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Digitalisation of Travel Industry: Investigating the Role of Artificial Intelligence, Cloud Computing and Machine Learning in Developing Smart Tourism Ecosystem

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Abstract: Innovative communication and information technologies have dramatically upgraded service ecosystem right from information search, product-mix offerings, product delivery, feedback etc. In travel industry, artificial intelligence, cloud computing and machine learning technologies etc. have increased interaction & transparency across a business network; improved service personalization & interaction and perform various functions through descriptive, diagnostic, predictive and prescriptive analytics. Digitisation tools such as Internet of Things (IoT), Artificial Intelligence (AI), Virtual Reality (VR) and Augmented Reality (AR), Mobile check-in apps, AI-powered chatbots etc. have simplified the traveller decision-buying process, reduced cost and increased organization's resilience to innovate product and service offerings. It has improved customer experiences-beginning with an online travel agency, a virtual tour search engine, buying tickets online, checking in at destination, sightseeing, checking out and returning home safely. Travel sector is benefitted with enhanced competitiveness, increase in the scale of information impact, improved financial efficiency, reaching new audiences, more visibility of brands, ease in customer acquisition & retention and exploration of new tourist products. To accelerate the growth and its intensive percolation, there is a need to place worker well-being, ethical considerations in development of intelligent interactive system and consider research and innovation on continuous & sustainable manner.

Keywords: Artificial intelligence, Cloud computing, Machine learning.

I. Introduction

The role of tourism in accelerating economic growth through job creation, contribution to government revenue, foreign exchange earnings, strengthening local infrastructure and local communities, conservation of natural environment, cultural assets & traditions, reduction of poverty & inequality and promotion of international collaboration is recognized across globe. During 2022, over 960 million tourists travelled internationally. Most visited destinations by international tourist arrivals in 2021 were France (48.4 million), Spain (31.2 million), United States (22.1 million) and Turkey (29.9 million). Finland is the most well-travelled country in the world, followed by US. India is

positioned at 54th among 117 countries in the world in terms of tourist inflow and its contribution to GDP is 89% more compared to 2022 and projected growth for 2023 is 5.1% (WEFT & TDI, 2021).

To support travel activities, Indian Govt. has initiated campaigns like Public-private partnership, Chintan Shivir, Apni Pehchaan, Apni Dharohar, Travel for LiFE besides organizing webinars under Dekho Apna Desh, quiz programmes, essay writing and poster making competitions at YUVA Tourism Clubs, IHMs, IITTMs, Schools, to create awareness about history, heritage, tourism among masses. Innovative communication technologies aid travelers to plan their trip, booking tickets for destinations, create & share trip experiences and offer feedback to industry players. At industry level, it encourages enterprises to increase market share, offer directions for product improvement, implement creative ideas to allure travels. The paper focuses on innovative travel technologies in information dissemination, improving service-mix, ease destination connectivity, evaluate performance and create value for travelers.

II. Review of Literature

The tourist industry thrive on collection & dissemination of uninterrupted flow of information to travelers, travel agencies, hoteliers, suppliers and all stakeholders so that they promptly respond to requests, increase their productivity & profitability and create favourable influence on tourist experiences and their revisit intentions [1] [2]. This is assured through digital transformation and its adaptation which focus on data management and its retrieval to benefit travelers [3]. Several innovative tools are transforming tourist industry such as artificial intelligence, data security, ML, IoT, robots, augmented reality, 3D printing, mobile Internet etc [4].

Artificial intelligence like human intelligence can assess the environment, adapt and quickly respond in solving problems [5] [6]. These technologies are the outcome of advances in AI algorithms, speed in processing capacities and development of computer architectures to derive information from massive amounts of data [7]. Recently the concept of super-intelligence and Hybrid AI has amalgamated different activities to create memorable experiences for tourists [8] [9]. AI Artificial intelligence systems rest on big data and its volume, velocity, variety, veracity, value and volatility [10]. It facilitate users with relevant information to take optimal decision which result in more sustainable tourism [11] [12]. With the emergence of service robots, the service delivery has become prompt and customized.

Cloud computing embraces IT infrastructure and service – mix to customers on pay-as-you-use basis. It application increase the capacity or add capabilities dynamically without investing in new infrastructure, training new personnel, or licensing new software [13]. Furthermore, Cloud computing provides limitless flexibility, better reliability & security, absence of investment in training new personnel or licensing new software, business-consumer interaction, capability enhancement through addition of services, geographic information services which improves effectiveness of tourism resource management [14] [15] [16]. The term `Machine Learning' is first coined in 1959 by Arthur Lee Samue to connote computational tools to make accurate assessment and forecasting [17]. It identify patterns in the existing data, develop algorithms & statistical model-based theories and perform the most accurate possible prediction and generalizability [18] [19] [20]. The integration of technology with management concepts enables the enterprises to understand traveler's characteristics, sentiments, loyalty besides improve sales forecasting, identify fraud, analyse reviews produced on social media and define more efficient key performance indicators [21] [22].

III. Artificial Intelligence and Travel Industry

Artificial Intelligence(AI) by eliminating human error, deliver prompt customer services, improve personalization & interaction, data analysis and guarantee fast response times, even with minimal staff. The specific usage of AI are:

- It can respond to travelers' queries 24/7 basis and can deliver customized services through chatbots and instant messaging apps.

- It collect, analyse and enhances the institutional ability to sort relevant data quickly from customer feedbacks, reviews, surveys etc.
- Travel related services can be provided during prime time through voice-based digital tools through robots.
- It can forecast weather patterns, trends in flight schedules on the basis of past flight data etc. and results are made available to concerned stakeholders. Information relating to disruption in flights and how issues can be resolved are also provided to travelers.
- It enables hospitality industry to understand communication and engagements of sentiments and emotions of travelers in social media channels.
- It also enables industry to optimally set prices during times of high or low demand periods.
- AI technology assist airport security personnel in sorting & scanning baggage, scan images and detect possible threat items. These ease and save the work of airport authorities.
- Through facial recognition using AI, enables to entice individuals in particular area which need safety and security especially tourists.
- It renders personalized services through websites such hotels, flights, train, cab facilities, travel related bookings so that convenience and comforts at optimal rates are provided to travelers.
- Travel products can be provided through online retailers based on past purchases or browsing.
- Al helps in optimizing revenue management in travel and tourism industry.
- Software based on AI can forecast price fluctuations in hotel room rates, flight fares, and other products and services within the industry, so that industry and customers are better understand fluctuations in prices and take necessary actions accordingly.
- Through predictive analytics, AI can be used to assess airplane maintenance requirements before they arise, thereby can take action promptly without causing any disruption and upheaval.
- Al helps to improve employee management and scheduling, allocation of work to each employee, deployment of senior staff in each shift, availability & deployment of contractual staff, the necessary time off between two shifts etc.
- Based on online tracking system, transaction histories, and personal preferences of travelers, AI can facilitate loyalty programmes for its members and influence re-visit intentions of customers.
- Based on pattern recognition, behavioral analysis and previous fraud cases, AI identifies payment fraud and alerts can flag suspicious activity for human intervention.
- A 360^{o} virtual tour of destinations, restaurants, hotels, parks, monuments provide live experiences to travelers from their own home. It also allows travelers to share their digital experiences with nearby persons through AI tools.
- Al powered assistants enable visitors to control room temperature in hotels and obtain tourist information from nearby location, without interacting with hotel staff.
- Al designed robots enables to greet guests when they arrive at their destination, cleaning & luggage handling, food preparation & food service, detection of concealed weapons at airports etc., thereby reducing human-to-human contact.
- It facilitates contactless payments in exigencies at times when access to cash, credit card / debit card are denied, thereby helping loyal customers.
- Cyber security threats especially phishing attacks and ransom ware attacks which create fear in the minds of travelers can be minimized through AI software and tools.
- By installing sensors in luggage cases, it helps travelers at airports. Recognition technology further enhances institutional interactions with prospective travelers.

- With Virtual Positioning System, small streets and destination can easily be located.

IV. Blockchain Technology and Travel Industry

Block chain reduces cost and confusions in the process of data sharing among stakeholders of hospitality and travel industry.

- It enables to trace the location of luggage especially during international travels when it changes hands multiple times.
- Recognition technology replaces document verification which can drastically reduce check-in times at airport.
- It allows travel companies globally to accept and make payments using Bitcoin and other cryptocurrencies.
- It allows travelers to access their loyalty points during travel more easily.
- It empowers travel businesses to undertake property management including rented property on behalf of travelers for short period at least cost due to absence of middlemen or commission agent.
- It facilitates travelers to directly contact hosts for short term stay and pay for stays.
- The Winding Tree platform aids booking and tracking of baggage without involvement of third-party. The system paves for greater transparency.
- Through in-house block-chain project introduced by TUI called *'Bed-Swap', inventories can be moved between* different points of sale in accordance with demand.
- NFTs powered by cloud computing technologies are digital assets connecting the industry with local artists. This will benefit artisans through sale and industry through customer loyalty schemes.
- iTravel applications allows peer to peer (P2P) exchange of information about hotels, restaurants, places or other point of interest.
- It allows the tour operators to customized travel package including booking of flight, hotels, local transportation, catering etc.
- Through Instagram, Pinterest etc. travel experiences can be shared, thereby selecting optimal destination-mix on the basis of reviews, travel blogs, feedback or recommendations.

Several cloud based applications such as Winding Tree, Webjet-tracks, Sandblock's blockchain technology, Traveler Digital services etc. provides consultation at minimum cost, promptly correct booking inaccuracies, share travel data among travelers and travel service providers.

V. Machine Learning and Travel Industry

Machine learning (ML) performs various functions through descriptive analytics, diagnostic analytics, predictive analytics and prescriptive analytics. It rely on Logistic regression, Linear regression, decision tree, classification, segmentation or clustering, dimension reduction and association rules methods. The specific benefits of ML are:

- It equips Front Desk Attendants and Customer Care Representatives of travel companies with Chatbot enabling personalized services at low cost. It also enables companies to analyse information collected through Chatbot in assessing the requirements and directions for improvements.
- Machine learning models can accurately forecast the best time to travel for a destination without relying on secondary sources of information.
- ML enables travel companies to analyse travelers' emotions, enticing trouble spots and correcting in advance, thereby helping travel industry to grow. The use of Natural Language Processing enables travel companies to derive meaning from reviews, blogs etc.
- It assists travel companies to segment travelers on the basis of metric characteristics and selecting target customers to reach with distinct service-mix. For example Humtourist, a tourism company which was earlier getting bad reviews,

used ML to offer innovative activities ranging from leisure to adventure in Manhattan area.

- Virus assassination robots are one of the current innovations implemented in hotels. These virus assassination robots locate virus & germs and destroy those using UV lights and disinfectants.

VI. Conclusion

Digitalisation through AI, cloud computing and ML have revolutionalised the travel industry to an unimaginable peak. It is likely to create more job opportunities, efficiency and productivity in all travel operations. It allows the travelers to access wide variety of information and co-create value in building smart tourism destinations. However, there is need to innovate, stablise and sustain travel industry by worker well-being, observing ethical consideration during interaction, securing safety & security in data storage, maintaining transparency in exchange process and undertaking research and innovations on continuous & sustainable manner.

References

[1] P. J. Sheldon, "Travel industry information systems," in S. Witt, and L. Moutinho (Ed.), *Tourism Marketing and Management Handbook.* Prentice Hall, London, 1989, pp. 589-592.

[2] C. M. Ramos, P. M. Rodrigues, and J. M. Rodrigues, "Opportunities, emerging features and trends in electronic distribution in tourism," *International Journal of Information Systems and Social Change (IJISSC),* vol. 6, no. 4, pp. 17-32, 2015.

[3] C. M. Ramos, "Business intelligence approach and sentiment analysis as a management strategy applied to study customer satisfaction in the hospitality sector," *Advances in Tourism, Technology and Systems,* Springer, pp. 537-547, 2022.

[4] C. M. Ramos, and I. S. Brito, "Effects of industry 4.0 in tourism and hospitality and future trends in Portugal," in *The Emerald Handbook of ICT in Tourism and Hospitality*. Emerald Publishing Limited, 2020.

[5] U. Gretzel, "Intelligent systems in tourism: A social science perspective," *Ann Tour Res*, vol. 38, no. 3, pp. 757-779, 2011.

[6] W. C. Lai, and W. H. Hung, "A framework of cloud and AI based intelligent hotel," in *Proceedings of the 18th International Conference on Electronic Business (ICEB),* Guilin, 2-6 Dec. 2018, pp. 36-43.

[7] J. J. Li, M. A. Bonn, and B. H. Ye, "Hotel employee's artificial intelligence and robotics awareness and its impact on turnover intention: The moderating roles of perceived organizational support and competitive psychological climate," *Tour Management,* vol. 73, pp. 172-181, 2019.

[8] N. Bostrom, *Super Intelligence: Paths, Dangers, Strategies*. Oxford University Press, Oxford, 2016.

[9] N. Wirth, "Hello marketing, what can artificial intelligence help you with?," *Int J Market Res*, vol. 60, no. 5, pp. 435-438, 2018.

[10] A. D. Mauro, M. Greco, and M. Grimaldi, "A formal definition of big data based on its essential features," *Libr Rev,* vol. 65, no. 3, pp. 122-135, 2016.

[11] I. Tussyadiah, and G. Miller, "Perceived impacts of artificial intelligence and responses to positive behaviour change intervention," *Information and Communication Technologies in Tourism,* Springer, pp. 359-370, 2019.

[12] D. Buhalis, T. Harwood, V. Bogicevic, G. Viglia, S. Beldona, and C. Hofacker, "Technological disruptions in services: Lessons from tourism and hospitality," *J Serv Management,* vol. 30, pp. 484-506, 2019.

[13] S. K. Sharma, A. H. Al Badi, S. M. Govindurali, and M. H. Al-Kharusi, "Predicating motivators of cloud computing adoption: A developing country perspective," *Computers in Human Behavior*, vol. 62, pp. 61-69, 2016, doi: https://doi.org/10.1016/j.chb.2016.03.073.

[14] AMD, "Adoption, approaches and attitudes: The future of cloud computing in the public and private sectors," 2011. [Online]. Available: https://whitepaper.silicon.co.uk/resource/adoption-approaches-attitudes-the-future-of-cloud-computing-in-thepublic-and-private-sectors

[15] D. Buhalis, and A. Amaranggna, "Smart tourism destinations," in Z. Xiang, and L. Tussyadiah (Eds.), *Information and Communication Technologies in Tourism*. Springer International Publishing, pp. 553-564, doi: https://doi.org/10.1007/978-3-319- 03973-2_4.

[16] F. Zhou, Y. Fang, and H. Chen, "Personalized travel service discovery and usage in cloud environment," in *2012 IEEE Ninth International Conference on e-Business Engineering*, IEEE, 2012, pp. 333-337, doi: https://doi.org/10.1109/ICEBE.2012.61, 2012.

[17] R. Akerkar, "Machine learning," in R. Akerkar (Ed.), *Springer Briefs in Business. Artificial Intelligence for Business.* Springer International, 2019, pp. 19-32, doi: https://doi.org/10.1007/978-3-319-97436-1_2.

[18] M. I. Jordan, and T. M. Mitchell, "Machine learning: Trends, perspectives and prospects," *Science*, vol. 349, no. 6245, pp. 255-260, 2015, doi: https://doi.org/10.1126/science.aaa8415.

[19] S. Jamal, S. Goyal, A. Grover, and A. Shanker, "Machine learning: What, why, and how?," in A. Shanker (Ed.), *Bioinformatics: Sequences, Structures, Phylogeny.* Springer Singapore, 2018, pp. 359-374, doi: https://doi.org/10.1007/978-981-13-1562-6_16.

[20] A. Althbiti, and X. Ma, "Machine learning," in L. A. Schintler, and C. L. McNeely (Eds.), *Encyclopedia of Big Data.* Springer International, 2020, pp. 1-5, doi: https://doi.org/10.1007/978-3-319-32001-4_539-1.

[21] C. M. Ramos, "Business intelligence approach and sentiment analysis as a management strategy applied to study customer satisfaction in the hospitality sector," *Advances in Tourism, Technology and Systems.* Springer, 2022, pp. 537-547.

[22] F. Afsahhosseini, and Y. Al-Mulla, "Machine learning in tourism," in *The 3rd International Conference on Machine Learning and Machine Intelligence,* Sept. 2020, pp. 53-57, doi: https://doi.org/10.1145/3426826.3426837.