

# **LITERATURE SURVEY**

## **Taxonomy of the Literature Survey:**

<b>S. No.</b>	<b>Title</b>	<b>Published by</b>	<b>Applications</b>
1	On track to the future with Smart Railways	INTEL	Smart ticketing <ul style="list-style-type: none"><li>• Automated fare collection.</li><li>• Digital signage and connected kiosks.</li><li>• Access control passenger information.</li></ul>
2	Smart ticketing system for railways in smart cities using Software as a Service	IEEE	Smart ticketing using <ul style="list-style-type: none"><li>• AWS</li><li>• Lambda</li><li>• IoT</li><li>• Raspberry Pi</li><li>• Dynamo DB</li></ul>
3	Application of smart computing in Indian Railway systems	International Journal of Scientific Research and Management Studies (IJSRMS)	<ul style="list-style-type: none"><li>• Passenger reservation system.</li><li>• Automated ticket vending machine.</li><li>• Unique identification</li><li>• Inter-database query processing.</li><li>• Ubiquitous computing.</li></ul>
4	Smart Transport and Logistics: A Node-RED implementation	ResearchGate	<ul style="list-style-type: none"><li>• Background on smart transport and logistics.</li><li>• Node-RED and development.</li></ul>
5	Passenger Railway Industry: The Mobility revolution shows the way ahead	TATA Consultancy Services (TCS)	<ul style="list-style-type: none"><li>• Mobility as a Service (MaaS) enables the real time personalized mobility.</li><li>• Use of IoT in better planning and optimization of transport networks and services.</li></ul>
6	Evaluating website quality: A case of Indian Railway website	International Journal of Entrepreneurial Knowledge	<ul style="list-style-type: none"><li>• Data analysis and results.</li><li>• Data collection.</li><li>• Measuring website quality.</li></ul>

# 1. ON TRACK TO THE FUTURE WITH SMART RAILWAYS

## Authors:

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In this, passengers with stored value cards can pass through station gates swiftly and the eGate Validator will automatically deduct fare from the contactless card. This comprehensive e-ticketing system offers numerous payment options and transactions from multiple issuers on a single device. Based on parameter settings, various fee deduction methods, group ticketing, and periodic ticket application, this offers multi-group transfer discounts. By completely automating the ticketing management process for a railway station, this electronic ticketing system may significantly increase the quality of intelligent traffic and transport efficiency.

The 22Miles Interactive Wayfinding Kiosk, which is powered by Intel NUCs, is a potent digital signage solution that enhances the wayfinding experience by guiding end users through crowded, complicated transit hubs and structures. The system offers information, navigation, and maps that can all be easily handled from the 22Miles Publisher Pro CMS and are interactive and nearly real-time. With the help of Intel NUCs, the flexible, multi-purpose 22 Miles software solution offers train stations 3D Wayfinding, 4K Video Walls, mobile interior positioning, dynamic signage, and more. Devices like kiosks and video walls can incorporate the interactive wayfinding and digital signage technologies. This makes it possible for dynamic map pop-ups and gives wayfinding a close to real-time, turn-by-turn mobile wayfinding experience.

## 2. SMART TICKETING SYSTEM FOR RAILWAYS IN SMART CITIES USING SOFTWARE AS A SERVICE ARCHITECTURE

**Proposed by:** Mr. Godson Michael D'silva, Mr. Anoop Kunjumon, Mr. Lukose Roy, Ms. Jessica John.

This paper suggests an architecture for a smart ticketing system for railroads that does away with paper tickets entirely and fully utilises the money commuters have paid for their travel. Only half of the ticket price will be taken into account if the commuter plans to go from a source to a destination without planning to return that same day. Depending on the number of days they subscribed to, commuters will benefit from the option of using seasonal tickets as needed. The authorities can also identify commuters using this model who either never pay for their tickets or passes or forget to carry them with them when they travel.

The train ticketing system is implemented on the AWS public cloud in this suggested architecture using services including AWS IoT, Lambda, and Dynamo DB. Lambda is used for even supervised machine learning in order to gain some insightful information. AWS public cloud takes care of auto scalability and performance in light of the enormous volume of event data created.

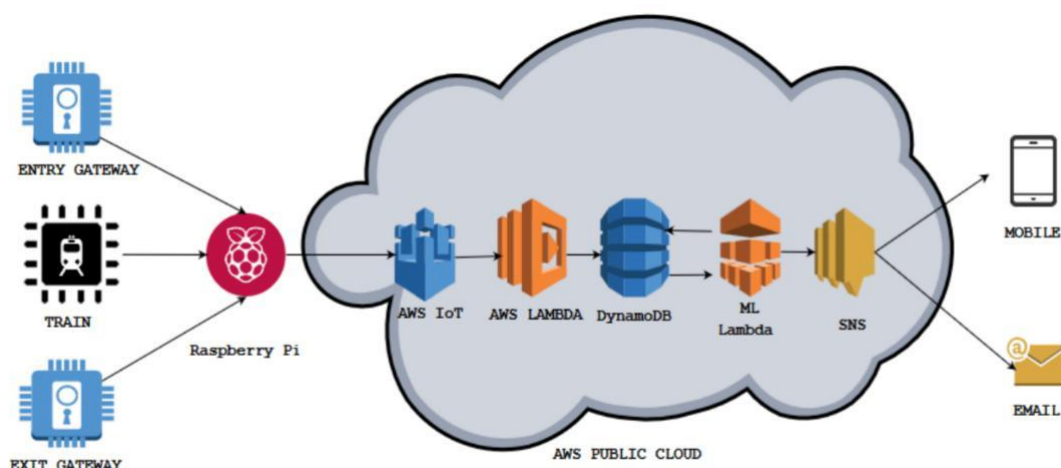


Figure 1: Generalized Smart Ticketing Architecture

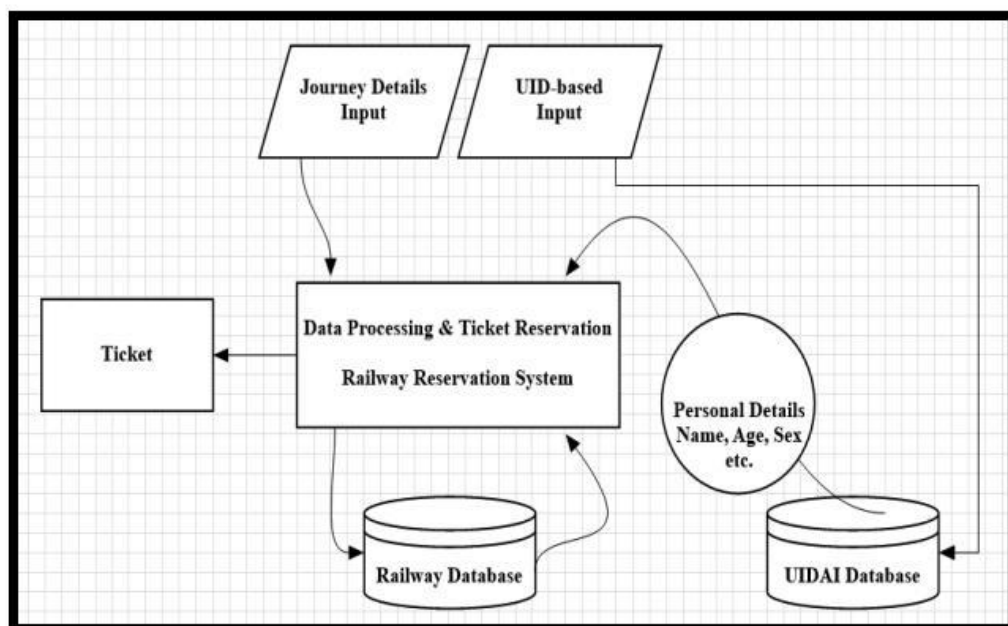
### 3. APPLICATION OF SMART COMPUTING IN INDIAN RAILWAY SYSTEMS

**Proposed by:** Parag Chatterjee, Asoke Nath

Smart computing, a relatively new field of technology, can be effectively applied in railway systems to upgrade to a more intelligent and efficient model. The majority of railroad services that provide public transportation must take into account passenger statistics as a crucial aspect. The efficient handling of this passenger data, in addition to its quick processing and seamless storing, is essential for providing quick and efficient passenger services.

#### **Smart Passenger Reservation system backed by unique ID:**

The main support structure for this entire smart Passenger Reservation System model would be the Unique Identity (for example, the Aadhaar Number in India). For primary identification in the services provided by the Passenger Reservation System, the Unique Identity (UID) would be regarded as the key. This UID-based reservation model can be simply implemented in countries where UID registration is complete in order to obtain a very efficient and clever approach to the ticketing system. As in the case of India, the model would be initially implemented on a selected domain, parallel to the existing one, which in turn would gradually eat up the present Passenger Reservation System with incremental coverage. This is because the UID registration is not fully complete country-wide.



**Fig. 1.**Working of the UID-based Reservation System in Indian Railways

## 4. SMART AND LOGISTICS: A NODE-RED IMPLEMENTATION

**Proposed by:** Sabrina Sicari, Alberto Coen-Porisini

Among the IoT applications, transportation and logistics are crucial. An IoT-based DNS infrastructure that uses a three-tier hierarchy of domain name servers and a three-level caching mechanism is the subject of a case study that simulates its behaviour. According to preliminary findings, such a method may be workable for object tracking in the IoT area. Radio-frequency identification (RFID) technology is primarily used by a cloud-based logistics framework described in to track the products and pallets in a warehouse. The fundamental flaw is that the experimental analysis is restricted to RFID simulations and does not take into account the entire designed architecture, which includes private and public clouds as well as other service provider modules.

Node-RED is a free project created by IBM that offers a framework-based, event-driven programming tool. As a result, the behaviour of the application is depicted as a network of black boxes that have the ability to communicate with one another and control the flow of information inside the intended system. Designers and developers may better comprehend the ongoing interactions throughout the entire IoT network with the help of a visual browser-based depiction. In actuality, a large number of entities—both software- and hardware-related—may be engaged. Additionally, Node-RED permits the actual connection of hardware and application programming interfaces (APIs).

Because Node-appropriate RED's libraries enable the integration of several technologies, the following ones have been used in the proposed solution: (a) Java as a programming language due to its widespread adoption in actual real-world implementations; (b) Message queue telemetry transport (MQTT) as a lightweight publish and subscribe method, for information sharing and system notifications; and (c) MongoDB as a database engine instead of a relational database. Keep in mind that Node-RED is in charge of managing the data flow and supplying the logic for the entire IoT application.

A Java software replicates sensor and RFID tag communication with the Node-RED control application using correct TCP connections. Instead, the MQTT protocol is used for communication between the concerned components, taking advantage of the well-defined subject hierarchy. The adopted publish and subscribe system controls both communications beneficial for the administration of the logistics and abnormalities, which are reported as alerts to the warehouse and by the findings presented in the remaining sections of the study.

## **5. PASSENGER RAILWAY INDUSTRY: THE MOBILITY REVOLUTION SHOWS THE WAY AHEAD**

**Proposed by:** Dr. Kandukuri Raju, Romil Shah, Mayukh Das

The global railroad industry needs to improve the passenger experience while maintaining profitability. In order to enable individualised mobility, it is necessary to invest in next-generation train travel, where a passenger is informed in real time at every stop along the way. The COVID-19 pandemic offers a strong case for contactless travel and reduced human touchpoints, and mobility as a service (MaaS) is also getting more and more popularity in today's world. New IoT-based data sources will become more popular as they assist travellers in making better decisions regarding their journeys. Better planning and optimization of transportation networks and services will also benefit from the use of IoT. As a result, rail travel will become more reliable and connected.

### **Mobility as a Service (MaaS):**

The transition from physically connected to digitally connected services is being facilitated by Mobility as a Service (MaaS), which is emerging as the main driver. Working with other partners in the travel ecosystem, implementing a seamless checkout system or digital ticketing that allows account-based, cashless, and biometric ticketing may prove to be the first step toward a better, safer consumer experience. Additionally, it will lower travel expenses for both rail operators and passengers. MaaS also makes it easier to reduce environmental pollutants, opening the door for cleaner transportation.

### **Intelligent rail travel: Focusing on passenger experience and safety:**

The future of passenger rail travel will see the emergence of an ecosystem in which various vendors will participate in a travel management system that is supported by elements like partner management, payment gateways, planning and routing, booking and ticketing, reporting, and customer engagement, all of which are integrated on a single, unified platform that is focused on the needs of the customer. Benefits include fewer waits from long lines at ticket counters, commuter services, and travel-related inquiries; frictionless automated payments and refunds; and smooth transit with real-time updates for travellers. Ecosystems will drive mass personalisation while simultaneously lowering the cost of operations and hazards for rail operators, especially when combined with prescriptive analytics to assist passengers during their journey.

## **6. EVALUATING WEBSITE QUALITY: A CASE OF INDIAN RAILWAY WEBSITE**

**Proposed by:** Rajesh Kumar Jain, Santhosh Rangnekar

Quality can be defined in a variety of ways based on the product or service it relates to or who is defining it, such as the consumer or the producer. According to the American Society for Quality, "quality" is a phrase that can mean different things to different people. Technically speaking, the word "quality" can mean two different things: a product or service's qualities that affect its capacity to meet explicit or implicit needs, or a product or service devoid of flaws. The largest rail network in Asia and the second-largest network of personnel managed by a single company in the world is Indian Railways, a leading public sector enterprise of the nation. With 108,706 kilometres of track, Indian Railways has a multi-gauge, multi-traction system.

### **Data Collection:**

A website that was thought to be excellent was compared to the Indian Railways website. Regarding their impressions of the ideal website quality and their actual experiences browsing the Indian Railways website, respondents' expectations were recorded. On the basis of a relevant literature review, an interview with website users, and my own observations, I devised the criteria for rating the Indian Railways website's quality. For the purpose of analysing user happiness with websites, a framework was created. 62 respondents who frequented websites were chosen at random. Participants in the survey came from a range of organisations, sectors, age ranges, and professions.

### **Limitations:**

Even though these findings offer some crucial information on customer happiness and content, ongoing monitoring of the evolution and usability of websites will be required. For a clearer understanding of the dynamics of Web-enabled ticketing, the data supplied should be expanded both cross-sectionally and longitudinally. It's possible that not all website users in the study's sample frame are comparable. Additionally, there might be other quality characteristics not covered in this study that are more or less significant and are linked to different reasons for using websites as well as different experiences. As a result, it is necessary to identify the demands of various user groups in terms of the level of interaction they desire with websites. Future study must therefore examine these issues.