Digital Technology in Smart Tourism: Autonomous Web-based Recommendation System

Raheleh Hassannia

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Assoc. Prof. Dr. Ali Hakan Ulusoy
Acting Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Doctor of Philosophy in Tourism Management.

Prof. Dr. Hasan Kılıç
Dean, Faculty of Tourism

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Doctor of Philosophy in Tourism Management.

Prof. Dr. Habib Alipour
Supervisor

Examining Committee

1. Prof. Dr. Atilla Akbaba
2. Prof. Dr. Habib Alipour
3. Prof. Dr. Salih Kuşluvan
4. Assoc. Prof. Dr. Ali Öztüren
5. Asst. Prof. Dr. Mehmet Güven Ardahan

ABSTRACT

Smart tourism refers to the application of information and communication technology for developing innovative tools in tourism. It supports integrated efforts to find innovative ways to collect and use data derived from physical infrastructure, social connectedness and organizational sources, and users in combination with advanced technologies to increase efficiency, sustainability, and experiences.

The purpose of the study is design and develops recommended system based on the agent and web technologies, which utilizes a hybrid recommendation filtering for the smart tourism industry. A hybrid recommendation system based on agent technology is designed by considering the online communication with other sectors in the tourism industry, such as the TSC, agency etc. although, the online communication between the sectors via agents is design and developed based on the contract net protocol. Furthermore, the design system is developed on the Java Agent Development Framework and implemented as a web application. Case study-based results with considering two real scenarios and 100 customers illustrated that proposed web application improves the rate of the recommendation for the customers, in the first scenario without disturbances, this rate improve 20% and the second scenario with disturbances 30% rate of recommendation improved. In addition, based on the second scenario real time data communication on the system is happened therefore proposed system supported real time data communication.

Keywords: smart tourism, recommendation system, multi agent system, web-based

ÖZ

Akıllı turizm, turizmde yenilikçi araçlar geliştirmek için bilgi ve iletişim teknolojisinin birlikte uygulanmasını ifade eder. Akıllı turizm verimliliği, sürdürülebilirliği ve deneyimleri artırmak için fiziksel altyapı, sosyal bağlantı ve organizasyon kaynaklarından elde edilen verileri, ileri teknolojiler kullanarak kullanıcıları toplamak ve kullanmak için yenilikçi yollar bulma konusunda entegre olan çabaları desteklemektedir. Bu çalışmanın amacı, akıllı turizm endüstrisi için hibrit öneri filtrelemesi kullanan, aracı ve web teknolojilerine dayalı önerilen sistemi tasarlamak ve geliştirmektir. Acenta teknolojisine dayalı bir hibrid öneri sistemi, turizm endüstrisindeki diğer sektörlerle online iletişim göz önünde bulundurularak tasarlanmıştır örneğin; turizm tedarik zinciri, acenta vb. Bunun yanısıra, acenteler aracılığıyla sektörler arasındaki çevrimiçi iletişim, sözleşme net protokolüne dayanarak tasarlanır ve geliştirilir. Ayrıca, tasarım sistemi Java Agent Development Framework üzerinden geliştirilmiş ve bir web uygulaması olarak uygulanmıştır.

Çalışmada, uygulanan iki gerçek senaryo ve 100 müşteri dikkate alınarak yapılan vaka çalışması sonuçları, önerilen web uygulamasının müşteriler için öneri oranını arttırdığını göstermektedir. Bu oran İlk senaryoda, rahatsızlık olmadan % 20 oranında artmıştır. İkinci senayoda ise rahatsız edici kabul edilebilir öneri oranının% 30'unu iyileştirdiği görülmektedir. Ayrıca, ikinci senaryoya göre de, sistemde gerçek zamanlı veri iletişimi gerçekleşmiştir, bu nedenle sistem destekli gerçek zamanlı veri iletişimi önerilmiştir.

Anahtar Kelimeler: akıllı turizm, tavsiye sistemi, çok acenta sistem, web tabanlı

To My Family

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LIST OF ABBREVIATIONS

BA	Broker agent
CB	Content-based filtering
CF	Collaborative filtering
EA	Execution agent
FIPA	Foundation for intelligent physical agents
IA	Information agent
ICT	Information communication technology
IT	Information technology
ITRS	Intelligent tourism recommendation agency
JADE	Java agent development framework
KBF	Knowledge-based filtering
MAS	Multi-agent system
P	Precision
R	Recall
RA	Recommendation agent
RS	Recommendation system
TPA	Tour package agent
TSCA	Tourism supply chain agent
TSC	Tourism supply chain
UA	User agent

Chapter 1

INTRODUCTION

1.1 Introduction

The tourism industry has experienced tremendous growth in recent years. Such a massive leap has been partly attributed to the rapid development of communication and information technology(IT) across the globe as well as the widespread use of the Internet, which has simplified the process of accessing large amounts of global data from potential customers (tourists) on points of interest, travel plans, and destinations (Sebastia, Garcia, Onaindia, & Guzman, 2009). Currently, e-tourism thrives on both the social and economic sector (Spencer, 2019). With the evolution of online communication through internet, customers now see online advertisements of various brands. It is fast catching up with the buying behavior of consumers and is a major source of publicity for niche segments and also for established brands. This is the new way of digital revolution and businesses worldwide have realized their worth. In contrast, interim agency-based software plays a crucial role in bridging the gap between the customers and the system by recommending likely holiday packages and exhilarating tours. Furthermore, such software provides assistance to customers within a specified territory (Adomavicius & Tuzhilin, 2005).

However, in order to assist customers, many software agencies have developed innovative strategies that provide these customers with information which are useful for planning holiday trips and selecting holiday destinations (Hlee, Lee, & Koo,

2018; J. Li, Wu, Li, & Zhu, 2009; Vansteenwegen, Souffriau, Berghe, & Van Oudheusden, 2011; Yeh & Cheng, 2015). An innovation strategy is a plan used by a company to encourage advancements in technology or services, usually by investing money in research and development activities. An innovation strategy ensures that firms remain proactive, which may positively affect organizational competitiveness (Hjalager, 2010; Lin, 2013).

Developing an efficient software agency depends strongly on the recommender system (RS) or filtering approach as well as real-time data communication process (Ferreira, Putnik, Cruz-Cunha, & Putnik, 2012; Palos-Sanchez, Saura, Reyes-Menendez, & Esquivel, 2018). In this system, recommendation system (RS) plays an important role in improving the customers' level of satisfaction (Park, Kim, Choi, & Kim, 2012). Generally, RS directly assists customers in finding reputable services, hotels, tours, tickets, restaurants, and others by aggregating and analyzing the demographic data of the customers' reviews (Tarus, Niu, & Mustafa, 2018). In this system, an analytic technology is used to compute the probability that a customer will purchase a particular holiday package or tour by providing recommendations on the right one to purchase. In travel agencies, RS based software suggested suitable holiday packages (tickets, hotel, tour, time) for the customer. Furthermore, RS helps improve the customer's loyalty and satisfaction by recommending the acceptable option which is more related to the request of customer (Etaati & Sundaram, 2015). RS is a subclass of information filtering system that seeks to predict the "rating" or "preference" a user would give to an item. Therefore, RS is a foundation of advanced technology such as multi-agent system (MAS), ifiltering algorithms which is migrated to the smart tourism, in this respect smart applications are the main body of

smart tourism in order to used and adopted traditional tourism industry to advanced technologies (Kim, Kim, & Park, 2017).

Smart tourism is another trendy expression connected to portray the expanding dependence of the travel industry destination, their enterprises and their vacationers on developing types of ICT that take into consideration enormous measures of information to be changed into incentives (Gretzel, Sigala, Xiang, & Koo, 2015; Jovicic, 2017). RS in the smart tourism used for developed autonomous application to improve the online shopping and online reservation (Palos-Sanchez et al., 2018; Polese, Botti, Grimaldi, Monda, & Vesci, 2018). Generally, RS are classified into four types, which are: content-based filtering (CB), collaborative filtering (CF), knowledge-based filtering (KBF), and hybrid filtering, which is a combination of other types (Borras, Moreno, & Valls, 2014; Mahmood, El-Bendary, Platoš, Hassanien, & Hefny, 2014).

1.2 Problem Statement

Recently, advanced technologies such as the agent technology has been introduced to develop the intelligent software by considering powerful RS (A. V. Barenji, Barenji, Roudi, & Hashemipour, 2017). A MAS is a distributed artificial intelligence system, which embodies a number of autonomous agents for achieving common goals (Vatankhah Barenji & Vatankhah Barenji, 2017) and introduced new methodology for design and developed smart application. Combination of RS and MAS can be defined intelligent based software agency to smart industry (Gavalas, Konstantopoulos, Mastakas, & Pantziou, 2014a; Morais, Oliveira, & Jorge, 2012). However, up till now, the tourism industry has been used these technologies for a

single purpose, such as the individual selection of ticket, hotel and city tours with considering simple RS on the body.

Meanwhile, a lot of tourism agencies don't prefer to using the existing software or web application for recommending tours package to the customer, because they are suffering online communication with the hotels, tours agency, and supplier, which effect to reduces the flexibility and agility of the system and produces more faults (Moliner, Sánchez, Rodríguez, & Callarisa, 2007). Additionally, if customers want to used web application for service tour packages , need to adapted her/his schedule with existing packages and customization of this packages are not possible in the real time manner (C.-k. S. Wong & Kwong, 2004; S. Wong & Lau, 2001), therefore customers and tour agency willing to used traditional method (i.e. contacting directly the hotel or tour agency) for selecting or arranging appropriate tours package based on customers request (Berne-Manero, Gómez-Campillo, Marzo-Navarro, & Pedraja-Iglesias, 2018; Hassannia, Rezapouraghdam, & Darvishmotevali, 2016).

Therefore, existing web application and software agency suffering from customization for end user, real time data communication between different sectors of the tourism industry and acceptable RS (S. Wong & Lau, 2001). Generally based on existing research works on this area we can highlight current problems of the software agency as follow (Austin, 2001; Bowie & Chang, 2005; Weaver, Weber, & McCleary, 2007; C.-k. S. Wong & Kwong, 2004), these problems improved by proposed system:

1. The software agency uses offline data for developed tour packages.
2. Each agency and hotel have no autonomous data update for their operation.

3. The software lacks real-time reconfiguration and cannot supported customization.
4. There is a lack of suitable end user platform and real time reconfiguration on packages tour.
5. There is a lack of suitable recommendation filtering system for recommending tour packages.

1.3 Purpose and method of the Study

Therefore, for covering the existing problems, this paper presents a web agent-based intelligent recommendation application that incorporates real-time data and hybrid-based filtering system into smart tourism industry for recommending tour package based on the customer request. Generally real time communication and autonomous application are first step for achieving smart tourism industry (Huang, Goo, Nam, & Yoo, 2017).

Therefore, the aim is developing a real-time based web application by considering agent technology and hybrid recommendation filtering mechanism to improve the rate of acceptable recommended based of customer's desires. So, this paper contributes to the tourism industry in the following three aspects: Firstly, it presents an online autonomous web agency for smart tourism ecosystem which is based on the established connection amongst all the sectors in the tourism industry. Secondly, it designs and develops the system based on the agent technology and hybrid filtering system. Thirdly, it proposes a suitable filtering system for the tourism industry and to realize package customization. Therefore, the novelty of the study work is design and improvement of a real-time MAS based RS for supporting the smart tourism, which will be used for finding appropriate tour package; the main objective of this study is

to upgrade and improve the current software agency in the tourism ecosystem, in order to kick start the process of realizing a truly smart tourism industry. Of course, there is some limitation in this study that will be explained completely in the last chapter. As a whole this research occurred in the experimental environment, so in the future this research should be used in the real surroundings.

Judgmental sampling is a non - probable form of sampling in which the researcher selects samples from the population concerned; assuming that selection errors of judgment to counterbalance each other (Judd, Smith, & Kidder, 1991). In this thesis, data were obtained according to a judgmental sample of 100 people from different country. The link of the developed website sends it to each person, via mail to each person separately. Analysis of the data done by Minitab. Minitab is a statistical package extended at Pennsylvania State University in 1972 by researchers. Analysis software such as Minitab automates calculations and graph creation, enabling the user to concentrate more on data analysis and results interpretation.

1.4 Organization of the Study

The remainder of this paper was organized as follows; chapter 2, literatures review, chapter 3, the proposed system based on agent technology was provided. Chapter 4 discussed the implementation of the proposed system and explained the simulation platform and result of the study. Finally, section 5 highlighted the conclusion and future work to be considered in this field.

Chapter 2

LITERATURE REVIEW

Nowadays, tourism industry has a major impact on the economy. And so, the tourism industry is becoming more demanding and complex with multi-layered desires and needs (Aldebert, Dang, & Longhi, 2011). It is flexible, often experienced when travelling, with high demand for both perfection and diversity. Consequently, the tourist offers should be multi-optional and of high quality. Furthermore, consumer need improved agile service change with shorter lifetime for the services rendered (Hassannia, 2014).

2.1 Information Communication Technology in Tourism

Over the last ten years, IT has come a long way in revolutionizing the tourism and hospitality sector. With the use of advanced technology, the cost of doing business have been brought to an all-time low, there have been improvements in service delivery, operational efficiency has drastically increased and the level of customer satisfaction has also improved. As a matter of fact, some businesses and customers have been able to take advantage of this growing trend of technology usage, to improve their communication, streamline their reservation systems as well as guest service systems. In all, technology has made a massive positive impact in the tourism and hospitality sector by doing away with unnecessary high cost human labor, for more affordable technological labor. With this structure in place, problems with customer service can be completely avoided by eliminating human errors in the system.

Further ongoing research and development into Information communication technology (ICT), especially within the circle of web based systems, have encouraged globalization and set the standards for a newer form of relationship and commitment. According to a statement by (Drosos et al., 2017), “technology is now at the forefront of the tourism industry”. In another study carried out by Öğüt & Onur Taş (2012), high traffic sites, which have a huge forum for encouraging networking and socialization, use ratings, ranking and comments as a tool to shape the status of the tourism company. On the down side of this, due to the need for higher reputation ratings amongst the tourism industries, unethical practice for boycotting good standards have been seen all across the net. Increased pressure on directors within their respective tourism company, has caused some of them to seek these unethical practices, in a bid to gain added advantage over their competitors. According to (Gössling, Hall, and Andersson, 2018), this has caused some of the consumers and producers to speculate as to whether the managers of these tourism firms are actually ranked according to their quality of service delivery. With the advancement of ICT within the tourism sector, there has been a sense of harmonization between the digital and physical reality. And so, data is no longer restricted in access as information about businesses is readily available. Thus, the analysis of these data has had a major impact on businesses. From that the Buhalis and Law (2008) study, it was seen there have been massive breakthrough in businesses within the tourism industry as a result of technology.

The term “tourism” means travelling for business, leisure or recreational intentions, while IT means the capturing, processing, storage and distribution of pictorial, audio, textual as well as numerical data by the use of electric signals given off by telecommunication networks or computers. As stated previously, IT is of great value

to the tourism industry, making major impact in the accommodation, housing and transportation sector. These technologies play an important role in satisfying the ever increasing demand of customers who are on tour and IT is integral in making data available by first and foremost, acquiring it, processing it, storing it and distributing it.

IT is the system of managing and disseminating information with the use of technology and it covers a lot of areas such as computer networks, software architecture, hardware design, operating systems, programming and encryption. Within IT, there are a several disciplines of which an IT professional is tasked with. Some of this discipline includes the design of intricate computer networks, databases and installation of applications. Moreover, IT goes a long way in providing or giving social or economic value to people. Furthermore, one of the most obvious importance of IT is the spread or ease of information access by a global audience. Also, the cost for carrying out production is dropped significantly, bringing about knowledge production, transmission, and sharing to a minimum. With this drop in cost, it is no surprise that inefficiency has arisen as well as uncertainty in delivery. However, IT is here to stay and has reduced the rift that is created by distance and terrains.

The tourism sector is heavily dependent on information exchange and performs optimally well when the communication technologies, multimedia, and information systems are incorporated into its structure (Poon, 1993; Sheldon, 1993; Cho, 1998). And so, the importance of ICT cannot be overemphasized as it has changed the global tourism market. And as multimedia technology improves and as the internet expands or grows, tourism promotional network becomes more dynamic and fluid,

altering the state of the sector. In all, the influx of IT technologies has brought about added benefits by increasing the speed at which transaction is carried out, reducing the cost of production, enabling customization, encouraging advanced business models and inciting innovative practices (Buhalis and law, 2008). Furthermore, with the advent of Web 2.0 and an avalanche of social networking sites and applications, more obvious changes in the internet can be perceived, as this has empowered users, encouraged collaboration and improved socialization online (Gretzel and Jamal 2015).

2.2 E-Tourism

E-tourism, as the name suggest, is the use of technology to digitize all the conventional tourism processes as well as its value chains in hospitality, travelling and catering. This term denotes or encapsulates the deployment of ICT in tourism as well as its effect on the value chain of tourism. Over the past few years, more challenges as well as better opportunities have arisen, which have been addressed or are in the process of being address. However, it should be noted that e-tourism is dependent on the geographic location of the individual as some countries employ these ICT in tourism better than others. And so, competition arises as to define the top players in the industries, as ICT in tourism has set the pace for easily identifying and booking holiday get away at breath taking locations all around the world. In all, e-tourism has improved the business practices of these companies and streamlined the value chain as well as better connected stakeholders to their respective tourism companies. Furthermore, the internet has made it possible for tourism companies to better communicate with their customers, the authorities, groups and stakeholders of the company. By utilizing intranets within the establishments, companies can further fine-tune internal network operations and also, the use of extranets will help solidify

close ties with their partners i.e. both locally, online or globally. This encourages globalization bringing about online transaction and an extended value chain. And according to Buhalis, D., & Deimezi, O. (2004), e-tourism will set the standard or pace at which tourism companies compete with each other.

For the past thirty years, tourism has been closely tied to the development of ICTs. According to Buhalis and Law (2008), the establishment of the global distribution system (GDS) and the computer reservation systems in the 1980s and 1970s, respectively, have brought about a transformation in the strategic and operational practices within the tourism sector. Indeed, the line that separates the supplier from the customer has been blurred, eliminating the need for middlemen . And so, this has made it easier for customers to have direct access to the offers or opportunities featured in the tourism industries. Due to the widespread usage of ICTs, tourism on a global scale is now feasible. In the 21st century, due to the widespread adoption of ICTs and the usage of the internet, tourism industries have experienced innovative changes in all structural, operative, and marketing subsectors, which has made it easier for customers, middlemen and suppliers to be reached on a global scale (Egger and Buhalis, 2008). And so, the various sub-sectors within the service industry of tourism can be efficiently improved and enhanced through the use of ICTs. In one of the statements released by the world tourism organization, countries without a well-grounded ICT infrastructure will find it difficult to compete tourism world of the future. Commonly referred to as “e-travel” or “e-tourism”, it is a term used to capture the usage of ICT by businesses and tourist to change or configure the value chain and processes of the tourism industry. As a result, developments ICT directly influence the service industry of Tourism. On close observation, the consumption and production experience are indistinguishable, the products are intangible and intricate,

and the inventories for the storage of services and goods are perishable for the conventional tourist. Furthermore, the tourism industry is surrounded by vast number of services and information exchange, and so, it is imperative that there is a system in place for coordination the activities in other to reduce the uncertainties that rise during carrying out a service. In other for revenue and profits to be maximized, the businesses needs to act swiftly to make sale of the inventories that are unsold. Therefore, the need for ICT is crucial, as an intensive service industry, ICT plays an important role within the tourism sector, influencing the dynamics of the system. According to a study conducted by Harteveldt, Stark, Sehgal and van Geldern (2009), the largest amount of transaction that is carried out all across the globe is as a result of tourism. And so, there is direct correlation between the development of tourism and the development ICT. The two are closely tied to each other.

Prior to the introduction of the computer system, airlines carried out manual management of reservation by employing the use of card systems. Also, hotels were able to keep close watch on inventory through the use of colored tapes that was placed on the walls. However, as soon as the computer systems were introduced i.e. ENIAC in the year 1946, airlines changed the dynamics of their service delivery. This was done by the first of all installing automated booking systems. After this wave of change took place in 1946, other airline and hotel operators began to install their own unique form of computer reservation systems i.e. between 1960s-1970s. Global distribution systems became a reality in 1980, as airlines and hotels began to merge in global systems, which made it feasible for travel agencies to reserve numerous services. In the 1990s, the internet set in motion a new system of tourism as services could now be brought directly to the tourist, eliminating the need for middlemen and changing the structure of the tourism industry (Buhalis and Law

2008). E-tourism became a norm as companies invested heavily on it. It is a planning and recommendation application for the assisting users for the organization of tourist and leisure agendas. The way it works is that a RS is put in place to suggest destinations to the users as well as the cities they are most likely drawn towards. This list is sophisticated as it considers the users' likes from his/her past trips, the user's profile or demographics, and the users' preference. In the next phase, a planning module outlines the recommended destination piecing together some user's restriction as well as some temporal characteristics i.e. the planning module is vital or important in deciding when the activities that have been highlight is to be carried out and the procedure for doing so. However, the tourism applications in place lack the ability to organize these highlighted or outlined activities as a type executable plan or agenda.

E-tourism refers to the design, analysis, application and implementation of IT and e-commerce solution within the tourism and travel industry. Moreover, it covers the analysis of the market structure, economic processes and the management of customer relationship. When considering the definition of e-tourism from a communication viewpoint, e-tourism can be defined as the application or deployment of ICTs within the tourism and hospitality sector. Additionally, it is the use of ICT to better improve tourism experience of users. E-tourism helps in the generation of recommendation on personalized vacations, through the use of software and smart applications. This system makes it easier for tourist who are leaving their home country to become acquainted with the new surroundings they are exposed to. It enables tourist to be better plan their holidays in the new city and tailor activities that improve leisure time. The software is smart enough that employs algorithms that analyses the user's preference, demographics and past trips to form a collection of

destination that the user is most likely going to be interested in. The planning module within the e-tourism architecture is an important component which is designed for the scheduling of the recommended destinations with respect to the timeline, closing and opening hours and the distance between planned locations. Therefore, e-tourism is an important framework, of which it most important priority is predict the user's preferred characteristics for trips and suggest destinations that match up the characteristics of the user's preference.

2.3 Smart Tourism

In this competitive world, ICT introduce to tourism industry, and bringing a whole new concept called "smart tourism" to our world (Gretzel, Sigala, et al., 2015; Jovicic, 2017). Smart tourism alludes to the utilization of ICT for creating imaginative apparatuses in the travel industry. It bolsters incorporated endeavors at a goal to discover imaginative approaches to gather and utilize information got from the travel industry areas and social connectedness and clients in mix with trend setting innovations to expand proficiency, manageability and encounters (Gretzel, Zhong, & Koo, 2016). The ICT tools used for smart tourism include internet of things , mobile communication (Palos-Sanchez et al., 2018), cloud computing, and artificial intelligence (Amato, Mazzeo, Moscato, & Picariello, 2014; Reyes-Menendez, Saura, & Alvarez-Alonso, 2018).

The idea behind the term "smartness" refers to the incorporation of smart features as well as integration of organization networks that aid interconnection and interoperability, in order to streamline and automate the activities that take place on a daily basis as well as give value to the stakeholders of the companies (Buhalis and Amaranggana, 2015). Speaking generically, the essence of smart tourism is to

improve the management practices, boost the positive experience of tourist, improve the communication structure and information flow and most importantly, ensuring the tourism industries are kept on their toes by introducing competition due to quality of service (Gretzel et al. 2015; Koo et al. 2015). Taking into account that the tourism sector is an important sector for most countries and in some, the sector generates most of the revenue of the country, as is the case for Turkish Republic of Northern Cyprus, smart tourism opens the door to more sustainable and user friendly system. This will impact how users select their destinations and improve the quality of service delivery by the respective tourism companies. Smart tourism was therefore spawned as a result of the influx of information technologies and innovative pursuit in technologies. This has made it easier for information to be exchanged easily, data to be collected and new opportunities for creating value and better management practices to be executed (Eagle N, Pentland A, Lazer D 2008). With the openness of the online platforms, stakeholders both home and abroad are able to access information for management and orchestration purposes in order to make use of the network resource and improve the business function of the establishment.

One of the major requirements of smart hospitality is the need for interoperability, enabling the connection and exchange of information between private and public companies. Usually, Businesses develop an enterprise wide solution to be able to automate the process of system to system collaboration between companies that are they are in close partnership with. This helps in the reduction of the cost of operation as well as the improvement in the production (Douglas, et al, 2000). Prior to this, systems of this nature were majorly closed systems i.e. the technology wasn't open source but unique to the company, bringing about the use of customized protocols designed for communication, leading to the deployment of interoperability and

interconnectivity. Moreover, most of the systems that was put in place worked manually and was operating on an analog-type methodology for the information exchange. In order to enhance and streamline smart hospitality systems, there needs to be a standard in place that has been defined by a respected authority for comprehensive interoperable infrastructure or communication of data. This will help in automating the process of information exchange across the interconnected systems. In order to continue on with the idea of “smartness”, a common platform must be put in place in the cloud. This will help or assist in enabling data connectivity and communication across the tourism applications. In other for stakeholders of the company to make strategic decisions and forecast trends as well as plan, data must be dynamically interchangeable. And to be able to manage huge pool of data, Ramos et al. (2015) suggested that an intelligent system is needed for the extraction, analysis, transformation of combined data both from an external or internal channel. Therefore, tourism technology no only acts as a means to improve the efficiency of operations but serves as a means to boost organizational performance (Melián-González and Bulchand-Gidumal, 2016), improve the overall experience of customers (Neuhofer et al., 2014) and distribute the information that relates to marketing. Campaigns which are made for tourism, have diverted their focus to social media. This is because customers online are influenced by the material they consume, meaning, businesses can capitalize on their on-site behavior and pre-purchase pattern (Buhalis and Foerste, 2015). With the use of social media, communication can be established between customers in real-time, when visitation is made on the site. This will aid restaurant and hotel workers keep close ties with their customers, solidifying bond and increasing reach. Also, this system will keep tourism companies on their toes as any negative review from an unsatisfied customer can

compromise the opportunity of getting more clients. An intelligent system that is capable of connecting the hospitality industry, which is interoperable and interconnected will revolutionize the sector. This type of system must have a smart network which is capable of storing, sensing, analyzing and interpreting the data in real-time. With the introduction of the internet of things (IoT), data coming externally can be extracted and kept close eye on.

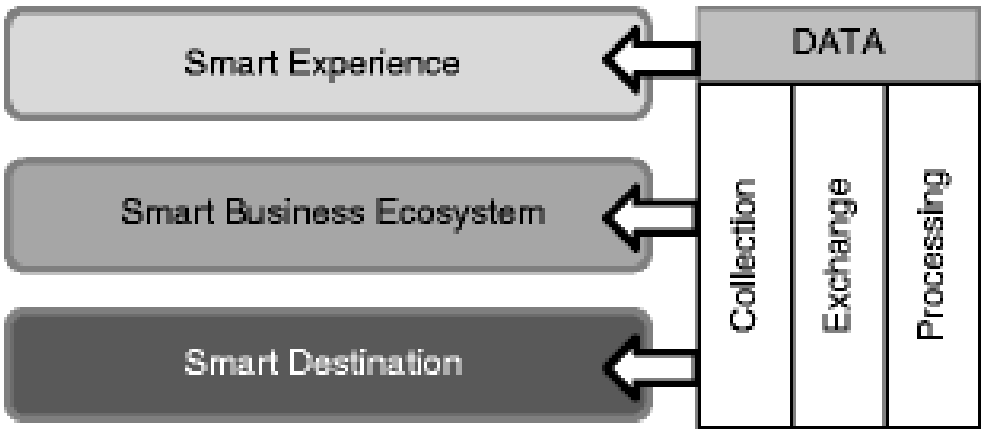

Figure 1: Information communication technology

The main aim of smart tourism is to improve the service quality (Neuhofer et al., 2014). One of the service that has been developed in recent years is the software agency or web-based agency (Aldebert et al., 2011). The primary objective of these agencies is to recommend suitable reservation (ticket, hotel, and tours package), while the secondary objective is to develop a suitable place for communication and information sharing between the customer and the tourism industry (Gavalas, Konstantopoulos, Mastakas, & Pantziou, 2014b). Therefore, the research divided literature review section into two parts. First part provided definition about filtering

methods, and second part focused on the existing research on the field of agency software by considering the agent technology.

2.4 Smart Tourism Destination

Smart tourism alludes to smart destination (Buhalis 2014), which are unique instances of shrewd urban areas: they apply smart city standards and foundation to urban or rustic zones and tackle huge information from occupants as well as vacationers in their endeavors to help versatility, asset accessibility and designation, maintainability and personal satisfaction/visits. Then again, shrewd the travel industry includes smart tourism encounters. Smart tourism enables sightseers to all the more likely convey and connect with and in urban communities to set up nearer aggregation with travelers as well as nearby organizations, neighborhood government and city absorptions. Likewise, shrewd the travel industry alludes to another savvy the travel industry economy with new resources, new actors, and new exchange models. Therefore, savvy the travel industry underpins city advancement and administrations in various distinctive ways. Consistent advancement in uses of equipment, programming and system improvements implies that the shrewd the travel industry city can react immediately, productively and viably to the travel industry needs and will have the capacity to beat contenders and keep up long haul flourishing.

The idea of smart tourism goals emerges from that of keen city. All things considered, the idea itself might be viewed as still to be developing and crafted by conceptualizing and characterizing it still in advancement. In applying the idea of computerized business biological community (Del Chiappa & Baggio, 2015) to the travel industry area, Baggio and Del Chiappa (2014) characterized a travel industry

goal as an arranged arrangement of partners conveying administrations to voyagers, supplemented by an innovative framework went for making a computerized condition which bolsters collaboration, learning sharing, and open development. In such a specific circumstance, the physical and virtual parts are emphatically basically coupled and coevolve to frame a solitary framework, inferring that all changes, changes or annoyances starting in any of them quickly spread to the entire framework (Baggio & Del Chiappa, 2014). The travel industry analysts agree that successful and effective data what's more, information trade, sharing, and advancement among all the partners required inside a goal arrange is significant for the travel industry aggressiveness (Argote & Ingram, 2000).

A standout amongst the broadest mutations to society in the twenty-first century is multiplication of data and correspondence advances (ICTs). The mechanical progressions of previous years have not just greatly affected society, business, and individuals in regular settings in urban communities yet additionally especially in connection to the travel industry (Boes, Buhalis, & Inversini, 2015). "Keen" has turned into an undeniably mainstream term to depict mechanical, financial, and social improvements energized by savvy advances that depend on sensors, enormous information, open information, and open API, better approaches for availability among people and machines and multi-gadget, organized trade of data. The versatile unrest, and explicitly the job of the cell phone and its numerous chances to help travel encounters (Wang et al., 2012), is particularly worth referencing in this unique situation. Advances in wearable innovations and expanded/computer generated simulation are relied upon to additionally push the limits of what information can be gathered and how it very well may be used/shown/experienced. In any case, it isn't too much the exclusive mechanical improves yet rather the inter communication,

symmetry and purposeful utilization of various innovations that comprises intelligence.

The term has been added to urban communities (smart city) to depict endeavors went for utilizing advancements inventively to accomplish asset enhancement, successful and reasonable administration, maintainability and personal satisfaction (Gretzel, Sigala, et al., 2015). Regarding physical framework (e.g. shrewd home, keen plant, brilliant matrix, savvy transportation), the attention is on obscuring the lines between the physical and the computerized and on cultivating innovation coordination (Gretzel, Werthner, Koo, & Lamsfus, 2015). Shrewd city activities are springing up far and wide, focusing on building keen framework. Saunders (2015) portray the mainstays of brilliant urban communities as: the shared economy (i.e. more astute methods for utilizing city assets; publicly supporting (more astute approaches to gather information); and aggregate insight (i.e. more brilliant approaches to decide). Google Trends demonstrates a lofty increment in scans for the expressions "brilliant city" and "savvy the travel industry" since 2014, showing that there is developing enthusiasm for the wonder. In fact, governments around the globe are putting vigorously in savvy city ventures and there is expanding enthusiasm for bridling such speculations for the travel industry purposes.

In such a unique circumstance, ICTs, data frameworks, and online life can be viewed as essential coordination systems (Bregoli and Del Chiappa, 2014) that permit data and learning to stream all the more effortlessly through the goal, increasingly logical information to be transmitted, and suppositions to be shared. also, the possibility that ICTs are among the elements that may impact information sharing the most is entrenched in the key administration writing (J.-T. Yang, 2010). This view is

intelligible with what Buhalis (2014) have as of late noted while expressing that 'bringing adroitness into the travel industry goals requires powerfully interconnecting partners through an innovative stage on which data identifying with the travel industry exercises could be traded in a flash'. The best needs of any brilliant tourism goals can be examined by embracing an interest side or a supply-side point of view. That implies upgrading the visitor's movement encounter, giving keen stages to assemble and disseminate data among neighborhood partners (Nam et al, 2017), encouraging the productive and compelling distribution of the travel industry assets, and coordinating the travel industry providers to guarantee that the advantages of the travel industry are evenhandedly circulated among the nearby society (Buhalis & Foerste, 2015). As such, a shrewd the travel industry goal can be viewed as an information based goal, where ICTs, the Web of Things, Cloud calculation and end-client network access frameworks (Buhalis and Amarangana, 2013) are utilized to give instruments, stages and frameworks to make learning and data open to all the partners in a methodical and productive way, and to make accessible components that enable them to take an interest as much as conceivable in the development procedure.

2.5 Recommendation System

The norm for a tourist is to plan his or her holiday vacation destination as well as the different point of interest; he or she is planning to see. And so, the data on such destination is usually gotten from travelling book guides, social media sites, online forum, travel agencies, and blogs. With the use of the internet, the information can be easily accessed and large amount of travelling information can be quite overwhelming to the travelers, especially if the person is elderly and not so knowledgeable with computers. And so, the challenge of finding the necessary

information as regards the holiday destination i.e. the pilgrim sites, historical landmarks, leisure locations, and previous reviews on pre-planned location, can be time consuming and mentally draining. Eventually, the tourist is frustrated and picks location that might not necessarily be the best choice out there. A lot of the websites for tourism don't offer customized searches and personalized recommendations for point of interests as well as the reviews from these locations. And so, the solution to this challenge was the use of RS. These types of systems were important in helping tourist to manage huge chunks of data in order to make the right call as regards the destination choices. The common name that is given to this system within the tourism circle is Tourism Recommendation Systems (TRS). The main idea of the system is to assist tourist in selecting the best PoIs based on their user profile and preferences.

RS s have been extensively utilized as a way of reducing the information overload and offering travel recommendations to tourists. A general definition of RS is the one provided in (Hassannia et al., 2019), defining RS as programs aimed to recommend the most suitable items (products or services) to particular users (individuals or businesses) by predicting a user's interest in an item based on related information about the items, the users and the interactions between items and users. Back in 2005, A domavicius and Tuzhilin provided a survey of RS as well as described various limitations of current recommendation methods and discussed possible extensions that can improve recommendation capabilities and make RS applicable to an even broader range of application. Around a decade after this crucial work, in (Colomo-Palacios, García-Peñalvo, Stantchev, & Misra, 2017), authors underline the importance of social information and social filtering, followers, followed, trust, reputation, credibility, CB of social data; social tagging and

taxonomies in the development of RS. As a consequence of this and other developments, new advanced recommendation approaches have been proposed, such as social network-based RS.

Therefore, RS as the name suggest are applications that aid users to pick out the most suitable service or product, by recommending it to them (Chiang, H.-S., & Huang, T.-C,2015). This is made possible, by analyzing the user's interest based on his or her interaction with goods and services. RS major priority is to downsize the huge chunk of data that can overwhelm a tourist, by making available to the tourist information that is personalized to his or her interests. Where RS shines is the ability to predict the tourist preference as well as studying the tourist behavior or the behavior that is exhibited by other users in other to properly and systematically provide useful and meaningful content to the tourist.

Over the last twenty years, there has been much attention given to e-services, which has been personalized to each users' preference with the use of RS (G. Adomavicius, A. Tuzhilin,2005) İnformation filtering and retrievals, were the humble beginnings for RS, which later on in the mid-1990s, became a unique branch of research and development. At this time, more effort was put into researching on recommendation challenges with respect to the structure of ratings. And as the world moved on into a more digitized environment and as more money and research was pumped into the development of RS methods, more sophisticated RS applications have been deployed in the market place. In one study, it was shown that majority of the bulk of research was done on application study of RS. This comes as no surprise when you consider the planetary size of information available (J. Bobadilla et al, 2013, D.H. Park et al, 2013). Example of the application of RS includes, recommending books, websites,

music, movies, products, services, tourism hot spots etc. As stated previously RS is a tool that has been personalized for recommending useful items of interest to an individual. In all, RS aid users by providing the service of filtered and downsized data that is tailored specifically for the user. However, the information that is recommended to the user shouldn't be too cumbersome and so, the idea is for new forms of data to be introduced as the user interacts with the system. And within the tourism industry, Rs has been used as a tool for downsizing and filtering the information that is offered as travel destination suggestions (S. Middleton, D. Roure, N. Shadbolt, 2009).

In summary, a RS offers the possibility of personalizing the information filtering so that only information tailored to the user's needs and preferences is shown. The adequacy of recommendations depends on the amount of available information. However, the task of introducing information should not be too tedious for the user, so the RS must be able to infer new data items and enrich the user profile as the person interacts with the system.

RS can be defined as programs which attempt to recommend the most suitable items (products or services) to particular users (individuals or businesses) by predicting a user's interest in an item based on related information about the items, the users and the interactions between items and users. The aim of developing is to reduce information overload by retrieving the most relevant information and services from a huge amount of data, thereby providing personalized services. The most important feature of a RS is its ability to "guess" a user's preferences and interests by analyzing the behavior of this user and/or the behavior of other users to generate personalized recommendations. E-service personalization techniques are typified by recommender

systems, which have gained much attention in the past 20 years. Early research in recommender systems grew out of information retrieval and filtering research, and recommender systems emerged as an independent research area in the mid-1990s when researchers started to focus on recommendation problems that explicitly rely on the rating structure. With the development of recommendation approaches and techniques, more and more recommender systems (software) have been implemented and many real-world RS applications have been developed. It was pointed out recently that application study is the main research focus of current RS research, especially in the current age of big data. The applications of recommender systems include recommending movies, music, television programs, books, documents, websites, conferences, tourism scenic spots and learning materials, and involve the areas of e-commerce, e-learning, e-library, e-government and e-business services. Therefore, to help researchers understand the RS development experience and to assist developers to approve applicable systems development in practice, this paper reviews the latest recommender systems (software) that have been developed using assorted techniques in a range of application fields.

Personalization is a common approach to attract even more people to online services. Instead of making general suggestions for the users of the system, the system can suggest personalized services targeting only a particular user based on his preferences. Since the personalization of the services offers high profits to the service providers and poses interesting research challenges, research for generating recommendations, also known as collaborative filtering, attracts attention both from academia and industry. The techniques for generating recommendations for users strongly rely on the information gathered from the user. This information can be provided by the user he as in profiles or the service provider can observe user's

actions like click logs. On one hand, more information on the user helps the system to improve the accuracy of the recommendations. On the other hand, the information on the users creates a severe privacy risk since there is no solid guarantee for the service provider not to misuse the user's data. It is often seen that whenever a user enters the system, the service provider claims the ownership of the information provided by the user and authorizes itself to distribute the data to third parties for its own benefits. RS can be broadly classified into Content based system and CF system. Content based system examines the properties of products recommended. CF system makes use of product consumer interaction data and ignoring other facts to provide recommendation (Guo et al, 2018). CF has been reported as one of the most successful recommendation technique, and has been widely used in number of different applications such as recommending movies, articles, products, web pages etc.

The RS utilized by existing recommendation frameworks predominantly incorporate CF recommendation, knowledge-based recommendation, and content-based recommendation. Every proposal strategy has its own points of interest and impediments. The burdens of content-based recommendation methods for the most part incorporate low computerization level and poor assorted variety of recommendation results CF approach relies upon a lot of verifiable informational indexes; in this manner, there are inadequacy and chilly begin issues. Knowledge-based recommendation is a static technique; whose primary trouble is information demonstrating. In addition, the customary suggestion frameworks can't completely utilize the normal favorable circumstances of idea cross section in information handling and investigation, and it is hard to rapidly and precisely acquire the attractive proposal results.

As indicated by the kind of information being gathered and the methods for utilizing them in proposal frameworks, the methodologies for suggestion can be named content based CB , CF and the hybrid one (Koren, et al 2014). CB filtering is broadly utilized for recommending frameworks plan, which uses this substance of things to make highlights and ascribes to coordinate client profiles. Things are contrasted and things past preferred via the clients and the best coordinated things are then suggested. One noteworthy subject of the CB manner is that RS needs to comprehend client inclinations for a few kinds of things and apply these for different kinds of things. CF manner is the heavily well-known methodology for suggestion frameworks structure. It uses a lot of information gathered from client conduct before and predicts which things clients will like. It doesn't have to break down the substance of the things. Rather, it depends on the connection among clients and things, which are ordinarily encoded in a rating criticism network with every component speaking to an explicit client rating on an explicit thing.

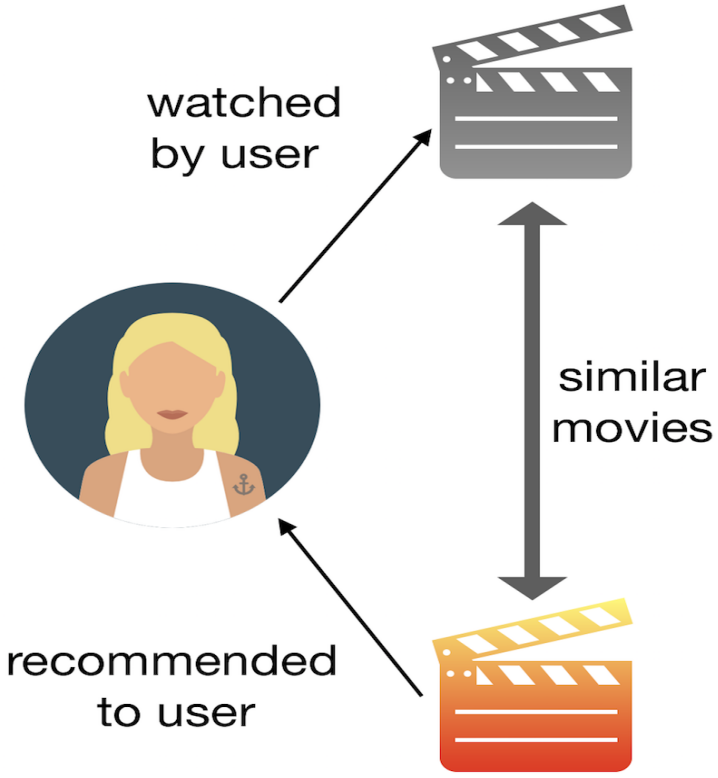

Figure 2: Paradigm for content based filtering RS

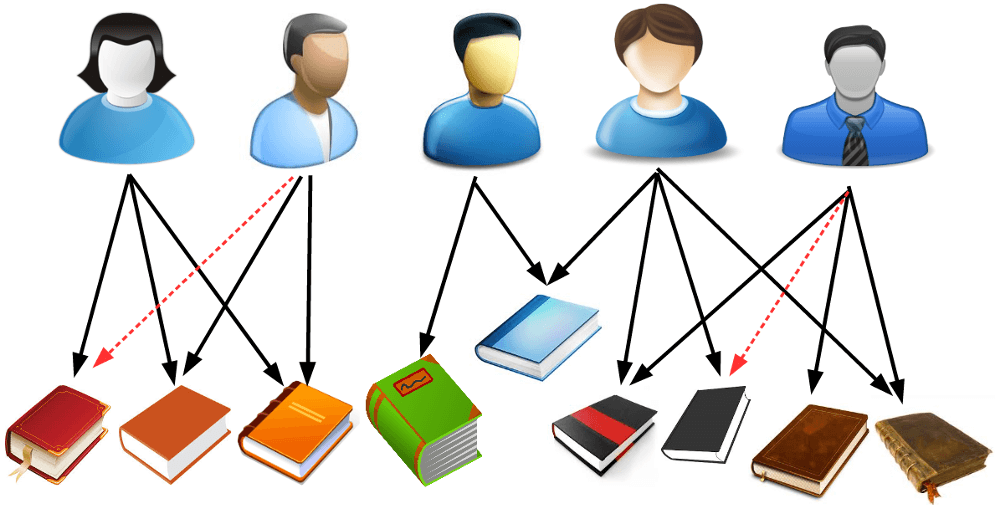

Figure 3: Paradigm for collaborative filtering RS

The hybrid approach is one that combines CB filtering way and CF manner effort to overcome their short come and prepare a more effective consequence (Chen et al., 2012). It is noticed that most of the deals with the CS proposal issue are endeavoring to give suggestion of things that might intrigue given clients. In spite of the fact that

a ton of works have been finished with the half and half way to deal with fathom the sparsity and chilly begin issues, proposal of CS things is as yet an open research issue.

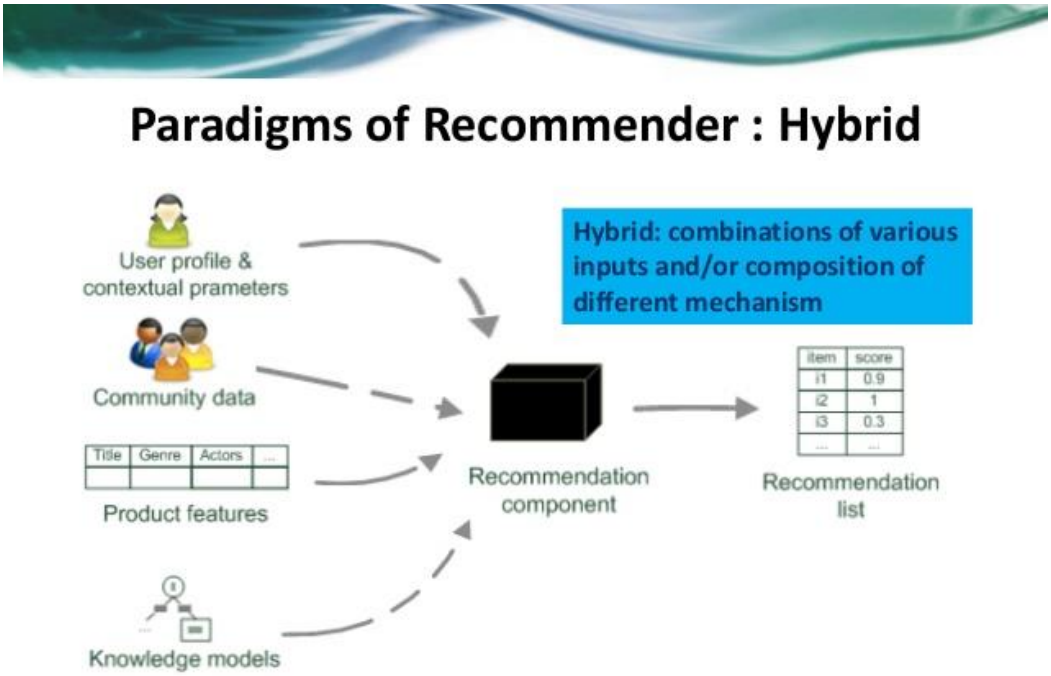

Figure 4: Paradigm for hybrid filtering RS

Recommendation frameworks have risen in the web based business space and are created to effectively prescribe the correct things to online clients.(Park et al., 2012). Generally, RS are classified into four types: CB, CF, KBF, and hybrid filtering. CF is a filtering approach that utilizes information filtering technique which is based on the customer's previous evaluations or history of previous purchases. Therefore, this approach strongly depends on the other customers' information. Without this information, this approach won't recommend any suggestion, which is the major disadvantage of CF based system (Herlocker, Konstan, Terveen, & Riedl, 2004). CF faces two main issues i.e. the sparsity problem and the scalability obstacle (Su & Khoshgoftaar, 2009). In contrast to CF, CB analyzes sets of data that have been rated by the individual customer and uses the contents of those data, as well as the

provided ratings, to infer a user profile which can be used to recommend additional items of interest (Lops, De Gemmis, & Semeraro, 2011).

In a CB recommender system, keywords are used to describe the items and a user profile is built in order to indicate the type of items that the user would prefer (Pazzani & Billsus, 2007). The main drawbacks of the CB system are 1) no suitable suggestions, i.e. the analyzed content does not have enough information to distinguish between items the customer would like or not like, and 2) content must be encoded with meaningful features. Moreover, the demographic data are sub-categorized under the CB, and this is aimed at grouping customers based on their individual attributes with respect to the stereotypical class to which each belongs to.

Therefore, the customer's profile is composed of his or her demographic characteristics, which signifies the class to which he or she belongs. However, a sparsity exists with respect to the user profile's demographic data (Pazzani, 1999). The KBF is based on the accumulated facts of the customer's inclinations and needs; functional knowledge, meaning that the acquired information on how a particular item meets a user's requirement, is vital for executing this action. As a result, a correlation can be drawn between the likely recommendation and the customer's needs. Another important piece of information which is connected to the knowledge-based approach is the ontology-based user profiling (Middleton, Shadbolt, & De Roure, 2004).

For example, Quickstep is a system recommendation platform that assists researchers by recommending online research papers. This is achieved by generating a model of the user's interests with respect to the ontology of the research paper's topics

(Trewin, 2000). To gain mastery over the difficulties that confront these well-known methodologies, which are used to make recommendations as well as filter out the positive aspect of these methodologies, some researchers have chosen to combine them and named it hybrid filtering (Ricci, Rokach, & Shapira, 2011). Therefore, hybrid filtering is an approach that combines two or more existing filing methods. The hybrid recommendation approach is broadly accepted in the tourism industry because it fills the gaps that exist in other methods (Borras et al., 2014).

2.6 Agent Technology

An agent refers to an entity that is tasked with the responsibility of carrying out an objective both autonomously and continuously within a non-determinacy environment, where there exist other entities as well as processes. It is a form of computer system that is encapsulated and placed in a certain environment with the ability to morph and take actions autonomously, in order to accomplish the programmed target (R. V. Barenji, Barenji, & Hashemipour, 2014). When we say autonomous, it means that the system is capable of making decisions based on the environmental feedback and these responses are as a result of the preset rule of engagement. And so, this definition points towards the fact that agents operate in environments outside their element, making use of its predefined beliefs and knowledge on the given environment, making decisions in response to the environment in order to change it. Based on the technology availability and the problem statement, agent usually use reasoning, searching, symbolic methods, learning, quantitative theory of decisions, planning, knowledge based reasoning, classical as well as sophisticated belief-desire-intention (BDI) models for tackling intricate challenges (Batet, Moreno, Sánchez, Isern, & Valls, 2012; Schiaffino & Amandi, 2009).. However, when there is more than one agent within a specified

environment and they communicate with each other, the system becomes a MAS (Fu, X., & Han, G2017). In a MAS, each respective agents cooperate or collaborate with each other in order to accomplish predefined objectives and targets (Borras et al., 2014; Mahmood et al., 2014). And so, the term “agents and multi-agents” are commonly used to mean the something. It should be noted, however, that agent-based employ a more dynamic methodology while tackling an environment that changes. In the growing technological world, we live in, agents have been able to find useful ways of solving problems in the defense, healthcare, manufacturing, business and of course, tourism sector. It is no doubt a widely utilized tool in the field of system integration, modelling, robotics, maintenance, control, assembling, simulation, communication, information and digital enterprise development (R. V. Barenji et al., 2014; Camacho, Borrajo, & Molina, 2001). This is one of the main platforms that is adopted by the servitization, industry 4.0 etc. In all, agents are most employed in process planning, scheduling, human evaluation of performance, business management and supply chain management. The feasibility of this technology is more promising than ever as it is completely applicable in the real world and shows huge potentials in the upcoming industry 4.0, which will be a completely cyber physical and internet driven system, enabling innovative pursuit in service industry, optimized manufacturing, and meeting up with economic targets. This is vital because there is a growing need to tackle competitiveness in the market for manufacturing enterprise, in order to make good decisions, pull together effective collaboration, improve communication, and address challenges that lean towards compromising the system as a whole.

A computer program that holds to some extent complete functionality as well as collaborates with others in order to achieve the preset task that was assigned can be

defined as a software agent. Another side to consider about agents is the ability of the agents to act autonomously and exhibit flexibility, in the environment that it is subjected to (Schiaffino & Amandi, 2009). Moreover, the idea of an agent is to be able to make decisions, active when needed and to be task driven. Therefore, a MAS is a collection of agents that work together to achieve pre-programed set of objectives. The sole purpose of their collaboration is to solve problems which can be done by merely using a single agent. MAS outshines its competitors in environment such as distributed domains i.e. software collaborative developing environment (Batet et al., 2012), distributed computing, supply chains for global manufacturing (Lorenzi, Correa, Bazzan, Abel, & Ricci, 2010). This improves the effectiveness as well as the efficiency of the groups working in the distributed environments. In another study (A. V. Barenji, Li, & Wang, 2018), user agents which stand as representatives for users that are similar are brought to light by employing user agents of transitive traversal, describes a methodology known as the agent based methodology. Privacy is conserved by employing the use of alias names during the communication amongst agents. Moreover, in order to ensure there is further protection of data from ease dropping, the data is obscured when added to personal information. Furthermore, in an agent-based system, privacy is also kept by generalizing the demographic filtering that is defined in order to support other forms of demographic filtering methods. However, this defined architecture doesn't address some aspects optimally i.e. the collision detection as well as prevention between the source and the filter and, manipulative attempts protection of the filter.

The term agent means an entity meant to perform a task continuously and autonomously in the non-determinacy environment where exist other processes and entities. It is an encapsulated computer system that is situated in some environments

and capable of being flexible and autonomous in action in order to meet its design objectives. Autonomous means they take decisions and act based on internal rules and information sensed from the environment. From this definition, it is evident that agents operate in an environment from which it is clearly separated; has its own knowledge and beliefs about its environment; uses preference in dealing with its environment; initiates and executes actions to change the environment. Based on the actual problem and available technology, agents use searching, reasoning, planning, learning, symbolic methods, classical and quantitative decision theory, knowledge-based reasoning and sophisticated belief-desire-intention models as tools in solving the problem (Vatankhah Barenji & Vatankhah Barenji, 2017). But when a number of agents exist in given environmental system, the community of interactions between one agent to the other is called a MAS, in which each agent maximizes its own utility by synergizing and cooperating with other agents to achieve set goals. So it should not be confusing when the two words, agents and MAS are used interchangeably. While agent-based take a more dynamic approach to cope with the continuous changeability requirements. Agent has found its useful application to various sectors such as manufacturing, defense, tourism, healthcare and business services.

Employing MAS model can serve as a useful tool for sealing the communication between the available supply chains. As a result, the process of supply chain can be regarded as the combination of various agents which are capable of taking decisions, made possible as by this pattern of software design. And so, every single agent in MAS work collectively to execute and perform various tasks in order to accomplish improved performance of the system and solve complex problems that go beyond the capabilities of a single agent (Kozlov, 2017). There has been a move from the use of supply chain information technologies to the use of MAS. This has brought about the

added advantage of e-businesses, however, for e-businesses to materialize fully, information systems needs to be categorized by smaller investments as well as costs, improved efficiency on computation for solving intricate problems, adaptable to change and deploy decentralized supply chains in its infrastructure. This will help in providing cross organizational cooperation. With MAS implemented, the hiccups and shortcomings of other commonly used technologies for supply chains can be avoided. The idea of MAS is for Autonomy i.e. agents act based on a programmed set of instruction in respond to external stimuli, being aware of their environment (Jennings and Woodridge, 1995). Reactivity: the agents are capable of analyzing their environment and responding to it based on external stimulus (Parunak, 1999). Social ability: in this situation, the agents are capable of collaborating and bonding with other agents or humans with the use of agent languages (Moyaux and Chaib-draa, 2006). Proactive: agents not only respond to the external stimuli but take decisions based on the subjected stimuli (Lo et al., 2008). Furthermore, MAS does well with handling of complex information in combination with the simplistic development within a short time period (Lu and Wang, 2007). By putting into use the concept of on the fly clustering as put forward by Berkovich and Liao (2012), and agent mining by Twardowski and Ryzko (2014), the configuration of the supply chain of the entire system can be effectively achieved at low cost within a short timeframe. Additionally, some of these added benefits can become more pronounce by the putting in place legacy systems in existence (A. V. Barenji et al., 2017).

2.7 Innovation in Tourism

There are some vital features that required in tourism, in order for new definitions and other innovative typologies to be created. And so, advancement in the tourism sector is greatly multidimensional as well as the tourism phenomenon. Therefore,

products for tourism that come about by innovation, add competitive advantage to the company that embraces it. As a matter of fact, by increasing the drive for innovation, the business or tourism establishment can become highly exclusive. Tourism businesses are tasked with the responsibility of creating value for their product by employing innovative practices (Santos, 2014). This means the businesses supply a unique experience to their respective clients and gain the needed advantage over their competitors.

The new tourist is more inquisitive and technology minded. The way their lifestyle is put modeled shows a need for innovation. And so, according to Crnogaj et al. (2014), tourism businesses can capitalize on this growing desire for innovative practices, by employing these practices in service and product delivery. Therefore, it should be noted that the successful innovation in tourism industry bringing about success and development, is of great importance. Moreover, customers play a vital role in making this innovation feasible. In a study, observed by Weiermair (2006), there is a need for the tourism industry to continuously adapt to the changes that take place due to demand. According to Scheidegger (2006), tourism businesses that strive to be successful need to put forward creative solutions by defining new and improved productivity as well as services that make them globally competitive. In line with this, there has been a huge barrage of research into innovative practices within the tourism and hospitality industry. This research has grown and extended into various new areas and the current literature has been able to pinpoint this innovative area of opportunities (Hjalager, 2002). According to the authors, embracing innovation in tourism will give added value to tourism and destination businesses, increasing their competitive advantage (Hjalager, 2005; Volo, 2005).

Furthermore, there is a need for tourism industries to keep on their toes in terms of innovation in order not to be swept away by the competition and fast pace at which copycats can steal winning ideas. And so, innovative practices that prove seamlessly difficult for copycats to take on is of great value to tourism businesses (Vila et al., 2012). When covering going through literature, on innovation, there have been two that stand out i.e. process innovation and product innovation. Other forms of innovative practices have also been identified, in a paper written by Abernathy and Clark (1985), there were four types of innovations that were identified i.e.

1. Normal Innovative exploits: this includes training, fostering production, improving staff capabilities, maintaining good standards and improving quality
2. Niche-based exploits: encouraging networking of businesses, introducing newer products from a combination of previous ones and capturing the attention of entrepreneurs to pursue new business ideas.
3. Revolutionary based exploits: find creative ways for introducing new technologies in the marketplace
4. Architectural based exploits: restructuring the infrastructure responsible for tourism, introducing newer events as well as attractions, implementation of research-based knowledge and performing all required processes in an efficient manner.

There have been improved performances as a result of the introduction of newer products into tourism firms. According to Ivankovic et al. (2010), the higher the number of newer products that are introduced into the hotels, the greater the profit margins that can be gotten from each respective room. According to another scholar, in the person of Hialager (1997), innovation can also be classified under information

handling, institutional, and identification management. Following these five classes of innovations in tourism were put forward by Later Hialager (2010), namely:

1. Innovation due to service and products: based on changes that are made to the product or service and are considered innovative by customers; moreover, they are also considered out of the box, add value to the tourism businesses as these could cause the tourist to purchase these services and products simply because of these new features.
2. Innovations due to process: initiatives that have been adopted that are geared towards improving productivity as well as efficiency and so, the most important form of investments within the technology circle.
3. Innovations in management: this includes staff restructuring and empowering, adopting newer business processes, improving the satisfaction at work, celebrating employee excellence in the workplace by bonuses, retaining strategies for valuable employees etc.
4. Innovations in marketing: defining and putting in place new marketing ideas; this includes, but not limited to, co-production branding and loyalty programs.
5. Innovation in institutions: newer organizational and collaborative configurations; this includes networks, clusters, and alliances.

2.7.1 Strategies for Employing Innovation (Innovation Strategy)

The concept of "innovation strategy" refers to a plan that has been defined by an establishment to incite the desire for innovative pursuit in technological advancement and service delivery. This is accomplished by usually investing monetarily in research as well as development. In order for companies to improve or boost the value of the products, there is a need for customers to be integrated into its structure.

In all, in order to be successful in today's highly competitive market, there is a need for innovative strategies to be employed. This will mean that establishments are kept on their toes in a bid to boost their competitive advantage in the tourism industry (Hjalager, 2010; Lin, 2013). When it comes to selecting the innovation strategies to employ, companies have their preferences as well as standards. Moreover, resource allocation plays an important role here as well as their innovative capabilities. There are normally various innovation options that are open to these businesses, which are captured under the form forms of innovation as defined by Schumpeter i.e. product, process, organization, and marketing. Also, a combination of these stated forms can arise. According to a statement by the OECD Oslo Manual, in the last edition, innovation can be defined as "the implementation of new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations" (Mortensen & Bloch, 2005, p. 46). According to Gomezeli (2016), there were four distinctions that were made between the common service innovations. Service or product innovation means the deployment of new services or products in the establishment. For the case of service innovation in hotel establishments, as well as the service sector, advanced technology is deployed or a combination of these technologies in order to provide added competitive advantages (Evangelista & Vezzani, 2010). Service and products innovation have one main similarity, which is to cut down cost, explore new market opportunities and come up with newer activities (Lehtinen & Järvinen, 2015; Gunday, Ulusoy, Kilic, & Alpkan, 2011). Ongoing research in the hotel tourism industry has shown that the deployment of newer services has varying intricacy levels. However, in most cases, the adoption of innovation emanates from an external source (Scaglione, Schegg, & Murphy, 2009).

When talking about the process innovation, it is an innovation strategy that employs the improved service delivery methodology. The idea is to either drop the cost of service delivery or improve the quality at which the service comes about (Mortensen & Bloch, 2005). Furthermore, process innovation plays an important role in achieving the desired targets or set goals. Take, for example, if there is a task that requires repetition, as regards a particular service, the process can be clearly defined and improved. Moreover, other than bringing in newer services, other scholars, such as Mowery, Fagerberg, and Nelson (2004), have come to the conclusion that the impact of innovation on the process, is complicated and not straightforward. In most cases, the individual hotel companies like to develop their own uniquely tailored process innovation by taking into account organizational innovation and service innovation (Nieves, Quintana, & Osorio, 2014).

On the other hand, there are marketing innovations, which has to do with the deployment of newer marketing strategies that wasn't previously adopted by the establishment. According to Mortensen & Bloch (2005), this could be in the form of product placement, making changes in pricing and promotion, packaging techniques and design. The bulk of its focus is channeled towards the customers, in a bid to sway them and increase its sales margin. According to Line & Runyan (2012), more research has also been able to show that marketing innovation is capable of boosting a business's competitive advantage. In another study, technological advancement is directly connected to the service, process and innovation strategies.

The mechanism of decision making for executing innovative processes within the service circle had begun to be deciphered and has manifested itself within the last 10years (Lin, 2013). According to Evangelista & Vezzani, (2010), there is also

ongoing research that has shown that various configurations of innovative practices have varying impacts on different tourism company. In all, the adoption of newer and improved services often warrants the introduction of promotions, service designs, placements, processes (service), and firm practices. And so, companies have a larger pool of options to consider when considering the four forms of innovation to deploy i.e. process, product, marketing, and organizational innovation. Moreover, the companies can choose to combine some of them or very much do without any of them.

2.8 Online Customer Behavior

So many of the highly placed professionals have pointed out how the use of the internet has brought about modifications in the buying environment (Varadarajan and Yadav, 2002). One of the profound changes that can be seen is the commonality of data. As a result, data is now readily available for prices, product features, product competitors etc. Knowing fully well that most customers' decision making is based on the data accumulated from the phase of pre-purchase, there have been increased efforts, on the paths of marketers, to understand the behavior and mentality of a buyer making online searches (Bhatnagar and Ghose, 2004). At most times, the customers go through the web and are captured by sites that put out intriguing contents that it is of interest to them. And so, the challenge a website designer has is to create sites that pull traffic i.e. it must be entertaining and informative.

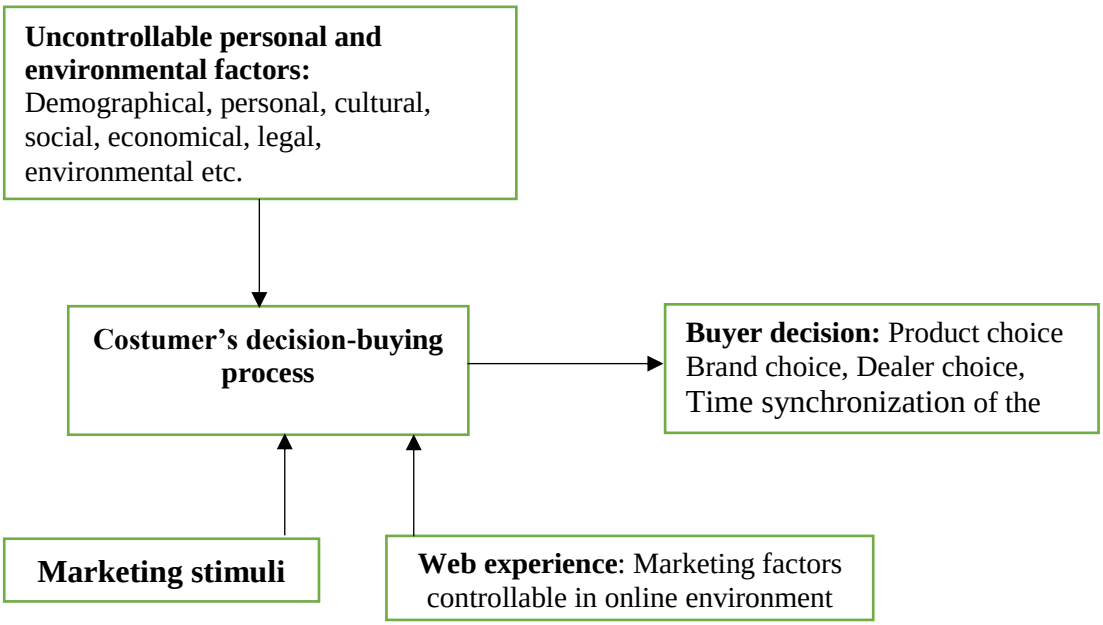

Figure 5: Factors that influence online consumer behavior

Nowadays, online shopping plays an important role in the economy of the world due to its widespread adoption by both retailers and customers. This is because of the ease of its platform usage, its value, and its efficiency (Eroglu, Machleit, & Davis, 2001). Unfortunately, most businesses operating a website fail to cease the customers' attention online by creating content that captivates and improves the user's experience, thereby compelling them to make purchases (Hausman & Siekpe, 2008).

The general impression that is made on the customer as well as the proposed action he or she will make, is impacted by the series of activities with includes the events, the design on the webpage, the site atmosphere, and the interaction that is made on the site between the customer and the business. These activities are therefore crucial for cultivating a sense of friendliness amongst the customers, in a bid to sway the customers to make favorable decisions. As online communication keeps evolving with the use of advanced communication technology, users are now exposed to a

barrage of advertisements. This online communication technology analyses the buying behavior of the customer and it is usually the main arsenal employed for carrying out publicity online for huge brands and certain types of niches. And so, this is a powerful revolution as most businesses have understood the power that this technology wields.

When looking at the figure above, it can be seen that during the searching phase, the customers are going through the site looking for customer's comments as well as reviews. Moreover, they will want to find out the company status online and the brands that offer their desired expectations. And so, during this phase, it is important that the site structure is well organized and the designs are captivating as well as intriguing. This is in a bid to get the customer's attention to make a purchase.

Phase 1: One of the most important features of the internet is that it allows for the pre-purchase phase. This helps the customers to make a different comparison of alternatives.

Phase 2: Within the phase of purchase, the sales service, assortment of products, and information quality are the features that are of most importance to the customers in order to enable them to make accurate decisions on what to buy from the presented buyers.

Phase3: After the online purchase have been made and executed, more importance is put on post-purchase behavior. In some occasion, the customers have some doubts about the product they purchased and would want to return or change the product

that was bought. And so, the need for exchange and return services will be more evident.

2.8.1 Factors Responsible for Governing the Behavior of a Customer Online

In order to understand these factors, the primary factor of motivation must be understood i.e. what makes a customer motivated to make a purchase of goods or service via the World Wide Web. This factor can be broken down into two i.e. the internal factor and the external factor.

When talking about the external factors, these are factors that are beyond the reach of control of the user online. These external factors can be categorized into five sections i.e. the socio-economy, demography, public policy, technology, sub-culture, marketing, and the reference group. On the other hand, when considering the internal factors, the behaviors or personality traits are the sub-factors to consider. This can be further broken down into learning, attitudes, motivation, perception, and self-image. The Functional Motives is used to describe the needs of the customer and it is made up of things like the price, the online convenience of shopping, and the product selection, the place of shopping (environment). On the other hand, Non-Functional Motives is used to describe social values, such as the product or store brand.

There are three main influencing factors that contribute to consumers' behavior online i.e. the seller's characteristics, demographic characteristics, and finally, social context (Torkzadeh and Dhillon, 2002, Moon and Kim 2001). In another study, conducted by Shun and Yunie (2006), they were able to pinpoint the main products which were sold online. This includes eBooks, software, music, and electronics. In making a purchase of any of these products, the customers don't necessarily need to see them in person, but only reading the product description and reviews, will make

them make a decision. According to another scholar in the person of , customers, online, can be categorized into four groups i.e. information, entertaining, exploration and shopping. Another important point was made by Cheung M.K. et al. (2005), in which they stated that the factors which contribute to influencing the behavior of customers online could be influence brought about by the customers' environment (the national, the concurrence, the market volatility and concentration, the current juridical structure, commerce restrictions, etc.), the characteristics of the online customer (endogenous factors and behavioral characteristics), the environment online (i.e. security concerns, viability, quality of shopping, usage ease, loading characteristics, network speed etc.), characteristics of the online firm (i.e. the online shop features) and the service as well as product features (i.e. its type, quality and product knowledge). According to another study, it is important for customers to be encouraged to take part in online social networking sites, this will make them easier to reach and communicate with. It should be noted that online marketers would be quite capable of altering the buying dynamics of a customer online by employing traditional marketing theatrics and tools. This is accomplished by just giving the customer a good user experience online. Moreover, web experience can be thought of as a combination of factors i.e. the information displayed, the emotions that were captured, the stimuli exerted, the degree of functionality, the services, the products, the 4ps (promotion, placement, product, and price). Furthermore, web experience connotes factors which include the findings, the surfing, alternatives consideration, comparison, transacting and interacting with online firms.

The general impression that is made on the customer as well as the proposed action he or she will make, is impacted by the series of activities with includes the events, the design on the webpage, the site atmosphere, and the interaction that is made on

the site between the customer and the business. These activities are therefore crucial for cultivating a sense of friendliness amongst the customers, in a bid to sway the customers to make favorable decisions. As online communication keeps evolving with the use of advanced communication technology, users are now exposed to a barrage of advertisements. This online communication technology analyses the buying behavior of the customer and it is usually the main arsenal employed for carrying out publicity online for huge brands and certain types of niches. And so, this is a powerful revolution as most businesses have understood the power that this technology wields.

Chapter 3

METHODOLOGY

It is evident that the conventional software or traditional methods employed in the tourism industry for selecting tour packages aren't suitable for the smart tourism (Bowie & Chang, 2005; Buhalis & Deimezi, 2004). Because, suffering from real time data communication, real time customization and suitable recommendation filtering approach, which leads to unsatisfied customers by recommended not acceptable tours (Ferreira et al., 2012; Gavalas et al., 2014a). To reply to previously mentioned challenges and issues, it is basic that smart software is designed and developed to meet up with the requirements of the present era of the smart tourism. In this respect, this research serves to provide a solution to this dilemma by proposing a novel intelligent tourism recommendation system, called the ITRS, by considering hybrid recommendation filtering mechanism as well as real-time data gathered from customers and the tourism supply chain (TSC), with aiming to improve the recommendations rate.

Therefore, ITRS need to be autonomous and smart application, the study used agent technology for deseing and develop ITRS because it is one of the well-known methodologies and tools for design and develop autonomous and smart application. MAS used to design and developed various applications on the different field such as

financial markets (Preis, Golke, Paul, & Schneider, 2006), control system (Vatankhah Barenji & Vatankhah Barenji, 2017), project management (Yan, Kuphal, & Bode, 2000) and in the many others fields, therefore it is accepted methodology and tools for design and develop ITRS. The architecture of ITRS illustrated in Figure 4 by considering data communication and agents' connection.

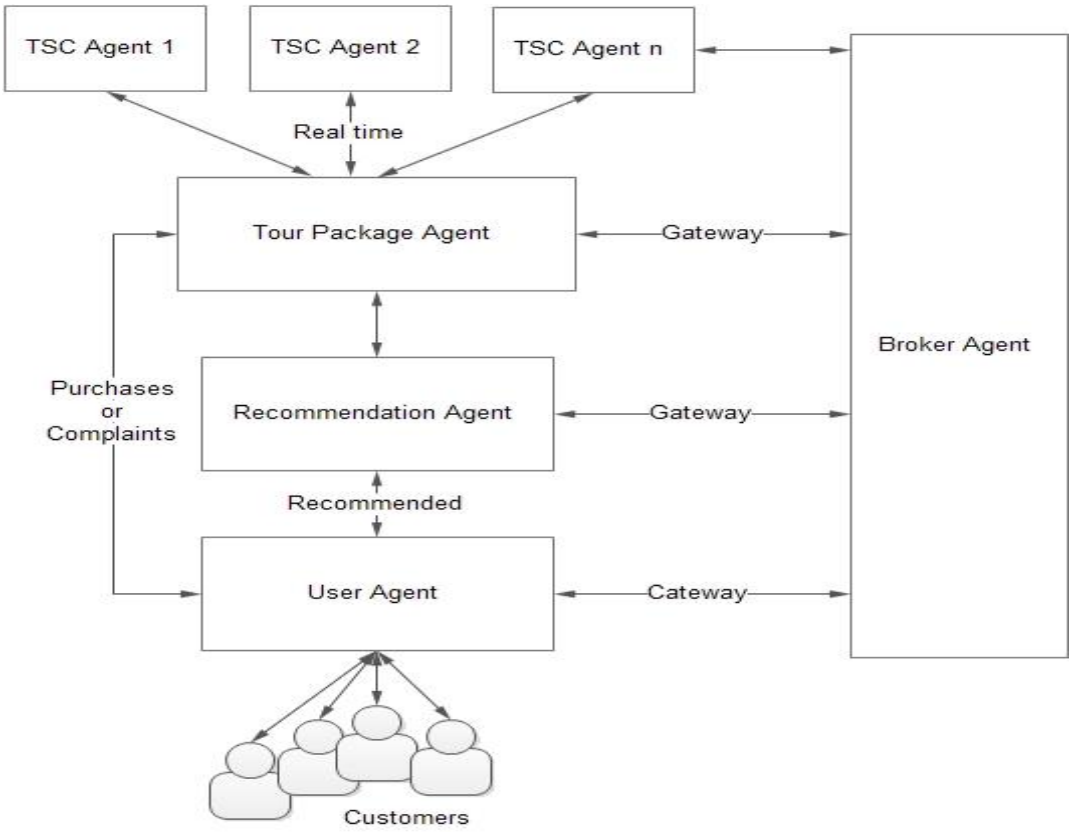

Figure 6: Overall proposed approaches based on agent technology

This architecture is developed based on agent based model (Heppenstall, Crooks, See, & Batty, 2011) and contains five agents: TSC agent (TSCA), tour package agent (TPA), recommendation agent (RA), user agent (UA), and broker agent (BA). In this application, the agent type is determined based on its functionality and respective application goals. In the proposed software, three groups of agents are exist: the execution agent (EA), information agent (IA), and hybrid agent (HA) (execution and

information) (Vatankhah Barenji & Vatankhah Barenji, 2017). The EA is responsible for transport describe as a procedure and making the obligatory decisions. The IA, as the name implies, is responsible for improving data or information to other agents in propose to inform the other agents on the system changes. Table 1 highlights each agent type and the information flow on the agent. Each agent's design and definition are subsequently illustrated in detail.

Table 1: Agent description

Name	Type	Input	Output	Result
TSCA	IA	TSC	TPA	Real time information form hotels, tour operator and etc. to proposed software.
TPA	EA	TSCA	RA	Create suitable tour packages, purchasing method, finalization.
RA	HA	TPA	UA	Recommended suitable packages for customer based on hybrid recommendation system.
UA	IA	Customer	TPA&RA	Responsible for gathering information from customer.
BA	IA	All	All	Responsible for making gateway between agents for communication purpose.

3.1 Tourism Supply Chain Agent (TSCA)

The TSCA is responsible for real-time communication and information updates on the proposed system via a web-based user interface. The major responsibility of this agent is to update the system database whenever the hotel managers alter the TSC information. The information accumulated from the hotels as well as other parts of the TSC is usually updated through this agent. Therefore, the TSCA must be able to adapt to the TSC. This agent consists of sub-objects categorized in two tiers. The first tier is comprised of the straight provision that supplies the tourism services to

interposition. Examples of typical straight suppliers are parks, shopping centers, hotels, bars and restaurants, handicraft shops, and transportation operators (Font, Tapper, Schwartz, & Kornilaki, 2008). The second tier is comprised of the supply services or first-tier supplier products, such as the food manufacturer, water and energy suppliers. The updated information through the TSCA directly affects the tour packages in real-time. For this purpose, the TSCA created an interface via the web for tour operators and hotel managers in order to update their information on the system, TSCA follow the semantic based agent communication.

3.2 Tour Package Agent (TPA)

The TPA creates many types of tour packages which is based on the changes in the supply, demand of the holidays and tours. These package tours are based on real-time data that has been accumulated from the TSC and customer demand; similarly, a generation of each package tour can be developed for groups or individual customers. Each package is composed of a set of sub-tours and each customer is expected to like the package. A package contains the modality of the tour, i.e., departure date, price per person, duration, hotel type, and other relevant information. Agent-based technology creates real-time communication between the TPA and two other agents, such as the RA and the TSCA, in order to generate an exceptional package tour this communication on the MAS named as an ACL (Fornara & Colombetti, 2003). This communication is illustrated in the sequence diagram that is shown in Figure 5. From the sequence diagram, the research assume that the customer has an initial package in the system, such as advertising-based package; after logging into the application and adding the related information, the updated version of the recommendation packages are send to the customer's profile.

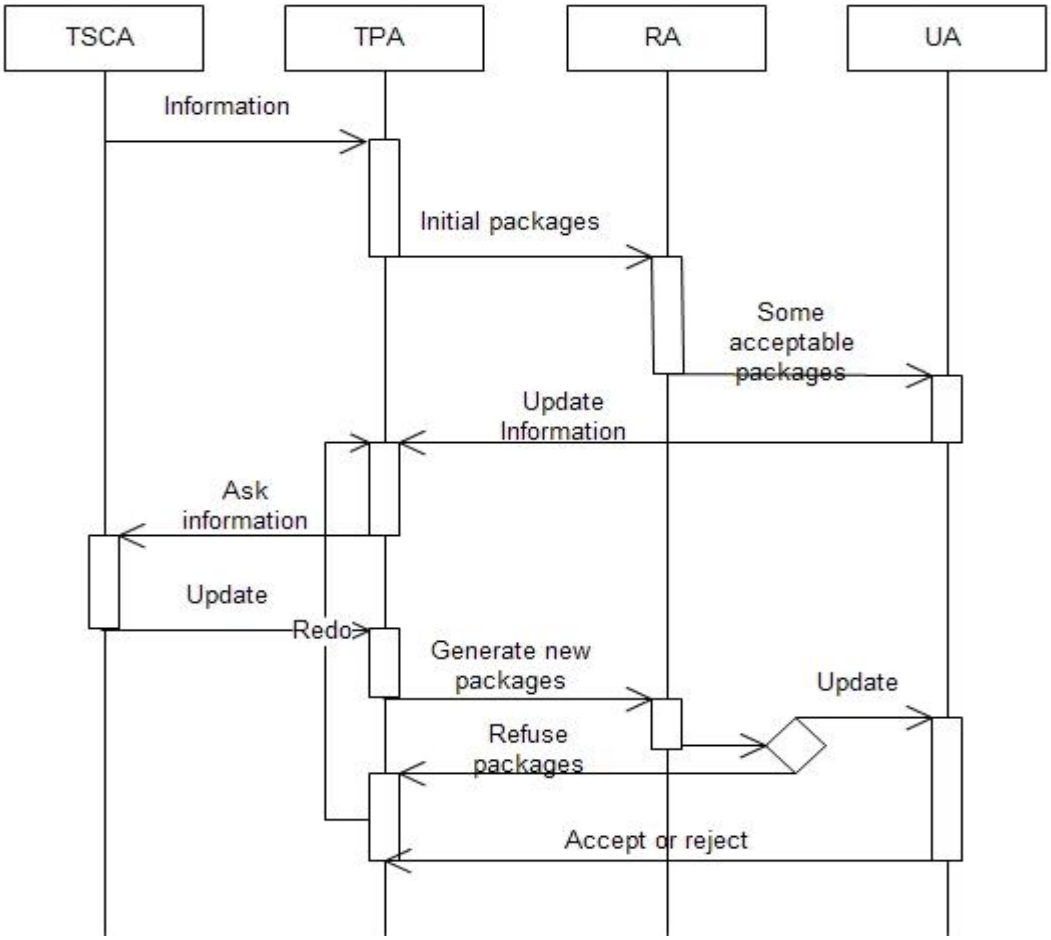

Figure 7: Sequence diagram

3.3 User agent (UA)

The UA is accountable for enabling user interface to end user and hotel managers, it could run on a mobile device through a mobile app or on a website as a web application, enabling the customer to create an account and interact seamlessly with the software. The main aim of the UA is to provide a user interface to the customer by specifying the demographic and evaluation data that would assist in creating a user interface that executes the recommendation and purchasing process. The UA plays a key role in the communication process between the customer and the application. Also, it is vital for the updating of demographic data in the system. Therefore, it must be user-friendly and have high security. Interactions between customer through the UA and other agents are illustrated in Figure 6. The user

interface was developed using HTML and AJAX, while the communication between other agents was developed using the HTTPS and JADE gateway.

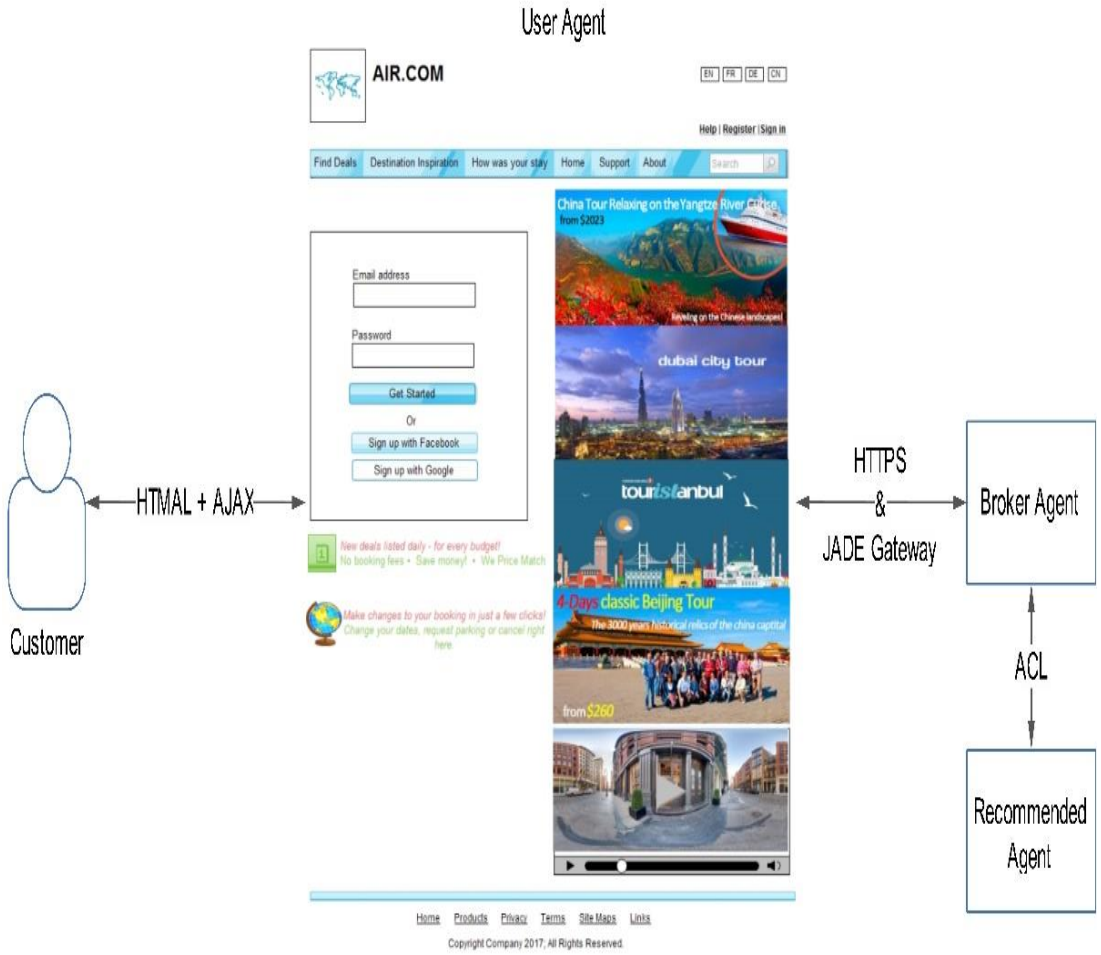

Figure 8: Communication between the customer and recommended agent via user agent

3.4 Recommendation agent

The major aim of the proposed software is to recommend the tour packages that are attractive to the customers and acceptable based on the customer desire. Therefore, RA plays an important role towards achieving this objective. RA makes recommendations to customers based on the CF and CB filtering methods; this means that the RA utilizes hybrid approach in the ITRS. The hybrid-based approach

and the real-time data that are updated by customers and TSC, helps to improve the RA's performance. The architecture of this agent is illustrated in Figure 7.

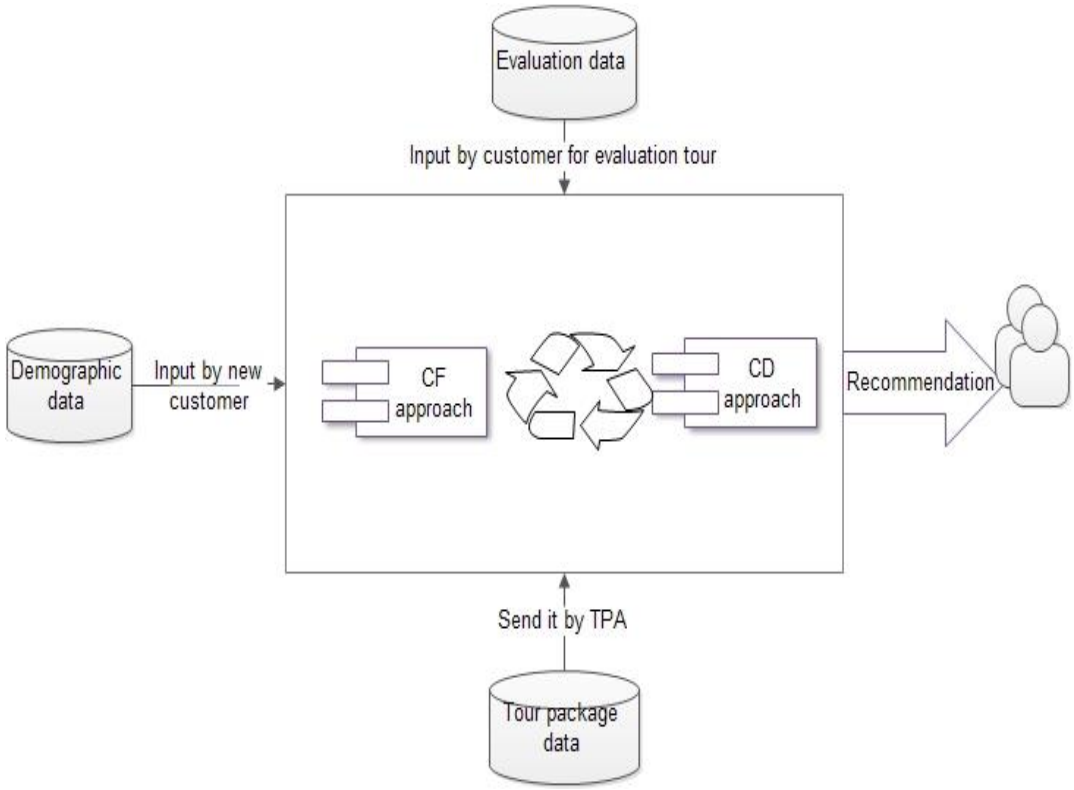

Figure 9: Architecture of recommendation agent

From Figure 7, it can be seen that RSA uses three types of data as an input; the first one is the demographic data, which is defined by customers in the user profile. This data is categorized into three main classes: personal information, trip information, and favorite information. Such information can be obtained from a brief questionnaire that the customer fills out when the corresponding UA is initialized. Additionally, the favorite information is represented by the qualitative labels and is more focused on the type of trip, based on criteria such as food, city, country, entertainment, and others (Saldaña, 2015). Furthermore, updating the demographic data through the UA plays an important role in the system; if the customer does not update his or her information on UA, the system simply recommends any initial or

standard package advertised without considering the demographic data. The second data is the feedback of the customers for the tour evaluation. The evaluation result of the customers is sent to system via UA. Therefore, activities are recommended depending on the customers' interest. Furthermore, the research used a text approach for acquiring and updating an evaluation data (W. Wang, Wang, Barenji, Li, & Tsui, 2018). Finally, the last data on the RA is the tour package data, which is built up and updated by the TPA using real-time communication with the TSCA such as the available hotels, tours and tickets etc.

To determine the best-recommended packages for the customers, the purposed hybrid filtering approach was utilized, which included both the content-based and collaborative algorithms. Both algorithms enabled the recommended activities to be filtered with respect to their type, language, date of proficiency, recommended age, price, and supply chain, before being shown to the customer. In the proposed system, recommendations are made on demand and proactively. The first approach was the CB approach, which follows an association rule leaning towards obtaining knowledge about a customer's preferences and to build on the content-based profile provided (Morais et al., 2012).

Association leaning is a rule-based machine learning method for figure out interesting interaction between variables in the large databases. The second approach uses item-based CF recommendation algorithms (Sarwar, Karypis, Konstan, & Riedl, 2001) to keep customers interested as well as to improve the customer's satisfaction with the system. Recommendations and suggestions must be quick and agile by making sure each new response is updated on the recommendation model. In other words, the proposed system should be had ability to send a set of recommendations

or suggestions within a certain timeframe. Consequently, in the proposed hybrid approach, both approaches (CF and CB) use a matrix Tn×n, where n is the number of tour packages and each tij ∈ T represents the total number of sub-items of tour i and j in the same tour package. RA updates the matrix in real time, whenever the data is updated. The RA checks all-possible rules i → j by considering the two values (P is the number of tour items in a tour package):

$$Support_{i \to j} = t_{ij}/P$$

$$Confidence_{i \to j} = t_{ij}/t_{ii}$$

Consequently, by using this method, if a set of *n* suggestions is requested through the system, the *n* privileged recommendations based on the confidence that satisfies the least confidence and support provisions are proposed.

Additionally, in the proposed system, CF uses the same method and matrix to compute the similarity, which returns the top *n* most related items.

$$sim(i,j) = t_{ij}/\sqrt{t_{ii}}\sqrt{tij}$$

The proposed hybrid recommendation mechanism utilizes these formulas, and so, these formulas become implemented based on the code generation on the implantation part. Therefore, these algorithms which are developed based on the existing works (Sarwar et al., 2001) implemented on the RA agent as code.

3.5 Broker Agent

The BA is responsible for monitoring and developing a suitable and safe communication platform in the MAS. BA utilizes a contact net protocol (A. V. Barenji, Barenji, & Hashemipour, 2016; R. V. Barenji et al., 2014). Additionally, other responsibility of the BA is to monitor other agents by sending related information for collaboration and cooperation purpose. In this respect, an agent can

cooperate with other agent by sending help signal. Help signal can only be reacted to by the agents who come into the preceptory region of the agent who has sent the signal. Mathematically, 'help' signal S^t_i sent by i^{th} agent for collaborative help in task 't' is defined as The BA ensures proper communication among other agents in the MAS and so, an ontology was determined in this regard. However, it must be noted that the defined ontology for this current work is more of a knowledge model than a real ontology. Nevertheless, the term ontology has been used by most MAS environments and it is used here as well (A. V. Barenji et al., 2017).

3.6 Research Method

The specified MAS application was executed using the standard in the field—the JADE framework which is compliant with the Foundation for Intelligent Physical Agents (FIPA). JADE offers a set of functionalities, such as a communication protocol and a white or yellow pages service (Bellifemine, Poggi, & Rimassa, 2000). This simplifies the development of the agent-based applications and the set of auxiliary agents, the agent communication channel, and the agent management system; as a matter of fact, it supports the life cycle management of such an application. The ontology was developed by the Web Ontology Language in collaboration with the Protégé tool (Tudorache, Noy, Tu, & Musen, 2008) for storing heterogeneous information and converting it into XML files. Also, the communication with the customer through a browser was developed using the AJAX platform (Woychowsky, 2007). The XML Http Request interface and the JADE-Leap extension were used to enable execution of agents in portable devices with limited hardware, such as smartphones or PDAs. Figure 8 illustrated technical tools for developed communication between the customer and recommended agent via user agent. The study launch proposed web application on the amazon web services,

for technical implementation the research follow (Varia, 2010) and EC2 was used for computing propose. The proposed hybrid RS was implemented as a code on the EC2 which follow the section 3.4.

3.7 Case Study

In this experiment, the research used a collaborative manner, a content-based approach and proposed hybrid approach to compare the predicted values generated for the different tours. These filtering approaches were implemented on proposed web application.

This study used the qualitative approach to evaluating the proposed model. The experiment was carried out with 100 customers (they were graduate students). The number of customers for evaluation of the proposed platform is an accepted number in this initial step, which makes it easy to eliminate bias on the system. This thesis used judgmental sampling that was related to selection of sample elements according to the judgment of the researcher (Babbie, 1999). Judgmental sampling, also called purposive sampling or authoritative sampling, is a non-probability sampling technique in which the sample members are chosen only on the basis of the researcher's knowledge and judgment. As the researcher's knowledge is instrumental in creating a sample in this sampling technique, there are chances that the results obtained will be highly accurate with a minimum margin of error.

To achieve high quality results, this study considers 10 sections, and on each section, 10 customers connected to application in the same time with 20 minutes deadline. In the first step customers provided personal information via UA (section

3.3) after that based on the request of customer suggested acceptable packages tours to the customer. Therefore, totally experiment took 200 minutes.

Electronic mail (email) is perhaps the oldest method of computer-based communication and is widely available in one form or another. It can be used for one-to-one, one-to-many and many-to-many communication. In online social research, the use of email has been one of the traditional methods for soliciting and collecting data for studies. Typical uses have been the distribution and collection of surveys, conducting interviews and conducting focus groups. These three roles have distinct needs from email.

This research used email-based data gathering such that email contain a link of developed website and each person need to click on the link in order to access for proposed platform, after that each user signing to the web application based on the initial password generated by web site, after logging each user change the user name and password. To achieve high quality results, the study consider 10 sections, and on each section, 10 customers connected to application in the with 20min deadline via this method. After logging in the first step customers provided personal information via UA based each user provided personal information, trip information, and favorite information which was explained in the RA, all data is save in the access database and after following each section desire package based on the customer desire was suggested to the customer, when customer satisfy submit all data to the system, and Minitab software is used for analysis these data in this research.

Before the launch of the web application, this study considered some data as the initial database on the system, this data was gathering from Booking.com and

Skyscanner.net. The research developed 70 summer session tour packages from four different countries, by considering more verity in the system in order to bring possible selection and show the effectiveness of the proposed RS; this number of packages are acceptable number for testing proposed system (Sarwar et al., 2001). This research, considers customers from different nationalities respectfully i.e. 20 Iranian, 20 Turkish, 20 Cyprus, 10 Nigeria, 10 Pakistan and 10 Europe. Table 2 illustrates this tour packages in detail by considering the visa requirements.

Table 2: Information about tour packages

Name of country	**Tours**	**Visa type and requirement**	**Airline**	**Cities**	**Types of hotel**	**Price range**
North Cyprus	10	Visa not required Hard electronic	Pegasus, Turkish airline, Mahan airline, atlas global, British airline, etc.	Famagusta, Lefkosha, Girne, Guzelyurt	Five, four and three-star hotels.	700-3000$
Turkey	25	Visa not required Hard electronic	Pegasus, Turkish airline, Mahan airline, atlas global, ata airline and etc	Antalya, Izmir, Alanya, Istanbul, Marmaris, Kemer, Ankara, Beleck.	Five, four and three-star hotels.	400-3000$
China	30	Visa not required Hard electronic	AirAsia, Thai air, china southern, Mahan airline, Aeroflot, etc.	Beijing, Shanghai, Guangzhou, Dali, Shenzhen, Xiamen, Nanjing, Dalian.	Five, four and three-star hotels.	700-3500$
UAE	5	Visa not required Hard electronic	Mahan airline, Emirates, ata airline, etc.	Dubai, Abu Dhabi.	Five and four-star hotel	400-2500$

Source: booking.com, Skyscanner.net

Chapter 4

RESULT AND DISCUSSION

In order to have an effective evaluation of the proposed system, in this study tried considering a variety of possibilities such as different countries, types of hotels, visa requirement and tours, which made it challenging for the proposed system. To consider real-time communication using the TSC, the research considered real-time data exchange on the system by the hotel manager via the web user interface as well as real-time communication between the proposed web application and the TSC. Moreover, two different scenarios were presented; in the first scenario, there was no drawback in the system, this meant that the TSC and all parts supported the existing tours (all 70). However, in the second scenario, two packages from Cyprus and three packages from Turkey were deleted via the TPA with respect to TSC communication as result of no empty room. In order to achieve equal evaluation, the proposed system developed for the three filtering approaches and negotiation failure between agents were assumed not to occur. To evaluate and analyze the proposed platform, based on software view two indicators were considered: precision and recall. Generally, exactness is the portion of pertinent cases among the recovered examples, while review is the part of applicable cases that have been recovered over the aggregate sum of important occasions (Morais et al., 2012).

Therefore, both precisions and recall can be defined based on an understanding and measure of relevance therefore, in this study Precision is defined as a ratio of

selected relevant items to the number of totals items, and recall is defined as the ratio of selected relevant items to the available total relevant items. Therefore, these two indicates illustrated the capability of the proposed web application according to the accepted rate which is the main aim of this paper, developed the quality of the software agency to improve and increase number of customers and agencies which are used intelligent software for formulation of these indicators this study used. Therefore, our study precision and recall are given by the following formulas.

Recall= d/(b+c+d)

b,c and d list of possible tour packages,

Precision= (1/N) *Recall.

N is recommendation.

In the first scenario, the research considered the TSC information from the tiers that did not change and supported all packages that existed on the system. Therefore, the proposed web application considered all the packages (70) during the recommendation process. For a better comparison, the study used the average of the precision and recall, which was illustrated in Figure 5 and Figure 6. In the first scenario, the results show that the proposed system has a higher value on both indicators; the collaborative system produced 12.45 recalls and 2.89 precisions. Then, the content-based system produced 14.22 recalls and 3.23 precisions. Additionally, our proposed system produces approximately 16.23 recalls and 3.99 precisions. These results show that the proposed system performs better than the other systems which improve the rate of recommendation tour packages based on the customer request and desire. In the second scenario, 5 packages were canceled. The TPA deleted these packages from the RA databases; as a result, these databases were updated, with respect to this disturbance and 65 packages instead of 70 packages

were used. Figure 6 shows the average of the indicators, illustrating that the proposed system in scenario 2 had higher values in both results (R = 13.41 and P = 3.43) and performed better than the conventional system.

Table 3 and Table 4 provided detail results by highlighted each section on the case study. Therefore, each table contains 10 columns and each of them illustrated result for a section, for example column 1, first 10 customers connected to web application and provided personal information to the web application and based on these information and customer request they received recommendation from the system. Collaborative based filtering provides 5.7 packages to customer this number this is average of the system and CB provided 6.2 and our proposed hybrid filtering provided 6.8 tour package to customers, therefore proposed platform improves the rate of disere recommendation. As you see on both tables with the increasing customer's data rate of recommendation packages were improved, but in the proposed platform this rate was better than other approaches. In the second scenario result of the last column was significant and proposed platform (P=1.9 and R=20.3) perform much better than collaborative (P=1.3 and R = 13.4) and content (P= 1.4 and R= 15.1).

Table 3: Results for scenario without disturbance

Type	Indicator	1	2	3	4	5	6	7	8	9	10
Collaborative	R	5.7	7.8	9.8	10.7	12.1	13.6	14.7	15.4	16.9	17.8
	P	5.7	4.6	3.2	3	2.7	2.4	2.1	1.9	1.7	1.6
Content based	R	6.2	9.1	11.6	13.3	14.4	15.6	16.5	17.6	18.3	19.6
	P	6.2	3.9	3.8	3.5	3.3	2.9	2.7	2.3	2.1	1.8
Hybrid system	R	6.8	10.1	13.5	14.7	15.8	17.2	18.9	20.5	21.4	23.4
	P	6.8	5.7	4.6	4.1	3.8	3.5	3.3	3	2.7	2.4

Table 4: Results for scenario with disturbance

Type	Indicator	1	2	3	4	5	6	7	8	9	10
Collaborative	R	4.1	4.6	5.6	6.7	7.9	9.4	10.5	11.2	11.7	13.4
	P	4.1	3.8	3.3	2.7	2.5	2.1	1.9	1.7	1.6	1.3
Content based	R	4.5	5.7	7.5	9.1	10.1	11.4	12.2	13.3	14.2	15.1
	P	4.5	3.7	3.4	3.1	2.7	2.4	2.1	1.8	1.6	1.2
Hybrid system	R	5.7	7.1	10.5	11.7	12.8	14.2	15.9	17.5	18.4	20.3
	P	5.7	5.2	4.1	3.7	3.3	3	2.7	2.5	2.2	1.9

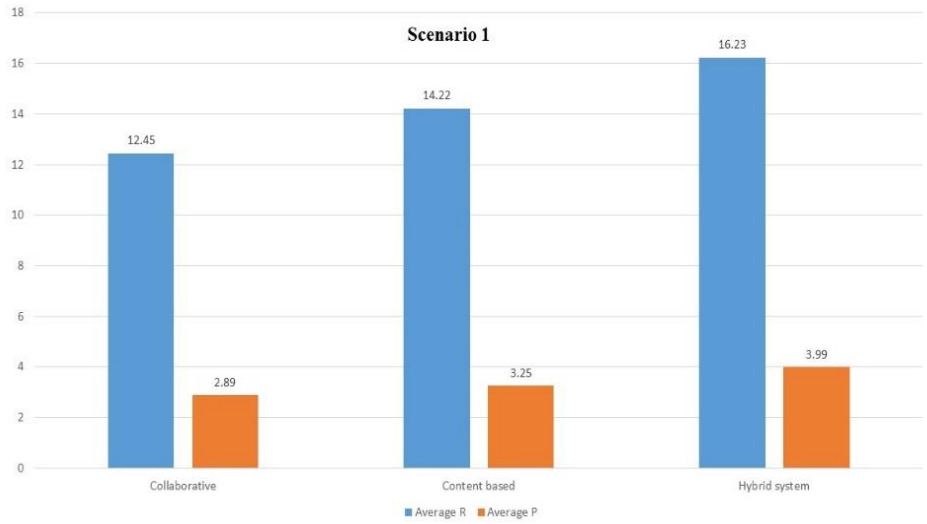

Figure 10: Result of scenario 1

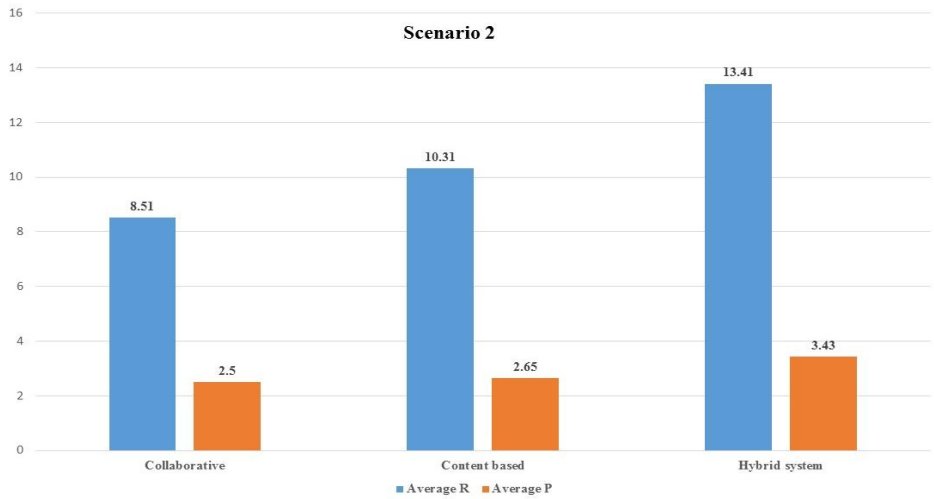

Figure 11: Result of scenario 2

Chapter 5

CONCLUSION AND IMPLICATIONS

In view of the proof underlined in the writing survey, smart travel industry is a general classification of tourism industry with an objective of encouraging approachability to the tourism industry and friendliness items, administrations, spaces and encounters through ICT-based apparatuses. Then again, it additionally actualizes creative and pioneering organizations and cultivates the interconnectedness of organizations (Buhalis & Amaranggana, 2015). Therefore, smart tourism aims to take advantage of advanced information to enable flexibility in services (with considering sustainability and stability) to address a dynamic and global market. In these circumstances, the first challenge is to develop intelligent application for tourism industry to adopt advanced technologies which are the first step of migrating traditional tourism industry to smart tourism industry, therefore, the study proposed an agent-based recommendation web application for tours selection, which is capable of improving the recommendation and satisfaction of customers in the tourism industry.

In contrast with online communication evolving through the internet, customers are now seeing various brands ' online advertisements and shopping. It catches up quickly with consumers ' buying behavior and is a major source of advertising for niche segments as well as established brands. This is the new way digital revolution has taken place and businesses around the world have realized their value. So

recognition of online customer behavior assists manager and marketer to increase their market share and profit. As Costantinides (2004) express one of the factors that have influence in online customer behavior is a web experience of the customer. Thus customer satisfaction from the online shopping leads to market share growth and profitability. For achieving this goal, upgraded online shopping, and in this case enhancement RS is an important section. Proposed web application developed based on agent technologies and contains five agents with unique features and responsibility in order to create real time data communication and performing suitable filtering mechanism. Therefore, the developed web application created an online platform for recommending tours for customers meanwhile integrated whole tourism sectors. This is accomplished by considering real-time data gathering for different sectors.

In this study, the research used a hybrid recommendation mechanism for recommending tours for the customer and, MAS used for the design and development of autonomous web application. In this respect, the design system implemented based on the web applicant and provided a graphical interface for the users and hotel manager. The communication between agents developed based on contract net protocol and implemented on the JADE. The proposed platform provided on-demand services for the customers. The proposed system was tested based on case study and compare with other filtering approaches two real based scenarios were consider and based on the results which were formulated by two indicators, proposed can be able to support real time communication and provided better recommendation to customers. In both scenarios, ITRS perform better than others platform such that based on recall indicator ITRS improve the desire recommendation for customers approximately 20% (first scenario) and based on the

precision indicator ITRS improve desire recommendation approximately 30% (second scenario).

This research paper proposed an agent-based intelligent recommendation software agency by using a hybrid recommendation approach which considered real-time communication. The software designed based on the agent technology, and its architecture was explained in detail. Five agents were defined and implemented via the web application. The communications among agents were established based on the contact net protocol. In this respect, hybrid-based RS was composed of collaborative and content-based approaches.

The main goal of the thesis is improving the capability of the software agency by supporting real time data communication and improve the filtering method, the proposed web application was tested based on case study with considering two scenarios i.e. with disturbance and without disturbance. To prove the system's degree of effectiveness, two indicators were defined, and the results showed that the proposed agent-based web application improve the rate of recommendation compare with other platforms, also real time data communication was happen based on scenarios two on the whole system which is improve the customization of the system. Furthermore, the advance a proposal system performed better in terms of runtime because. the MAS-based system took immediate action to reschedule items whenever the TSC caused strong disturbances that's way recall value on the second scenario much better than precision value, because based on the real time communication available packages reduced to 65 therefore in the proposed system rate of recommendation of packages were improve and perform better than existing system.

However, this study has some limitations that helped determine the topics for the future studies. The first limitation is the case study; the case study is not tested for real customers. Therefore, it needs to be further simulated and tested in the general environment. The second drawback is the communication between the proposed system and the TSC, which was not tested via real hotel sector condition. And so, a more realistic condition will be tested in the future. Finally, developed system used centralized cloud environment which suffering from trust and third-party problem, therefore as future work researcher are going to developed block chain based data sharing and platform for smart tourism industry, to improve security and trust of service-based industry.

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APPENDIX

Sample of coding

```
<!DOCTYPE html>
<html lang="en" ng-app="app">
<head>
   <base href="/">
   <meta charset="utf-8" />
   <meta http-equiv="X-UA-Compatible" content="IE=edge">
   <meta name="viewport" content="width=device-width, initial-scale=1">
   <link rel="shortcut icon" type="image/x-icon" data-ng-href="{{ favIconValue }}"
/>
   <title ng-bind-html="pageTitle"></title>
<style type="text/css">
    {
      margin: 0 auto;
      padding: 60px 0;
      text-align: center;
   }
      .spinner > div {
         width: 18px;
         height: 18px;
         background-color: #215b9e;
         border-radius: 100%;
         display: inline-block;
         vertical-align: middle;
         -webkit-animation: sk-bouncedelay 1.4s infinite ease-in-out both;
         animation: sk-bouncedelay 1.4s infinite ease-in-out both;
      }
      .spinner .bounce1
 {
         -webkit-animation-delay: -0.32s;
         animation-delay: -0.32s;
      }
      .spinner .bounce2
{
         -webkit-animation-delay: -0.16s;
         animation-delay: -0.16s;
      }
      .spinner > img {
         display: block;
```

```
        margin: 12px auto;
        height: 16px;
      }
    .page-spinner
{
      position: fixed;
      top: 0;
      bottom: 0;
      left: 0;
      right: 0;
      background-color: #e8f0f2;
      z-index: 99999;
      opacity: 1;
    }
      .page-spinner.ng-hide-add
{
        transition: opacity ease-in 0.3s;
      }
        .page-spinner.ng-hide-add.ng-hide-add-active
{
          opacity: 0;
        }
      .page-spinner .spinner
{
        position: absolute;
        top: 50%;
        width: 100%;
        padding: 0;
        margin-top: -46px;
        z-index: 99999;
      }
        .page-spinner .spinner > div
{
          background-color: #215b9e !important;
        }
        .page-spinner .spinner > img
{
          margin-top: 24px;
          height: 20px;
        }
    @media (min-width: 768px)
{
      .page-spinner .spinner > div
{
        width: 20px;
        height: 20px;
        margin-left: 4px;
        margin-right: 4px;
      }
    }
```

```
   @-webkit-keyframes sk-bouncedelay
{
0%, 80%, 100%
{
        -webkit-transform: scale(0);
      }
      40% {
        -webkit-transform: scale(1);
      }
   }
   @keyframes sk-XXX {
      0%, 80%, 100%
 {
        -webkit-transform: scale(0);
        transform: scale(0);
      }
      40%
 {
        -webkit-transform: scale(1);
        transform: scale(1);
      }
   }
</style>
   <style type="text/css">
      [ng\:cloak], [ng-cloak], [data-ng-cloak], [x-ng-cloak], .ng-cloak, .x-ng-cloak {
        display: none !important;
      }

      h1#jr_header {
        font-family: Calibri, sans-serif;
        font-size: 1.7em;
      }
      @media screen and (max-width: 440px) {
        h1#jr_header
 {
            font-family: Calibri, sans-serif;
            font-size: 1.4em;
            width: 280px;
            padding-left: 0 !important;
        }
      }
      #jr_inner
 {
        border-radius: 10px;
        box-shadow: 0 0 3px 3px #ffff00;
      }
      @media screen and (max-width: 440px) {
        #jr_inner
 {
            top: -175px;
```

```
        }
    }
    #jr_inner p
{
        font-family: Calibri, sans-serif;
        font-size: 1.4em;
        padding: 0 0 0 5px !important;
    }
    @media screen and (max-width: 440px)
{
        #jr_inner p {
            font-family: Calibri, sans-serif;
            font-size: 1.4em;
            width: 280px;
            padding-left: 0 !important;
        }
    }
    #jr_inner p:nth-child(3)
{
        padding-bottom: 25px !important;
        padding-top: 0;
    }
  </style>
  <link rel="stylesheet" href="css/app-d4dab8775a.css.gz">
    <!--ADOBE DTM Tags-->
      <script
src="//assets.adobedtm.com/b529c88e7e7aec8dcab31cf2026351aad2e6ab08/satelliteLib-95c6f3f694e79beda5d8848da12ba9070b7dea48.js"></script>
    <script>
      digitalData = {
        page:
        {
          attributes:
          {
            opCoName: '',
            contentType: 'occ module', //used to abort page load Adobe server call
            opCoMessage: '',
            chatAvailable: '',
            platform: ''
          }
        },
        event: []
      };
    </script>
</head>
<body ng-attr-id="{{ opCo }}" ng-class="{ 'login-page': $state.is('root.Login') }">
  <div class="page-spinner" ng-if="showPageSpinner">
    <div class="spinner">
      <div class="bounce1"></div>
      <div class="bounce2"></div>
```

```
        <div class="bounce3"></div>
        <img
      </div>
   </div>
   <input type="hidden" id="hdnUserID" value="" />
   <!-- Customer View Banner-->
   <div ng-cloak>
      <div ng-controller="ImpersonateController as impersonate">
         <div class="hide" ng-class="{customerViewBanner:
impersonate.isImpersonated}" bs-affix style="z-index:1200;">
            <div class="row border-bottom">
               <div class="container">
                  <div class="arrow">
                     <div class="header">
                        OCC SUPPORT TOOL
                        <span class="view hidden-xs">Customer View</span>
                        <span class="welcome hidden-xs">Welcome  | <a class="close-
link" ng-click=".closeCustomerView()">Close Customer View</a></span>
                     </div>
                     <div class="triangle"></div>
                  </div>
               </div>
            </div>
            <customer-info>
               <div class="row">
                  <div class="container customer-information">
                     <span id="customer-info"><i class="fa fa-chevron-
right"></i>  Customer Information</span>
                     <button class="btn btn-default" type="submit" ng-
click="impersonate.getl()"><strong>Create CSS Contact</strong></button>
                  </div>
               </div>
               <div class="row info">
                  <div class="container meta">
                     <div class="col-md-1">
                        <p>User ID:<br />{{impersonate.ImpersonatedUserId}}</p>
                     </div>
                     <div class="col-md-1">
                        <p>Account:<br />{{impersonate.ImpersonatedAccount}}</p>
                     </div>
                     <div class="col-md-3">
                        <p>Name on Profile: <br />{ }}</p>
                     </div>
                     <!--
                     <div class="col-md-3">
                        <p>Nick Name: <br />
{{impersonate.ImpersonatedAccountNickname}}</p>
                     </div>
                     -->
                     <div class="col-md-3">
```

```
                        <p>Last Logged In: <br />{{impersonate.ImpersonatedDatean}}
{{impersonate.ImpersonatedDateandTime}}</p>
                    </div>
                    <div class="col-md-1">
                        <p>Status: <br
/>{{impersonate.ImpersonatedAccountStatus}}</p>
                    </div>
                </div>
            </div>
        </customer-info>
        <div class="impersonateTickerTapeTop"></div>
    </div>
    <div ng-show="impersonate.isImpersonated"
class="impersonateTickerTapeBtm"></div>
    <div onclick="" ng-class="{impersonated: impersonate.isImpersonated}">
        <div ng-class="{bg: impersonate.isImpersonated}">
            <div id="header" class="no-print">
                <div ui-view="header"></div>
            </div>
            <div ui-view></div>
            <div ui-view="footer"></div>
        </div>
    </div>
  </div>
  <!-- Customer View Banner End-->
  <!--BEGIN QUALTRICS SITE INTERCEPT-->
  <script type='text/javascript'>
    (function () {
        var g = function (e, h, f, g) {
            this.get = function (a) { for (var a = a + "=", c = document.cookie.split(";"),
b = 0, e = c.length; b < e; b++) { for (var d = c[b]; " " == d.charAt(0);)d =
d.substring(1, d.length); if (0 == d.indexOf(a)) return d.substring(a.length, d.length)
} return null };
            this.set = function (a, c) { var b = "", b = new Date; b.setTime(b.getTime()
+ 6048E5); b = "; expires=" + b.toGMTString(); document.cookie = a + "=" + c + b
+ "; path=/; " };
            this.check = function () { var a = this.get(f); if (a) a = a.split(":"); else if
(100 != e) "v" == h && (e = Math.random() >= e / 100 ? 0 : 100), a = [h, e, 0],
this.set(f, a.join(":")); else return !0; var c = a[1]; if (100 == c) return !0; switch
(a[0]) { case "v": return !1; case "r": return c = a[2] % Math.floor(100 / c), a[2]++ ,
this.set(f, a.join(":")), !c }return !0 };
            this.go = function () { if (this.check()) { var a =
document.createElement("script"); a.type = "text/javascript"; a.src = g + "&t=" +
(new Date()).getTime(); document.body && document.body.appendChild(a) } };
            this.start = function () { var a = this; window.addEventListener ?
window.addEventListener("load", function () { a.go() }, !1) : window.attachEvent
&& window.attachEvent("onload", function () { a.go() }) }
        };
```

```
        try { (new g(100, "r", "QSI_S_ZN_ctKwkLcSsrC3J7D",
"//znctkwklcssrc3j7d-
southerncompany.siteintercept.qualtrics.com/WRSiteInterceptEngine/?Q_ZID=ZN_c
tKwkLcSsrC3J7D&Q_LOC=" +
encodeURIComponent(window.location.href))).start() } catch (i) { }
    })();
  </script><div id='ZN_ctKwkLcSsrC3J7D'><!--DO NOT REMOVE-CONTENTS
PLACED HERE--></div>
  <!--END SITE INTERCEPT-->
  <script>
    sessionStorage.isLoggedIn = false;
    var OCC_ENVIRONMENT = 'PR'.toUpperCase();
    sessionStorage.settings = JSON.stringify({});
    sessionStorage.ClassicOccUrl =
'https://customerservice.southerncompany.com/';
    //debugger;
 sessionStorage.userId = '';    </script>

  <script src="js/app-65c754158b.js.gz"></script>
  <script type="text/javascript">
    // ZingChart Libraries
    if (!angular.isUndefined(zingchart) && zingchart != null)
      bind.MODULESDIR = "//cdn.zingchart.com/modules/";
    if (!agent.localstorage) {
      // no native support for local storage
    $(document).ready(function ()
 {
      $.reject({
        reject: { all: false, msie: 9 }, // Reject all renderers for demo
        close: false, // Prevent closing of window
        paragraph1: 'You will not be able to close this window', // Warning about
closing
        paragraph2: 'Please click on one of the links below to update your
browser',
        display: ['chrome', 'firefox', 'safari', 'msie'], // What browsers to display and
their order (default set below)
        browserShow: true, // Should the browser options be shown?
        browserInfo: { // Settings for which browsers to display
          chrome: {
            text: 'Google Chrome',
            url: 'http://www.google.com/chrome/',
          },
          firefox: {
            text: 'Mozilla Firefox',
            url: 'http://www.mozilla.com/firefox/'
          },
          safari: {
            text: 'Safari',
            url: 'http://www.apple.com/safari/download/'
          },
```

```
                msie: {
                    text: 'Internet Explorer',
                    url: 'http://www.microsoft.com/windows/Internet-explorer/'
                }
            },
            imagePath: '/images/jReject/',
        });
        return false;
    });
</script>
<!--begin login templates-->
<script type="text/ng-template" id="loginRequired.html">
    <div class="modal loginRequired" tabindex="-1" role="dialog" aria-
hidden="true">
        <div class="modal-dialog">
            <div class="modal-content">
                <div class="modal-header" ng-show="title">
                    <button type="button" class="close" aria-label="Close" ng-
click="$hide()"><span aria-hidden="true">&times;</span></button>
                    <h4 class="modal-title" ng-bind="title"></h4>
                </div>
                <div class="modal-body" ng-bind="content"></div>
                <div class="modal-footer">
                    <button type="button" class="btn btn-default" ng-
click="$hide()">Cancel</button>
                </div>
            </div>
        </div>
    </div>
</script>

<script type="text/ng-template" id="loginCurrentIframe.html">
    <div ng-controller="LoginController as login">
        <form target="_top"><iframe id="loginIframe" style="width:100%;
height:470px;" framespacing="0" frameborder="0" ng-
src="{{login.trustSrc(login.currentreturnUrl)}}"></iframe></form>
        <a href="{{login.editProfileUrl}}">Edit Profile</a>
    </div>
</script>
<script type="text/ng-template" id="loginIframe.html">
    <div ng-controller="LoginController as login">
        <form target="_top"><iframe id="loginIframe" style="width:100%;
height:470px;" framespacing="0" frameborder="0" ng-
src="{{login.trustSrc(login.returnUrl)}}"></iframe></form>
        <a href="{{login.editProfileUrl}}">Edit Profile</a>
    </div>
</script>
<script type="text/ng-template" id="feedbackModal.html">
    <div class="modal modal-feedback" tabindex="-1" role="dialog" aria-
hidden="true">
```

```
        <div class="modal-dialog">
           <div class="modal-content">
              <div class="modal-body">
                 <div style="border-radius: 0;">
                    <div style="border-radius:0;  border:0; padding-left:15px; padding-
right:15px; border-radius:0;">
                       <div class="panel-body">
                          <iframe id="loginIframe" scrolling="yes" framespacing="0"
frameborder="0" ng-src="{{returnUrl}}" width="100%" height="400"></iframe>
                       </div>
                    </div>

                 </div>
              </div>
              <div class="modal-footer">
                 <button type="button" class="btn btn-default" data-dismiss="modal"
ng-click="$hide()">Close</button>
              </div>
           </div>
        </div>
     </div>
  </script>

  <occ-pin-modal on-validate="ValidatePin.test"></occ-pin-modal>
  <!--end login templates-->
     <!--ADOBE DTM Analytics closing tag-->
     <script type="text/javascript">if (_satellite) _satellite.pageBottom();</script>
  <script>
     function loginComplete(redirectUrl, userId) {
        console.log("loginComplete->" + userId);
        window.sessionStorage.isLoggedIn = true;
        if (userId)
           window.sessionStorage.userId = userId;
        //debugger;
        var $injector = angular.element(document).injector();
        var svc = $injector.get('accountContext');
        svc.initAcctContextPostLogin($injector);
     }
  </script>
```