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Centre for Railway Information Systems (CRIS)-The Automated Railway Management System: A Case Study

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ABSTRACT

Railway is the backbone of Indian transportation system. To operate the railway system, it is necessary to manage different functionalities. India Railway has many departments to operate the system correctly and cost effectively. To minimize the risk and to maximize the profitability railway has an efficient Railway Management System. Centre for Railway Information Systems or CRIS is an important Railway Management Information Systems. The purpose of this paper is to give an overview about Centre for Railway Information Systems. Different projects under CRIS has also discussed here. Different emerging technologies use by CRIS has also discussed here. Flow charts are used to explain the ticket booking concept easily. Contact information of different officials has also shared in this paper.

Keywords: Centre for Railway Information Systems, Railway Information Systems, CRIS, Railway Management System etc.

Globally Railway is one of the biggest networks of transportation. To manage and operate the railway network correctly and smoothly the whole system needs a strong and reliable Information system and a strong Information Technology infrastructure.

Centre for Railway Information Systems or CRIS is an organization under the Ministry of railways, Government of India. The main task of CRIS is to design, development, maintenance of different Information Systems used in India Railway. It has been successfully implemented by the unique collaboration of Information Technology professionals with the experience Railway personals. It has used different modern technologies to successfully execute all the projects under CRIS. Digital railway

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is one of the parts of Digital India program. CRIS is an important information system for Indian Railway to manage different departments systematically.

Objectives

Railway is very important mode of transportation for the passengers and for the goods. It is a huge network spread all over the country. The objectives of this study are:

- To learn about the Centre for Railway Information Systems - CRIS
- To know the different projects executed by CRIS
- To know the different Technologies used in CRIS
- To know the useful contact information of the officials
- To discuss the Advantages and the Challenges to CRIS
- To get a futuristic concept in CRIS

Methodology Adopted

The research work entitled 'Projects of Centre for Railway Information Systems (CRIS)-The automated Railway Management System: A Case Study' is an interdisciplinary work and it is theoretical in nature. Various secondary sources from different areas and subjects viz. Information Technology, Communication Technology, ICT, Information System, Railway management, Railway Information systems etc. are used to complete this work. Although the concept of this research is to study the different technologies used in CRIS. Various web sites are analyzed and reviewed to gather different information and to make the case study.

Projects under CRIS

Different projects have successfully executed under CRIS. The projects are as follows:

Software Projects

CRIS has develop, implements and maintain various types of software projects. The projects are as follows-

- **Ticketing and Passenger**

  Ticketing and passenger service is one of the main tasks of CRIS. The details are described below-

  - **Unreserved Ticketing System**

    Unreserved Ticketing System is one of the important tasks of CRIS. UTS is used to book the unreserved tickets by the passengers at railway counter. In August 2002, he unreserved ticketing system has began as a pilot project at Northern Railway. One of the pioneers of this centralized ticketing system was self-printing ticket machines (SPTMs) but this standalone system was phased out with the advent of UTS.

Initially, there was the central hardware architecture at station level because of the event of network failures it could server to the customer effectively using the dumb terminals and dot matrix printers. As the reliability of the network has improved, a new design has been implemented by introducing thin client machine supply to booking operators. Each Zonal Railway is responsible for operating UTS counters and running services smoothly. CRIS only maintains the UTS application and ensures business continuity at the system level.

The passenger may book the unreserved tickets from the following system:

- UTS at Railway Station Counters

Fig. 1: Ticket Counter

- UTS at online ticketing system
  - The passenger may book the tickets using website - www.utsonmobile.indianrail.gov.in

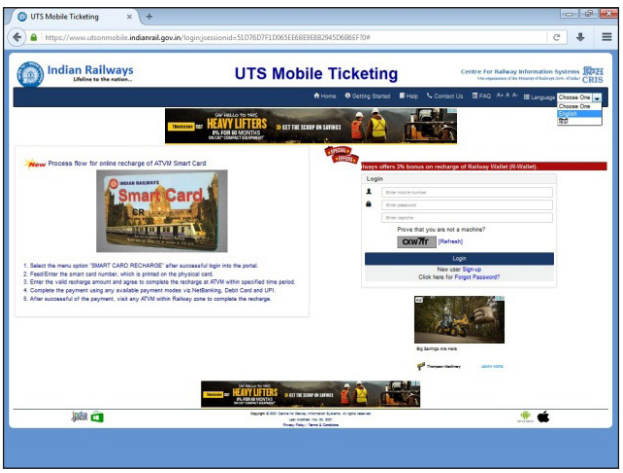

Fig. 2: Online UTS Ticket service

❖ UTS Mobile Apps

Fig. 3: UTS Ticket service

❖ Cash-Coin & Smart Card operated ticket vending machine (CoTVM)

Fig. 4: CoTVM Ticket service

❖ Jan Sadharan Ticket Booking Sewa (JTBS)

Fig. 5: Jan Sadharan Ticket Booking Sewa (JTBS)

❖ Automatic ticket vending machines (ATVM)

Fig. 6: ATVM Ticket service

❖ Yatri Ticket Suvidha Kendra (YTSK)

❖ **Passenger Reservation system**

Passenger Reservation System is one of the challenging tasks of CIRS. Passenger Reservation system is used to book reservation ticket for the passengers. It is world largest Passenger Reservation system which is developed, implemented and maintained by CIRS.

The main advantage of this system is that anyone can book the ticket from anywhere and anytime (except the maintenance time).

Information and Communication Technology (ICT) and different modern technologies like Artificial Intelligence, Cloud Computing Technologies, Big Data Analysis, Data Mining etc. has working simultaneously to execute the system smoothly. Country-wide Network for Computerized Enhanced reservation and Ticketing(CONCERT) which is a distributed database model having 3 tier Client Server architecture with 4 data centres at New Delhi, Mumbai, Kolkata, and Chennai has also perform a vital role in Passenger Reservation System.

The passengers get the facility to reserve train berth/seat upto 6 person at a time from anywhere. They might book the ticket using website in online mode or through the mobile phones without required to go to the rail reservation centers.

Indian Railway Catering and Tourism Corporation (IRCTC) is the Subsidiary company under Indian Railways, Ministry of Railways, Government of India. It provides ticketing, catering and tourism services for the Indian Railways. CRIS has designed and hosted the Next Generation e-Ticketing (NGeT) System for the ticket booking to the passenger.

Fig. 7: Rail Connect Mobile application

The passenger may book the reserved tickets from the following system:

- ❖ Next Generation e-Ticketing (NGeT) system using online platform
- ❖ IRCTC Rail Connect Mobile Apps

The passenger may book the reserved tickets from the following system:

- ❖ Next Generation e-Ticketing (NGeT) system using online platform:

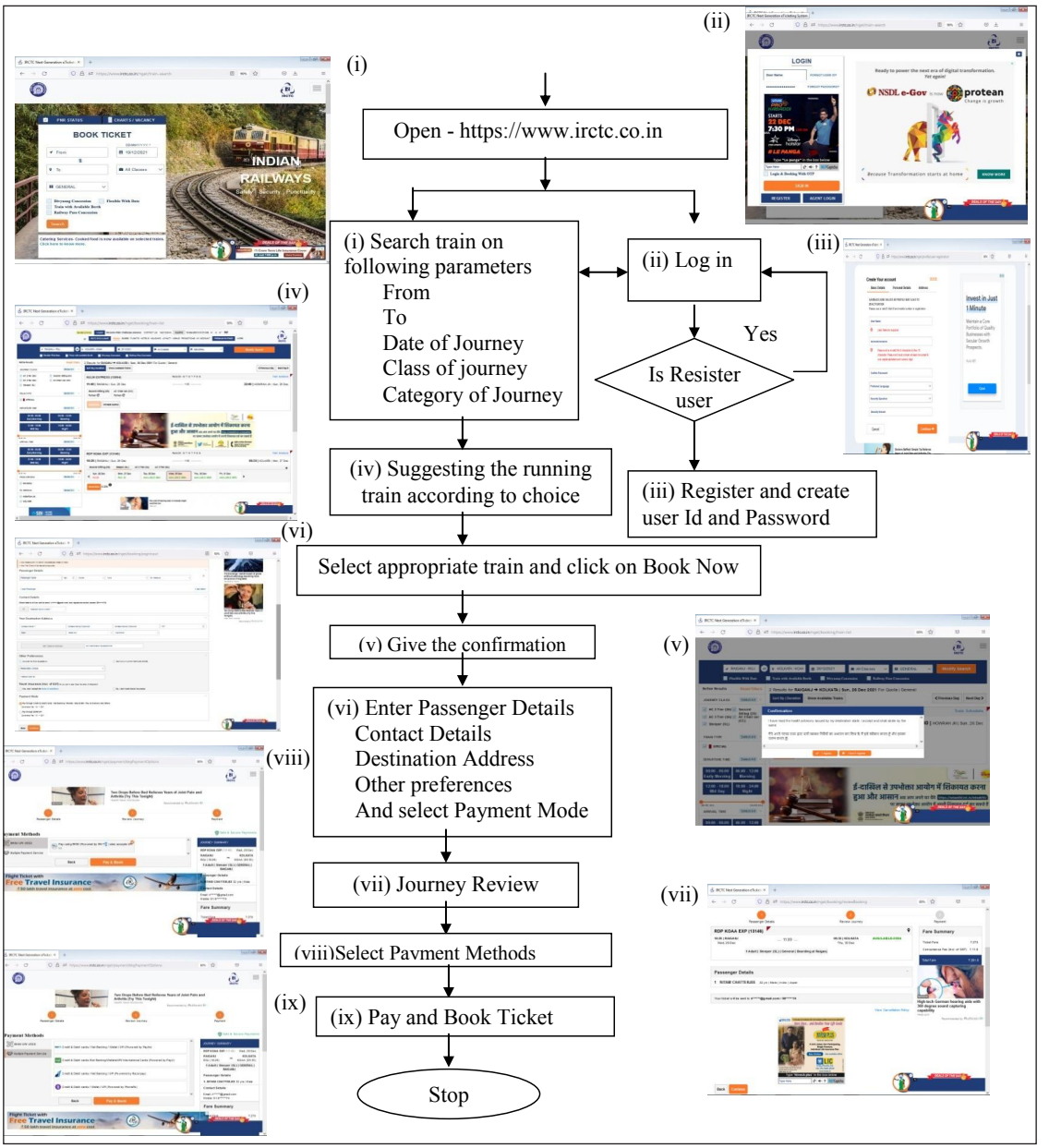

Fig. 8: Flowchart of Reservation Ticket booking

❖ **National Train Enquiry System**

National Train Enquiry System is a software which is used to provide real time train running information and train status to the passenger in effective, reliable and user friendly manner.

❖ **RPF Security Helpline 182**

Railway Protection Force Security Help line no is **182.** It is a 24X7 help line for the passengers. Any kind of complain related to the train could be register through the help line number. It is an Automatic Call Distribution (ACD) supported and integrated system. It could register, reporting, monitoring, tracking and resolution of security complaints. 72-Divisions have integrated with ACD. Daily more than 10000 Average calls have received by the ACD. Monthly more than 2000 average Security Related calls have received. People may access the helpline through the following website- https://182rpf.indianrailways.gov.in.

❖ **Freight and Operations**

❖ **Control Office Application**

Control office application has many functionality including charting of running trains, monitoring line occupancy, cautions orders, abnormal working, it provide facilities to order train, view all possible routes, crew, locomotive details etc.

❖ **Freight Operations Information System**

Freight Operations Information Systems creates perfect statistics of loading, earning and freights. It generates systematic allocation plan for the several commodities for perfect allotment of rakes. B2B integrations with some application like COA, ICMS, CMS.

❖ **Integrated Coaching Management System**

Integrated Coaching Management System is used for following purposes:

- ❖ Online punctuality assessment and reporting.
- ❖ Online asset failure reporting an analysis.
- ❖ Centralize reporting an data entry system.
- ❖ Digitalization of coaches, rakes and locomotives.

❖ **Parcel Management System**

The functionalities of Parcel Management System are as follows:

- ❖ Automatic Parcel booking and tracking system.
- ❖ It provides online parcel booking activities to the peoples.
- ❖ It helps to track the parcel through SMS.
- ❖ Automatically calculate penalties, concession, demurrage, etc.

❖ **Real Time Train Information System**

- **Asset management**
  - **Track Management System**

    Track Management System is used to manage the track efficiently. Track management system has following operations-:

    - Implementation of data collection technique through digitalization of track assets and it maintains information about tracks.
    - To avoid physical inspection of track, register through online to keep records.
    - Data validation and verification done automatically to improve the quality of the inspection.

  - **Traction Distribution Management System**

    Most challenging task of Railway is to manage the traction distribution. It is very difficult to supply electric power to running Locomotive through Traction Distribution. It is very complex to design a system for overall management, inspections recording and proactive traction maintenance in order to improve traction assets reliability. It is a customized Traction Assets Management tool which is a single point destination for all needs of Traction Assets information and maintenance. It has the following features:

    - Traction Assets Master
    - Inspection and Maintenance
    - OHE Failure Recording
    - Real Time Data Logging
    - GPS Based Tracking
    - Exception generation and SMS based alert
    - Integration Capabilities with different Asset management systems of Railways, likes- Track management, Signal Assets management etc.
    - Web site of access TDMS is- https://tdms.railsaver.gov.in/TDMS/

- **Human Resource & Accounting**
  - Accounting Information Management System
  - RPF Security Management System

- **Procurement & Automation**
  - E-Working Software Solution
  - Employee Self Service & Internal Applications
  - E-Procurement System
  - e-Drishti / RailDrishti

- **Infrastructure**
  - **CLOUD TECHNOLOGY**

    To use the recourses optimally it is necessary to update the system. Centralized Procurement and Installation of common infrastructure is one of the main goals to adopt Cloud Computing Technology. To enhance the security and to make the system more reliable it is necessary to virtualize the system.

- **Mobile Applications**

  Centre for Railway Information Systems- CRIS have designed, developed and maintains the various mobile applications. The applications are as follows:

  - NTES
  - UTS
  - RAIL SAARTHI
  - RESS-Railway Employee Self Service
  - Rail Connect
  - TDMS
  - IREPS-Aapoorti
  - Chalak Dal
  - Rail Madad
  - Rail Sugam
  - ICMS
  - Rail Saver
  - HRMS

NTES

NTES means National Train Enquiry System. It gives the real time trains running status. It is used for the following purposes:

- Spot the Train with Map feature-It is possible to spot any train either by Train Number or by Train Name. It is possible to select a particular station to get better result.
- Live Station Information- It is possible to get live station information about the train between a particular time intervals.
- Train Schedule with save feature
- Train available between two stations
- Cancelled Trains

- Rescheduled Trains
- Diverted Trains
- Manage favorite trains, stations and train schedules

UTS

Fig. 9: UTS Application Poster for passenger

It gives the facility to pay the amount digitally using various options such as Rail Wallet, Debit Card, Credit Card, Net Banking, UPI, e-Wallets etc. It gives 5% bonus amount on recharge to Rail wallet. R-Wallet can be recharged through:

- UTS Mobile Application
- Debit card of any Bank
- Credit Card
- Net Banking
- Unreserved Ticket Counter at all stations
- Websites:- www.utsonmobile.indianrail.gov.in

RAIL SAARTHI

Rail Saarthi is All-in-One Railway mobile application. The full form of Saarthi in the name of the application is Synergized Advanced Application Rail Travel Help and Information. It is an integrated mobile application of India Railway to manage multiple mobile application of Railway.

Rail Saarathi application has managed the following applications:

- Ticketing
- Reserved Ticketing-IRCTC
- Unreserved Ticketing-UTS

- **Enquiry**
  - Rail Drishti
  - Tran Running- NTES
  - PNR Enquiry-PNR
  - Seat Availability-Accomodation
  - Fare Enquiry-Fare
- **Affiliated Services**
  - AIR Ticket Booking-IRCTC AIR
  - Food on Track- IRCTC Catering
  - Tour Booking- IRCTC Tourism
  - Book Retire Room – Retiring Room
- **Feedback**
  - Complains/Suggestions- Rail MADAD

RESS-Railway Employee Self Service

Railway Employee Self Service is a mobile application. It is developed by CRIS under AIMS portal. It is designed to provide the employees financial data and personal data. An employee has to register himself to access his/her personal details, Salary information, PF, loan and income tax projections. The employee may download his/her pay slips from this portal.

Rail Connect

Rail Connect is an application which deals the transportation and revenue management services for railroads, rail shippers and rail leasing companies. IRCTC's Rail Connect is a great way to book and cancel tickets. Travelers can book their tickets through the IRCTC phone app, and also make payments using the IRCTC e-wallet. Users can deposit money in their e-wallet from their respective banks, and use the money to book tickets. The passenger can easily book train tickets and cancel the tickets again very easily. Passengers can also order their own food through the IRCTC Rail Connect application. The Rail Connect app had more than 30 million users and downloads in the two years since its launch. In addition, more than 140 million tickets have been booked since 2017, with over 4.5 million daily ticket bookings.

TDMS

Traction Distribution Management System is used to manage the traction assets information and maintenance.

IREPS-Aapoorti

IREPS means the Indian Railway E-Procurement system. The main purpose of this application is to maintain a web portal for e-tendering and re-auctioning related various projects. This is an official web app of Indian Railways which is used for collecting various items and auctioning non-essential items. The Ireps app can also be accessed at www.iepf.gov.in. Indian Railways digital signature application with dual proof. Login Enter the username and password first. Provide your signature certificate at the next stage and act accordingly.

Chalak Dal

Chalak Dal is a crew information system type mobile application. The chalak dal is the Indian Railway Information System Android application. The official app of Indian Railways, Chalak Dal App, was launched to manage crew, loco inspectors and crew working. The key feature of crew management is crew strength.

Rail Madad

Rail Madad is a mobile application designed by CRIS for desired assistance during travel.It is a part of the Railway Passenger Grievance Redressal and Management System (RPGRAMS). On 21st February, 2015 Ministry of External Affairs launched an online grievance monitoring system launched. Passengers who travel by train will register themselves in the rail Madad app to complain if they have any problem and then they will lodge their complaint there and based on how serious the complaint is. The decision will be taken after proper evaluation by the Ministry of Railways. The rail madad app is a key platform for Indian Railways passengers to lodge complaints and resolve their grievances appropriately.

The rail madad app was originally launched by the Delhi Division, the Northern Railway. It is a platform for passengers to lodge complaints and take action in response to such complaints. At the next stage, the passenger will be informed about the action taken by Mantra on the basis of the complaint via a customized SMS and the next step and the passenger will be redirected to his / her ID via SMS.

Rail Sugam

Rail Sugam App is one of the first mobile apps of Indian Railways to provide special help in providing information anytime, anywhere in the freight business. This app was created using Google Maps to provide performance terminal handling contact details in addition to advanced GIS view.This app also provides contact details of the concerned officials. The app also provides consignment travel details, advanced GIS data and gives the traveler the expected time of his arrival. Some information of rail Sugam mobile app is:

- IR freight operation capacity,
- Any important IR website,
- Freight terminal and
- Freight trucking.

The others use full applications are:

- **ICMS** is Integrated Coaching Management System. It is used to manage the coach information and coach management.
- **Rail Saver** is an energy management system. It helps to manage the electric consumption and reduce the electricity bill and helps achieve sustainability.
- **HRMS** is a Human Resource Management System. It helps to manage the employees' information. All job related information has stored and managed by this management system.

Career or Recruitments

To manage the different types of activities, Centre for Railway Information Systems - CRIS provides different types of career options to the different categories of people. Some of the career options are as follows:

- **Permanent post**
- **Deputation post**
  - Gazetted
  - Non-Gazetted
- **Engagement after Retirement**
  - Project Assistants
  - Project Officers Etc.

Contact Information's

- **Head Office**

  Centre For Railway Information Systems

  Chanakya Puri, New Delhi – 110021, Ph - 011-24104525, Fax : 26877893

- **Head Office (ITPI Campus)**

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- **Regional Office Delhi**

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- **Regional Office Kolkata**

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- **Regional Office Secunderabad**

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  Phone - 040-27702116

- **Regional Office Mumbai**

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CONCLUSION

Railway is a very essential mode of transportation for all the countries. The countries economy is completely depending on the railway system. The more strong the railway networks have a country, the more revenue it would generate. Thus, to become more sustainable, reliable and cost-effective mode of transportation, the railway system does not have any alternative.

In this study it is only consider the features of CRIS and the current projects of CRIS. There are many other organizations but CRIS is only considered here for the study. This study is restricted to the Indian Railway system only. The emerging technologies have just given an overview in this study. At present the scope of implementation of the emerging technologies is very large. CRIS is a very stable Information System for Indian Railway. It is expected CRIS will give better services in near future too.

REFERENCES

1. An, M., Chen, Y. and Baker, C.J. 2011. A fuzzy reasoning and fuzzy-analytical hierarchy process based approach to the process of railway risk information: A railway risk management system. *Information Sciences*, **181***(*18): 3946-3966.

2. Avramović, Z.Ž., Marinković, D.M. and Lastrić, I.T. 2019. Digitalization of Railways–ICT Approach to the Development of Automation. *Jita-Journal of Information Technology and Aplications*, **17**(1).

3. Bukhsh, Z.A., Hartmann, T. and Stipanovic, I. 2016. From analysis of information needs towards an information model of railway infrastructure. In *23rd International Workshop of the European Group for Intelligent Computing in Engineering, EG-ICE 2016*.

4. Chang, T.W., Lee, S. and Cho, M.S. 2009. A Study of the Information Classification for Railway Industry. *International Journal of Railway*, **2**(1): 37-42.

5. Guo, Z., Zhang, Z. and Li, W. 2012. Establishment of intelligent identification management platform in railway logistics system by means of the Internet of Things. *Procedia Engineering*, **29**: 726-730.

6. McMahon, P., Zhang, T. and Dwight, R. 2020. Requirements for big data adoption for railway asset management. *IEEE Access*, **8**: 15543-15564.

7. Mohamed, H.A.R. 2014. A Proposed Model for Radio Frequency Systems to Tracking Trains via GPS (The Study for Egyptian National Railways). *International Journal of Intelligent Systems and Applications*, **6**(4): 76.

8. Paul, P.K. and Aithal, P.S. 2018. Digital Society: It's Foundation and Towards an Interdisciplinary Field. *Advances in Information Technology, Management, Social Sciences and Educatio.* ISBN No.: 978-81-938040-8-7.

9. Paul, P.K., Dangwal, K.L. and Chaterjee, D. 2012. Information technology and advance computing and their interaction for healthy education, teaching and learning: the ikm approaches. *Asian Journal of Natural and Applied Sciences*, **1**(2): 70-77.

10. Paul, P.K., Govindarajan, S., Chaterjee, D. and Bhatnagar, R. 2013. Information Systems and Information Science: Overview Emphasizing Comparative Study. *Information Systems*, **3**(1): 336-341.

11. RailTel Corporation of India Limited. (2019-2020). 20th Annual Report-2019-2020. ISIN No-INE0DD101019.

12. Singhal, V. and Jain, S.S. 2015. Safety information system of Indian unmanned railway level crossings using ICT.

13. Temple, W.G., Li, Y., Tran, B.A.N., Liu, Y. and Chen, B. 2016. Railway system failure scenario analysis. In *International Conference on Critical Information Infrastructures Security* (pp. 213-225). Springer, Cham.

14. Thaduri, A., Galar, D. and Kumar, U. 2015. Railway assets: A potential domain for big data analytics. *Procedia Computer Science*, **53**: 457-467.

15. Tsvetkov, V.Y., Shaytura, S.V. and Ordov, K.V. 2019. Digital management railway. *Advances in Economics, Business and Management Research*, **105**: 181-185.

16. Zhu, C., Yan, Z., Lin, Y., Xiong, F. and Tao, Z. 2019. Design and application of a monitoring system for a deep railway foundation pit project. *IEEE Access*, **7**: 107591-107601.

17. Zhu, W. and Jia, Y. 2018. The Research on Safety Management Information System of Railway Passenger Based on Risk Management Theory. In *IOP Conference Series: Earth and Environmental Science,* **108**(4): 042067. IOP Publishing.

18. Zhukovyts'kyy, I. 2017. Use of an automaton model for the designing of real-time information systems in the railway stations. *Transport problems*, **12**.

Web References

1. Markets and Markets. (10th Septemper, 2021). Railway Management System Market.URL-https://www.marketsandmarkets.com/Market-Reports/railway-management-system-market-193193339.html

2. Indian Railway Employee. (12th September, 2021). Control Office Application (COA). URL- https://indianrailwayemployee.com/content/control-office-application-coa.html

3. RailTel. (10th Septemper, 2021). RailTel Corpotation of India Limited.URL- https://www.railtelindia.com

4. Rail News (accessing date- 15th December, 2021, date of publication-16th March, 2013). Rail News. URL- http://www.railnews.in/indian-railways-improves-operations-with-control-office-application/

5. Centre for Railway Information Systems (15th January, 2022) Centre for Railway Information Systems. URL- https://cris.org.in/