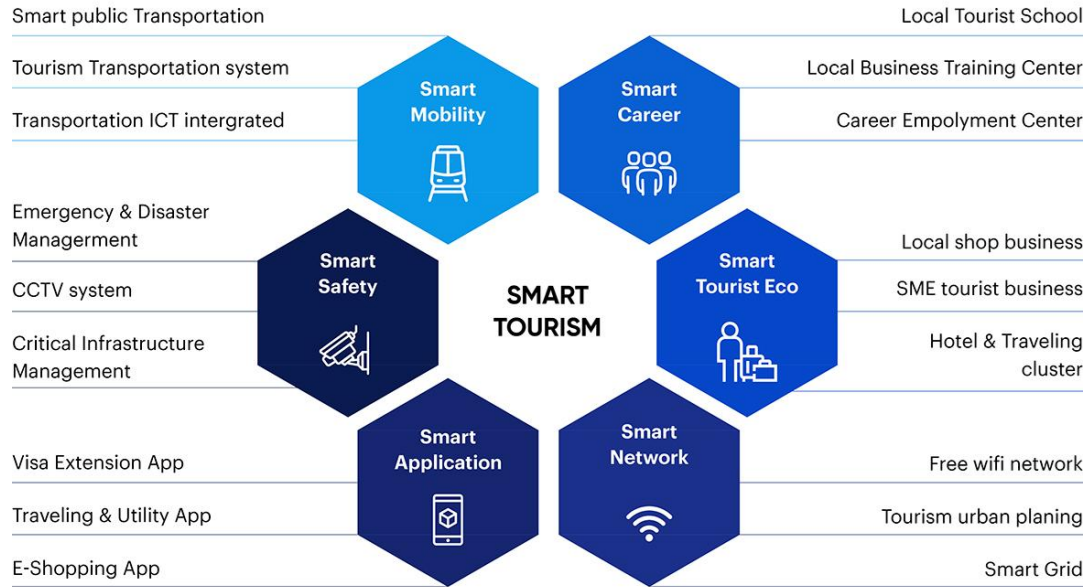
Smart Tourism System (STS)

Vision for the future and strategic priorities

# Smart Tourism towards Society 5.0

- Society 5.0 is categorized as a super smart society according to human evolution from society 1.0.

- The innovative technology through IoT could reach SDG's point, especially in industry, innovation, and infrastructure also partnership for the goals.
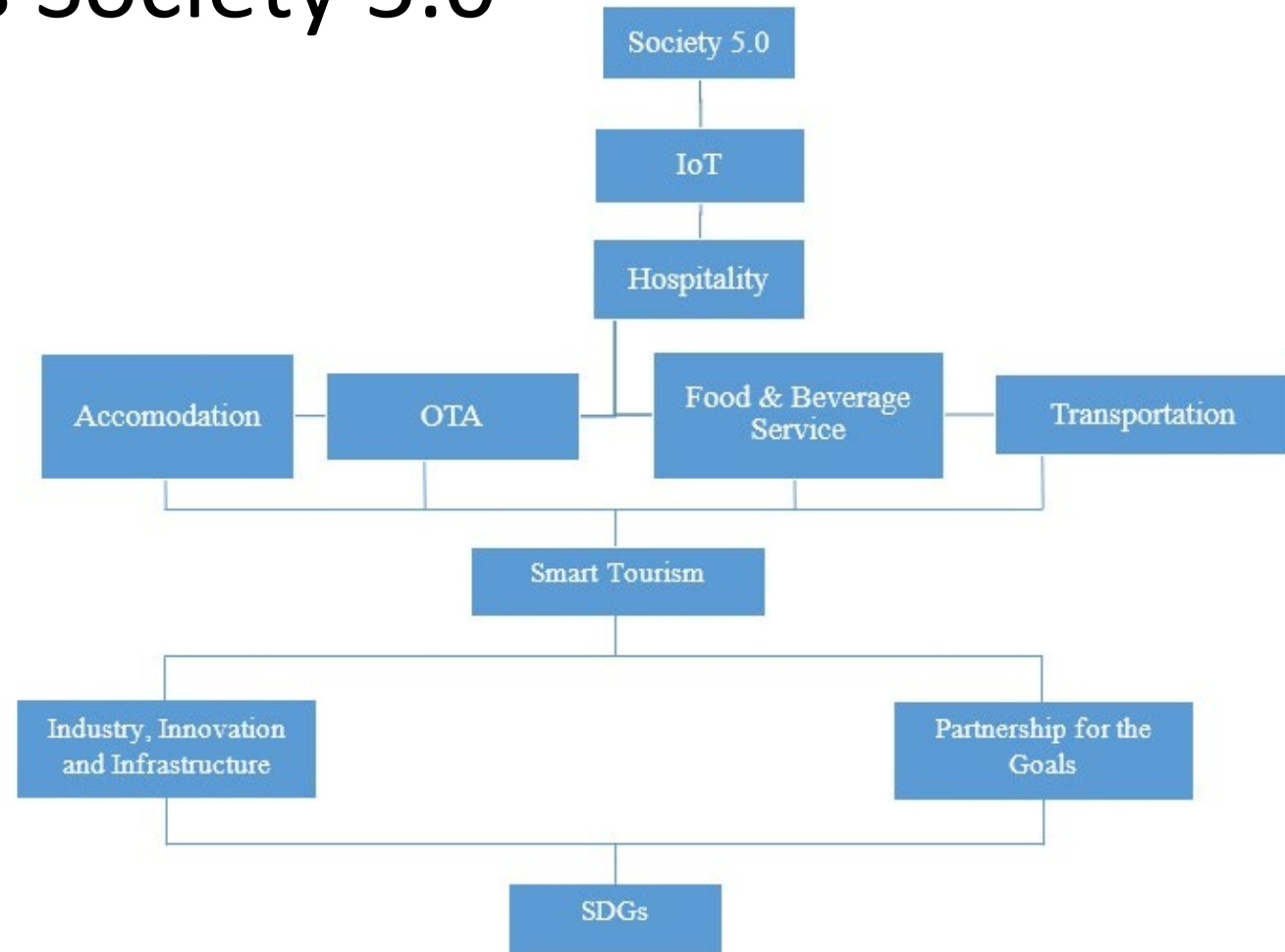
Digital Twin in Tourism

- Digital twin is a 3D digital copy, a replica, of an (existing) asset such as a hotel. It differs from Building Information Modelling (BIM) by being less focused on the design and construction phase, Instead, it seeks to replicate the usage of an asset.

- Digital tourism is the use of digital tools to prepare, organize, control and enjoy the travel experience when doing Tourism.
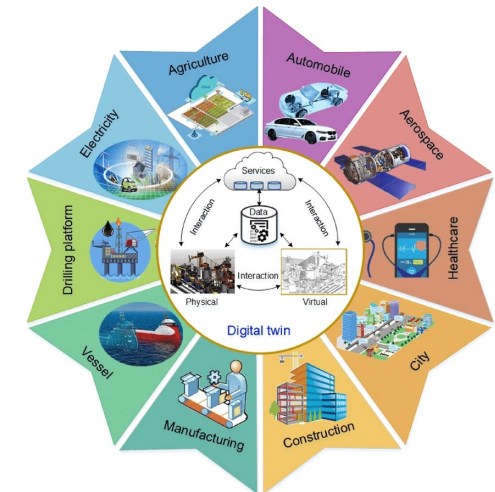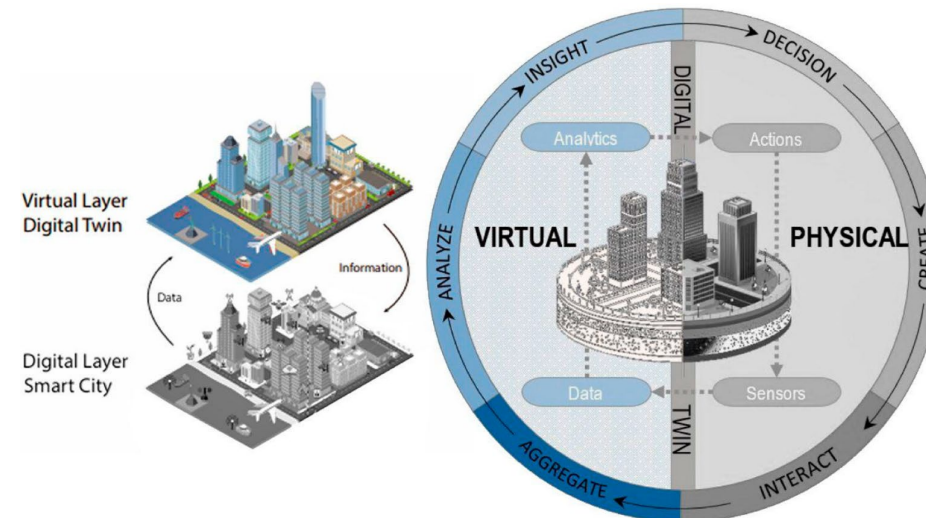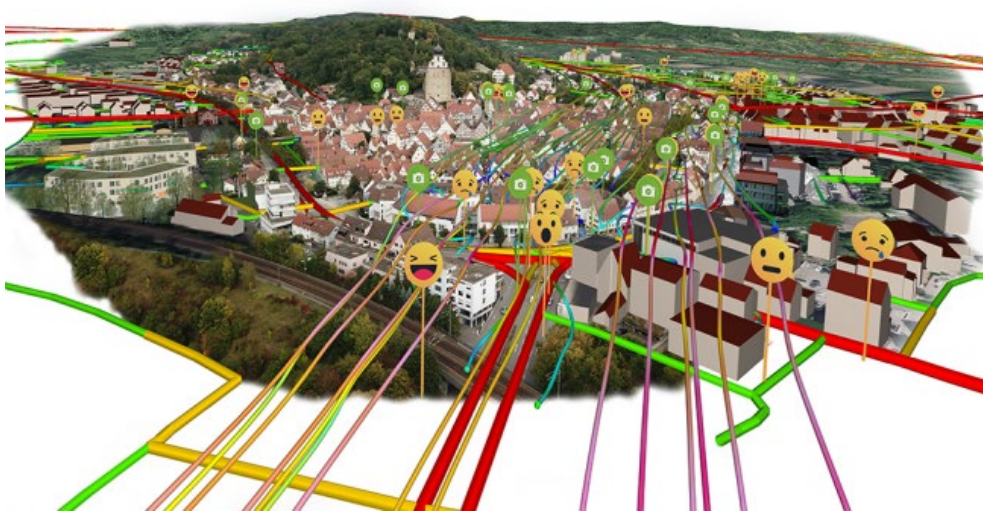
Digital Twin in Tourism

- Digital transformation helps to improve customer experience and builds a positive impact during the entire trip – beginning with an online travel agency, a tour search engine, booking engine, buying tickets online, checking in, sightseeing, checking out, and returning home safely.

- Digital twins are making it easier and more enjoyable for tourists to experience attractions around the world. By providing real-time data, personalized experiences, and interactive elements, digital twins are revolutionizing the way people plan and enjoy their visits to tourist attractions.
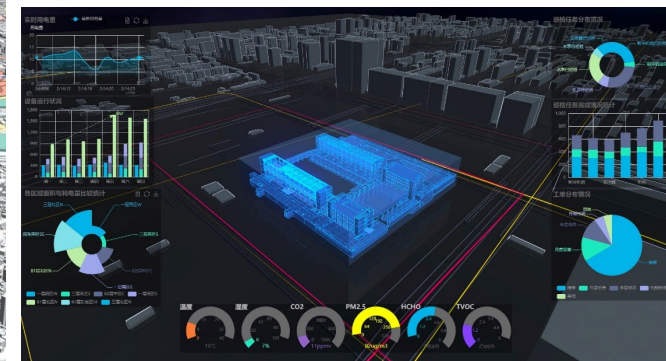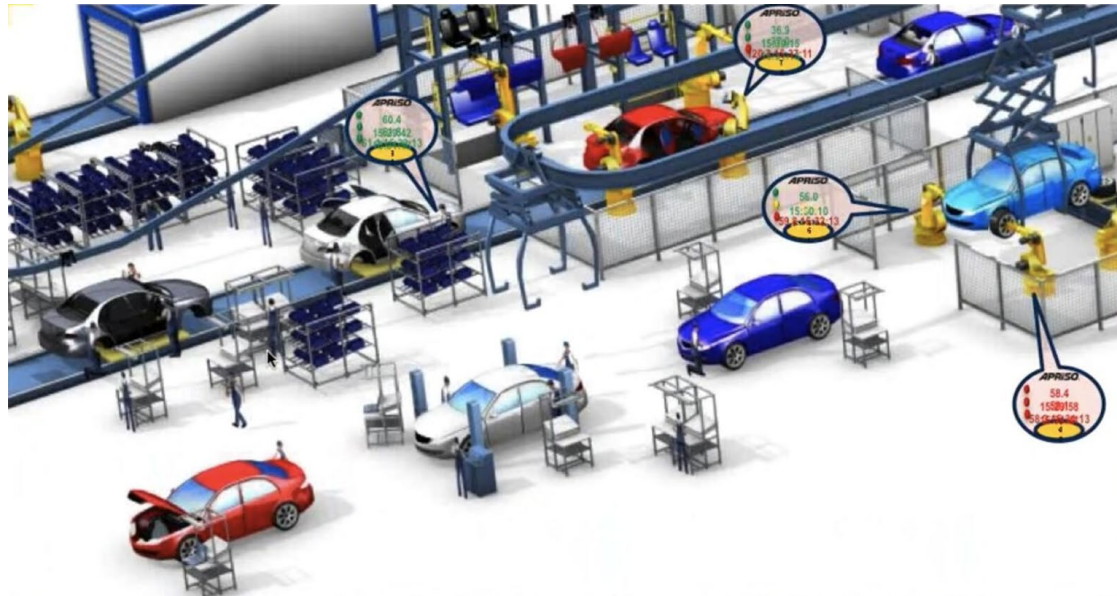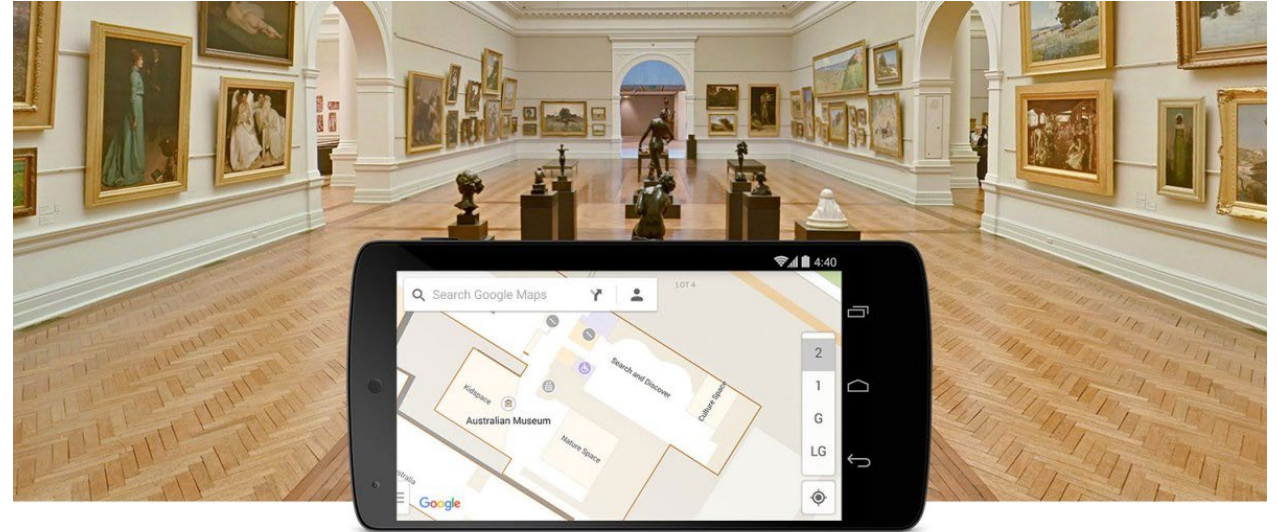
Digital Twin in Tourism

- Digital transformation in the hospitality industry can be used in several ways for improving the guest experience, operational efficiency, and bottom-line performance. For instance, hotels are using digital check-in and check-out processes, as well as online reservations and guest self-service portals.

Digital twins in museum

Tourism and Personalization

- Personalization is a growing marketing trend. In particular, customization is being rapidly adopted within the travel sector. Personalized experiences build trust, customer loyalty, and improve a brand's ability to communicate and engage with customers effectively.

- Personalized tours are customized travel experiences tailored to an individual's preferences, interests, and budget. They are designed to create an itinerary unique to each traveler, offering a more intimate and authentic travel experience.
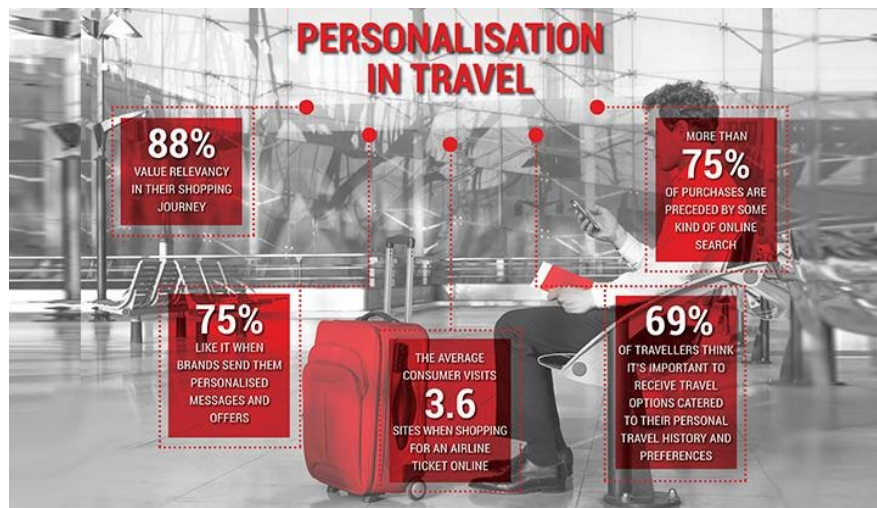
Tourism and Personalization

- Personalising a hotel stay means using what you know about your guest to adapt your service to their preferences. However, be careful not to confuse personalisation with customisation. While both concepts follow the same goal of offering a tailored experience, customisation empowers guests to do this on their own.

- Travel operators have realized that building more relevant and personalized customer experiences is critical to maintain a competitive edge. To achieve true personalization, travel operators must engage their audience from multiple touchpoints, using data gathered from all possible sources.

Remote Sensing in Tourism

- Most passive systems used by remote sensing applications operate in the visible, infrared, thermal infrared, and microwave portions of the electromagnetic spectrum. These sensors measure land and sea surface temperature, vegetation properties, cloud and aerosol properties, and other physical attributes.

- Some of the major functions of GIS application in tourism include digital basic maps, digital files for analyzing and mapping, digital files for mobile mapping and modeling, and digital multimedia.

- Travelers can retrieve weather data, trip planning, destination and
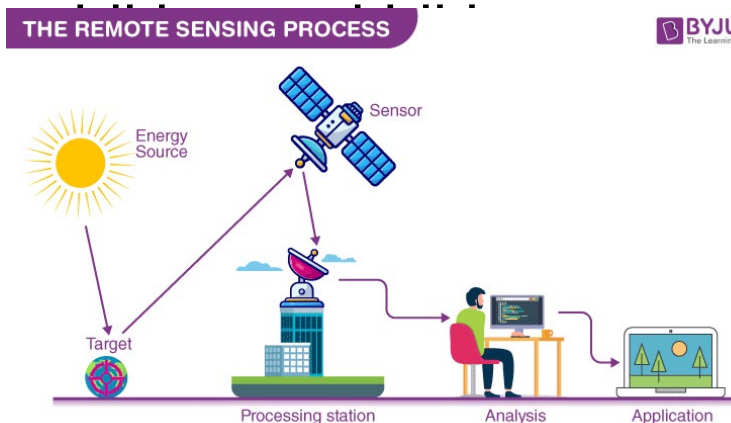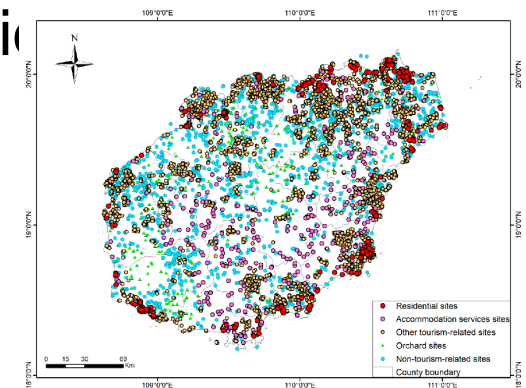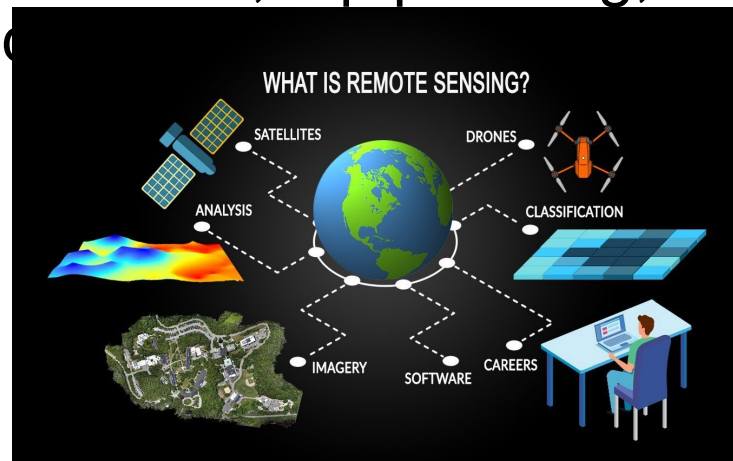
Blockchain in Tourism

- Blockchain helps streamline and fast-track the settlements between hotels, travel agents, third-party vendors, and different aggregators. The centralized ledger speeds up transactions while keeping them more secure than ever before, helping companies combat fraud and data theft.

- Blockchain technology can be a game-changer for hospitality and travel businesses. By managing loyalty programs, tracking sourcing and inventory, and providing secure payments, blockchain can streamline operations and enhance the customer experience.

- TravelChain allows users to collect and monetize travel data, and receive tokens as compensation for sharing with travel service providers.
  - Winding Tree: Displacing Online Booking Hubs
  - Webjet: Adding Assurances and Avoiding Inaccuracies
  - Sandblock: Improving Loyalty's Fungibility
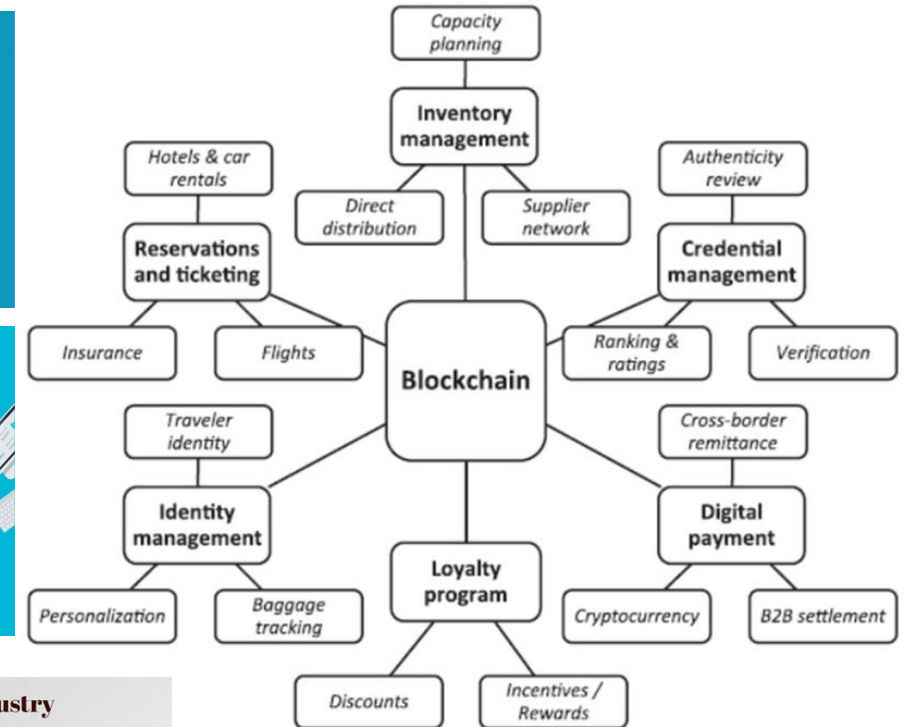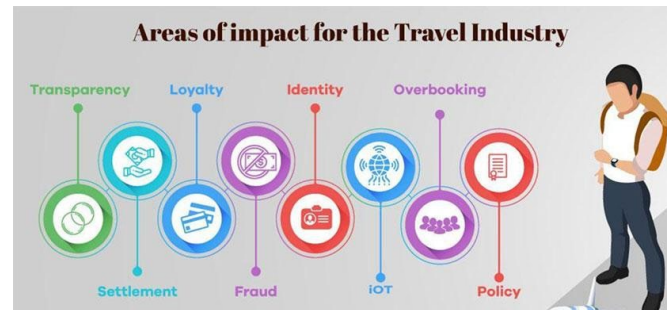 - Accenture: Striving Towards Shorter Lines
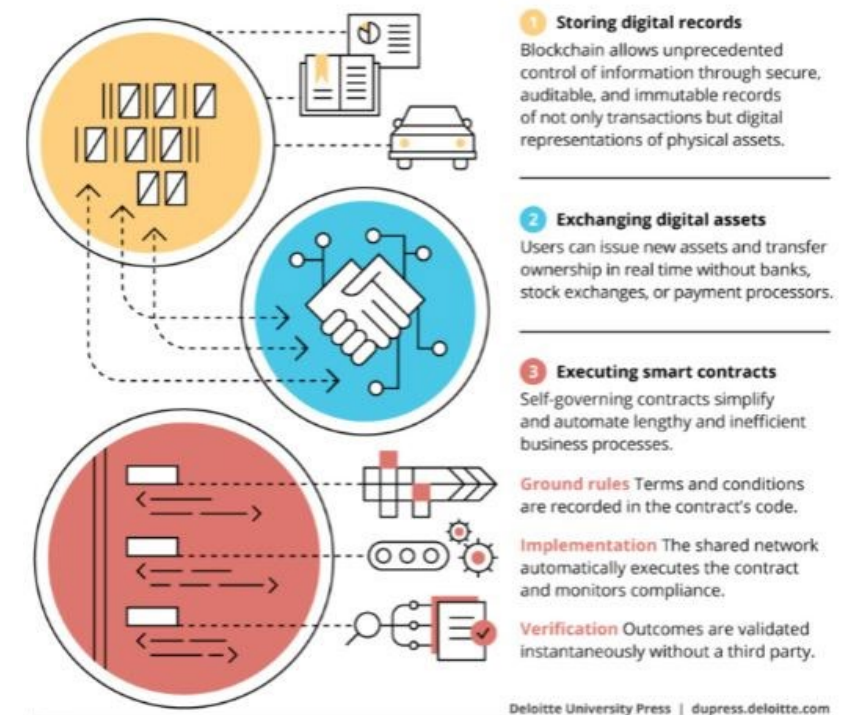
Blockchain in Tourism

The most common use case in airports for blockchain is in optimizing the passenger identification process; 40% of airlines and 36% of airports have stated this as a major benefit. With the advent of blockchain, it is now possible to exchange data in a secure, tamper-proof and reliable manner.

Applications of Blockchain in the Tourism Industry:

- Smart Contracts and Booking Systems

- Identity Verification and Authentication

- Loyalty Programs and Rewards

- Destination Management and Tracking

- Reviews and Reputation Systems

- Blockchain-Based Booking Platforms

- Secure and Traceable Travel Insurance Claims

Areas of impact for the Travel Industry

Transparency · Loyalty · Identity · Overbooking

Settlement · Fraud · IoT · Policy

Capacity planning · Inventory management · Authenticity review · Hotels & car rentals · Direct distribution · Supplier network · Credential management · Reservations and ticketing · Insurance · Flights · Blockchain · Ranking & ratings · Verification · Traveler identity · Cross-border remittance · Identity management · Loyalty program · Digital payment · Personalization · Baggage tracking · Cryptocurrency · B2B settlement · Discounts · Incentives / Rewards

Blockchain in Tourism

BLOCKCHAIN & TOURISM

Use-Cases of Blockchain in the Travel & Tourism industry

- Decentralized Payment System
- Customer Verification
- Baggage administration
- Customer Rewards
- Business Information Ledger

1 Storing digital records
Blockchain allows unprecedented control of information through secure, auditable, and immutable records of not only transactions but digital representations of physical assets.

2 Exchanging digital assets
Users can issue new assets and transfer ownership in real time without banks, stock exchanges, or payment processors.

3 Executing smart contracts
Self-governing contracts simplify and automate lengthy and inefficient business processes.

Ground rules Terms and conditions are recorded in the contract's code.

Implementation The shared network automatically executes the contract and monitors compliance.

Verification Outcomes are validated instantaneously without a third party.

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Blockchain in Tourism

- According to the United Nations World Tourism Organization (UNWTO), the international tourist arrival has grown annually by 6 %, worldwide; By 2036, close to 7.8 billion passengers will be air-borne as compared to 4 billion in 2017. Similarly, the hospitality sectors recorded USD 500 trillion dollar market in 2018 and this growth projected to be three-fold by 2030. Thus, there is a need to maintain trust between travelers and tourism and hospitality stakeholders. It provides the seamless services such as-ticket bookings and payments while ensuring a proper communication channel between various tourists.

- Blockchain addresses tourist requirements as it provides trust, transparency, security, and creditability by adding transactions in a distributed ledger which cannot be tampered.
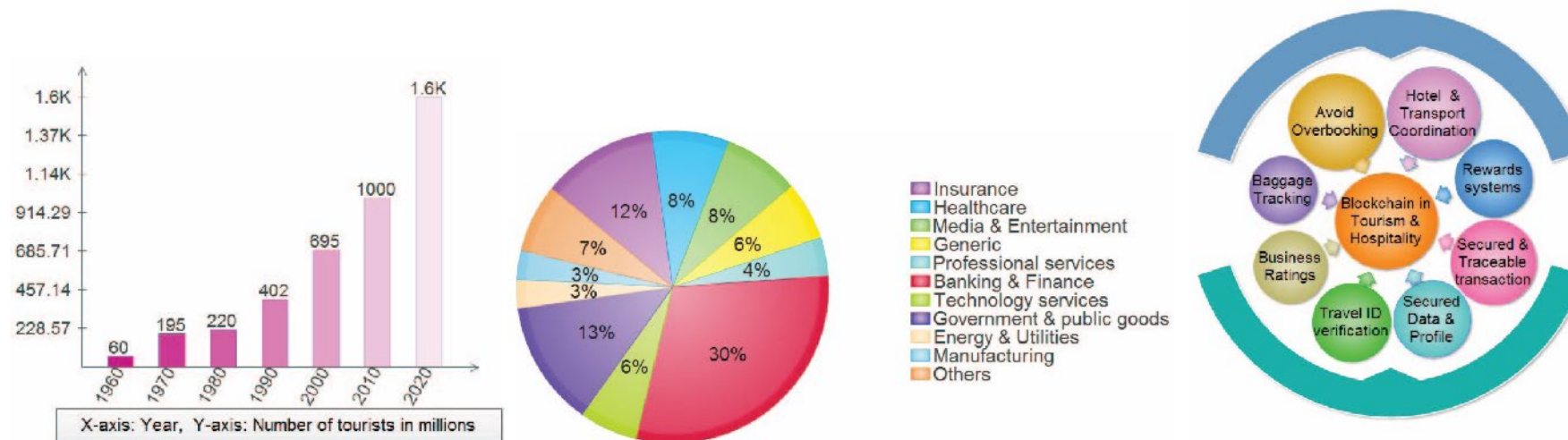
Fig. 1. Technological revolution in tourism industry: (a) Projected growth in tourist arrivals worldwide by 2020 , (b) Sectors currently employing blockchain applications , and (c) Advantages of blockchain in tourism and hospitality management

Robots in Tourism

- Service robots are being implemented in many front office tasks and include those from waiter robots in restaurants to robotic concierges in hotels and are increasingly being used in the hospitality and tourism sectors to simultaneously provide the customer with improved services while reducing costs.

- Airport robots can also be used for security purposes. Robots can be equipped with sensors and cameras to monitor airport premises and detect potential security threats. These robots can move around freely and provide real-time data to security personnel, improving situational awareness and response times.

- Among the most innovative uses of robots within the travel industry so far is Travelmate, a robotic suitcase, which removes the hassle of travel. The suitcase can follow its owner around autonomously, utilizing collision detection technology and 360-degree turning capabilities, removing the need to carry the case.
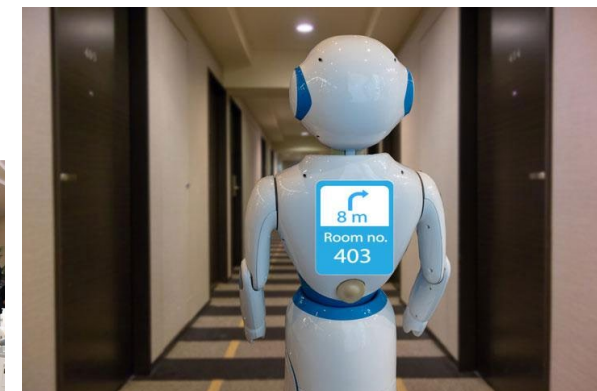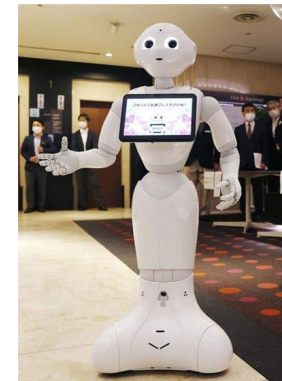
Robots in Tourism

The robots are designed to deliver items to guest rooms, including towels, toiletries, and other amenities. Guests can also use the robots to request housekeeping services or recycle unwanted items. The results have been impressive.
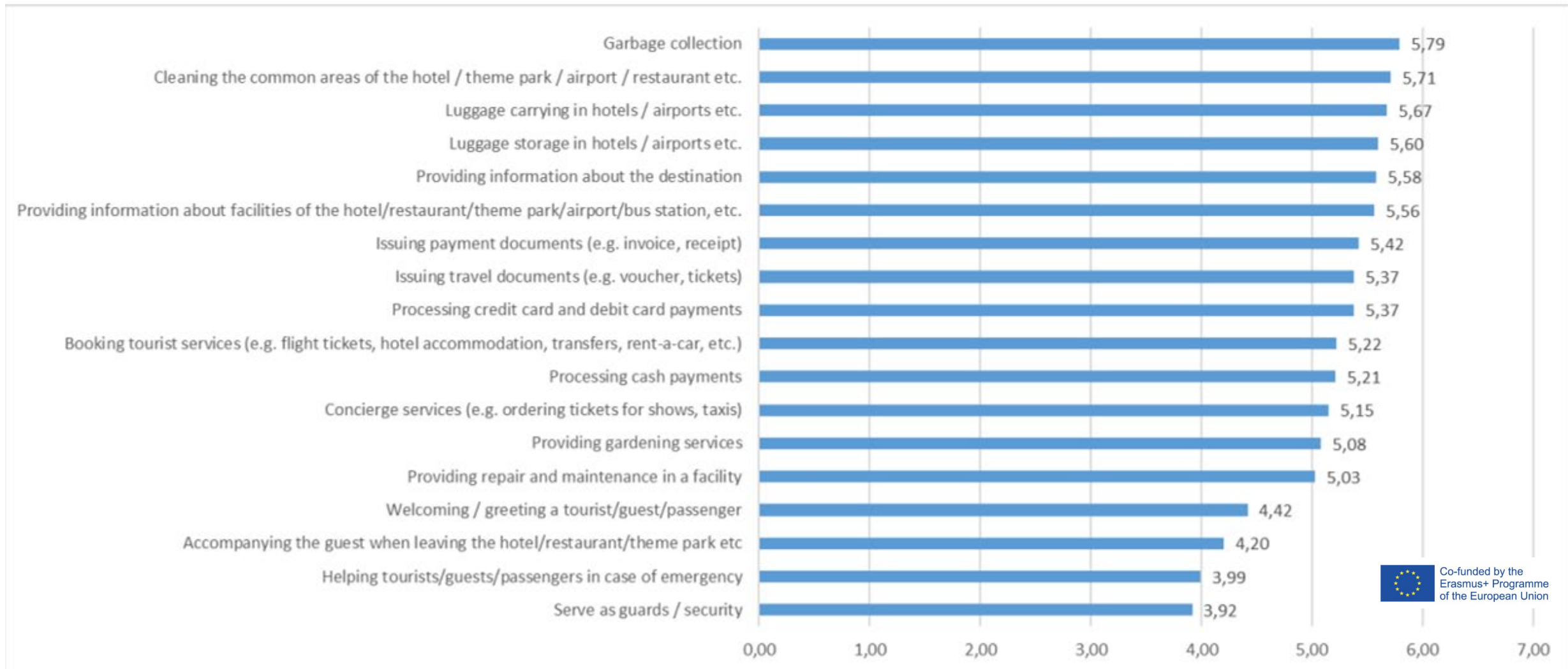
Here is a list of some of the benefits of robots in hotels:

- Hotel Robots can make make check-in smoother.

- Hotel Robots are not contagious.

- Robots don't get tired.

- Robots free up staff members to perform other guest-related tasks.

- Robots bring variable costs down.

- Robots aid in delivering dependable, consistent services.

Robots in Tourism

Perceived appropriateness of robot application in travel, tourism and hospitality – common activities

| Activity	Value
Garbage collection	5,79
Cleaning the common areas of the hotel / theme park / airport / restaurant etc.	5,71
Luggage carrying in hotels / airports etc.	5,67
Luggage storage in hotels / airports etc.	5,60
Providing information about the destination	5,58
Providing information about facilities of the hotel/restaurant/theme park/airport/bus station, etc.	5,56
Issuing payment documents (e.g. invoice, receipt)	5,42
Issuing travel documents (e.g. voucher, tickets)	5,37
Processing credit card and debit card payments	5,37
Booking tourist services (e.g. flight tickets, hotel accommodation, transfers, rent-a-car, etc.)	5,22
Processing cash payments	5,21
Concierge services (e.g. ordering tickets for shows, taxis)	5,15
Providing gardening services	5,08
Providing repair and maintenance in a facility	5,03
Welcoming / greeting a tourist/guest/passenger	4,42
Accompanying the guest when leaving the hotel/restaurant/theme park etc	4,20
Helping tourists/guests/passengers in case of emergency	3,99
Serve as guards / security	3,92

Robots in Tourism

- According to the global hospitality robot market forecast, the market size is expected to reach up to $17,10,879.9 thousand by 2028, surging from $2,81,500.0 thousand in 2020, at a noteworthy CAGR of 25.7%.
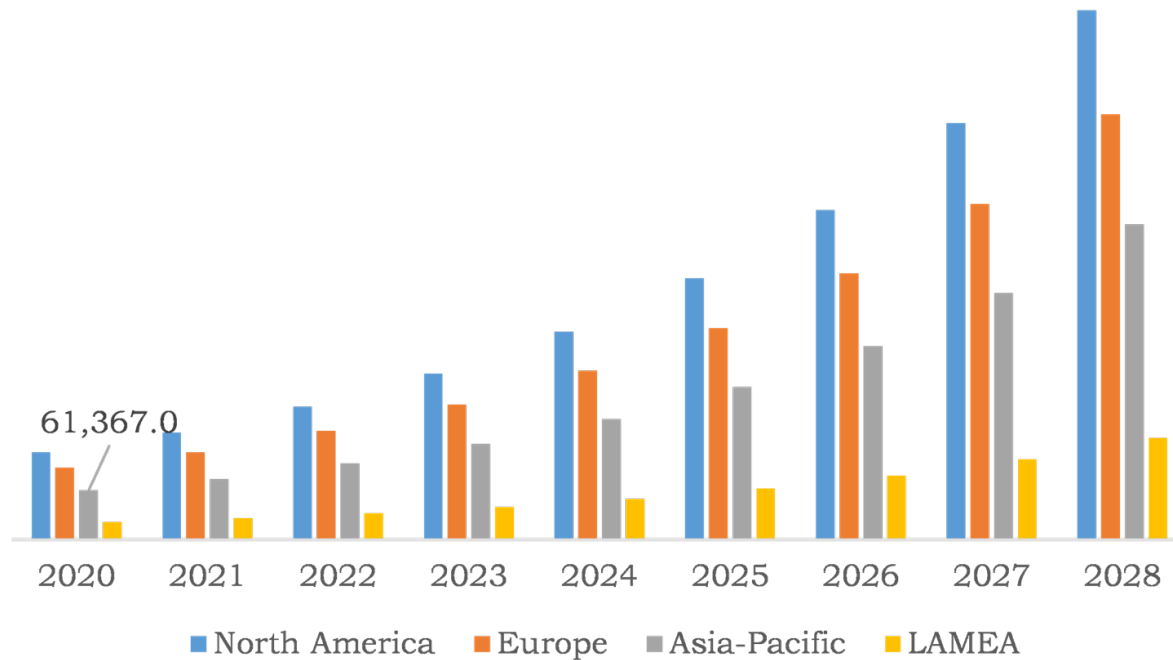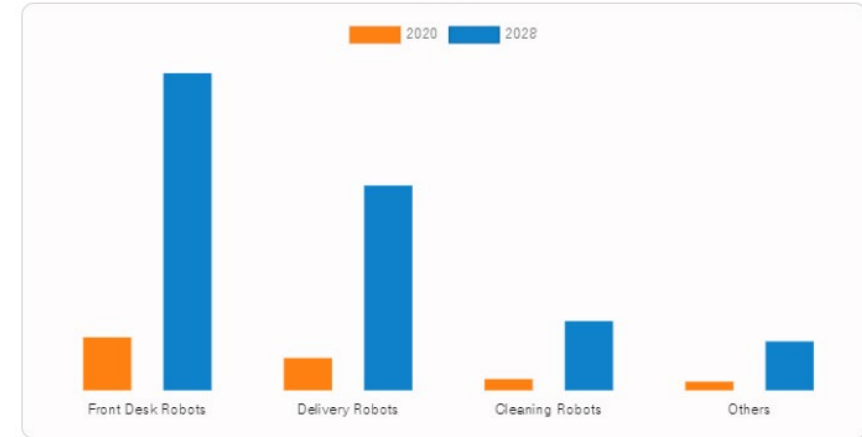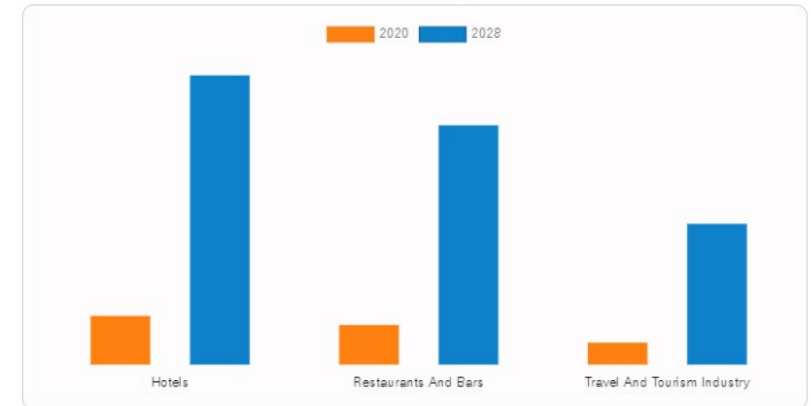
Tourism and Immersive Reality

- Immersive technology has been adopted and implemented in various tourism areas. The technology provides a surrogate experience that can be used to convince potential visitors to travel to a tourism destination. The benefit usage of immersive technology includes navigation systems, tourism promotion, and enhanced user experiences during visitation.

- Experiential travel, also known as immersion travel, is a form of tourism in which people focus on experiencing a country, city or particular place by actively and meaningfully engaging with its history, people, culture, food and environment. It can often be transformative.

Immersive reality in museum
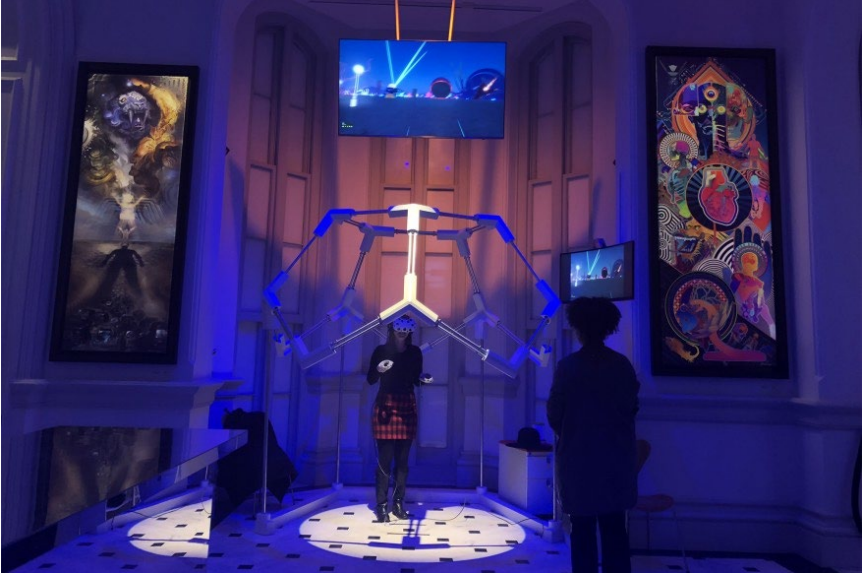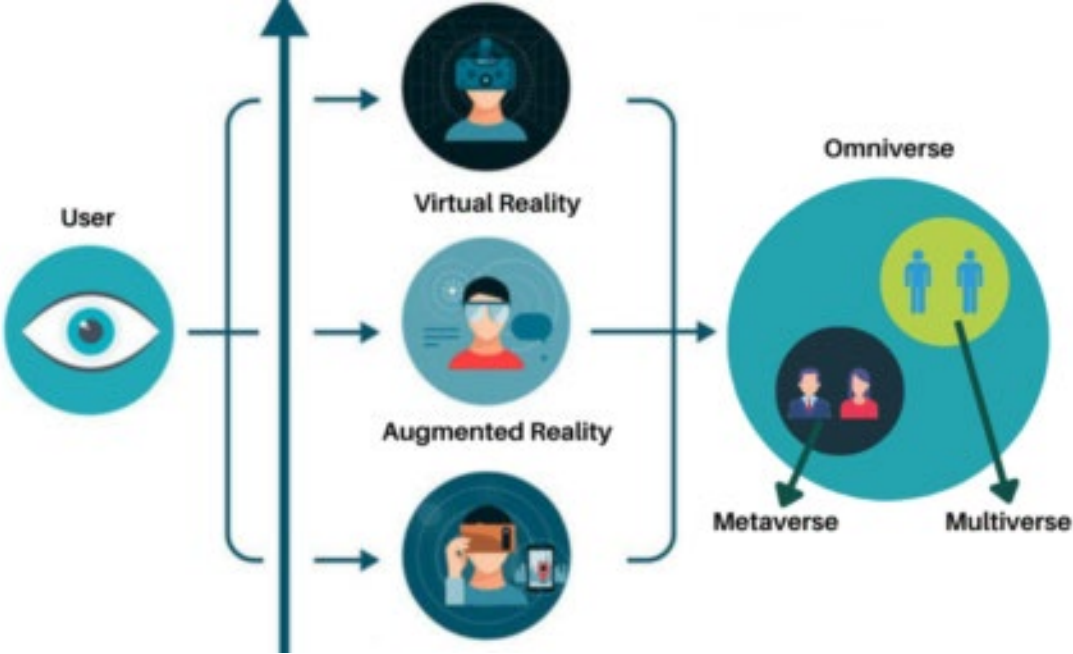
Tourism and Virtual Reality

- Virtual tourism has been in use for years to highlight the unique aspects of a location. These aspects can be history and culture to exciting activities, local attractions, and fun trivia. 360-degree VR video is used by hotels and local governments to capture everything about a destination in an immersive way.

- VR tech can revolutionize the tourism industry by transforming how travelers plan and experience their trips. In the future, it could be used for destination marketing, creating personalized travel experiences, and enhancing in-destination experiences through immersive tours and interactive exhibits.
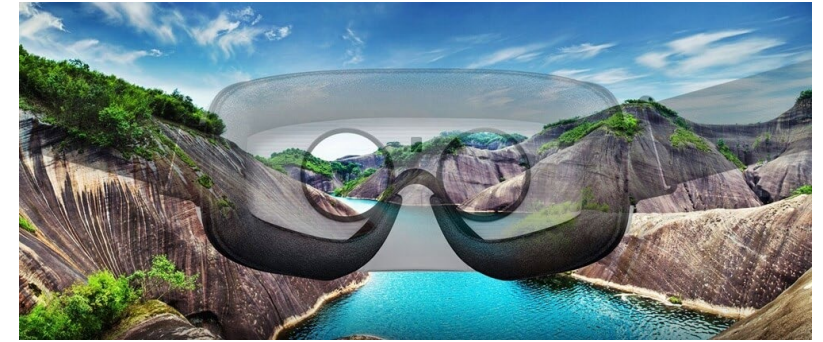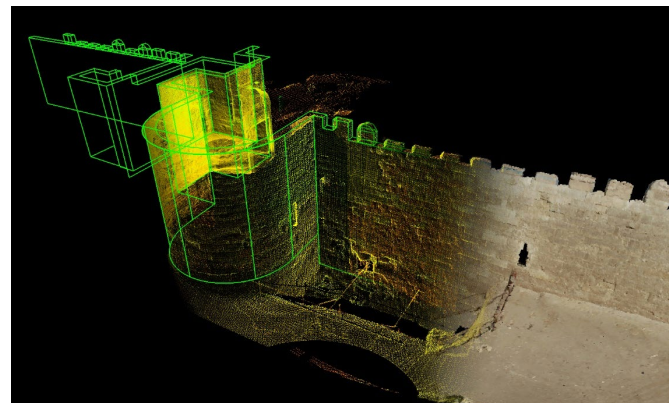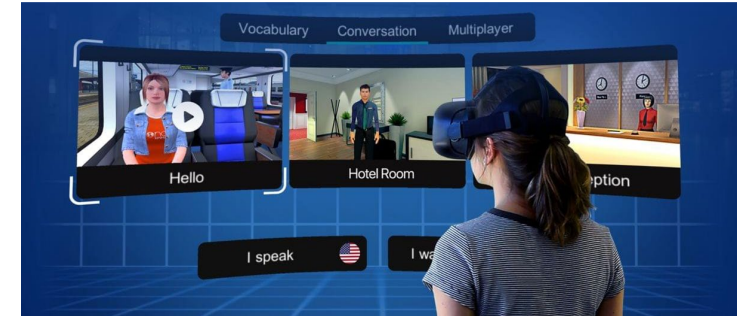
Tourism and Virtual Reality

- VR offers a variety of applications, such as virtual tours, hotel previews & cultural/educational experiences to aid in decision making.

- Virtual tourism involvement has a significant positive effect on tourists' place imagination, experience memory and affective attachment; tourists' place imagination has a significant positive effect on experience memory and affective attachment; tourists' experience memory has a significant positive effect on affective attachment; tourists' affective attachment has a significant positive effect on social education effect.

Examples of the Use of Virtual Reality in Tourism

- Virtual tours of famous landmarks
- Museum and art gallery visits
- Virtual reality travel agencies
- VR language immersion programs
- Adventure and extreme sports simulations
- Cultural and historical reenactments
- Wildlife and nature experiences
- Culinary experiences
- Virtual reality for accessible travel
- VR-enhanced hotel experiences
- Virtual reality theme parks
- Virtual reality cruise experiences
- Event and festival experiences
- Travel planning and destination previews
- VR for travel education and training

# How will augmented reality support the tourism experience?

Tourism and Augmented Reality

- Augmented reality allows users to get virtual or interactive tours of travel destinations or tourist spots. By using AR-based travel apps, users can go on virtual tours of famous landmarks while being in one place.

- Away from hotel environments, some companies within the travel industry are developing augmented reality apps, which allow tourists to enhance physical locations and tourist attractions.

- This can save time and money by allowing event planners to get a feel for the space without having to physically visit the hotel. Augmented reality can be used to allow guests to customize their room before they arrive.
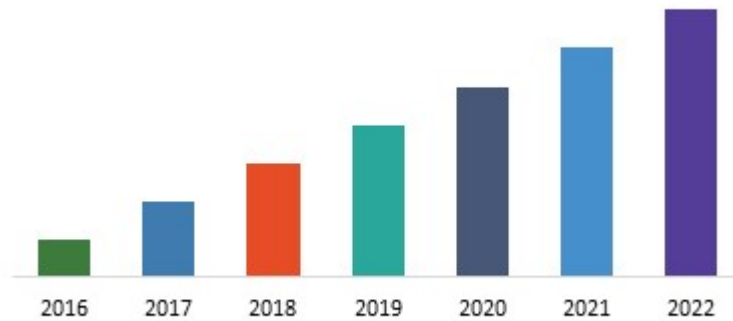
Tourism and Augmented Reality

- Augmented reality (AR) is being developed as a part of smart tourism to provide information about destinations and attractions. Its usage will maximize tourist satisfaction, based on tourists' active usage.

- Apps like AR City Tours offer guided tours of major cities like Paris, Rome, and New York. By pointing their smartphone at a particular attraction, tourists can access historical information, architectural details, and other interesting facts to enrich their sightseeing experience.
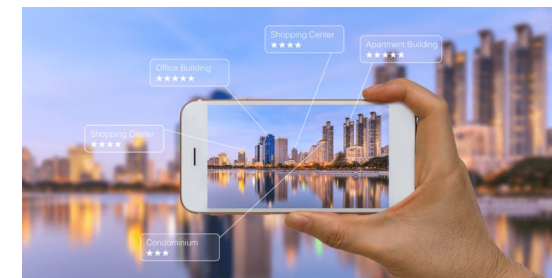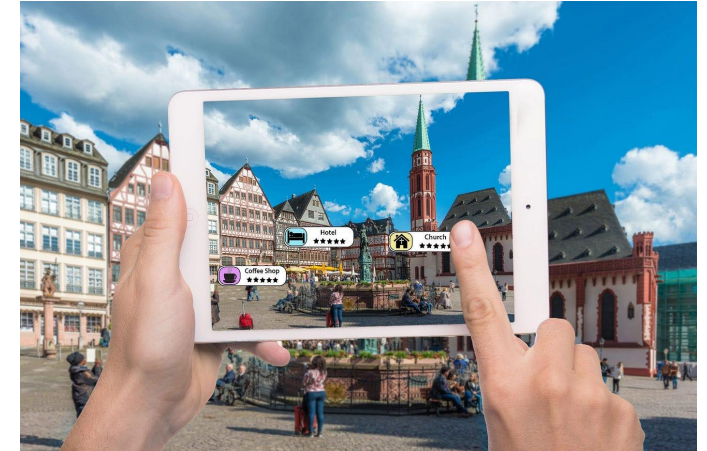
Virtual and Augmented Reality Market

- The global virtual (VR) and augmented reality (AR) market in the tourism industry is expected to reach $9.6 billion by 2025, with an annual growth rate of 25.7 per cent during the forecast period.

Augmented Reality & Virtual Reality Market for Tourism Industry Value, 2016-2022 ($Million)

2016 2017 2018 2019 2020 2021 2022

Source : IndustryARC Analysis, Expert Insights

VIRTUAL REALITY

AUGMENTED REALITY

Global AR/ VR in Tourism Industry Market Dynamics

TRANSPARENCY MARKET RESEARCH
in-depth Analysis. Accurate Results

- Lack of awareness and low rate of adoption in small enterprises and developing countries to hinder the market

Restraints

Opportunities

Key Drivers
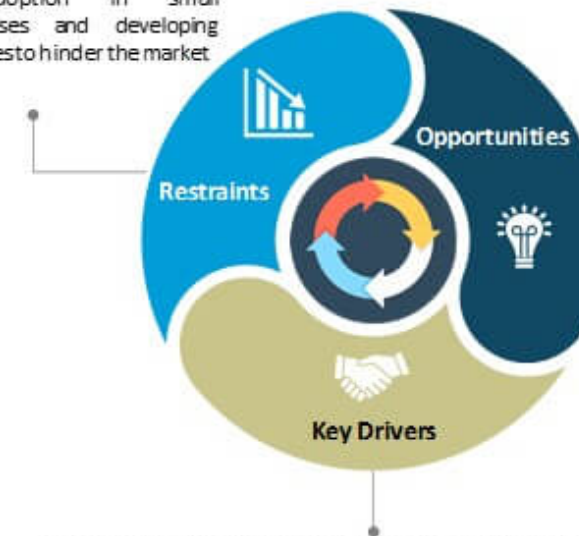
- Increasing awareness about new technologies among users and guests is expected to create new revenue opportunities for solution providers and encourages the development of advanced solutions for the tourism industry.

- Increasing adoption of digital technology to provide real-time tour experience to customers for tour and travel booking is expected to drive the market growth

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Thank you for your attention!