Generative Smart Tourism, the Road for Big Data

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***Abstract*— Smart systems are powerful tools that can break down complex scenarios to provide guidance for decision makers in order to select the most appropriate course of action. This technological breakthrough has been implemented in various business models varying from the financial market to simple navigation software. It has been also applied in the Tourism industry in the form of recommender systems to aid the traveler in selecting their desired product. Although this process managed to group the products according to a given criteria or similarities by previous users, it has yet to achieve its full potential in terms of providing a personalized and smart recommendation for each tourist. This paper highlights the importance of understanding and analyzing the user preferences before providing a recommendation for any touristic service by dividing this reconnaissance phase into three different dimensions that can change dynamically according to the behavior of the tourist.**

***Index Terms*—smart tourism, dynamic recommendations, travel companion, tourist behavior, Internet of things, big data, online bookings**

I. Introduction

As technology is being incorporated in every major aspect of our lives, we have become more demanding in terms of acquiring all different kind of information at ease and at a click of a button. If we do our proper search about any subject or service we are looking for, we can find all the data we need; for free, over the Internet. However, in this new technological era, we always find ourselves unable to make a decision with the overwhelming number of products being offered online and we never seem to find the time to do our proper homework when it comes to select the most appropriate product Technology made a giant leap in the last couple of years and has now become embedded in our lives. Social media and smart phones have played a key role in this evolution and we currently spend the majority of our time using their services.

The travel industry was also affected by this change and the online business has conquered the market. At first, people used to book their trips via travel agencies where there was always a human element involved. People were unaware of the destinations they wanted to go and were looking to seek advice from professionals in the field. The travel agency role was to recommend destinations to the clients and handle the hassle of making bookings, getting rates and confirming the trip to the client. Once the world got accustomed to the use of the internet, the traveler started to make his own search and suggested the destination to their travel agents. The role of the travel agency shifted to simply recommend products within the destination proposed by the customer and try to get the best deals in order to keep their customers.

Online bookings and revenue has increased significantly in the last 5 years and is expected to grow exponentially alongside the Smartphone industry. Travelport, a leading travel commerce platform, has revealed, during the past Arabian Travel Market, a number of significant travel industry forecasts for the UAE and the Middle East, with double digit annual revenue growth expected for online travel in the next five years. With 29 percent online penetration, the UAE currently outpaces the total region's 25 percent. Online travel bookings, which represent 25 percent of all bookings in the Middle East, are forecast to grow in 2015 and 2016 to reach 36 percent by the end of 2017 when online revenue is expected to reach $35 billion. Hence, the majority of the tourism business has shifted to online platforms and booking engines. This recent approach allowed the customers to view information about different destinations, compare prices and select best deals while sitting at the comfort of their homes. The largest online booking platforms have incorporate an integration with third party organizations that provide rating of the products being offered. This module provided an integrity for quality of service and a static kind of recommendations when it comes to the different services the traveler has to choose. Each online provider is seeking a competitive advantage to lure the clients and divert the traffic to their sites. Some suppliers create a new product by providing access to new destinations or contracting some unbeatable deals with the top ranking holiday. Others incorporate a loyalty program that offers discounts and a change to get a refund on your trip. The market has become flooded in a way that we have created new platforms that would simply compare the online sites for us and provide us the comparison sheet to select the best deals. The difference in prices between the online providers has become minimal and thus we believe that a new approach could provide an edge over current platforms.

A. Existing Booking and Recommender Systems

The major interface currently used for online bookings is the web however trends are changing and bookings via mobile devices have increased significantly during the

Manuscript received July 1, 2017; revised August 15, 2017.

doi: 10.18178/joams.5.6.424-439

past years. A research on "eMarketer.com" showed that the US travelers made 51.8% of their online bookings in 2016 via mobile devices with an increase to last year's figures (Fig. 1). This would show a trend that people are becoming more comfortable booking their holidays on small-screen devices.

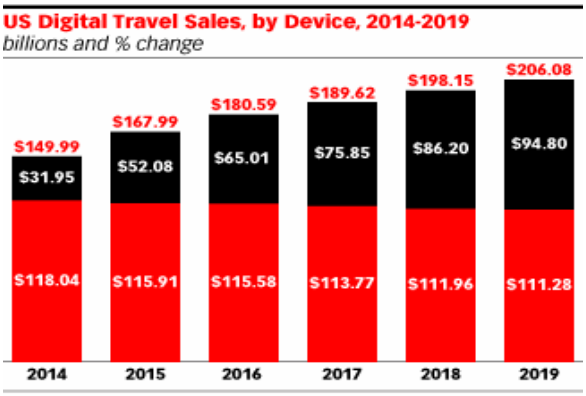

Figure 1. US trend for tourism products booking interface.

On another note, another research performed by Criteo shows that even though the travelers have access to the hotel's own mobiles sites for bookings, they still prefer to book via their online travel agencies and that the percentage of mobile bookers has increased every year (Fig. 2). Therefore, updating conventional booking engines and upgrading it to smart recommender systems could prove a core competence over rivals within the market.

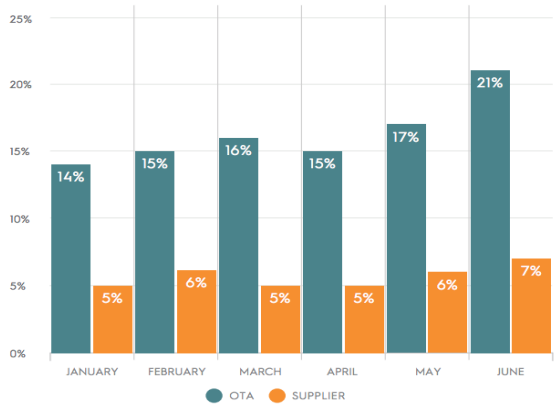

Figure 2. Share of E-bookings on Smartphones.

Recommender systems possess a unique feature that provides the end user of the platform to receive some sort of guidance to complete a certain task or to select a product based on pre-defined data or triggers. It has been widely used recently in multiple kinds of businesses and the current plan is implement it in online tourist booking sites. There are two different kinds of systems that recommend products to travelers: Web and Mobile. The most relevant approaches for web integrated Google maps services to allow its users to view all the attractions and plan ahead for the time required to visit these attractions and travel between it [1, and 2].

On the mobile interface, the recommendations started similarly to offer services according to the traveler's location and preferences [3]. Mobile systems would require an internet access at the destination which most people won't have so they proposed an infrastructure to provide access to their system through wireless sensor networks. We have a different alternative for the connectivity and we will be discussing in the business model section.

B. *Research Signficance and Implications*

The Tourism industry is shifting towards becoming a self-automated service where the intermediary (the local travel agent) role is becoming less and less obsolete. In order for a certain business to tackle these challenges, it is required to have a competitive advantage over other well-known established names such as Expedia and Booking.com. Providing an extra technological module, that bridges the gap between tourist & destination, and offers a novel approach to the travelers, would be the only option for many tour operators to sustain their activity. Therefore, businesses are required to stay ahead of the competition by developing solutions that the travelers will require in the future. Our proposed model would be able to tackle these problems and provide a new type of experience for the travelers. The business model proposed in this paper is a smart travel companion that works on three different levels and includes an innovative booking engine with new search parameters that would attract the travelers and assist them to select the destination that is most suitable for them.

The rest of this paper is structured as follows. Section 2 represents the literature review where we analyze the latest papers in intelligent systems, the impact of technology on touristic destination and how we can create personalized customized touristic products. Sections 3 and 4 describe the current gap in literature in terms of providing a personalized recommendation technique that is updated dynamically according to the preference of the tourist. This section challenges the efficiency of the techniques being utilized to provide smart decisions, the lack of guidance at the destination and the observations on current recommender system frameworks. The research questions and proposed framework are also presented in this Section. In Section 5, we analyze the collected data and validate our research hypotheses. Section 6 represents the author recommendations to tackle current blockers in recent frameworks and suggest a new smart travel companion model. We conclude this paper is Section 7 with future recommendations.

II. Related Work and Literature Review

When we refer to “Smart systems”, we perceive a machine (or network of systems) capable of understanding a given problem and finding an appropriate solution for it. It also implies that such decisions are made without any kind of human intervention. The preferred approach to defining smart technology was described by the authors in [4]. Their model requires any smart technology to adapt according to its environment,

"sense" by adding a level of awareness to the actions and decisions made, understand scenarios and draw conclusions for future use, analyze developments and learn from previous experience, provide a solution for current problems and plan for the next move or what to do next and finally self-organize in order to maintain sustainability in an echo environment. Recently, smart systems were also referred to as intelligent systems that are capable of optimizing resources and services using the latest technologies [5]. Another approach to smart systems does not rely solely on the technological breakthrough but focuses on the collaboration and synchronization of different technologies to assist in providing an optimal solution [6]. We believe that a synergy between man and machine would present the most intelligent solution. Artificial intelligence; no matter how developed it may become, would not surpass human intelligence or human decision making process. However, if we can provide structured data of users and implement a framework to analyze it, we can provide guidance and forecasts that would help us determine the proper decision.

The tourism industry has grown rapidly in the last decade with the vast exposure of new destinations through the internet and the recent incremental usage of social media and mobile devices. These factors contributed mainly to develop the concept of applying smart techniques and applications in the tourism industry. Liming Bai [7] provided a framework to create a smart tourism information system. The framework proposed five different elements: structural architecture, geographical simulation, System evolution through cognitive computing, measurement of effectiveness and a program for industrial optimization. The main purpose of the study was to convert traditional information systems to intelligent entities that would aid in decision making process. This was conducted using a model that starts with an operational simulation using basic routine programming but then adds existing experiences to evaluate the proposed recommendation and predicts future behavior. Geo-Business Intelligence is an important factor in smart tourism since it provides context awareness at the destination and is not limited to guidance for pre-booked services. A Smart Tourism System platform uses Geo-Business Intelligence to collect data from structured and unstructured sources, process and analyze the data in an Information Creation engine, use Big Data to analyze information from social networks and sends this information to web portals using a cloud environment (Angelaccio et. al, 2013).

In order to create a smart tourism system, we would need to use both approaches. We would be required to create pre-defined simulations and enhance it using user experiences and data collected from the destination and hopefully at the time of the event. We would then be able to provide guidance to the same user according to his updated behavior. This kind of data should be captured by a certain sensor technology that can analyze and relay data in real-time. Therefore, it would be essential for the tourism destinations to play a key role in developing smart tourism solutions.

A smart city can be defined as "an urban environment which, supported by pervasive ICT systems, is able to offer advanced and innovative services to citizens in order to improve the overall quality of their life" [8]. Smart cities have become an integral part of social sophistication and provide better quality of life by bridging the gap between inhabitants and their environment. A similar approach should be implemented to promote destinations in the tourism industry. In order to apply the functionalities of smart tourism to a certain destination, it is required to invest in such technologies which could prove prevent destinations from performing this change. However, tourism is a major player in global economy and investments in the tourism sector will yield in positive increase in the overall economy of the destination country. A smart destination is defined as "an innovative tourist destination, built on an infrastructure of state-of-the-art technology guaranteeing the sustainable development of tourist areas, accessible to everyone, which facilitates the visitor's interaction with and integration into his or her surroundings, increases the quality of the experience at the destination, and improves residents' quality of life" [9]. Other descriptions of smart destinations require a collaboration between all the stakeholders via technological platforms including the tourism destinations in order to provide a unique experience to the tourists and allow information sharing in real-time [10]. Tourists are a key stakeholder to the smart tourism but destinations need to actively participate in this strategic shift and put more effort to create effective and creative experiences. China has recently started an initiative called the Smart Tourism Destination or STD. The STD is a platform that allows tourists and organizations to share information related to tourist activities, tourist services currently utilized and the status of resources at the destination on a mobile device [11]. This initiative was adopted by the government since it realized the economic impact that such initiative might produce. It provides a unique experience that tourists can only find in China. Different studies tried to find cheaper and alternative ways to implement smart systems at the destinations and provide the same quality of services. Near Field Communication or NFC technology could be an answer to medium destination and governments. NFC can play a key role in promoting destination and enhancing quality of services [12]. NFC can also track, register and send data about tourist activities for processing without the use of the Internet [12].

We believe that destinations should assist in promoting destinations by providing services such as the smart tourism destination of China. However, with the vast expansion of free Wi-Fi, the race for smart cities and latest developments in the Internet of Things, the entire world would be connected and it will not be solely for tourism services. Moreover, our proposed model incorporates cognitive computing such as IBM's Watson that can analyze, detect and recommend solutions without being connected to the Internet. We would then be able to

assist the traveler in real-time while saving data on the device until a free connection to the internet is made where data would be sent to the source for future analysis and data mining procedures.

Current competitiveness in the tourism industry is forcing destinations to pursue innovative ways to advance in the market. However, most of the previous literature focused on the technological aspect rather than a combination of technology with the major stakeholder: the traveler. Neuhofer et al., [13] recognized this drawback and created a framework that combines the destination services with the tourist input. They claim that an active and successful experience has to be designed over three phases (pre-travel, on-site destination and post-travel). They also define two different dimensions: physical and virtual. The physical dimension manages the on-site phase by providing feedback from a physical location while the virtual dimension manages the pre and post travel phases in terms of providing data to other consumers in order to recommend these destinations. There are two factors that influences the overall satisfaction of the tourist: External factors such as environmental, products and cultural interaction while the internal factors represent cognitive associations with the destination and the motivators of the experience with a sense of belonging [14]. In order to provide the tourist with a complete travel experience, we should challenge all the senses to imprint a unique memory in the mind of the tourists. Sensory dimension plays an influential key role in the tourist experience therefore it is an important factor in destination marketing and management. Senses create internal factors such as place attachment and loyalty that would aid in promoting the destination and attract more consumers [14]. Stakeholder engagement in tourism is extremely important and is classified into two different approaches: the stakeholder role in planning & development and the association in market share [15]. Scenario Based Design or SBD is an innovative technique that can assist in developing destinations and actively involving all tourism stakeholders. An SBD model consists of three phases: Developing preparatory materials, interviews with key stakeholders and a workshop [15]. These approaches tend to provide a single platform to share information and enhance user experience at the destination. Although technology is the key enabler to create such service, it requires a collaboration of technology, traveler and destination to create a unique and novel tourism service.

We strongly agree that the traveler's input and engagement in the design of smart products is essential to the success of smart tourism thus the creation of a man-machine solution that would cover all the requirements of the traveler. Our framework is defined as an evolution of the model proposed by Neufoher et. al [16] where we create three dimensions: at the time of the booking, after the booking process & before the travel, andduring the travel (on site). This process would allow us to gather and analyze more information about the traveler even after the initial booking to map attractions of same preferences at the destination. This process converts recommendation or guidance from generic by suggesting products that match a certain fixed attribute such as age range and destination to more specific services by learning user taste and interests and filtering the results into more personalized services.

The current services available online via tourism or booking platforms are limited to information and ratings for holiday products. The traveler has to review all this information and try to filter the results according to his preferences. The amount of data that requires analysis from the traveler is growing larger every day with the emergence of new destinations. The latest studies focus on providing personalized services [17] according to data gathered from the traveler directly via special designed forms or indirectly via information published online via social media platforms about the traveler. This kind of approach is referred to by intelligent recommender systems.

There are three different elements for intelligent recommendations: 1- personalized recommendations using data acquired from social media, 2- PAS-model that would analyze grouped data from social media to generate profiles, 3- context information to provide business analysis at the destination [18]. The role of social media is to provide data about the traveller and combine it with user preferences to create a profile for the tourist using business intelligence tools. An additional dimension of location attributes is created in order to filter the results and generate a narrow list of personalized services available for the traveller at the destination [18]. Recommender systems would analyze all the data and filter the results automatically [19] according to the preference and taste of each tourist. Previous literature work did not have the luxury of current research since the use of mobile devices and the addiction of users to use and share their experiences at the time of the service can provide enormous and important feedback that can be used to alter recommendations at the destination and assist in creating user profiles according to the dynamic and static attributes of the user. Moreover, context awareness applications can be integrated in such smart solutions to tag, match and map the attractions that are aligned with user preferences and notify the user about these services at the destination. Current recommender systems are not efficient since it tackles a single approach or single requirement of the tourist. According to the review of previous work, the design of recommender systems should tackle three major approaches together: context-based, collaborative and demographical-based [15-20]. The papers also indicate the importance of introducing the stakeholder perspective into the design of smart systems by analyzing data from social media or any online portal with public information. We have more complex approaches to smart tourism systems that provide a planner to suggest recommendations and plan the visits on behalf of the traveler [21]. Other approaches make it more complex by sketching routes for attractions and planning visit timings however such algorithms are complex and cannot provide the best solution at all times. In addition, the traveler might face the initial problem of

overwhelming amount of data or attractions that travelers cannot simply manage. Due to the large number of recommender systems, smart destinations and attractions, researchers are trying to create frameworks that would enable them to evaluate the smart services and attractions with the satisfaction level of customers [22-23]. The papers provide an insight into creating a performance evaluation tool or technique to test if the current attractions at a certain destination are aligned with the updated requirements of the travelers. The papers also suggest that the proposed technique can be actively implemented in business models in order to evaluate current touristic attractions and create novel activities. The papers highlight the need for upgrade of current attractions since it will become obsolete if it does not match the latest tourist expectations.

After reviewing the intelligent recommender systems, we concluded that guidance provided to travelers is based on static information such as age, nationality, destination and services booked and information found on social media and online portals. We agree with previous research that profiles should be created for travelers in order to provide accurate and useful recommendations. However, we believe that the can retrieve valuable information from the traveler once the initial booking is done and before the trip to the required destination. Recent mobile applications can track autonomously the behavior of the users and learn about their preferred activities. This approach would not only provide users with their desired services at unfamiliar destinations but would serve as a sensory element where traveler gets a sense of belonging and comfort at the destination. In addition to this, mot recommender systems tackle activities or individual services without referring to the price of the results. Our recommendation in the trip advisor is to map the user preferences to several destinations and use a background computation that would calculate and create similar packages that the traveler is selecting with better or similar prices at different destinations but still matching the user preferences.

The literature review tree (in Fig. 3) provides an illustration on the different types of papers we have studied in order to construct our proposed model. We have reviewed papers in three different areas that are related to our research. The first set identified the current tourist preferences for smart tourism products which provided the guideline to identify the requirements of the new E-Traveler in order to build our platform around it and create personalized products according to the preferences of the tourist. The second set checked the impact of tourism on the development and growth of the countries and destinations. It also highlights the role of technology and the tourists in promoting and enhancing new destinations. The last sect identifies the current work of intelligent recommender systems in the tourism industry. We reviewed the creation of intelligent systems from an engineering perspective and through the geographic business intelligence that would provide responsive recommendations during the trip.

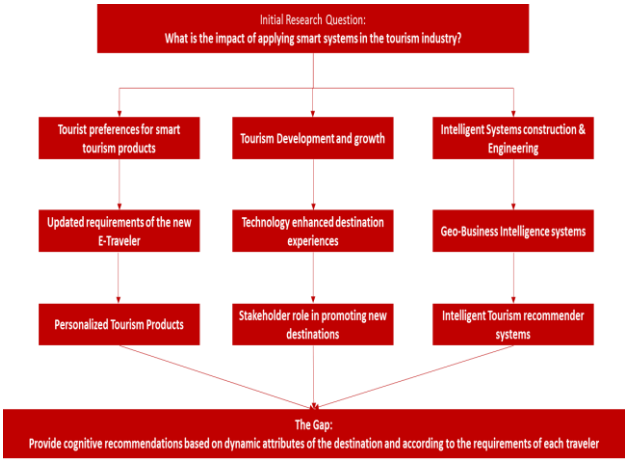

Figure 3. Generative smart tourism literature review map.

III. The Research Probmlem

We went back to the basics, reviewed the requirements of the e-traveler and cross-checked it with the products being offered on the online booking sites. If the tourist is familiar with the destination, it is relatively easy to search and book your required hotel and trip. However, when we lack information about our trip, we could have a bad experience that would reflect badly on the booking site or company that we have selected thus impacting profits to organizations. We looked to create a synergy between research works suggesting tourism recommendation techniques and current online business organizations in order to define a new business model that can be implemented with the current technology

A. Updating Current Tourisim Applications

One of the main concerns to the travel industry is to promote new destinations. We are always afraid to experiment something new in our lives and we certainly would not like to risk our savings to explore new destinations. This statement is true whenever users try to book their trips via online booing sites where guidance is not provided or not trusted completely. Even if we are familiar with the selected destination, we do not possess vital information, that might be required in emergencies or could simply be used to enrich our stay and experience. We have to design a business process that incorporates the user needs with the parameters of the suppliers in order to filter the results [24,25]. Moreover, we have to utilize personalization techniques provided by the tourists according to their preferences [17] to match it with the attributes or characteristics of the service providers.

B. Providing Proper Recommendations

Current recommendations are static and present the data to the customer based on pre-defined parameters that characterize a certain destination. The only attribute that all the current systems are built around is the cost factor. The current business models lack the dynamic parameters that follow the selection of the users and restrict the guidance to a grouping order according to location and

geographical attributes. With the fast hike of sale and use of smart phones, we focused on resources to manage recommendation during the trip based on geo-location and dynamic context [10]. Another important factor was the dynamic parameters that could include the seasonality and weather at the time of travel [26]. Our intention was to combine previous research efforts [27-32] between human analysis and system recommendation through algorithms; basically a man-machine interaction that provides the traveler all the tools to make a decision and feel comfortable with the introduction of a travel companion during the trip.

C. Providing Guidance After the Booking Process

Even with the scarce number of booking sites that provide recommendations, the traveler is not provided any feedback after completing the reservation and during the vacation. Any person would like to receive notifications of attractions nearby when experiencing a new destination. Some recommendation systems take it a step further by scheduling trips within the trip [2] or calculate the travel time between attractions and services in order to present the customer with the best plan of their vacation [27]. However, this kind of assistance is not linked with the preferences of the traveler and provides an overall guidance process. In order to provide a more customized experience, the recommendation should be guided towards the interest of the traveler in order to be successful and generate more profits for the booking engine site and the destination of the traveler.

D. Identifying the Problem with Current Frameworks

We have identified that current business models do not meet the expectations of the new travelers. The frameworks used in the few business models that provide a certain type of recommendations are based on static or general data that most travelers find irrelative to their preferences. The main concern is that all the current recommendations or comparisons follow one main attribute: the cost. In order to overcome these challenges and create a product aligned with the new requirements of the tourists, we propose a new business model that integrates novel functionalities for the booking engine to provide recommendations based on static and dynamic parameters. Our aim is not simply to propose a recommendation but to provide our customer a travel companion experience that begins at the time of the booking and ends when the customer returns back from his trip. The data from each trip will be analyzed in real time in order to verify that the traveler is benefiting from every moment during his trip and to serve as an analysis tool to enhance the recommendation program.

IV. Research Questions and Framework

In this section, we will address the challenges that are faced in previous literature and current proposed frameworks and business models. We will ask the questions and present their respective hypotheses that we will validate in the analysis section.

A. The Question of Perception

Before proceeding with the research and the proposed solution of this paper, we gathered the information to cross check if the current platforms provide the sense of confidence to experience new destinations and possess the proper tools to manage the new requirements of the today's travelers. Therefore, we wanted to check from the major stakeholders:

RQ_1: What is the current perception of the online booking platforms or services being offered in the tourism industry?

H_1: with the latest improvement in technology, most of the travelers perceive that the current online platforms do not provide the services that the new e-travelers are looking for.

B. The Question of Motivators

We reviewed the different aspects of motivators to apply such a solution in the current online tourism environment as well as the impact on the traveler's overall experience.

RQ_2: Are the current online platforms providing dynamic recommendations to guide the traveler into booking his perfect destination?

H_2: Most of the travelers cannot find constructive recommendations via the current online booking platforms available.

RQ_3: Would a guided recommendation module provide a competitive advantage over the current online booking platforms?

H_3: Most of the travelers prefer to book their trips when they receive guidance on their requested destination

RQ_4: Would a smart travel companion enhance the satisfaction level of the traveler?

H_4: Most of the travelers will be more satisfied when they experience hidden activities of their preferences at unfamiliar destination

RQ_5: Would a smart travel companion generate more revenue for tour operators and destinations?

H_5: Most of the travelers will book more trips when they are informed of destinations and activities personalized and customized according to their taste.

C. The Question of Enablers

We reviewed the different aspects of enablers that would allow us to implement such a solution and create a successful business environment. These enablers were provided from previous related work and from the guidance of travel experts.

RQ_6: What is the added value in creating an artificial human interface to provide "smart" assistance?

H_6: Most of the travelers prefer to book their trips with a personalized "human" guidance

RQ_7: Would a personalized recommendation promote new or remote tourist destinations?

H_7: Most of the travelers will visit new and unfamiliar destinations when they are aware that it matches their traveler profile

RQ_8: Would an online platform provide constructive feedback before the booking process, before the travel and after the traveler reaches the destination?

H_8: Most of the travelers are unable to find an all in one platform that handles their complete requirements

RQ_9: Would a personalized context aware solution at the destination encourage travelers to travel more often?

H_9: Most of the travelers are looking for dynamic and customized recommendations at their selected destination

D. The Question of Blockers

We reviewed the current blockers for the application of smart technologies in the travel industry. We have selected the blockers that are related to our travel companion experience from related work and the current requirements of the tourists. In our proposed business model, we have suggested and implemented solutions for these blockers and we have applied it in our travel companion model.

RQ_{10}: Would the traveler agree to use roaming services in order to send recommendation at the destination?

H_{10}: Most of the travelers do not use roaming at their destination for its extra cost

RQ_{11}: Would the traveler allow technological tools to access personal data in order to provide personalized assistance at the destination?

H_{11}: Most of the travelers do not support data mining on personal data to create a traveler profile

RQ_{12}: Are the travelers engaged and participating in the evolution of tourism technology?

H_{12}: Most of the travelers do not participate in the smart tourism revolution

E. Research Methodology and Framework

We followed a research methodology that consists of four elements:

1- A framework that showcases the different aspects of motivators, enablers and blockers
2- A quantitative survey based on the attributes of the framework to collect data
3- An inferential statistical analysis of the collected data
4- A refined new business model: The Travel Companion Experience

Our proposed research framework (as shown in Fig. 4) represents the different elements that created our model. We managed to define the motivators, enablers and blockers attributes in order to design the research survey and retrieve results that are mapped to our framework.

We created a questionnaire based on our framework and exploratory research study and distributed to our research population sample. We printed these surveys and circulated it in shopping malls for tourists to fill it up. For travel technology professionals and tour operator employees, the survey was sent via email and the results were combined.. The target population is tourists who have booked a trip via an online booking site or travel industry experts and employees who work in travel agencies with an online booking platform, from both genders, 18 years old or older. After analyzing the results, we managed to study 172 proper samples and the analysis is based upon our findings. We conducted a secondary survey in order to study the new e-traveler requirements. A total of 60 samples were reviewed and analyzed.

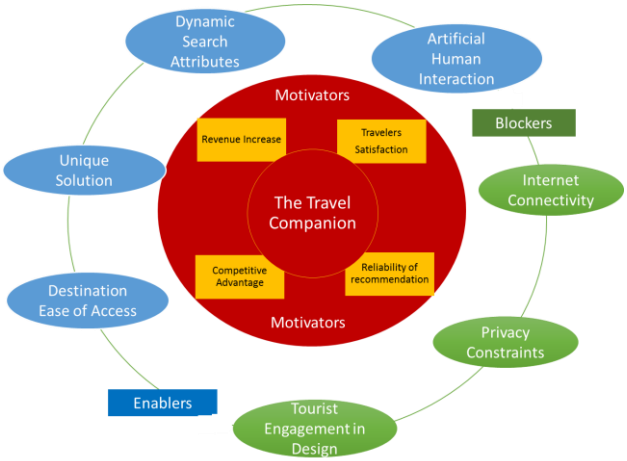

Figure 4. Proposed Research Framework for Smart Tourism

V. Research Results and Analysis

Our target population is tourists with various background and cultures. In this part, we would analyze the general characteristics of the tourists that have provided us with their feedback in our survey. These attributes show the age range of the travelers, their booking platform preference, number of previous holidays booked and who provided the recommendation for their latest trip.

A. Descriptive Statistics

The results (as shown in Fig. 5) indicate that the majority of the population tested age ranged between 18 and 34 with around 63% and the remaining population aged 35 and older. This characteristic would help us define if the requirements of the new travelers are different than the current configuration. Also, 76% of the population would prefer to make their bookings via online booking sites or online travel agencies. We wanted to identify if our travelers have previously travelled and explored various destinations. The majority of the sample population has booked 2 or 3 trips before while 10% only were first timers.

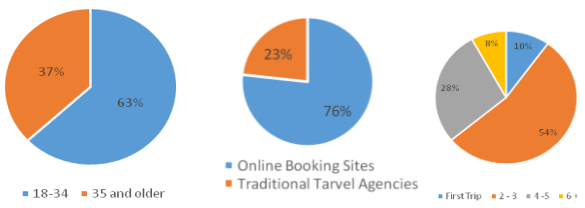

Figure 5. Population Age Range Distribution, Platform Performance, and Number of Trips Booked Descriptive Statistics Respectively.

We also identified how tourists have selected their destination or what factors influenced them to take their trip as shown in Fig. 6.

Figure 6. Destination Selection Factors.

The results show that the major part of the selection process is pre-planned by the tourist and does not depend on any recommendation. The remaining shows that we still perceive that we would enjoy our trip if we know someone who has; whish usually is a wrong assumption. This would show that the current platforms lack a proper recommendation tool that is dynamic and personalized according to the taste of the traveler.

B. Relative Importance Index

In order to identify the major requirements of the travelers and to build a solution that would allow tourists to explore new elements of their trip, we reviewed several attributes. The tourists were requested to indicate the most influential elements for a satisfying travel experience. The model is based on a five-point scale as follows: 1-Highly Insignificant, 2-Insignificant, 3-Neither, 4-Significant and 5-Highly Significant. In order to properly interpret the results, the Relative Importance Index (RII) was employed. RII calculation formula is shown in Eq(1):

$$\mathbf{RII} = \Sigma \mathbf{W} / \mathbf{A} * \mathbf{N} \qquad (1)$$

where:
"W" defines the weighting given to each statement
"A" marks the higher response integer
"N" defines the total number of respondents.

The results as shown in Table I. indicate that the rate comparison feature is the most important attribute of the online booking sites followed by the mobility of the services through smart phones and the user friendly and fast booking process. An important element is the recommendations and it has ranked as the fifth component on our grid. This shows that there is either lack of recommendation techniques and constructive feedback on these platforms or the recommendations are not aligned with the preferences of the traveler.

TABLE I. RELATIVE RANKING INDEX OF ONLINE BOOKING PLATFORMS ATTRIBUTES

Online Booking Platform Advantages	RII	Rank
Rate Comparison feature	0.820	1
Booking Through mobile devices	0.813	2
Fast Booking Process	0.803	3
Tourist Rating of the product	0.733	4
Recommendation of destinations	0.720	5
Information about the destination	0.567	6

We also checked the advantages of the traditional or offline travel agencies and we requested our respondents to rank their attributes accordingly as shown in Table II. The results show that the professional recommendation feature ranks the highest in our list since the tourists trust experienced professionals and their judgments of the destinations. The second highly ranked attribute is Human Interaction since a tourist would require assurances that his booking is confirmed and he would not face any problems once he reaches his desired destination. The third and important aspect is the assistance after the booking process. At the moment, the online booking sites allow us to easily create a booking but leaves us a bit stranded once we have finalized this process. An interaction after the booking process generates a higher level of confidence to the tourist and allows them to book more trips. The tourist would feel more comfortable if he is aware that he can contact a certain individual in case he requires assistance at the desired destination.

TABLE II. RELATIVE RANKING INDEX OF OFFLINE BOOKING PLATFORMS ATTRIBUTES

Traditional or Offline Booking Platform Advantages	RII	Rank
Professional recommendation	0.873	1
Human Interaction	0.860	2
Assistance after the booking process	0.813	3
Level of confidence in selecting the right product	0.800	4
Travel Agent Rating of the product	0.787	5
Rate Comparison	0.767	6

We also asked our respondents to rank their most desired functionalities according to their preferences and the results are shown in Table III. The highest rank was for recommendations of personalized activities at the destination. The tourists were receiving information about attractions in their destination however this information was not structured and did not relate to the taste of the traveler in certain scenarios. We have entered the era of Internet of Things and we have become dependent on our smart devices. Such evolution has ranked the use of mobile app for guidance and assistance as our number two ranked functionality. Human assistance is always favorable but the ease of use and access to an artificial intelligence tool is faster and sometimes more productive.

The third ranked attribute allows us to identify places and attractions we are accustomed to in our home place and automatically maps it to our destination. Such tools would provide us a sense of belonging to the destination and allows us to enjoy our trip.

TABLE III. RELATIVE RANKING INDEX OF TRAVELER REQUIREMENTS

Requirements of Travelers for a Smart Tourism Solution	RII	Rank
Recommendation of personalized activities at the destination	0.843	1
Mobile App for guidance and assistance during the trip	0.833	2
Tool that maps your preferred places at home to the desired destination	0.800	3
Smart tool to inform you about attractions in your surrounding via GPS	0.787	4
Internet Access at the destination	0.783	5
Recommendations of destinations on the booking platform	0.777	6
Automated Price comparison for different destinations with similar criteria	0.763	7
Dynamic attributes comparison such as weather conditions, holidays and so on	0.760	8
Sharing and Rating services	0.453	9

Another important factor is that the travelers require a context aware tool that identifies the surrounding and sends notifications of places that might be of interest. This tool could be customized to offer only products of the traveler's preference. The Price comparison which was the highest ranked feature of the online booking sites is ranked number six. This shows that the current online booking platforms are not aligned with the latest requirements of the travelers and it could be updated to achieve corporate sustainability or competitive advantage over competitors.

C. Inferential Statistical Analysis

In this Section, we will provide detailed analysis for the hypotheses presented in the previous sections.

D. Perception Hypothesis

We first checked the perception hypothesis that would validate if our claim regarding the current online booking platforms is true. This hypothesis hypothesizes that the most of the tourists perceive that with the fast hype of technological achievements, the tourism industry is not benefiting from it:

H_1: With the latest improvement in technology, most of the travelers perceive that the current platforms do not provide the services they are looking for.

The data for this hypothesis was collected twice both before and after the other survey questions. The results were different since the travelers were able to identify the technological modules that could be added to the current online platforms and how it can help them select and enjoy their holidays.

	N	α	Agree	Neither	Disagree	Sig.
Before	**172**	0.05	68	78	26	0.42
After	**172**	0.05	18	20	134	0.011

We analyzed the data collected using single population proportion one tailed t-test. According to the p-value results, we can clearly say that we have sufficient evidence to state that the travelers perceive that the current online platforms require a technological update and existing tools do not provide the services that they require from a booking engine.

E. Motivator Hypothesis

To test the motivator hypotheses, several t-tests were conducted on Hypothesis H_2-H_5 and the results are shown in Table IV. It is clearly evident that all results were highly significant and confirm the motivators' attributes in our model. More specifically, the results confirm that :

- Travelers are not presented with proper recommendations to guide them in selecting the best destination according to their preferences.
- Travelers are not confident to explore holidays at unfamiliar destinations without a proper guidance to support their selection and ensure that they will get value for their money.
- Travelers are not aware of the attractions at their selected destination and would be very satisfied if they would receive on site instructions to experience attractions according to their taste
- Travelers will book more trips, visit more destinations and generate more revenue for the online travel agency or platform and for the destination to be visited as well.

TABLE IV. MOTIVATOR HYPOTHESIS T-TESTS

Hypothesis	*N*	*α*	*Agree*	*Disagree*	*Sig.*
H_2	**172**	0.05	108	29	0.0195
H_3	**172**	0.05	133	29	0.018
H_4	**172**	0.05	131	26	0.0388
H_5	**172**	0.05	102	39	0.001

F. Enabler Hypothesis

To test the enabler hypotheses, several t-tests were also conducted on Hypothesis H_6-H_9 and the results are shown in Table V. It is clearly evident that all results were highly significant and confirm the enablers' attributes in our model. More specifically, the results confirm that:

- Travelers require to trust the recommendations and an interaction with the artificial recommender system would provide that sense of confidence to proceed with the booking.
- Travelers will have a more direct and easy access to visit new unfamiliar destinations since they are aware of all the products offered at their desired destination but more important products that

matches their preference and should guarantee their total satisfaction of the trip.

- Travelers are unable to find a single platform to manage all their requests thus making the creation of such a smart system a unique solution that would generate revenue and value.
- Travelers require to trust the recommendations and an interaction with the artificial recommender system would provide that sense of confidence to proceed with the booking.

TABLE V. ENABLER HYPOTHESIS T-TESTS

Hypothesis	*N*	*α*	*Agree*	*Disagree*	*Sig.*
H_{10}	**172**	0.05	102	58	0.0011
H_{11}	**172**	0.05	107	42	0.0129
H_{12}	**60**	0.05	49	11	0.0243

In short, current booking platforms provide static recommendations such as "most recently booked", "our suggestions" or "what other users have booked". It does not provide recommendations based on attributes such as weather conditions, public holidays or any other element that would change the overall experience of the traveler. Moreover, this recommendation is not followed up once the traveler reaches his destination and requires information according to his preference.

G. Blocker Hypothesis

To test the blocker hypotheses, several t-tests were also conducted on Hypothesis H_{10}-H_{12} and the results are shown in Table VI. It is clearly evident that all results were highly significant and confirm the blockers' attributes in our model. More specifically, the results confirm that:

- Travelers do not prefer to use data roaming packages and incur more cost to their already expensive vacation.
- Travelers are still uncomfortable to allow software programs to interpret their personal data and analyze it. However, we believe that this will change when the users realize that a certain application will not share this information with third parties and the benefit of using such programs would save money for the traveler and increase their satisfaction level.
- Travelers are not involved in the design of smart tourism. At the moment, such participation is limited to surveys and boring input once the traveler is back to his daily routine back home. This is major element in the rise of smart tourism therefore a new approach should be implemented that would allow the traveler to record his feedback and opinion at the destination and probably after experiencing an activity.

TABLE VI. BLOCKER HYPOTHESIS T-TESTS

Hypothesis	*N*	*α*	*Agree*	*Disagree*	*Sig.*
H_6	**172**	0.05	152	13	0.001
H_7	**172**	0.05	102	39	0.0011
H_8	**172**	0.05	103	28	0.0018
H_9	**172**	0.05	131	28	0.0388

H. Influence Hypothesis

In this section, we review the elements that affect the acceptance of having an artificial recommendation from an online booking site and the data mining techniques used to generate a profile of the traveler in order to create a personalized responsive recommendation. More specifically, we look at several dependencies hypothesis including:

H_{12a}: The travelers' age influences the acceptance of an artificial recommendation via the online booking platforms.
H_{13a}: A technological application tool such as a mobile application influences travelers booking engine choice decisions.

In order to test such dependencies, several Chi-Square tests were conducted and the results are shown in Table VII.

TABLE VII. INFLUENCE HYPOTHESIS CHI-SQUARE TESTS

Observed	Age 18 - 34	35 and older	*Total*	*Chi-Square Sig.*
Prefer Artificial Recommendation	30	10	40	0.08
Does not prefer Artificial Recommendation	8	12	20	
Mobile App influences Booking Choice	32	12	44	0.012
Mobile App doesn't influence Booking choice	6	10	16	
Total	38	22	60	

As per the results, we have sufficient evidence to confirm that the travelers' age and acceptance of an artificial recommendation are interrelated. This influence hypothesis showcases that the new travelers require relevant information at a click of a button. The previous scenarios where people assumed that they would like a certain destination or event based on word of mouth is not present anymore. Moreover, the role of traditional travel agents where staff would listen to the requirements of the tourist and create a holiday package "offline" is diminishing every day and would be completely replaced by an automated artificial recommendation system in

years to come. We also have sufficient evidence to confirm that the travelers' age and development of new intelligent tools are interrelated. This hypothesis informs us that the requirements of the travelers are shifting and those technological tools to share, rate and recommend services will form the major part of any tourism business in the future.

I. Correlation Analysis

According to the data provided from our second survey and previous literature, we have identified the Internet roaming charges as a blocker for smart tourism implementation. Travelers do not prefer to pay extra amounts to get connected to the internet unless it is an emergency situation. However, with the fast hype of mobile device usage, we believe that travelers would be more flexible regarding the payment of internet roaming charges if they are using a mobile application at the destination. Moreover, since the aim of our smart application is to provide guidance and assistance with a personalized recommendation tool, the advantages of using this service would be more relevant and will overcome the internet charges restrictions. In order to test the relation between these 2 variables, we compared the results of the survey when we asked the respondents if a mobile application is essential for them and if they are willing to pay roaming charges at the destination. 39 out of 60 respondents answered that they require a responsive mobile application at the destination while 21 respondents considered it as a secondary feature. 31 out of 60 respondents answered that they are against paying roaming charges while 29 had no problem with getting charged for roaming. 10 respondents from the 39 who required the mobile application rejected the roaming charges. All the respondents that did not believe a mobile app is an essential element in their touristic experience rejected the roaming charges. In order to analyze this data, we study the correlation coefficient to measure the strength and direction of this relationship. The Pearson correlation of Mobile App and Internet Roaming Charges from our data generates a value that is equal to 0.761. The results inform us that there exists a strong positive relationship between these two attributes. The impact of this result on our research is very important since we could transform a blocker attribute such as the Internet Roaming Charges into an enabler attribute if we can create a mobile application that provides guidance and customized recommendations to the travelers.

Privacy constraints were also identified as a blocker for smart tourism implementation. Users of any program or application are still showing signs of lack of confidence or trust when these programs tend to analyze their personal information; especially when they are unaware of it. Concerns were raised lately for the exploitation of mobile devices through applications that require access to personal information in order for it to be installed. Personalized or custom recommendations based on the preferences of the user require access to personal data. This could be achieved by accessing information on social media however our proposed model requires access to data made after the booking process and before the travel. During this time, the solution would track and map the preferred activities and places that are performed by the user in order to suggest an alternative at the destination. We explained this concept to the travelers in our second survey and we asked them if they prefer having such personalized recommendation. We also asked for feedback on privacy concerns when using data mining techniques to generate profiles for users. 44 out of 60 respondents answered that they are interested in receiving customized recommendation while 16 respondents did not provide positive responses.26 out of 60 respondents still showed concerns for privacy while 34 respondents provided positive response to privacy in relation with personalized services.11 respondents from the 44 who were interested in systems that can provide recommendation to their preferences still showed privacy concerns regarding the access required to perform such action. All the respondents that did not believe a mobile app is an essential element in their touristic experience rejected the roaming charges. In order to analyze this data, we study the correlation coefficient to measure the strength and direction of this relationship. The Pearson correlation of Personalized Recommendation and Privacy Constraints from our data generates a value that is equal to 0.739. The results inform us that there exists a strong positive relationship between these two attributes. The impact of this result on our research is also significant since it informs us that we can reduce privacy concerns by informing the users on the important benefits of providing a personalized service and ensuring them that this data is used to enrich their overall experience. If we would create an application to map the preferences of the user at the origin with similar attractions at the destination, we would eliminate the barrier between experimenting new destinations and the guaranteed satisfaction of the traveler.

J. Summary and Conclusion of Results

We began this research by defining the top ranked functionalities or attributes that the new e-travelers seek in any smart system nowadays. The ranking functionality informed us that the latest requirements of the tourists are not currently available or properly published in the current booking platforms. If we would want to create a new technological environment, we would need to provide the top ranked features. Our data has shown that travelers seek professional or reliable recommendations as their main request. They currently cannot find constructive feedback on the online booking platforms and it is preventing them from booking a trip or reducing their overall satisfaction of the trip. The second feature is Human Interaction. Even through this cannot be replaced however our solution of a travel companion that can provide assistance and guidance during and after the booking process can replace this feature and provide the same level of quality. The third main requirement is to filter all the irrelevant information that is found online and receive recommendations that are aligned with the traveler preferences. This element has a direct impact on the overall satisfaction of the traveler and an indirect impact on revenue increase since travelers would book

more products when they are aware that they are getting value for their money. Rate comparison, mobile booking, and fast booking process are already available however it is not combined with the remaining features thus the development of our travel companion solution. The remaining important factor is the assistance after the booking process which is not available on online booking platforms. Assistance is not a feature that we require when something bad happens but more of a service that makes our experience easier and enjoyable. An artificial intelligence tool that provides all these requirements at any time is the key element in this design.

After the ranking process, we reviewed several questions and tested their hypotheses. These questions are derived from the literature, experience and the above mentioned ranking techniques. We managed to prove that a smart tourism functionality can aid in generating more revenue for travel platforms since users will make more booking once they are confident with the recommendation they are getting and it will generate more revenue to the destination by providing an easier access to new or remote touristic destinations. We also managed to prove that the current frameworks and models used for smart tourism do not reach the expectations of the new type of travelers. An evolution of the current platforms is required from travel agents in order to maintain sustainability and competitive advantage. The only direction for travel agents and destinations is to embrace the smart tourism integration in order to create a travel experience that would satisfy the tourist and generate more revenue for organizations and countries.

One of the important missing features was a platform that provides guidance and recommendation once the traveler reaches his destination. There are a few attempts to such a service however the data generated and presented to the traveler is not customized with his preferences and therefore it sometimes gets overwhelming for the traveler to select a proper attraction and would miss several activities that were far more relevant in this process. We highlighted the blocker attributes of the implementation of smart tourism in our research such as the engagement of tourists in the design of such products and the additional charges that would be consumed by the travelers in case they wish to use smart services with internet connectivity at the destination. We also showcased the lack of trust in recent smart applications where users are still conservative when it comes to analyze their personal data. However, we have defined the relationship between enabler attributes and these blocker attributes. Our correlation tests showed that there exists a positive relationship between these different sets of attributes tat; with the proper presentation of the advantages of personalized services and an online travel expert companion in the palm of your hand, would alter these blocker attributes into enabler of smart tourism services and platforms.

The aim of this research was not simply to highlight the disadvantages of the current systems but to recommend a solution that tackles all the requirements of the tourist to generate a unique novel product. This solution is discussed in the following section and represents the author contribution to this research. The following is not a framework or model but more of a complete solution and business plan that can be implemented and would unlock all the hidden benefits of smart tourism.

VI. The Proposal Smart Travel System

After the analysis of the data, we realized that there exists a gap between the traveler and the online booking sites in terms of filtering the information and providing the appropriate information about the same destination to different users. Moreover, we noticed that the travelers feel a sort of detachment once they reach their destinations without a direct contact with the ground handler supplier. We also analyzed the online sites and their booking engines in order to check if such missing information or technology is present in order to guide the tourists in new territories. We managed to find classification of destinations based on static criteria such as adventure, relaxation, beach and so on. However, once we dive deeper to select the destination, no more recommendations are offered with different destinations and we go back to the initial level of selecting our hotel in one destination. Another concern was that all the recommendation attributes are static and the traveler cannot find when it is an off or peak season, when the weather conditions are appropriate for his kind of outdoor experience and if there are better prices in different destinations offering the same kind of products he is looking for.

In order to tackle these challenges and to provide a solution to the new type of travelers, we have decided to propose a smart travel companion experience that combines all the static information and recommends products dynamically according to the preferences of the tourist. The travel companion creates a "virtual human" interaction in the form of an experienced travel buddy that joins the traveler on his journey. The travel buddy knows how to get the best deals, is aware of all the attractions location and operation and provides assistance, during the trip, by suggesting services that are in aligned with the traveler preference and taste. Before discussing how the model would work at every level, we would like to highlight that the travel companion online booking site will incorporate new dynamic attributes at the time of the search to provide the traveler the information required to make a selection. We have added three dynamic attributes: Seasonality, Weather conditions and Public Holidays. Seasonality would display information about the High & Low seasons of the desired location while the results would open a calendar similar to the airline bookings in order to inform the clients when is better to travel and when it is cheaper. Weather conditions are the second dynamic attribute which will be triggered when the traveler inputs his selected travel dates. In order to match it with the seasonality attribute, the initial search will ask only for the month of travel. Once the results are displayed, an additional filter will show to narrow the

results according to the specified dates. The last dynamic attribute showcases the public holidays at the destination where most of the attractions are closed in order to notify the traveler beforehand to plan his attractions. After the selection is made, the system will automatically display other alternatives at different destinations as long as the results with static and dynamic attributes follow the "similar or better" rule. The proposed system will compare now the results and will consider the price as an element of the search at this stage. The recommendations will be displayed as small pop-ups with the top three matches where the traveler can select more information to view the remaining recommendations.

We also noticed that there exist 3 different types of booking requests. The first type, the most common, is when the traveler is aware of his destination and logs in to the booking site to find the best deals in that location. It might be a recommendation from friends or family but the search is made and the results are displayed according to the search criteria. In this scenario, all the attributes of the search are provided at the same time and then the alternative dynamic search can display the results simultaneously with the main results. If there are better results on different destinations with the same attributes, the traveler could change his mind however he will be aware of the alternatives and he will feel confident to make the booking on our site. The second type is where the traveler is aware of the type of service he wants but does not have a fixed destination. For example, a newlywed couple could be looking for a romantic getaway but are confused with all the options available. The dynamic search that will be performed will ask the traveler for static preferences such as beach, relaxation, spa, romantic and so on and will narrow the results of the destinations. Once the traveler selects a destination, the system will narrow the results of the Top 3 destinations according to the traveler new attributes such as star rating, services offered at the destination as well as the dynamic attributes we discussed earlier. Once the traveler reaches the lowest level of search which would mean he is considering a hotel or attraction, the system will display the results of the alternatives that are matching his criteria alongside the competitive prices. If the result is not fixated within a certain time frame, the system will push notifications to ask the traveler about different preferences such as services offered in the destinations, flight time and ticket prices and even preferred type of cuisine in order to filter the results and help the traveler choose. The third type is currently unavailable online and consists of an event or adventure search. We believe that this could become one of the most booked products online. It is important since it allows the traveler to book and rate an adventure instead of the services that allowed him to reach the destination. It could be simple as a trip to the white house from Brazil, an adventure to the Grand Canyon from France or a visit to the great wall of China from a traveler in UAE. We currently have little information about these kinds of trips and we cannot book it online. The Travel Companion site will gather information about every adventure that can be done and create packages dynamically as we will see in the booking engine proposed framework. Basically, the traveler will have all the information required to make such trip and a package will be created for him to reach and experience his adventure. All of these details are only the first step of the Travel Companion experience. Our aim is to provide assistance, guidance and assurance to the traveler that all levels. Our proposed Travel Companion model functions on three different levels:

a) Dynamic Recommendations **At The Time** of the Booking
b) Data gathering and Analysis **After** the booking Process and **Before** the Travel
c) Attraction, Event and Adventure Recommendations **During** the Trip

A. Dynamic Recommendations

As we have mentioned earlier, the recommendations will work on two different kinds of attributes: static and dynamic. The static attributes would be added to all the products provided in the database in order to provide the traveler to filter the results by his preferences. The system will group all products with similar attributes to speed up the search. The above mentioned grouping mechanism and the static attributes will form our first element of the framework (as shown in Fig. 7). Comparison is made in this section based on the static data and the pricing within one destination; selected by the traveler. The search results will be displayed through a regular booking engine that would search all the products within the selected destination and sort them according to the price. The regular booking engine will not compute comparisons with other destinations since system speed is a key factor and we need to display the results in less than Five seconds. We suggest to have two simultaneous search on two different resources. The traveler will see the results from the regular search engine while the background search engine will make the same search on all other matching destinations and keep the Top 3 in the queue for display. Once the client reaches the hotel element, the data from the alternative dynamic search will display the results to the user in form of Top 3 destinations with the "same or better rule". This would be the task of the fourth element to create the dynamic packages across different destinations. The last element of the framework is the vital module of the "Adventure Search". Once the traveler selects an adventure and the origin of his trip, the system will generate a tour plan starting from the flight to the nearest airport for the adventure, the hotel stay, transfers and tickets to the attraction; if needed. The system will create a package with the cheapest combination with the option to change every element of his package. Once the selection is made, the booking is confirmed and pushed to the distribution channel.

Figure 7. Proposed Technical Smart Booking Engine Framework

B. Data Gathering After the Booking Process

At this stage, the traveler managed to select his preferred destination according to a live dynamic recommendation with new attributes that are missing from static search engines. The next step is to gather personalized information about the client to present all the services of the traveler's preference during the trip. In order to do so, we will request the clients who did not use the mobile app to install it. This is an easy task since most of the new clients tend to book via mobile app as we have seen in the introduction. The tool will provide all basic functionality such as reminders of services booked or an itinerary review. The app will be integrated with Google maps and places where it will download an offline map of the destination booked and add all the attractions available for tourists. This feature will remove the burden of acquiring data roaming packages where the client can find all the information needed within the app. The nearest utilities such as hospitals, police stations and supermarkets are highlighted on the map as well as the embassy of the traveler's nationality. In addition, the app will analyze the GPS and history of the device before the travel in order to learn more about the places the client visits and what kind of products are interesting to the client. Once the data is gathered, the app will search for similar places at the destination to provide the traveler the option to experiment new services at the destination or simply visit locations with a sense of familiarity such as experiencing new cuisine versus home food. We will still send push notifications to learn more about the preferences and tag matching locations during the trip. The second step would be to send the customized recommendations of the attractions to the traveler via the app. The "Travel Buddy" would start suggesting tours and services aligned with the client's preferences and will provide a portal to book it in advance in order to create a trip planner. The trip planner would set the schedules in the calendar and identify the best route to experience these services in order to save time and allow the traveler to benefit more from his time. Another feature to gather data is to allow log-ins on the site and access via the app to the social media accounts of the travelers. Most of the users share their posts and interests on their social media accounts and this information could be analyzed in order to provide recommendations for the users. In order to promote this idea and invite users to share their social media accounts, we have provided a business plan that would provoke the clients to use their social media accounts on our platform. The plan is to allow every user to become an agent. Once a user refers a friend to book via the site, they will both get loyalty points that can be used to book services and get discounts. Another feature would be to get points once you share your trip on social media accounts and receive a certain amount of shares and likes. This would provide a free marketing campaign to the site and serve as a database to propose recommendations.

C. Recommendations During the Travel

Once the traveler reaches his required destination, the app will be able to provide information without a data connection since all the points of interest are tagged within the offline map. At this stage, most of the attractions would have been booked since the data was filtered according to the preference of the user at earlier stage however the client would still require to check new attractions or even change the type of preferences once they discover the destination. The app will have an internal rating system that allows the business intelligence module to suggest new attractions according to the rating provided by the traveler. When the user rates his adventure, the future dynamic recommendations will be based on these new criteria. If it is positive, similar attractions will be pushed to the app however if the rating is negative, the app will provide top rated un-booked attractions to the traveler. The client can also ask his "travel buddy" to search for attractions or services within the vicinity of their stay at anytime and all the details will show on the map with the information to book it. Moreover, the data analyzed before the travel will inform the traveler whenever new dynamic input is available such as watching a football game; of the traveler's team, by presenting the app user the nearest sports bar similar to the place he visits back home. Another option would be to analyze the behavior for dining timing and preferences to recommend similar cuisines at the destination. All these attributes and notifications can be customized in case the user wishes to receive the information and notifications within the app. The preferences can be set according to the type to allow the user to receive all or selected type of notifications.

VII. Conclusions

We have noticed the incremental growth of online bookings during the past years where the booking process can be done anytime and at a click of a button. The booking trend is shifting from desktop to mobile apps and this new trend can provide the needed big data to engineer the recommendations platform according to the preferences of the traveler. Since the smart phones and gadgets have become an integral part in our lives, the data saved on these devices contain the backbone of the data for recommender systems; especially after the initial booking process.

In this paper, a survey was conducted to analyze the type of information that the traveler is currently obtaining from static booking sites and we tried to compare it with

what the travelers want in order to check the gap in current business models. One of the major findings was the absence of recommendations and the satisfaction level of the tourists from this new booking experience. The majority of the travelers required more details on certain activities that they can do at their location however this information was not present or came in too late when there was no time to perform it. We also learned that the tourists would always prefer if a human interaction is provided to give them a sense of confidence about their trip and to provide an insight on the selected destination. We managed to prove that there exists a gap in current booking system between the new requirements and the products being offered hence this structure allowed us to propose a new model that can be operational and successful with the current technology. Our proposed system, the *Smart Travel Companion*, involves an "artificial human interaction" by creating a bond with the traveler through all the levels of the travel experience. This interaction would provide the traveler the sense of confidence in online booking site and the products being offered. The proposed business model helps the traveler to select his destination by including dynamic attributes such as weather conditions and seasonality in order to get the best deals as well as to properly plan the activities that can be performed at the location. We also uncovered a new type of online product: The Adventure booking. This new feature will allow the travelers to choose an adventure and the system will create a trip dynamically from the selected origin. This product will allow the travelers to book the products they want in an easy to use centralized location with all the information and pricing available.

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