

ARTIFICIAL INTELLIGENCE AND INTERNET OF THINGS FOR ENHANCING TRAVEL EXPERIENCE: A CONCEPTUAL FRAMEWORK FOR SMART TRAVEL

Dr. Aamir Junaid Ahmad

S S Systems Pvt. Ltd., Patna, India

CEO & Founder

Email: info@ssspatna.com

Abstract—Travel services are increasingly shaped by digital platforms, data-driven decision making and connected devices. This conceptual paper examines how Artificial Intelligence (AI) and the Internet of Things (IoT) can jointly improve the travel experience, with particular attention to personalised ticket discovery, recommendation, dynamic pricing, baggage visibility and service retention. The paper is grounded in the ideas reported by Hindustan Times in March 2021 from an interaction with Aamir Junaid Ahmad, then CEO of BusAndTicket.com, and extends those ideas through a focused review of tourism technology literature. The source case proposed AI-supported search and recommendations that become more personalised as service-use information accumulates; it also discussed a proposed dynamic bus-ticket pricing approach using variables such as weather, events and seat availability, subject to stakeholder approval. For IoT, the case proposed sensor-based baggage monitoring that could notify travellers when luggage is loaded, adjusted, unloaded or accessed. Based on these use cases, the paper develops a conceptual AI-IoT travel-experience framework linking data capture, intelligent processing, context-aware service delivery and feedback. The analysis suggests that the strongest value arises when AI converts connected data into timely decisions while IoT supplies reliable real-world signals. The paper also identifies implementation issues involving data quality, privacy, cybersecurity, cost, interoperability, transparency and human

oversight. The framework provides a basis for future empirical research on smart travel services in bus, rail, air and hospitality contexts.

Keywords—Artificial Intelligence; Internet of Things; Smart Tourism; Travel Experience; Personalisation; Dynamic Pricing; Baggage Tracking; Recommender Systems.

I. INTRODUCTION

Travel is an experience-intensive service in which the customer interacts with several interconnected stages: discovery, planning, booking, departure, movement, arrival, baggage handling, accommodation and post-trip engagement. Digitalisation has already reduced friction in search and booking, but the next stage of transformation is the ability to interpret traveller context and connect that interpretation with events occurring in the physical travel environment. AI and IoT are complementary in this respect. AI provides prediction, recommendation, classification and optimisation capabilities, whereas IoT provides a stream of observations from sensors, devices and connected infrastructure.

The focal industry case for this paper comes from a Hindustan Times report published on 8 March 2021. The report described an interaction with Aamir Junaid Ahmad, CEO of BusAndTicket.com, concerning the use of technology to improve bus-ticket booking and the broader travel experience. The report stated that AI and IoT could support more personalised ticket booking, better deals

and recommendations, with further personalisation possible as more information becomes available through continued service use [1].

The same case proposed dynamic pricing for bus tickets using analytical benefits of AI. The proposed variables included weather, events and seat availability, although the report explicitly noted that implementation would be subject to stakeholder approval [1]. This distinction is important: the article describes a proposed business application rather than evidence of an already deployed pricing system.

On the IoT side, the case focused on a practical travel pain point: lost or mishandled luggage. The proposed solution used sensors to communicate baggage events to travellers through push notifications, including loading, adjustment and unloading. The concept also envisaged a mobile link through the passenger ticket so that the traveller could monitor baggage status and gain greater confidence in the journey [1].

These use cases provide a useful starting point for a conceptual research question: how can AI and IoT be combined to create a more personalised, transparent and responsive travel experience without creating disproportionate risks in cost, privacy or security? Prior tourism research supports the relevance of this question. Recommender systems have long been studied for personalised tourism planning, while technology-enhanced experience research shows that technology can alter how tourists interact with services and destinations [2], [3].

II. OBJECTIVES AND RESEARCH QUESTIONS

The study has four objectives:

- To identify the principal AI-enabled mechanisms that can enhance travel planning and booking.
- To examine how IoT-generated operational data can improve visibility and confidence during travel.
- To conceptualise the interaction between AI, IoT and the traveller across the travel journey.

- To identify implementation conditions and risks that should be addressed before large-scale adoption.

The analysis is guided by three research questions: RQ1: What travel-experience functions can be improved through AI? RQ2: What additional value does IoT provide by connecting physical travel events with digital services? RQ3: What organisational and technological conditions are required for responsible AI-IoT travel services?

III. METHODOLOGY

This paper uses a conceptual and qualitative secondary-research approach. The primary case source is the Hindustan Times article published on 8 March 2021 [1]. Its reported use cases are extracted and organised into functional themes: personalisation and recommendation, analytical pricing, and sensor-based baggage visibility. These themes are then interpreted alongside established tourism-technology literature on intelligent recommender systems, technology-enhanced experiences and smart tourism destinations [2]–[5].

The paper does not claim to present survey results, experimental measurements or operational performance data from BusAndTicket.com. The reported dynamic-pricing and baggage-tracking ideas are treated as a documented industry case and as inputs to a conceptual framework. This approach prevents proposed capabilities from being presented as measured outcomes.

IV. AI-ENABLED TRAVEL EXPERIENCE

A. Personalised Search and Recommendations

The number of available travel choices can create information overload. Intelligent recommender systems address this by modelling user preferences and producing contextually relevant options. Research on tourism recommenders identifies functions ranging from destination recommendations to itinerary construction and discusses content-based, collaborative and other AI-oriented methods [2]. In the BusAndTicket

case, the proposition was to use AI and IoT to provide more personalised ticket-booking experiences and to improve deals and recommendations. The article further suggested that repeated use could provide additional information for customising search results [1].

Conceptually, personalisation can operate across several variables: previous searches, booking history, preferred departure times, route choices, price sensitivity and contextual conditions. However, personalisation should not be equated with unrestricted collection of personal data. A responsible system should collect only information relevant to the stated service purpose, communicate how recommendations are produced at an appropriate level, and provide users with meaningful control.

B. AI for Dynamic Pricing and Demand Management

Dynamic pricing attempts to align price with changing demand and supply conditions. In the reported case, AI-based analytics were proposed to vary bus-seat rates according to factors including weather, events and seat availability [1]. From a management perspective, the potential value is not simply price variation; it is the ability to combine multiple signals faster than manual decision processes can. A model could estimate demand pressure, identify under-utilised capacity and support decisions about inventory and pricing.

Yet dynamic pricing introduces fairness and transparency questions. Travellers may perceive automated price changes as arbitrary if the factors driving them are not understandable. Accordingly, an AI pricing system should include governance rules, monitoring for anomalous outcomes, limits on price volatility and human review for exceptional situations. The Hindustan Times report itself qualifies the proposal by noting that implementation would require stakeholder approval [1].

C. Predictive and Context-Aware Services

AI can also interpret real-time or historical data to anticipate customer needs. Tourism

recommender research emphasises context and personalisation, while smart-destination research treats data, innovation and human capabilities as components of a broader ecosystem rather than as isolated technologies [3], [4]. For travel providers, this means that AI should be connected to operational systems. For example, a service could combine route demand, capacity, weather and event information to provide more relevant options or alerts. The value of such intelligence depends on the timeliness and reliability of the underlying data.

V. IOT-ENABLED TRAVEL VISIBILITY

A. Baggage Tracking as a Service Experience

The IoT use case in the source article is particularly concrete. Sensors attached to or associated with baggage can generate event information as luggage is loaded, adjusted, unloaded or accessed. The proposed system would transmit push notifications to the traveller and could expose tracking through a link associated with the mobile ticket [1].

The important service innovation is not merely locating an object. It is transforming an invisible operational process into a visible customer experience. Baggage handling normally occurs outside the traveller's direct line of sight. By exposing relevant status events, IoT can reduce uncertainty and create a digital feedback loop between the transport operator and passenger.

B. From Connected Objects to Connected Journeys

The same principle can extend beyond baggage. IoT devices can generate information about vehicles, facilities, occupancy, environmental conditions and other physical processes. When such signals are integrated with travel platforms, the journey can become context-aware. For example, connected infrastructure can provide event information while AI determines which information is relevant to a particular traveller. This illustrates the central distinction between IoT and AI: IoT observes and communicates

physical-world states, while AI can interpret those observations and support decisions.

Travel function	IoT contribution	AI contribution	Traveler value
Ticketing	Context and availability signals	Recommendation and prediction	Relevant options and timely information
Pricing	Supply, demand and environment data	Analytical pricing models	Potentially better-matched offers
Baggage	Loading/unloading/access events	Event interpretation and alerts	Visibility and confidence
Journey support	Connected operational signals	Personalised notifications	Reduced uncertainty

TABLE I. CONCEPTUAL AI-IOT VALUE CHAIN FOR TRAVEL SERVICES

VI. INTEGRATED AI-IOT FRAMEWORK

The combined perspective leads to a four-layer conceptual framework. The first layer is the sensing and data layer, where IoT devices, booking systems, mobile interactions and external context generate signals. The second is the intelligence layer, where AI models transform data into predictions, recommendations, classifications or optimisation outputs. The third is the service layer, where these outputs are converted into booking suggestions, alerts, pricing decisions or customer-support actions. The fourth is the feedback and governance layer, where user responses and operational outcomes are monitored and used to improve the service while enforcing privacy, security and accountability controls.

A. Data and Sensing Layer

Data should be collected from clearly defined sources and mapped to a service purpose. IoT data may include event timestamps and sensor states; platform data may include searches, bookings and route information; contextual data may include weather or scheduled events. Data quality is foundational because inaccurate signals can produce inaccurate recommendations.

B. Intelligence Layer

AI models can support recommendation, forecasting, anomaly detection and decision assistance. A key design principle is that model complexity should follow business need. A simple rule-based alert may be preferable to a complex model when the task is straightforward and explainability is critical.

C. Experience Layer

The customer should experience the technology as a reduction in friction rather than as a collection of technical features. Recommendations should be relevant, baggage alerts should be timely, and pricing or availability information should be understandable. Technology-enhanced tourism research similarly emphasises the experience created through the interaction of people, services and technology [3].

D. Governance and Feedback Layer

The final layer addresses trust. Systems should establish access controls, encryption, data retention policies, incident response procedures and human escalation routes. The recent smart-tourism literature continues to identify privacy, data quality, explainability and collaboration as important issues in AI-IoT adoption [5].

VII. EXPECTED BENEFITS AND IMPLEMENTATION CHALLENGES

Dimension	Potential benefit	Key challenge
Personalisation	More relevant search results, recommendations and offers.	Preference data may become excessive or intrusive.
Operational	Real-time	Sensor failure,

visibility	awareness of baggage and other connected processes.	connectivity gaps and interoperability.
Decision support	Faster analysis of demand, capacity and contextual conditions.	Model bias, poor data and unexpected model behaviour.
Customer confidence	Greater transparency through timely status notifications.	Incorrect alerts can reduce trust rather than improve it.
Retention	Better experiences can support repeat usage and engagement.	Technology investment must be justified by measurable value.

TABLE II. BENEFITS AND CHALLENGES OF AI-IOT TRAVEL SERVICES

VIII. DISCUSSION

The central finding of the conceptual analysis is that AI and IoT create greater value together than when considered as isolated technologies. IoT can reduce uncertainty about what is happening in the physical travel environment, while AI can reduce uncertainty about what the traveller may need next. In the reported BusAndTicket case, this relationship is visible in two complementary proposals: AI-supported personalisation and analytical pricing on one side, and IoT-enabled baggage visibility on the other [1].

The framework also suggests that successful smart travel is not defined by the quantity of technology deployed. It is defined by whether technology improves a meaningful service outcome. A sensor that generates data without a usable customer-facing action creates cost rather than value. Similarly, a sophisticated recommendation engine that uses poor or excessive data can produce irrelevant recommendations. Therefore, the design should begin with the travel problem, identify the

minimum useful data, select an appropriate AI method, and then establish measurable service indicators.

IX. FUTURE RESEARCH DIRECTIONS

- Empirically test whether AI-based personalisation increases booking conversion, satisfaction and repeat usage.
- Evaluate traveller acceptance of AI-driven dynamic pricing under different transparency conditions.
- Develop reliability measures for sensor-based baggage tracking, including notification accuracy and latency.
- Study privacy-preserving architectures for integrating booking, mobile and IoT data.
- Compare AI-IoT travel applications across bus, rail, air and hospitality environments.
- Investigate how smart travel systems can balance personalisation with sustainability, accessibility and equitable service delivery.

X. CONCLUSION

AI and IoT have the potential to reshape travel from a sequence of disconnected transactions into a more responsive and context-aware service experience. The 2021 BusAndTicket case reported by Hindustan Times provides a practical illustration: AI was proposed for personalised ticket search, recommendations and analytical dynamic pricing, while IoT was proposed for sensor-based baggage visibility [1]. The conceptual framework developed in this paper integrates these ideas into a broader value chain consisting of sensing, intelligence, service delivery and governance.

The paper does not claim that the reported proposals constitute measured outcomes. Rather, they are treated as an industry case that demonstrates how emerging technologies can be translated into customer-facing travel functions. Future empirical work should therefore measure actual user outcomes, operational performance, cost, privacy expectations and trust. The central managerial implication is that technology should be implemented around identifiable traveller problems and supported by reliable data,

appropriate AI methods, secure infrastructure and human oversight.

ACKNOWLEDGMENT

The author acknowledges the reported industry interaction published by Hindustan Times in 2021 as the primary case stimulus for this conceptual paper and acknowledges the wider academic literature on smart tourism and technology-enhanced tourism experiences.

REFERENCES

- [1] ANI, "Here's how artificial intelligence and IoT can improve travel experience," Hindustan Times, Mar. 8, 2021. Available: <https://www.hindustantimes.com/lifestyle/travel/heres-how-artificial-intelligence-and-iot-can-improve-travel-experience-101615202780653.html>
- [2] J. Borràs, A. Moreno, and A. Valls, "Intelligent tourism recommender systems: A survey," *Expert Systems with Applications*, vol. 41, no. 16, pp. 7370–7389, 2014, doi: 10.1016/j.eswa.2014.06.007.
- [3] B. Neuhofer, D. Buhalis, and A. Ladkin, "A typology of technology-enhanced tourism experiences," *International Journal of Tourism Research*, vol. 16, no. 4, pp. 340–350, 2014, doi: 10.1002/jtr.1958.
- [4] D. Buhalis and A. Amaranggana, "Smart tourism destinations enhancing tourism experience through personalisation of services," *Information and Communication Technologies in Tourism*, pp. 377–389, 2015.
- [5] M. Suganya and V. Sivakumar, "A study on influence of AI and Internet of Things on smart tourism destination," *Shanlax International Journal of Management*, vol. 13, no. S1-i2, pp. 180–184, 2026, doi: 10.34293/management.v13iS1-i2-Feb.10404.
- [6] K. Kabassi, "Personalizing recommendations for tourists," *Telematics and Informatics*, vol. 27, no. 1, pp. 51–66, 2010, doi: 10.1016/j.tele.2009.05.003.