

Chapter 1 Computerised Passenger Reservation System of the Indian Railways

1.1 Highlights

Railways did not set out clear milestones or targets for the switch over from BSNL channels to their own OFC network. Even where the zonal railways had chalked out action plans, these were not adhered to and the progress of switch over was very slow. Railways continued to largely rely on hired BSNL channels with recurring expenditure towards hiring of the channels even though there were frequent and extensive failures of BSNL channels, disrupting the PRS services. There were also no service level agreements between the Railways and BSNL explicitly setting out the minimum guaranteed efficiency and penalties for failure and as a result the Railways did not have a structured redressal mechanism against BSNL.

(Para 1.6.2)

The PRS had design deficiencies necessitating manual interventions during program terminations and link failures. The Current Day Reservation System also posed problems and reservations to intermediate stations were not possible. The Coaching Refund System was not integrated with the PRS.

(Para 1.6.3)

General controls comprising system documentation, sound IT security practices, change management and structured disaster recovery policy were inadequate. There were deficiencies both in physical access and logical access controls. The total number of users with supervisory privileges was very high and booking clerks were also routinely assigned supervisory privileges, creating a risk of possible misuse of the powers associated with the privileges.

(Paras 1.7.1 and 1.7.2)

The mechanism of change management was inefficient and policy changes were not incorporated in the system software in a timely manner. There was no structured disaster recovery policy and the maintenance and protection of infrastructure as well as the data was inadequate.

(Paras 1.7.3 and 1.7.4)

Application controls were weak and a number of tickets were booked on fictitious details, indicating bogus/proxy booking in advance and thereby decreasing the availability of seats to genuine passengers.

(Para 1.8.2)

Validation checks for generation of pre-bought tickets, for journeys involving more than one lap, were weak. The system permitted generation of a zero value ticket for the second lap without generating

the ticket for the first lap. Seats/ berths were also blocked for dummy passengers using the pre-bought facility.

(Para 1.8.3)

The application software did not have validation checks to ensure compliance with the rules governing break journey. Various quotas for accommodation in trains were not properly managed resulting in decrease in availability of seats to the general public; this also resulted in loss of revenue to the Railways.

(Paras 1.8.4 and 1.8.5)

Fares and distances were incorrectly adopted leading to incorrect levy of fares. The electronic databases contained numerous deficiencies rendering the data unreliable.

(Paras 1.8.6 to 1.8.8)

Even though allotment of berths was meant to be a zero error process, multiple instances were noticed where the system allotted the same berths to different passengers.

(Para 1.8.9)

Trains and stations were incorrectly defined in the system thereby preventing reservation of accommodation against them. The status of late running of trains was not set promptly leading to incorrect refunds to passengers.

(Paras 1.8.10 and 1.8.11)

The internal control mechanism in respect of custody and utilisation of ticket rolls was weak and the ticket rolls were susceptible to misuse.

(Para 1.9.2)

1.2 Gist of recommendations

- * Railways should strengthen its communication network and reduce BSNL links to the bare minimum. Where BSNL links have to be continued for strategic reasons effective performance must be ensured through proper agreements and penal clauses.
- * The system design deficiencies need to be rectified based on user requirements to prevent manual interventions. Coaching Refund System needs to be integrated with Passenger Reservation System.
- * Railways should maintain the system documentation and manuals to enable referencing at the operational levels and develop a comprehensive IT policy encompassing IT security. Adequate physical access controls should be instituted to safeguard PRS assets and access controls should be strengthened to ensure accountability for transactions. Assignment of various privileges should be standardised and adequate controls need to be established to prevent misuse of privileges.
- * Railways should institute a mechanism for incorporating changes promptly. A structured disaster recovery policy should be developed with off-site back up sites for business continuity as well as data storage.

The PRS locations should be adequately protected from damage through fire, water etc.

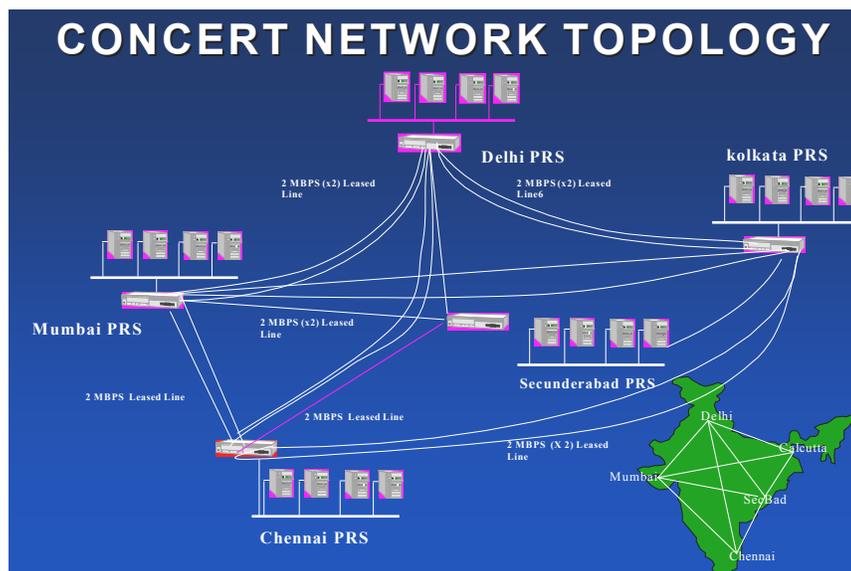
- * Railways should build adequate checks to prevent reservation on fictitious or incomplete details and to enhance credibility and confidence in the system. Adequate validation checks should also be instituted for generation of pre-bought tickets. Any transaction of a pre-bought ticket for second lap should be validated with the details of the first lap of journey. The business logic and corresponding rules for break journey have to be adequately built into the system with validation checks to ensure compliance.
- * Railways should strengthen its control mechanism to ensure that accommodation under various quotas is not misused and that unused accommodation in these quotas is taken back to the general pool systematically to optimise utilisation.
- * Railways should rectify the application, to correct the fare table and institute a mechanism at the appropriate level to ensure that distances between stations are uniformly adopted in the system, so that fares can be correctly levied. The inaccuracies in the master tables should also be rectified immediately to enhance reliability of data and to render generation of meaningful reports.
- * The software needs to be rectified to prevent multiple bookings against the same berth, as allotment of berths to passengers should be a zero error process. Suitable modifications in the program need to be carried out to provide compact accommodation for multi passenger reservation having a combination of confirmed reservation and waitlisted/RAC status.
- * Railways should strengthen its control mechanisms to define the train profiles in the system as per the physical composition of trains. En route stations also have to be correctly defined for trains. Suitable mechanism should be developed to ensure that status of late running of trains is set promptly in the system so that cancellation charges are computed correctly.
- * The internal control mechanism to monitor the supply and custody of unused ticket rolls needs to be strengthened. Physical verification of ticket rolls should be conducted periodically to prevent misuse of tickets.

1.3 Introduction

The Indian Railways (IR) carries about 5.5 lakh passengers in reserved accommodation every day. The computerised Passenger Reservation System (PRS) facilitates booking and cancelling of tickets from any of the 4000 terminals (i.e PRS booking windows) all over the country. These tickets can be booked or cancelled for journeys commencing in any part of India and ending in any other part, with travel times as long as 72 hours and distances up to several thousand kilometers.

The pilot project of PRS was launched on 15 November 1985, over Northern Railway with the installation of the Integrated Multiple Train Passenger Reservation System (IMPRESS), an online transaction processing system developed by the Indian Railways in association with Computer Maintenance Corporation (CMC) Ltd., at New Delhi. The objective was to provide reserved accommodation on any train from any counter, preparation of train charts and accounting of the money collected. This application was subsequently implemented in 1987, at Mumbai, Chennai, Kolkata and Secunderabad. With the addition of new locations and many redefinitions, the IMPRESS system fell short of growing expectations of the travelling public. Hence a new application software, i.e., Country Wide Network for Computerised Enhanced Reservation and Ticketing (CONCERT) was developed by the Centre for Railway Information Systems (CRIS), New Delhi primarily using 'C' and also using 'FORTRAN'. The application was first implemented at the Secunderabad PRS site in September 1994 and subsequently at the other four PRS sites. Currently, the PRS servers are maintained at the five sites in Delhi, Mumbai, Kolkata, Chennai and Secunderabad and operate in a distributed database process environment.

Communication of all the terminals with their server was established using Railway/Department of Telecommunication (DOT) channel lines, fibre-optic cable/microwave channels, switches, modem, multiplexers etc. The inter-networking of five PRS nodes was completed in April 1999. Inter-connectivity is established between the five PRS centres over 2 mbps leased Bharat Sanchar Nigam Limited (BSNL) lines. The system has the capability of issuing reserved tickets from anywhere to anywhere, in any train, date or class between any pair of stations from any booking terminal of the PRS.



The main modules of the PRS are the Reservation module, the Cancellation and Modification Module, the Charting Module, the Accounting Module, and the Database Module. The passengers' request for reservation, cancellation and modification of journey are handled by the system through

requisition slips. Major outputs generated by the system are Reservation-cum-journey tickets, Cancellation/Modification tickets, Reservation Charts and Daily Terminal Cash Summary. The system is also capable of generating different types of Management Information System (MIS) Reports. The system was audited at ten zonal railways namely Eastern Railway (ER), Northern Railway (NR), Southern Railway (SR), Central Railway (CR), Western Railway (WR), South Central Railway (SCR), North Eastern Railway (NER), South Eastern Railway (SER), North East Frontier Railway (NFR) and East Central Railway (ECR).

1.4 Audit objectives

The review of PRS (CONCERT) was conducted with a view to assessing whether:

- * the acquisition and maintenance of hardware, communication network and software including system design were adequate and effective;
- * the general controls were adequate and system was operating in an adequately controlled environment;
- * the application controls were adequate and the system was in compliance with rules and adequately secured from possibilities of fraud;
- * there was an effective mechanism to ensure most economic usage of available resources; and
- * the accounting arrangements and control mechanism for credit card transactions were adequate.

1.5 Audit scope and methodology

The scope of audit included evaluation of the application and was primarily concerned with the transactions related to booking of tickets from the terminals operated by the railway personnel. Control Objectives for Information and related Technology (CoBIT) was referred to as a frame of reference for evaluation of the IT system. For application controls, 'test data method' including simulation and online enquiries were used to evaluate data validation and program logic. The reports generated by the PRS were also studied. Audit also selected data, as made available by the various zonal railways, pertaining to periods of fifteen days to three months of the year 2005-2006 for substantive checking of the completeness, integrity and consistency of data using Computer Assisted Audit Techniques namely, Interactive Data Extraction and Analysis (IDEA) and Structured Query Language (SQL).

The records maintained by Commercial Department of all zonal railways and those related to five PRS server locations at Delhi, Mumbai, Chennai, Secunderabad and Kolkata, and at CRIS office at New Delhi were also reviewed. Discussions were held with railway officials, CRIS personnel and users to gain understanding regarding the various functional aspects of the system.

Provisions contained in Indian Railway Conference Association (IRCA) Coaching Tariffs, Commercial Manual Volume I, Railway Codes & Manuals and orders of the Railway Board were also referred to as frames of reference.

1.6 Deficient acquisition and maintenance

Acquisition and maintenance of hardware, including the communication network, is a vital phase in implementation of any computerised system. For the system to function effectively, it is imperative to ensure that the hardware procured is compatible. Piecemeal and ad hoc procurement results in mismatches with a possible impact on system efficiency. In PRS, the role of the communication system is also vital, as the functioning of the system is primarily dependent on the performance of the network. It is also essential that the system is comprehensively designed, taking into account all operational requirements. In 2001, the 'VAX' servers were replaced with 'Alpha' servers, both of Compaq manufacture. A review, however, disclosed that:

- * Failure to take user requirements into account and inadequate assessment of needs led to augmentation of capacity in a piecemeal fashion after implementation of the 'Alpha' systems. Arrangements for maintenance of software and hardware were also inadequate.
- * While the Railways recognised the importance of switching over to their own OFC network, they did not set out clear milestones or targets for the switch over. Even where the zonal railways had chalked out action plans, these were not adhered to and the progress of replacement of the BSNL channels by Optical Fibre Cables (OFC) of the Railways was poor. Consequently, the Railways continued to rely largely on hired BSNL channels with recurring expenditure towards hiring of the channels though there were frequent and extensive failures of BSNL channels disrupting the PRS services.
- * The PRS had design deficiencies necessitating manual interventions during program terminations and link failures. The system did not validate the advance reservation period for special trains introduced in some cases. The Current Day Reservation System also posed problems and reservations to intermediate stations were not possible. The Coaching Refund System was also not integrated with the PRS.

1.6.1 Deficient acquisition and maintenance of hardware

Audit observed several deficiencies in the acquisition and maintenance of hardware and software over various zonal railways as brought out below:

- * With the growth of PRS activity and increased load on back end PRS systems, the Railways felt it necessary to augment its infrastructure and accordingly replaced the existing 'VAX' systems with 'Alpha' systems, both of Compaq manufacture, in September 2001. The procurement of Alpha servers at a total cost of Rs.9.10 crore was done centrally by NR for all five PRS sites. The configuration of the systems and other

technical specifications were finalised by CRIS. On ER, the Alpha servers were procured to replace the old 'VAX 4705' systems, without obtaining the requirements of the users/PRS sites. Since they were found not compatible with the existing 114GB disk space and two Optical Drives (ODs), ER did not decommission the old 'VAX 4705' systems. The use of non-compatible ODs and lack of maintenance resulted in failure of one OD. ER had to carry out the entire backup work with the help of the one working OD. The additional load on the single working OD led to a system crash on 19 March 2003.

Improper assessment of requirements also resulted in procurement of additional hardware and servers in a piecemeal fashion, with delays up to 28 months, in some zonal railways.

- * The preventive maintenance of various PRS locations (Rail-head and Non Rail-head) was not in accordance with the Annual Maintenance Contracts (AMC) concluded and the shortfall on NFR accounted for as much as 79 per cent of the scheduled maintenance for the period from January 2004 to March 2006. Railway Board decided (May 2002) that maintenance of PRS hardware should also be carried out through CRIS, the software maintenance organisation, instead of M/s CMC, the then maintenance contractor. The single PRS window service, through CRIS, came into effect from October 2002. CRIS, however, further subcontracted the annual maintenance of Alpha servers for all the PRS sites to M/s CMC limited, New Delhi, for the period from 1 May 2005 to 30 April 2006. In spite of involving CRIS, the performance of the contractors was not satisfactory particularly in ER, where there were undue delays in rectification of faults. Preventive maintenance was also not carried out regularly and the penal provision was not acting as an effective deterrent for ensuring efficient delivery.
- * The terms of AMC provided that all reservation centres should maintain a minimum of 25 per cent of spare modems and multiplexers (MUX). Twenty two PRS centres in Dhanbad division on ECR, however, did not maintain adequate spares. As a result, the defective equipment had to be sent to Kolkata for replacements. Till the replacement arrived at the location, the counter/location had to remain closed resulting in inconvenience to the public. On NFR too, the PRS activity was disrupted for considerable periods from January to March 2006 due to non-maintenance of the requisite level of spares.

Further, ER incurred an avoidable expenditure of Rs.0.25 crore due to failure to exclude obsolete equipments from the AMC.
- * In December 2001, Railway Board issued guidelines for providing PRS facility only at sites, which had a minimum of 100 transactions per day. This was in line with the thinking that maintenance of a PRS centre involves investment as well as operational expenditure. However, it was observed that at least 171 booking locations in different zones were operational, where transactions per day were less than 100 per day. Given the estimated expenditure of Rs.6 lakh for setting up a PRS site,

the continuance of these 171 booking locations required re-examination keeping future requirements in view. During discussions at Railway Board, it was mentioned that the Railways intend to merge Unreserved Ticketing System (UTS) with PRS and utilisation of infrastructure created at these locations would be optimised in future.

Recommendations

While planning the procurement of hardware for any IT system, the Railways need to obtain the user requirements and ensure timely procurement. In the case of upgradation, compatibility with existing systems has to be ensured. The Railways should ensure that AMC's clearly spell out performance parameters and prescribe suitable penalties for shortfalls.

1.6.2 Deficient acquisition and maintenance of communication network

Data communication between locations and servers was either through leased lines from BSNL/MTNL or through Railway's own communication channels. Important locations had two channels, either two DOT channels or a combination of DOT and Railway channels. The smaller locations, however, had only one channel, either of DOT or of the Railways. The data communication channels were either of 9.6 kbps or 64 kbps capacity. However, there were inadequacies in the channel availability as detailed below:

- * With the progressive availability of the Railways' OFC network it was decided to use this network for PRS communication also and instructions to this effect had been issued as far back as in April 2004 by Railway Board. In August 2005, the Railway Board reiterated that all zonal railways should switch over to the Railway OFC network for enhancing the reliability of communication and to reduce recurring expenditure on the hired BSNL channels. However, no targets or milestones were specified by Railway Board. The zonal railways identified the locations where switch over to Railway OFC network could be effected. But, the progress of replacing BSNL channels with OFC was found to be very slow. On NER, ER, SR and SWR, totally 153 channels were identified for transfer to the OFC network by March 2006, but only 41 were finally transferred to OFC with a recurring rental expenditure of approximately Rs.0.66 crore per annum on the remaining BSNL channels. Further, on SER, in respect of 14 PRS locations, though the OFC network was available, BSNL channels were continued with an additional expenditure of Rs.0.15 crore per annum towards hiring of these BSNL circuits.
- * Frequent and extensive failures of BSNL channels were noticed at various locations on ER, SER, NER, NFR and ECR resulting in disruption of PRS activities. Thirty to 50 incidences of channel failures per day were reported and the duration of these failures ranged up to as much as 1,086 hours. At one PRS location alone, (Abhaipur of Malda Division), ER estimated a revenue loss of Rs.0.22 crore due to link

failures over a period of seven months from January 2005 to July 2005. Further, in Samastipur division of ECR, one additional back up channel was hired from BSNL, at a cost of Rs.0.12 crore per annum. The back up channel also failed on many occasions along with the main channel thereby defeating the purpose of hiring the extra channel.

- * The Railways faced a number of problems in the restoration of disrupted BSNL channels as the maintenance was very poor. Consequently, channels remained out of order for days together. Further, there was no service level agreement between the Railways and BSNL explicitly setting out the minimum guaranteed efficiency and penalties for failure. As a result, the Railways did not have a structured redressal mechanism against BSNL, despite frequent and prolonged channel failures.
- * Further, channel hire charges of Rs.0.10 crore were paid in respect of the eight locations on NR, which were either yet to be opened or were not functioning during the periods for which payments were made.
- * NFR incurred an avoidable expenditure of Rs.0.25 crore for the period from April 2002 to March 2006, towards rental charges of low speed data channels, despite having high speed 64 Kbps BSNL data channels at the same locations. They also paid rental charges at a rate higher than the actual applicable tariff for data circuits, resulting in an additional expenditure of Rs.0.91 crore for the period from 1 April 2001 to 31 March 2005. Additional expenditure of Rs.0.24 crore was also incurred due to non-implementation of the revised tariffs of leased data circuits from 1 April 2005 to March 2006.

During discussions at Railway Board, it was mentioned that BSNL channels were essential at some strategic places but it was agreed that OFC channels had to be optimally utilised and accountability of BSNL for failures/inefficiencies had to be ensured. However, the Railways had not switched over to their own OFC network, despite identifying BSNL channels that could be converted to OFC. Thus, while the communication network, on which the efficacy of the PRS largely depends, was deficient and not commensurate with the requirements of a pan India network, the Railways did not treat the setting up and utilisation of an OFC network with the urgency it required. There was no overall strategic plan with clear milestones to shift over to the Railways' OFC network and even those plans, which were made locally, were not adhered to.

Recommendations

Railways should strengthen its communication network and ensure that zonal railways switch over to OFC to improve efficiency and to reduce BSNL links to the bare minimum. Where BSNL links have to be continued for strategic reasons it is necessary to ensure effective performance and efficient delivery of services through proper agreements and penal clauses.

1.6.3 Deficient system design

Audit noticed several system design deficiencies in the CONCERT software as detailed below:

- * The Master Client Program (MCP) is the main application program through which a terminal operator generates/prints a ticket. On SCR, it was noticed that at times of termination/disruption of MCP, the system did not alert the system administrator or console operator about the disconnection of a terminal and each time the terminal operator had to contact the console section over phone for restoration of the program. Further, in such cases of MCP termination, the amount of liability of a terminal operator i.e., the amount collected by him against the tickets booked, till the point of termination was not included in the Daily Trains Cash cum Summary (DTC) generated by the system at the end of the shift of that operator. The operator's liability till the time of MCP termination had to be manually intimated.

There was inconvenience to the passengers as well. For instance, in May 2005 at SCR, while committing a block booking transaction, the MCP repeatedly got terminated, resulting in inordinate delays at the booking counters. The problem occurred frequently as noticed from the daily failure reports and CRIS was unable to identify the reasons and remedy the problem till date (September 2006).

- * Further, while booking a ticket of another PRS site, in case of a link failure before printing the ticket, CONCERT treated the transaction as complete though the ticket was not printed. That failed transaction was saved in the database and reflected in the DTC, even though the operator had not issued any ticket and had not collected any money from the passenger. If the passenger was still available after restoration of the link, the operator had to search the data base for the saved transaction and then issue a blank paper ticket. Otherwise, the operator had to either resort to special cancellation or obtain special credit from the accounts department to reconcile the discrepancy in his/her liability.
- * The system did not pick up all the journey tickets reserved through the system and did not properly account for the cash realised. At Badshahnagar station on NER, it was specifically observed that the booking clerks found excess cash of Rs.2,171 to Rs.4,446 with them and there was no system based process to cross check the amount with the tickets issued. Therefore, when excess cash was found, the actual cash was verified manually, on the basis of amount realised from passengers as shown in reservation forms. Thus, the DTC was not correctly made out by the system necessitating manual reconciliation. Even though these weaknesses existed in the accounting module of the PRS for a long period, no remedial measures were initiated.
- * Charges of temporary nature levied in addition to normal fare are termed as 'ad-hoc charges'. A review of train profiles of five selected trains revealed that the system permitted imposition of only one ad-hoc charge at a time (SCR & ER). For instance, on SCR, the Railways had to

manually collect the additional surcharge applicable during the Pushkaram on river Godavari, since levy of a surcharge, for the journey to Tirumala Tirupati Hills, was already provided on the system and there was no provision of imposition of another surcharge through PRS.

- * The Advance Reservation Period (ARP) was 60 days excluding date of journey. However, the Railways operated special trains during festival/summer seasons and these trains had ARPs of less than 60 days. In such cases, these trains had to be disabled for reservation by the data base administrator and enabled manually on the opening date just before 08.00 hours, as the system could not check and validate ARP of less than 60 days. Railway agreed to the audit observation (CR).
- * Under the computerised Current Day Reservation System the facility of booking of accommodation was provided in CONCERT, even after the charting was completed, subject to the availability of vacant berths. The facility of current day reservation was not available on some locations on NER and NFR and current reservations were done manually. On ER, the computerised Current Day Reservation System posed recurring problems. Reservation for travel to intermediate stations was not possible through the system even if a berth against the particular intermediate station was vacant. Reservation against vacant roadside quota was also not permitted by the system. Though the problems in the system existed for more than three years, they were not rectified. This was primarily due to the fact that CRIS failed to implement the software according to the requirements of ER and the software did not comply with many of the business rules of PRS.
- * Coaching Refund System (CRS) was an application developed by CRIS for granting refunds on reserved and RAC (Reservation against Cancellation) tickets, in cases where passengers failed to turn up or discontinued journey due to dislocation of train services or travelled by lower class etc., which was not possible through the PRS. However, CRS was not fully integrated with PRS and as a result, the operator had to toggle between PRS and CRS to process refunds.

Thus, the software provided for the PRS had a number of deficiencies, which posed not only operational difficulties but also a higher risk of security due to the manual interventions required.

Recommendations

Since manual interventions enhance risk to a system, the PRS software needs to be revisited to minimise manual interventions. The deficiencies in the current system, as detailed above, need to be rectified based on user requirements. The integration with the Coaching Refund System needs to be carried out.

1.7 Deficient general controls

General controls are those controls which regulate the environment in which the IT operations are run. These cover areas like IT practices pertaining to

system documentation, IT security and information protection, change management policies, disaster recovery and business continuity planning. A review of the PRS revealed that:

- * System documentation and various manuals were not adequate.
- * Sound IT security practices were not followed and there were deficiencies both in physical access and logical access controls. The log out procedure was deficient and user privileges, especially the Supervisory *ids*, were allotted without considering the reasonableness of extending the privileges, thus, creating a risk of possible misuse of the powers associated with the privileges.
- * Change management was inadequate and changes in the system necessitated due to change in/introduction of rules were not carried out in a timely fashion resulting in inconvenience to the travelling public as well as increasing the risk of loss of revenue to the Railways.
- * There was no structured and documented disaster recovery policy for PRS over Indian Railways. The maintenance and protection of infrastructure as well as the data was also inadequate due to poor environmental controls.

1.7.1 Inadequacy of system documentation

Good documentation of a computerised system reduces the risk of mistakes by users. Documentation should normally cover program descriptions and listings, input/output descriptions, file content descriptions, user manual and desk instructions. Essential documents of PRS system such as System Documentation, Operational Manual, Training Manual etc., were not available at the zonal levels. The risks associated with non-maintenance of sound documentation include:

- * unauthorised working practices being adopted by IT staff;
- * increase in the number of errors made by IT staff;
- * the risk of system non-availability and increased down time in the absence of technical documentation which would help troubleshooting; and
- * change management problems.

A number of instances of unauthorised working practices, differing system functionalities in various zones, errors in functioning of the system which remain unresolved for long periods of time and long system downtime are detailed throughout the review. These could have been avoided with adequate and regularly updated documentation.

Recommendations

Railways should prepare and maintain the system documentation and manuals such as user manuals, technical manuals and training manuals to prevent unauthorised working practices and to enable referencing at the operational levels. These should be available at appropriate levels for use.

1.7.2 Inadequate IT security practices

Every organisation, which uses IT in a big way has an obligation to ensure security for IT and related assets including data, applications, infrastructure and personnel to ensure Confidentiality, Integrity and Availability of the information systems and communication systems that store, process and transmit the data. Checks to control the physical access, logical access, log in and log out procedures and user privileges should be adequately defined and provided for. The prevalent checks were inadequate as brought out below:

1.7.2.1 Inadequate physical access control

The PRS, being a mission critical system, needs to be physically safeguarded with access only to specifically authorised personnel. In all the five locations where the PRS servers were kept, there was no effective mechanism such as an electronic control access system to physically disallow entry of unauthorised persons, thus rendering the entire PRS system vulnerable to disruption by outside and unauthorised elements. On CR, the PRS server in Mumbai was located in a building which also houses a Railway Magistrate court and a detention centre for keeping under-trial persons, rendering the building accessible to the public, thereby compromising the security of the system. Further, Railway Board had directed (May 1997) all zonal railways to install Closed Circuit Surveillance TV (CCTV) systems at important PRS centres to monitor and to detect touts and other anti-social elements. However, it was seen that:

- * The access to the PRS locations was neither restricted nor monitored through electronic security systems in most locations. While the CCTV systems were yet to be implemented at the PRS centers in some zonal railways (ECR, SR and ER), in some others, the system was installed only in some locations. The CCTV system was installed in one location only, out of 54 locations on SER and similarly, on WR they were installed in only seven out of 91 locations.
- * Closed Circuit Surveillance TV systems installed at some locations were not functioning for various periods (SCR, WR and NFR). On NR, the two Palm Biometric ID systems installed at a cost of Rs.2.90 lakh, at the entrance of the console room housing the PRS servers, for restricting unauthorised entry, were not in use.

1.7.2.2 Inadequate logical access control

Logical access (access through electronic means) to the PRS helps control and protect the applications and underlying data files from unauthorised access, amendment or deletion. The access was to be controlled by identifying each individual user through his/her unique login *id*, which was also linked to the user rights and access to various areas of the application. The system provided for two very important operation level rights as follows:

Terminal Type	User Type	Rights
Booking	Booking	Access rights for performing enquiry/ reservations/ cancellation functions.
Supervisor	Supervisor	Access rights for performing supervisory functions such as special cancellations, name change etc. in addition to all the above rights

The activity of management of access rights and assignment of privileges was through the 'User Definition Management' (UDM), a software utility. Requests for new user *ids* and changes required were proposed by supervisors of locations and the database administrator assigned the requisite privileges to the user. Deficiencies in the user *id* and password management were observed as follows:

- * The total number of users with supervisory privileges was very high and booking clerks were also routinely assigned supervisory privileges. To illustrate, the ratio of users having supervisory privileges to the users having only booking privileges was 88.58 per cent on ER, 83.20 per cent on SER, 81.66 per cent on NFR and 60 per cent on CR. Such high ratios were due to supervisory privileges being given to persons, who should have been given only booking privileges, thereby vitiating the concept of select rights at different levels of hierarchy.
- * The user *ids* including supervisor *ids* assigned to the staff were neither deleted nor invalidated on the transfer/retirement/resignation of the staff (CR, ER, SER, WR, NR, SCR & SR). Even in a non-rail head PRS location such as Agartala, user *ids* were not deleted even after the transfer of the users to other government department/Union Territory. On SER, even after four months of issue of instructions for deletion of some users after their transfer, the user *ids* were continued as 'active users' in the data base, which was fraught with the risk of unauthorised access. Further, the database contained active user *ids* with unrealistic/absurd expiry dates such as '12/12/1999' and '12/12/2099'. On SR, an user *id* 'HARDWARMELA' having supervisory privileges and location privileges at Chennai main PRS centre was created for specific business, but was not deleted even after completion of the specific business.
- * On some zonal railways, the system was accessed by different users through same *id*, an undesirable practice, particularly where the privileges allotted for the persons were different. For instance, on ECR, user *ids* and passwords were shared amongst more than one user. At the PRS centre in Anandnagar on NER, both the booking clerk and supervisor were found to be using the same *id* to access the system. Even in non-rail heads at Agartala and Port Blair, booking clerks were using supervisory *ids*.
- * The system accepted a single digit password, in contravention of accepted standard IT practices. Moreover, the user accounts, which were

not in use for a long time, were not automatically disabled. This made unauthorised access to the system, through dormant accounts with weak passwords, easier. (ECR, NR and SCR).

- * On NR, the user *ids* and passwords were communicated by a messenger through open letters or telephonically and secrecy was not ensured. On SR too, ad-hoc measures, such as obtaining the administrator password from the representative of the firm responsible for system maintenance were in vogue, resulting in disclosure of confidential login information in an irregular manner and increasing the risk of tampering and manipulation of data by unauthorised persons.
- * On SER, there was a difference between the actual number of users (61) as certified by the Chief Reservation Supervisor, Old Koilaghat and the number of active users in the User Management Database (UMD) file (132). On ER, user serial numbers were not generated serially and the list had gaps between serial numbers. User names such as 'ABC' and blanks were also seen in the database.

1.7.2.3 Deficient log out procedure

The login and log out procedures define the user access to the system. Unless a proper log out procedure is followed, there is every danger of unauthorised access to the system. Similarly, log in restrictions control and to some extent prevent hacking of the system. A review of the system, however, revealed that:

- * The system provided for temporary log out, where the user was required to leave the terminal for a very short period of time. A review of the logs on ECR, however, revealed that the time off was very high ranging from 15:38 to 112:23 minutes on certain days in a 12 hour period. Leaving the terminal unattended for such long periods of time resulted in passenger inconvenience.
- * Further, the system did not automatically log out the user from the terminal in case the online terminal was left unattended/inactive for a long time. This coupled with the inadequate physical access rendered the PRS terminals susceptible to the risk of unauthorised access.
- * Important security logs for capturing unauthorised login attempts at booking terminals were not even maintained (NR and SCR). Moreover, the system did not automatically shut down or at least alert the system administrator in case of repeated unsuccessful log in attempts.

1.7.2.4 Improper and unmatched assignment of privileges to the users

Privileges were to be assigned to users at various levels on a select basis depending upon the functional responsibilities vested at each level and on a 'need to know' basis. The system had a set of default privileges for different sets of users and these were assigned by the system at the time of defining a user in the system. Some of the important privileges were 'quota', 'command' and 'location' privileges. Berths in trains were classified into different quotas such as General (GN), Ladies (LD), Tatkal (CK) etc. These

quota privileges were required to be assigned to a user for booking tickets against them along with command privileges for performing reservation activities such as normal reservation, tatkal reservations, modification etc. Location privilege is granted to a user in order to enable him to work in a particular location. Due to shortage of trained staff, a user may be allotted more than one location for administrative convenience. It was, however, noticed that:

- * The user *id* database contained many active users with no location privileges. The field depicting the location of some users was found blank while some of the users were given privileges for multiple locations including locations of other railways, enabling access to the system from different locations by a single user and increasing the risk of misuse. (ER, SER, CR, WR and NFR). On ER, it was noticed that a user had privileges for 300 locations. On SER also, it was seen from the database that location privilege was granted to 105 users for 200 to 300 locations, including locations of other railways.
- * Location privileges of railway PRS locations were also improperly assigned to booking clerks of non-rail heads at Agartala and Port Blair (ER).
- * The privilege for booking of tickets for foreign tourists was allowed to all supervisors on all supervisory terminals as a default privilege, though tickets for foreign tourists were to be booked at only select locations. For instance on NR, tickets against foreign tourist quota were to be issued from the International Tourist Bureau, IRCA Building, New Delhi. However, it was observed that tickets were generated against foreign tourist quota from a number of other locations also.
- * A quota cannot be operated unless and until both quota and command privileges are given to the user. However, it was seen that there was uneven distribution in the grant of these privileges. For instance, on SER at Old Koilaghat Building, it was noticed that supervisory users having quota privileges could not use them in the absence of corresponding command privilege. Similar problems in the grant of privileges were noticed at CR, WR and NER.
- * The site privilege is necessary for accessing PRS sites and the five site privileges corresponding to the five PRS centres are D(Delhi), B(Mumbai), C(Kolkata), M(Chennai) and S(Secunderabad). But certain users were found to be given sites such as U, V, W, X and Y, not part of the standard list. The zonal railway could not adequately explain the reasons for such sites or what they were supposed to denote.
- * Further, at Pandu PRS location in Maligaon on NFR, users authorised to generate tickets against railway passes only, irregularly generated tickets of Rs.11,980 in cash also and the amount was not deposited to the railway exchequer. Moreover, a user authorised to operate only at this location also generated six tickets from PRS/Guwahati indicating that controls were weak.

- * On SER, the hardware maintenance contractor (M/s CMC) engaged by CRIS was allotted a user *id* with most of quota, command and location privileges. These privileges enabled the contractor to issue reserved tickets, modify/cancel tickets and setting of train status etc., leading to a risk of unauthorised use of these privileges.
- * The passenger dump contained numerous errors and the booking location was left blank in many records in the data base. On NR alone, 7,351 records did not indicate the booking location. The passenger dump also showed records with monetary values in locations, where monetary transactions could not take place. On CR, it was observed that in certain Passenger Name Records (PNRs), the terminal location was shown as CRIS in passenger dump, whereas the PNR history indicated that these tickets were issued from PRS locations. In some cases, booking location in passenger dump was shown as 'Pune', where as the PNR history showed that they were internet tickets.

Thus, the privileges or rights allowed to the users did not match the requirements and were not as per the business rules of the system, thereby increasing the risk of unauthorised use of the system as well as undermining the efficacy of the system.

Recommendations

Railways need to draw up a full-fledged IT policy including IT Security Policy with adequate documentation. A credible threat assessment mechanism should be developed and adequate physical access controls instituted to safeguard PRS assets, especially the servers at five major sites. Access controls should be strengthened and user id/password management should be improved to prevent unauthorised access to system and to ensure accountability for transactions.

The system logs should be scrupulously maintained for a periodical review of the unsuccessful login attempts by unauthorised users. Assignment of various privileges should be standardised and adequate controls should be established to prevent misuse of privileges.

1.7.3 Change management

A dynamic system such as the passenger reservation system is based on the policies of the Government. From time to time, the framework of rules undergoes changes and these would need to be incorporated into the system in time. A sound change management procedure ensures that the requisite changes are made into the software in an authorised, accurate and timely fashion. It was noticed that:

- * Various concessions are made from time to time to passengers according to the policy decisions of the Railways. However, a test simulation exercise on NR revealed that concession codes for all the categories of passengers were not provided in the system. For instance, concessions were admissible for the escorts of blind and mentally retarded children below the age of five for travel in various classes. However, there was

no code provided in the system to enable generation of concession tickets against I AC and AC 2 tier. Similarly, parents accompanying children receiving the “National Bravery Award” and eminent sports coaches who have received the Dronacharya Award are entitled to concessional tickets but no provision was built into the system to book such concessional tickets.

- * Pursuant to Government of India notification of March 2006 regarding introduction of service tax on catering services on board the trains of Indian Railways, service tax for catering service on Rajdhani / Shatabdi trains was to be included in the fare structure. It was, however, observed that, the service tax on catering services provided on Rajdhani/Shatabdi trains of WR, was not included in the fare structure, which resulted in short recovery of Rs.0.42 crore for the period from 1 April 2006 to 31 May 2006. Railway Administration stated that this has since (June 2006) been introduced after obtaining necessary instructions from Railway Board.
- * On NFR, audit also noticed that there was considerable delay, ranging from 34 days to 14 months, in incorporation of new distances between pairs of stations for 12 trains.
- * Mela surcharge was not incorporated in the system for the Pitrapaksh Mela at Gaya and Punpun Ghat in 2005 (PRS Kolkata -ER). Though mela surcharge was imposed for ‘Mugh Mela’ held at Allahabad from 14 January 2006 to 26 January 2006, the Railway Administration advised PRS Kolkata to incorporate mela surcharge only on 6 January 2006, 52 days after reservations were opened for the Mela, by which time most of the tickets had already been sold, leaving it to the Travelling Ticket Examiners, to collect the surcharge from passengers during the journey.

Thus, the mechanism to carry out changes in the software in line with the changes in the framework of rules was not efficient.

Recommendations

Railways should institute a mechanism whereby changes necessitated either due to amendments or introduction of rules are incorporated in the system promptly to ensure correct levy of various types of fares and to prevent inconvenience to travellers. The system should reflect the business rules of the organisation at all times.

1.7.4 Disaster recovery and business continuity plan

A structured Disaster Recovery Plan is essential to reduce the risks arising from unexpected disruption of the critical systems and to have continuity in business activities. The Disaster Recovery Plan usually includes provision for off-site storage of valuable data and also a back-up server(s) at an alternative location to continue the business operations, in the event of a major disaster at the main server(s) site. Depending on the criticality of the operations and the risk to business, these back up sites could be either hot

sites or cold sites. Applications such as PRS depend on the continuous online processing of transaction on a real time basis. Therefore, at the very least, there should be a ready-to-start reserve facility with offsite storage of important data, to support these operations in case of disruption. The data processing operations of the PRS are critical to the Indian Railways with over 96 per cent of reserved accommodation, particularly on long distance trains, being catered through PRS and any disruption could affect the passenger traffic seriously. It was, however, observed that:

- * There was no structured and documented disaster recovery policy for PRS over Indian Railways. It was stated that a policy for disaster recovery was being formulated by the Railway Board.
- * There were no alternate sites with reserve servers for transacting reservation related business in case of a physical or man made disaster. With PRS being mission critical in nature, a prolonged downtime involving days/weeks to recover could have even law and order consequences.
- * In most of the Railways, all the servers of PRS, Unreserved Ticketing System and National Train Enquiry System were kept at the same location increasing the risk of business loss in the event of a disaster.
- * As per the orders of the Railway Board, backup of daily PRS data was to be maintained for 3½ years. However, in all the five places where the PRS servers were located, there was no provision for remote off site storage of data at an alternate location to overcome situations like fire, earthquake, sabotage etc. Back up data was stored along with the servers exposing it to the same set of risks.
- * The backed up data has also to be tested periodically to ensure that it can be retrieved easily and is not corrupted. However, at PRS Mumbai and on SCR, though the procedure of backing up data was in vogue, the periodic testing revealed that either the data was not backed up properly or the tapes were damaged.
- * Fire alarm detection system was not installed at many locations (PRS Kolkata- ER and PRS centers on NER). The fire alarm system installed at Secunderabad, was not functioning since February 2002.
- * Further, the PRS locations on various zonal railways were not adequately protected. On SR, the PRS was not protected from water seepage, which coupled with failure of the electric supply, resulted in a complete failure of PRS in October 2005. Similarly, at Kanpur Anwarganj too, there was flooding of PRS cabin due to rains, since proper insulation was not provided. At Port Blair, the PRS location became inoperative in April 2004 due to thunderstorms. In December 2005, due to the absence of a surge protection device the multiplexer was destroyed. On NER, PRS centers were found provided with coolers, which increase the humidity levels and could damage systems, instead of air conditioners. The non-rail head PRS location at Imphal, serving a considerable part of North East India, was gutted on

24 April 2005 due to inadequate fire protection and was not operational for a period of seven months. Delayed restoration not only affected railway revenue and expenditure, but also hampered the interests of passengers.

Thus, while there was no efficient disaster recovery plan, even the maintenance and protection of the infrastructure as well as the data was deficient due to poor environmental controls.

Recommendations

Railways should develop a structured disaster recovery policy. Off site back up sites may be developed for business continuity as well as data storage. The PRS locations should be adequately protected from damage through fire, water etc.

1.8 Deficient application controls

Application controls are those controls which ensure that the transactions are carried out according to the business rules of the organisation by the authorised persons. These controls contain validation checks to cover input, processing and output operations of the systems. Validations checks ensure that the transactions are processed according to the business rules. Further, one of the main objectives of the PRS was to bring more transparency to the entire process of booking of tickets and to make available seats/berths to bonafide passengers according to the extant rules of the Railways. However, a number of important validation controls were either absent or deficient in CONCERT and the system was susceptible to misuse in a manner, which adversely affected the objective of transparency in seat availability to the passengers as detailed below:

- * Transactions were done beyond the time of booking from different terminals of PRS locations.
- * Validation checks were weak and a number of tickets were booked on fictitious details, indicating a risk of bogus/proxy booking in advance and thereby decreasing the availability of seats to genuine passengers.
- * Validation checks for generation of pre-bought tickets (tickets for the second lap where the journey involved more than one lap) were weak and the system did not validate the class of travel and the name of the passenger. The system permitted generation of pre-bought tickets without generating a ticket for the first lap and even where a second lap of journey was not involved and seats/ berths were blocked for dummy passengers using the pre-bought facility.
- * The application software did not have validation checks to ensure compliance with the rules governing break journey.
- * Various quotas for accommodation in trains, as prescribed by the Railways, were not properly managed resulting in decrease in availability of seats in various trains to the general public, which resulted not only in loss of revenue to the Railways but also provided scope for malpractices in berth allotment during the journey.

- * Deficiencies existed in the validation of fares. Fares and distances were incorrectly adopted leading to incorrect levy of fares.
- * The electronic databases contained numerous deficiencies by way of incompleteness, incorrectness and unreliability and any decision support system based on the MIS from this data was bound to be adversely affected.
- * Even though allotment of berths was meant to be a zero error process, multiple instances were noticed where the system allotted the same berths to different passengers.
- * Trains and stations were incorrectly defined in the system, thereby preventing reservation of accommodation against them. The status of late running of trains was not set promptly leading to incorrect refunds to passengers.
- * The system did not provide compact accommodation in case of multi passenger reservations.

1.8.1 Transactions beyond the specified time of booking

As per extant instructions, booking counters of the PRS were to be opened from 0800 hours to 2000 hours. However, from the various reports generated internally by the Railways, it was observed that transactions were done beyond the specified time of booking from different terminals of PRS locations on ER, ECR, SCR and SER. The number of transactions done after 2000 hours in a location ranged up to 225. On ER, a test check for a single day indicated 95 transactions that were recorded before the opening time of the PRS counters i.e., from 0500 and 0800 hours. On SCR, a terminal operator at Nellore generated three tickets on a day in April 2005 between 0715 and 0758 hours. SCR replied (April 2006) that in the special form designed for booking tickets under 'Tatkal Scheme' time validations were not incorporated, though such validations existed in other forms and that after this problem was reported to CRIS, time validations were incorporated in the 'Tatkal' booking form also. However, there was yet another case of issue of a ticket in sleeper class through 'Tatkal' at 0757 hours on 27 April 2006 at Ongole. On SER, even though the PRS location at Santragachi, functioned for one shift only from 0800 hours to 1400 hours the system was printing the ticket beyond 1400 hours also.

Recommendations

Railways should strengthen its control mechanism to prevent transactions taking place outside the specified hours as these increase the risk of unauthorised bookings.

1.8.2 Booking of accommodation on fictitious names

Validation checks are required to be in place to ensure that tickets are booked with proper details and for genuine passengers.

- * Simulation exercises conducted on CR, ECR and SCR and review of records on NR, revealed that the system accepted single letter names and

many passengers were found to be booked with single letter names. Eighty two passengers were booked in the name of 'MRS' and 43 passengers were booked in the name of 'PTY' on 13 October 2005 on NR, for travel from Nizamuddin to Madgaon for a sports party and the ages of all the passengers were shown as '99', the default setting, indicating that ages were not keyed in. Moreover, at Mumbai PRS on WR, it was observed that 30,381 tickets were booked, for the period from 1 October 2005 to 31 December 2005 with such passenger names as 'TBA', 'ANKL', 'PTY', 'Cricket player', 'Railway courier', 'Pay Bill Clerk' etc., without indicating ages.

- * Further, the provision in the system to change the boarding points was being used without proper controls. A scrutiny of statement of change of boarding points for a transaction date generated from the system revealed that in 20 cases, the age of passengers was not mentioned. Similarly, in the related PNRs, the names of the passengers had multiple numeric characters (ER).

Recommendations

Railways should build adequate checks into the system software to prevent reservation on fictitious and incomplete details to increase credibility and confidence in the system.

1.8.3 Deficient controls for generation of pre-bought tickets

When a journey involves more than one lap, the system generates separate tickets for each lap of journey. Fare collected for two laps is printed on the first ticket only. The second ticket contains 'zero' value under fare column and is termed as 'pre-bought ticket'. The validation checks for generation of pre-bought tickets were weak as brought out below:

- * The software did not validate the class of travel in the pre-bought ticket with the class in the original ticket and, therefore, a passenger could perform the second lap of journey in a class higher than the class defined in the original ticket. The system was, therefore, prone to the risk of loss of revenue to the Railways.
- * The system allowed generation of a pre-bought zero value ticket without generating the first ticket on which fare was collected, thus, allowing blocking of tickets for journeys without even making any payment for them. An analysis of passenger dump of 3 November 2005 on NR, revealed that 194 seats were booked on 4 September 2005- the opening day of booking, in seven trains from Beas to various destinations on pre-bought tickets. In all such bookings, it was found that passenger name was indicated as 'Beas quota', with age as '99'. It was further observed that reservation charges were recovered only from five passengers. As the seats were booked on pre-bought tickets, no payments were made at the time of reservation and passenger particulars were not available, indicating the possibility of misuse of the system.

- * On SCR and NER it was observed that the system allowed generation of a pre-bought ticket for a destination, even where a second lap of journey was not involved. Exploiting this weakness in the system, cases were noticed on SCR whereby two pre-bought tickets were generated by a terminal operator on two days for blocking accommodation. When commented upon in Audit, SCR replied (March 2004) that the counter operator should check the original ticket before issuing the zero value pre-bought ticket. Further, SCR contended that such aberrations were not due to the defect in the application software but due to erroneous acts of the railway personnel and that adequate control mechanism existed for dealing with the erring personnel in the form of disciplinary rules. The contention was not acceptable since the fact remained that there was no validation mechanism built into the system. The numerous cases of blocking of accommodation under fictitious names indicated that the existing disciplinary mechanism was not acting as sufficient deterrent.
- * For journeys involving more than one lap, the PRS software did not check whether the scheduled arrival time of the first train was prior to the departure time of the second train before issuing the pre-bought ticket for the second lap of journey. Audit noticed during a simulation exercise that the system generated a ticket with an endorsement 'blank paper ticket' for a journey from Katpadi to Dehri-on-Sone with the first lap terminating at Dhanbad by Dhanbad express (Train no 3352). While the scheduled arrival time of train no 3352 at Dhanbad was 13.55 hours, the system generated a zero value pre-bought ticket, for the second lap of journey from Dhanbad to Dehri-on-Sone (to be performed on the same day of arrival at Dhanbad), on a train (no 3009), which was scheduled to depart from Dhanbad (at 01.35 hours) much earlier than the arrival of the earlier train. Similarly, in another instance on WR, a ticket with an endorsement 'blank paper ticket' was reserved for travel from Ahmedabad to Agra Cant, with the first lap terminating at Delhi, by Ashram Express. The second lap of journey was booked from Delhi to Agra Cant. by Punjab Mail the next day. While the scheduled arrival of Ashram Express at Delhi was 10.25 hours, the departure time of Punjab Mail from Delhi was 05.30 hours. i.e., before the arrival of Ashram Express at Delhi and the passenger could not undertake the second leg of the journey.
- * The validation checks to prevent misuse of the facility of onward route booking were also deficient. In a test check, it was observed that name change was permitted in the second lap of journey before commencement of first lap of journey without changing the name in the first lap of journey. In a simulation test by Audit, a ticket was booked for a journey from Chennai to Dhanbad in the name 'Test' Male -34 years, for the first lap and a pre-bought zero value ticket, in the name 'Cricket', Female-50 years for the second lap, which was allowed by the system, indicating weak validation checks and allowing scope for fraudulent bookings.

Recommendations

The application software should have process controls in place to validate the class of travel of the second lap with the first lap or to prevent generation of a pre-bought ticket when no second lap of journey is involved. Validation checks need to be incorporated in the system to check the arrival time of first train with the departure time of the second train before issue of pre-bought tickets for the second lap of journey. Change of name for the second lap should not be permitted independently without change of name for the first lap, following the laid down procedure.

1.8.4 Deficient controls for break journey facility

As per break journey rules, the holder of a single journey ticket for distances of more than 500 kms, is allowed to break journey at any station en-route. The first break of journey shall not, however, be made until a distance of 500 kms has been travelled from the starting station. Further, as per rules, the second lap of the journey needs to be performed within two days of the first lap. However, it was noticed that:

- * The system did not validate the details of the person undertaking the second lap of journey, allowed break journey before the stipulated 500 kms and failed to check the number of days between two legs of break journey. The system also did not have in-built controls to check the number of days allowed for the break and accepted even a gap of fifteen days from the date of commencement of the first journey.
- * A test check on ER, revealed that a passenger was allowed to break the journey at 342 kms and then proceed after a break of one day for the next leg, which was not in accordance with extant rules.

Recommendations

The business logic and corresponding rules for break journey have to be adequately built into the system with validation checks to ensure compliance.

1.8.5 Irregularities in management of various quotas

Various quotas are prescribed by the Railways from time to time. This apart, accommodation in some trains is earmarked specifically for security personnel, railway staff, medical teams etc., which have to be managed effectively.

1.8.5.1 Non-allotment of vacant berths earmarked for tatkal quota

During the course of printing of the final chart in ER, it was seen that all the vacant berths, except berths earmarked for Tatkal Quota, were released for clearing waiting lists. However, a large number of vacant berths earmarked for Tatkal Quota were not released to the waitlisted passengers, resulting in under-utilisation of accommodation and depriving the needy passengers of the accommodation in the trains.

1.8.5.2 Irregular quota utilisation

On NFR, after the PRS became functional at Golaghat Town and Sibsagar Town, the manual quotas of the above stations should have been withdrawn. However, Audit scrutiny of records at the charting section of Guwahati revealed that the manual quotas allotted to the above stations had not been withdrawn and the passengers were continued to be booked on this quota frequently from Guwahati in a number of trains, the prominent ones being North East Express and Rajdhani Express. This increased the risk of misuse of booking manually, despite a PRS system being available.

1.8.5.3 Non-compliance of orders on allotment of defence quota

Railway Board's order of 2005 clearly stated that in respect of the allotment of Defence Quota by Movement Control Officer (MCO), the MCO will provide the details of the persons in whose favour the quota has been released 24 hours in advance of the scheduled departure of the train. In case the PNR number was not furnished against any of the entries, no reservation would be provided to the passenger. However, it was observed that at Guwahati PRS, the MCO did not provide to the charting section, 24 hours in advance, the details of the persons in whose favour quota was released. Consequently, as per the charting status, the status of booking or reservation of these berths allotted to Defence personnel was shown as vacant. On SCR, it was observed from the passenger database, that a specific field was available to indicate the type of quota on which a ticket was reserved. However, blanks in the field where warrant details have to be captured, in respect of some passengers having confirmed accommodation under Defence Quota indicated the possibility of misuse of this quota by passengers other than defence personnel.

Recommendations

Railways should strengthen its control mechanism and build in suitable validation checks in the system to ensure that accommodation under various quotas were not misused. At the same time, it needs to be ensured that unused accommodation in these quotas is taken back to the general pool systematically to optimise utilisation.

1.8.6 Inadequate validation for fares and tickets

The two static files namely Intermediate Station Files (ISFs) and the Fare Table are used by the system for fare computation and the output is stored in a separate file. The Fare Dump file for each of the trains defined in the system stores details in respect of the station codes, via points, distances and fare for each class of travel. Deficiencies existed in the system with regard to validation of fares, fare tables, printing tickets and final charting as detailed below:

- * The system did not validate fares as admissible under the rules. For instance, the distance between Howrah and Azimganj by 2065 up and 2066 down Jana-Shatabdi Express was 217 kms. As per the fare table, the fare for the distance was Rs.95, and the concessional fare for Senior

Citizens was Rs.67. But it was seen that the system charged a fare of Rs.97/- as base fare and Rs.72 as concessional fare for Senior Citizens, which was more than the fare leviable as per the rules.

- * Fares were also incorrectly adopted by the system. On a test check of two Rajdhani trains, commencing from Hazrat Nizamuddin and bound for Trivandrum and Chennai respectively, it was noticed that there was short collection of fare for about 10 pairs of stations ranging between Rs.5 and Rs.105 from April 2003 to March 2006. Similarly, wrong adoption of fares in Rajdhani trains (2429, 2430, 2431 and 2434) for about three pairs of stations resulted in excess collection of fares ranging between Rs.10 and Rs.60. On NR too, a comparison of fare dump of different Rajdhani trains (46 pairs of stations) with the Rate Tariff Circulars of NR, revealed discrepancies in fares between same pair of stations of excess as well as short charging of fares ranging up to Rs.845 and Rs.125 per head respectively.
- * Instances were noticed on NER and NR, where tickets were printed as 'No room' by the system. The system should not have permitted printing of such tickets at all.

Recommendations

The application should be rectified to correct the fare table so that correct fares are levied by the system and also to prevent printing of invalid tickets.

1.8.7 Incorrect adoption of distance

The chargeable distances are calculated by the PRS on the basis of distances entered in the system. In calculating the distance for charging the fare, fraction of a kilometer is taken as one kilometer. The distances calculated by the Commercial Department and vetted by the Traffic Accounts Department were entered into the computer system by the database section. Several inconsistencies were observed in the adoption of distances leading to levy of incorrect fares as brought out below:

- * The distance for the up direction was different from the distance for the down direction in respect of 57 trains¹ on CR, ER, NER, SCR, SER and NFR. Moreover, in 801 cases² the distance adopted for the same pair of stations for different trains on the same route was different. These discrepancies could result in either overcharging the passenger or in loss of revenue to the Railways. Additionally, on NWR, distances were incorrectly entered in the system for 12 pairs of stations over Jaipur division resulting in short realisation of fare to the extent of Rs.0.55 crore during 2002-03 and 2004-05.
- * It was observed on WR that in respect of 700 pairs of stations distance vetted by accounts and input in the system varied between one and 13 kilometers for different trains. Traffic Accounts Department did not verify the correctness of the distance vetted, subsequent to input of the

¹ CR 33,ER 11, NER 10,SCR 1, NFR 1, SER 1

² NR 96, WR 700, SR 5

data. On CR also, it was observed that distance statements were not authenticated by accounts department as proof of vetting.

Recommendations

Railways should institute a mechanism at the appropriate level whereby the distances between stations are uniformly adopted in the system. The distances adopted should also be verified. Differences and discrepancies result in erosion of confidence in the system.

1.8.8 Inaccuracies in master tables

Master tables contain the basic data based on which the transactions in computerised system are processed. The Master Station table contains basic data such as station names, station codes, fare structure etc. However, information contained in the electronic databases of the various railways contained numerous deficiencies by way of incompleteness, incorrectness and unreliability as detailed below. Not only would this interfere with the operations, but also affect any decision support system based on the MIS from this data.

- * Station codes were repeated in the master file and in many cases they were indicated against different station names. Cases were also seen where station name and station code were not entered (CR). Many incorrect codes were provided such as 'YYYY' for Varanasi instead of BSB, 'VVVV' for Visakhapatnam instead of 'VSKP', 'UUUU' for New Delhi instead of 'NDLS', 'BBBB' for Delhi instead of 'DLI' and 'CCCC' for Patna Jn. instead of 'PNBE' (NR, SCR & ECR). Further, on NR, it was observed that names of government buildings and railway quotas were given as station codes.
- * The master file also contained two codes for one station falling on the same railway. For instance, two station codes 'ILL' & 'ILO' have been defined for one station Illoo on SCR. Similarly on WR, two station codes were defined for New Bhuj (NBVJ and NBUJ) and for Sabarmati Jn (SBI and SBT). Moreover, the Station 'Tungabhadra Dam' with the codes TBDM & TBDT was shown under both SWR & SCR. It was also seen that station names were incorrectly defined against some station codes. On NER, the station name was not updated after change of route of a train. There were similar inaccuracies in the train numbers and train names.
- * Similarly, coach *Ids* (AE1/AE1 D/AE1 S) were found on ECR, though no such coaches were attached to the trains on the concerned dates.
- * The passenger dump indicated refunds to passengers who booked accommodation on the authority of Privilege Passes (SCR) due to errors in processing, though no such refund was actually permissible or made.

Recommendations

The inaccuracies in the master tables need to be rectified immediately to enhance reliability of data and to render generation of meaningful reports.

1.8.9 Allotment of same berths to different passengers

Multiple instances were observed where same berths were improperly booked to different passengers by the system. On SCR, the same berth (No.50), in coach AS 2 by train no. 7054 of 27 January 2006 was allotted to different passengers. Similarly, the same berth (No19) in coach S4 by train no. 8004, of 26 June 2006 was allotted to different passengers. Audit scrutiny of records at Dhanbad location on ECR, also revealed that on 23 July 2006, a ticket was booked from Bokaro Steel City to Patna by Train No. 8624, and berths 25, 28 and 44 in coach S6 were allotted. Two other tickets were booked by the same train on 23 July 2006 from Ranchi to Patna and the system improperly allotted the same berths.

Similarly, instances of allotment of berths through current booking against berths already booked through the normal reservation system were noticed. On ER, two passengers i.e., one booked in advance and the other booked after charting, were allotted the same berth (No 9) of S1 coach in Train No.2307 on 27 December 2005. Further, similar problems were reported for some of the reservations made through current day booking counter for train No. 1603 of 21 June 2006. The lapses were reported to CRIS for rectification.

Recommendation

The software needs to be rectified on priority as the activity of allotment of berths to passengers should be a zero error process.

1.8.10 Incorrect definition of trains and stations

The actual composition of the trains, in terms of the number of sleeper and AC coaches and the total number of berths available in each coach, is to be defined in the system as the train profile for each train. Similarly, en-route stations are to be defined for each train so that reservation could be made through the system. It was observed that:

- * Train profile of train No. 2020 defined in the system on ER, provided for 70 seats in coach No. C5 against a physical availability of only 67 seats. The train was running for years together with the same profile and the above mentioned seats were also booked for journeys, resulting in inconvenience to the passengers. The anomaly was rectified only in August 2005. Similarly, while Sealdah Ballia express had eight sleeper coaches in 'up' and 'down' directions, the train profile defined in the system incorrectly had only four sleeper coaches in the 'down' direction. Thus, reservation was done by the system only for four sleeper coaches in the 'down' direction, even though the train physically had eight coaches. This resulted in denial of confirmed accommodation to passengers and accommodation was manually allotted, during the course of the journey, by the Travelling Ticket Examiner.
- * On ECR, it was seen that en-route stations of some trains were not defined in the system and as a result tickets were not generated for travel to such en-route stations, even though the trains had scheduled halts at

such en-route stations. Passengers were, therefore, not allowed to perform the journey by a train of their choice even though the train was halting at the station and were compelled to pay for a longer route. In a simulation exercise done by Audit, it was seen that a passenger who intended to travel from Dhanbad to Guwahati via Asansol by Coalfield express, was denied a system ticket from Dhanbad to Guwahati via Asansol since Asansol was not defined as an en-route station for the train though the train had a scheduled halt at the station. The system generated the ticket only when the operator mentioned the journey as being performed from Dhanbad - Howrah – Guwahati. Thus, the passenger was compelled to pay excess fare for the extra distance up to Howrah, though the journey was actually performing the journey via Asansol.

- * Where there are no direct trains from originating station to destination stations, reservation of berths is done in slip coaches, which are detached from one train and attached to another train en-route. It was observed that the slip coaches/trains were not defined in the system and as such journey tickets on these trains or coaches were not being generated. In some cases, the slip coaches were incorrectly defined in the system and passengers were booked into slip coaches, which were detached before the destination station. For instance, a passenger was booked by train number 3231 of 9 November 2005 for travel from Howrah to Kiul. The passenger was accommodated in a slip coach, to be detached before Kiul. Similarly, on 8 January 2006, for a passenger travelling to Patna Jn. by AC three tier, the system allotted a berth in a slip coach to be detached at Madhupur, an en-route station. Thus, the system logic was not correctly built in.

Recommendations

Railways should strengthen its control mechanisms and ensure that the train profiles defined in the system are as per the physical composition of the trains. En route stations also have to be correctly defined for trains.

1.8.11 Incorrect setting of train status

As per the refund rules, if a train was running late by more than three hours, full refund was permissible. The ‘Setting/Resetting train status’ option in the system was used to set train status, if a train was cancelled or was running late. As refund amount was calculated on this basis, setting the status at the appropriate time was very important. However on CR, it was noticed that late running of train was set in the system after the scheduled arrival time of the train.

Date	Train No.	Train Name	Location	Scheduled Arrival time	Time of setting status of the train	Train late by (No. of hours)
26.3.2006	5018	Gorakhpur-LTT Express	Bhusaval	10.10	12.02	03.05
28.3.2006	5018	Gorakhpur-LTT Express	Bhusaval	10.10	11.37	03.10
28.3.2006	9048	Bhagalpur-Surat Express	Jabalpur	04.20	08.30	05.30
01.4.2006	2615	Chennai-New Delhi GT Express	Nagpur	10.30	12.29	04.00

Thus, if a passenger had produced his ticket for cancellation just before the scheduled arrival of the train, he would have received less refund than what was legitimately due to him.

Recommendations

Suitable mechanism should be developed to ensure that status of late running of trains is set promptly in the system so that cancellation charges are computed correctly.

1.8.12 Non-allotment of compact accommodation

An analysis of the system revealed that the system held data of confirmed passengers in one file and RAC/Wait Listed (WL) passengers in another file. Thus, for a PNR, with multi-passenger reservations, if some passengers were confirmed and others placed under RAC/WL, the system while charting, did not allocate compact accommodation.

- * Audit review of chart of train No. 1077, Jhelum Express of 18 May 2006 disclosed two cases, where at the time of charting, waitlisted passengers booked in one ticket were allotted confirmed berths in separate coaches, though it was possible to provide compact accommodation in one coach to all the passengers booked against each ticket (NR).
- * On SCR, similar problems in the final charting were noticed where for a family consisting of five members, the system reserved four berths and one RAC for the fifth member (child aged 8 years) by train No. 7423 of 13 December 2005. At the time of final charting, all the four confirmed passengers were given berths in one coach and the RAC passenger was accommodated in another coach without giving compact accommodation, despite availability of vacant berths in the same coach.
- * Names of two passengers did not appear in the chart on ER, although they possessed valid journey tickets. In the chart, two other names of passengers appeared against the berth allotted to them. In another case, names of 37 passengers having journey date of 8 August 2005 (Jasidih to Sealdah) by train No 3186 did not appear in the chart of 8 August 2005 and appeared in the chart of 9 August 2005.

Recommendations

Railways should address this issue and make suitable modifications in the program to provide compact accommodation wherever feasible for multi passenger reservation in view of the implications for passenger comfort.

1.9 Inadequate utilisation of resources

To facilitate operation of and utilisation of master data from PRS system, the Railways had created a facility of a data warehouse.

Various consumables and other materials are also utilised in the day to day operation of PRS in all the PRS locations. It is imperative to have an effective control mechanism for ensuring effective utilisation of the facilities created and for monitoring the key consumables and materials. A review disclosed that:

- * The utilisation of the data warehouse was inadequate since the zonal railway apprehended that some features of the data warehouse were not accurate.
- * The internal control mechanism over ticket rolls was weak and was susceptible to misuse. The management of resources was also inadequate.

1.9.1 Inadequate utilisation of data warehouse

In SCR, a project was sanctioned at a cost of Rs.0.93 crore (July 2002) to be implemented from 2002-03. The data warehouse was intended to contain data for five years to be populated with PNR related files of all the PRS sites. However, SCR apprised the Railway Board in November 2005 that the passenger profile management of the data warehouse project was not accurate as compared to the reports generated through CONCERT. As a result the utility value of the data warehouse remains doubtful.

1.9.2 Ineffective internal check on account of ticket rolls

According to the Railway Board instructions, all the zonal railways should keep the stocks of ticket rolls in safe custody with regular physical verification.

- * In NER Gorakhpur, a number of deficiencies in the internal control mechanism regarding custody and use of ticket rolls were noticed. Scrutiny of records maintained in the accounts department revealed that advices for ticket rolls were never received from IRCA, New Delhi. Due to non-receipt of such advices, the physical verification of ticket rolls received in NER was never carried out. A case of fraudulent refund of railway ticket on NER, was observed, where PRS ticket rolls were either stolen outright or pilfered by placing plain paper over it during dummy booking. The tickets were subsequently printed from outside, on computers, on the basis of details available in the final chart. Subsequently, refunds on these tickets were obtained after the departure of trains so that fraud was not immediately noticed. In addition, a number of pre-printed blank computer tickets were also found missing from the station. Similarly, in Siwan and Pithoragarh locations ticket numbers were also found missing from the continuity statement. Duplicate tickets were also found at Chhapra.
- * A similar case of pilferage/ theft and misuse of pre-printed PRS ticket rolls was observed in Bharuch on WR (January 2005). A refund of Rs.84,380 was obtained on 53 forged tickets. Further, 200 pre-printed blank computer tickets were found missing from the Bharuch PRS. A debit of Rs.0.70 crore was raised by Bharuch station as disputed debits for the missing tickets. No recovery has, however, been made so far and the matter was subjudice. Subsequent enquiry by Railway authorities revealed that a CD containing the software of railway reservation was prepared and a parallel system of forging tickets was set up outside.

- * On NFR, scrutiny of the register of receipt and issue of ticket rolls of Guwahati PRS revealed that despite having a balance of old stock of ticket rolls as on 20 March 2006, tickets were issued simultaneously from the new stock affecting the continuity of the issue of ticket rolls. Further, physical verification of the stock of ticket rolls was not carried out by the concerned authority in deviation of Railway Board's orders.

1.9.3 Inadequate monitoring of issue of materials

On ER, costly PRS equipment (like Terminal, Ticket Printer, Chart Printer, MUX, Modem, Multiplexer etc.) were found issued to persons having fictitious names and having fictitious designations and station codes. Also, such equipments were issued against locations not existing in the PRS. This indicated inadequacy in monitoring and absence of validation checks to ensure correct issue of equipments.

Recommendations

The data warehouse project needs modification to make it reliable. To check the frauds and manipulations in respect of supply and accountal of ticket rolls, it is imperative that advice notes, in all cases, must be sent to Accounts by the Commercial wing, for cross verification of the quantity despatched with the quantity received. Physical verification of ticket rolls should be conducted periodically to prevent misuse of tickets. The accountal of hardware needs to be strengthened.

1.10 Irregularities in accounting

The PRS also provides important data required by the management in respect of earnings zone wise. Any discrepancies in the outputs generated would present a skewed picture of railway performance. The Railways have also provided the facility of booking against credit cards in line with the industry at large. Any deficiencies in this area would result not only in loss to the Railways but also result in erosion of credibility. It was observed that:

- * The apportionment of earnings to zonal railways was defective. Erroneous figures were supplied by CRIS leading to inappropriate credits to Special Railway Safety Fund.
- * Despite agreements with banks and retaining indemnity bonds from banks, there were outstanding amounts for long periods and in some cases the banks refused to honour credit card transactions.

1.10.1 Defective apportionment of earnings

As per extant orders, PRS earnings are apportioned among different railways. Scrutiny of daily statement of cash vouchers of 6 May 2006 on NR, revealed that a number of transactions though pertaining to other zonal railways were classified as local traffic. This could lead to wrong apportionment of earnings among different railways. On NFR, it was seen that the terminal cash was not apportioned to other railways at all.

Further, Railway Board introduced levy of safety surcharge from passengers depending on the class and length of journey with effect from

1 October 2001. The earnings from surcharge were to be retained by the originating railway and appropriated to the Special Railway Safety Fund (SRSF), from the originating revenues collected. On an analysis of the PRS data of November 2005, on WR, it was observed that the data supplied by CRIS was erroneous as the amount shown in the field for 'safety charges' did not match with the actual amount collected towards safety surcharge from passengers. Reports generated on the PRS data supplied by CRIS revealed that an amount of Rs.0.16 crore (November 2005) was exhibited less against the levy of safety surcharge, which resulted in less credit to the SRSF.

1.10.2 Deficient credit card transactions

As per agreement executed between the Railways and different banks for issue of tickets on credit cards, banks were required to deposit indemnity bonds of stipulated amounts to safeguard the interests of the Railways for all risks, losses or any other expenses that the Railways may incur for the issue of tickets against credit cards during the contractual period. It was, however, observed that:

- * On ER, the outstanding dues against different banks on credit card transactions stood at Rs.2.53 lakh as on 27 March 2003. Out of this outstanding amount, only a paltry amount of Rs.41,338 could be recovered till January 2006, in spite of the availability of the indemnity bonds worth Rs.5 lakh as security.
- * On NFR at Guwahati PRS location, 'on line' reservation through credit card has not been invoked till date. Instead, 'offline' reservation facility through credit card was extended for 30 minutes from 0800 hours to 0830 hours at a single counter. Due to adoption of offline reservation procedure and assignment of inadequate time for booking through credit card, the necessary check towards the verification of the card could not be exercised by the counter operator before issuing tickets and multiple cases were seen where tickets were booked but money could not be realised either on account of the cards being invalid or the banks refusing to honour the transactions. Due to non-realisation of dues from one bank, NFR had suspended issue of tickets on credit cards from October 2005.
- * On NR, it was seen that there were discrepancies between transactions in the PRS statement and bank statements affecting the accuracy of accountal and settlement of Railway dues.

Recommendations

The MIS role of the PRS stands limited by the defects in the apportionment of earnings. This needs to be rectified. Reservation against credit cards should be made online at all booking locations to allow for verification and to prevent invalid credit card transactions. The system of collection of dues from the banks concerned needs to be strengthened.

1.11 Conclusion

The Passenger Reservation System is a prominent example of how Information Technology can be leveraged to provide transparency and convenience to users on a very large scale and is a pioneering e-governance initiative in the country. However, an IT enabled system on such a vast scale, also requires rigorous controls to sustain operations and to ensure that it is being run as intended, and complying with all the relevant rules and regulations. The system was found to have a few major design deficiencies and the areas of concern were related to system based and manual controls. These leave the system open to the risk of misuse adversely affecting the seat/berth availability to general passengers. The system also had design deficiencies which caused inconvenience to the passengers. Moreover, crucial areas covering security of the system and data, system and process documentation, database management, change management and user privilege management processes were either inadequate or poorly addressed. Absence of a structured disaster management policy coupled with associated work practices exposes the system to serious risk of disruption, in case of a physical disaster.