

RETROFITTING IN INDIAN RAILWAY STATIONS (THROUGH CONCOURSE AND PLATFORM AREA)

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Abstract - Along the fast changing urban scenario in modern terms of infrastructure, built-forms, social preferences as well as sustainability needs Indian Railways has also been upfront in proposing schemes and possibilities for retrofitting of the present railway stations. Major railway station in Indian has typically become hubs of transport network due to their strategic locations in cities. Their interiors spaces increasingly can serve various non-transport related functions like retail shops, cafe, restaurants, supermarkets, clinics or even libraries, packed within a compact environment. The paper intends to understand appropriate retrofitting in railway station concourse and platform area. The study highlights aspects like encouraging an architectural vision with a focus on the efficient movement of passengers in the concourse area, convenience transfers of arrival-departure passengers, passenger's safety-security and comfort while maintaining the quality of design and a pleasant healthy environment for both active- passive passengers of the railway station. The likely outcome of this paper will provide a framework to policymakers and planners in retrofitting architectural detail in these two prime spaces of railway stations to achieve world-class standards.

Key Words: Retrofitting, Passengers-friendly, Interior designing, Passengers satisfaction, Aesthetic preferences

1. INTRODUCTION

When railways continue to remain the sole long means of travel for all who lived far away railway stations acted as the gateways for cities. Although now it no longer acts as the city's primary gateways due to the rise of cars and air travel, but most of the travellers however consider rail as the important mean of travel. Indian railways owns and manages one of the broadest railway networks of the world with over 64,000 Kilometres Route and 7,000 stations. The Indian railways carries more than 17.5 million passengers every day and some of the major railway stations handle 100-200 million passengers per annum. Thus to gather the flow of passengers at the railway station there are mainly two areas.

• 1.1 Platform

A designated area used as an elevated strip for the movement of passengers along the railway coaches to board the train and for alighting passenger to exit the platform area by it means. (As shown in figure 1)



Fig - 1: showing platform area

• 1.2 Entrance lobby/Concourse(Connecting course)

A main entrance area that initially interacts with the boarding passengers and provide general information, enquiry desks, unreserved waiting areas, modern amenities and access to various number of platforms at station by the mean of foot over bridges. (As shown in figure 2).



Fig-2: showing entrance lobby

Because of lack of passengers responsiveness and limited social perception, Indian railways has lost market share in its freight and passengers segment and the other constants for the adverse condition of railway stations are overcrowding, unauthorized vending, lack of modern amenities, adverse condition of waiting lounges, access control, passengers guidance systems that all result in an unpleasant stay for passengers and adversely affect their satisfaction with the Indian railway. Passenger's satisfaction with railway stations undoubtedly needed to be retrofitted for both active-passive passenger's to get best pre-travel expectations and post-travel experiences at the railway stations. The retrofitted station's areas will provide a tangible impact on the general perception of passengers about rail travel and railway stations, provision of adequate quality of services with modern standards will help in delivering a passenger's stay pleasant.

2. RELEVANCE OF STUDY

Favorable time spent by passengers on platforms to board the train remains the significant part because as a set of information and facilities provided to the passengers at platforms develop essential pre-travel expectations and post-travel experiences so it is necessary that amenities available must match passenger's expectations to make their experience pleasant. Similarly, the rest time spent by the traveller in the entrance lobby/concourse area also unexpectedly result in intensifying the experience of the passengers at the railway stations. The concourse area is precisely the most significant part of the railway station as this specific zone is initially approached by the passengers and execute a pivotal role for providing a connecting course for the passengers from the approach road to the platforms and also to various important station facility like (general waiting lounges, ticket counters, modern amenities, enquiry counters, railway shops and food plazas) are located at this point of station. This only place accommodates the maximum crowd over the railway stations.

3. EVOLUTION OF WAITING AREAS

Time has observed an evolution of the railway stations and simultaneously the waiting spaces at the station from very early the Nineteenth Century model of the front building with elaborate brick details coupled with the multiple long platforms shed with one foot over bridge (As shown in figure 3) through to modern compacted single structure forms. (As shown in figure 4) The retrofitting of the internal spaces tended to provide the character to the railway stations (As shown in figure 5) as it must be important to acknowledge the aspects of station design. The design approach with manuals and standards present as design guidelines will result in providing better pre-travel expectations and post-travel experiences of the passengers at all the waiting spaces (platforms, concourse). As apparent throughout the world, it is also essential to restyle, redevelop, renovate or build the new railway stations in India to match the efficiency, facility, indoor character to revive the public perception (As shown in figure 6) about Indian railway stations and to create a continued new modern language of **Station Architecture** in India.



Fig-3: showing Charbagh railway station at Lucknow



Fig-4: showing Beijing railway station at Shanghai



Fig-5: showing Concourse/waiting area of King cross railway station at London



Fig-6: showing proposal of Concourse area of Charbagh railway station at Lucknow

4. PROBLEM INFOCUS AT INDIAN RAILWAY STATIONS

- 4.1 PROBLEMS RELATED TO PLATFORM

Undesignated space for sitting at platforms

At some Indian railway station which merely handles the heavy footfall of passengers, the platform area tends to provide less sitting area which result in improper sitting arrangements by the railways for passenger. The situation more over being observed to be barrier for the boarding passenger because the passenger travelling through railway may carry heavy luggage with them, which then encroach more area at platform along with passenger. (As shown in figure 7)



Fig- 5: showing improper arrangement of sitting

Poor facilities for differently disabled peoples at platform

It's being faced as a common problem at in Indian railways stations as reported and however observed also that platform designing is being very less friendly for disabled passengers and senior citizens. Due to overcrowding at platform many of passengers of these kind somehow don't find themselves able to board or alight the train in these conditions. (As shown in figure 8)



Fig- 6: showing problem for disabled

Unauthorized entry of passengers at platforms

The maximum number of passengers using Indian railways are very irresponsible in following the rules set by the railways, as in result many major problems like crossing of railway tracks at station, unauthorized entry of passenger's from various points in station premises which as is result tends to provide an environment of threat and safety issues to other users. (As shown in figure 9)



Fig-9: showing unauthorized access

Sitting over stair case or near o other VCE's (Vertical circulation equipment)

As in Indian railway stations the mean of vertical circulation provided to passengers are only stairs, ramp, foot over bridges under pass and elevators/escalators at very less redeveloping station being used as a mean of vertical circulation at stations these particles are also being utilized as a sitting space which create problem for travelling passenger to board their train by these kind of encounters between alighting and boarding passengers (As shown in figure 10)



Fig-10: showing unauthorized sitting

Overcrowding at platform by the misconduct of potters and misbehaviour of public

Due to peak hours, heavy footfall at some major railway stations, improper sitting arrangements the platforms get under the condition of overcrowding and encroachments raised by the passengers. (As shown in figure 11)



Fig-7: showing overcrowding at platform

- **4.2 PROBLEMS RELATED TO CONCOURSE/ENTRANCE LOBBY**

Unintended accumulation of passengers at entrance lobby

As the main entrance lobby is one of the space where the passengers find multiple facilities and amenities provided by the railway station the passengers avail maximum services and move towards waiting area or towards platforms but somehow as observed and reported many of the passenger use the entrance lobby as a waiting area and portray a poor image of Indian railway stations with accumulation of passengers unintentionally at entrance lobby which in result don't provide clear-unobstructed routes for the boarding passengers hence the flow of movement of boarding and alighting passenger is very necessary for the least gathering of passenger's at entrance lobby .(As shown in figure 12)



Fig-8: showing unintended accumulation

Improper sitting arrangements for the visitors

There are very limited sittings at the waiting area may be due lack of space, budget or infrastructures etc. which result in creating improper and necessarily required sitting spaces hence the passengers uses the floor of the waiting area to wait until they boards the train. (As shown in figure 13)



Fig-9: Improper sitting at entrance hall

Unreserved booking counters – (insufficient space for Passengers)

The basic principle of designing a railway station is generally on the bases of the foot fall of passenger, future extension to railway station , number of foot fall in peak time . Hence on these considerations the calculation of space required by a passenger at station is being set to provide a circulation space to every passenger but at unreserved booking counter arrangements made not fulfil the standards and result in in sufficient space for passengers.(As shown in figure 14)



Fig-10 showing overcrowding at booking counters

Apart from these problems some other common problems that arise at the platforms and entrance lobby/concourse are due to lack of infrastructure facility especially for differently abled, lack in security measures which result in access controls of the passengers towards the platforms, poor sanitation, improper maintenance of electronic equipment and sanitary particles. In order to get out of these problems the passengers look forward to the Indian railways to ensure the quality service for the themselves, conveyance for both boarding and alighting passengers and so also the Indian railway look forward towards the passengers to cooperate with the railways to maintain the stations area cleans and hygienic and to obey the rules set by the Indian railways. ***So how the possible solution for the productivity of railway station and passengers satisfaction will come out.***

5. PROBLEM INFOCUS AT INDIAN RAILWAY STATIONS

The maximum area of the stations are being used by the public, therefore the several assumption are formulated to understand the mental attitude of the passengers on platform and on entrance lobby few of them are listed below for boarding and alighting passengers .

• 5.1 BOARDING PASSENGERS

- Passengers want quick and nearest approach to the entrance of railway station.
- They only gets indicated by the signage provided over the platforms to the prescribed point after the entrance at the railway stations.
- Passengers could be of any coach class whether having reservation or not.
- May be need to rush because of his late arrival at station so, passengers need quick access to the platform.
- Prefer to stay close to the platform entrance they used.
- At the platform area the boarding passengers may not need refreshment stalls and use dustbins.

• 5.2 ALIGHTING PASSENGERS

- As the arrival and departure of the train may be delayed the passengers find the waiting areas.
- He/she shall leave the train in the area that enables passengers to minimise the walking distance to exit platform.
- Change the platform side more often if high densities pedestrian is in front of passengers.
- More often to boarding passengers spent lesser time over station area.

Over all these assumptions of the passengers behaviour at the railway station and passenger's satisfaction survey report the strategically and technological solution for the retrofitting of the railway stations is being based.

6. PLATFORMS

6.1 PROVISION OF VCE

There should be adequate provisions of (vertical circulation equipment's) such as stairs, ramps, travelators, escalators, lift for both disabled and normal passengers .For the disable passenger provision of wheelchair lift, so that the disable passengers can use it and access to the exit gates .This wheelchair lifts are available in various form and it may move circular, straight etc. (As shown in figure 15). Another option of vertical movement for disable passengers has been work out in japan with introduction of escalator with integrated mobile platform when its required three steps join together and provide a moving platforms source (<https://www.accessible-japan.com/wheelchair-accessible-travel-in-japan-general-information>) (As shown in figure 16).There should be minimum 4 exit with 100 meter maximum travel time on 600 meter platform and an architecturally preferred minimum 2.640 m clear distance to any obstruction such as a VCE from the platform edge. This distance includes the .609 m wide platform safety edge, 1.725 m clear passage for customers circulating along the platform length and a .13 m buffer zone along the length of the obstruction. As per *WCS manual and standard 2009*



Fig-15: showing movement through wheel chair lift



Fig-16: showing movement through escalator lift

6.2 CANOPY, ROOFING OF PLATFORMS

Generally in Indian railway system there is normal roofing of asbestos cement sheet over the platform supported by the framed section which does not provide any architectural appearance and not act as a rain water accumulator. As in present scenarios only the platforms were meant to be covered, tracks are open to sky which result in unhygienic condition at tracks by adverse weather conditions and birds waste etc. Thus to improve the aesthetic character of the platform area the light weight and a durable solution of roof covering in all-weather condition such as acrylic sheets, aluminum composite panels, fiber-reinforced plastic sheet, P.V.C coated fabric or membrane which will be aesthetically appealing and the supporting columns could work as a duct for the rain water pit rechargers. (As shown in figure 17 and 18)

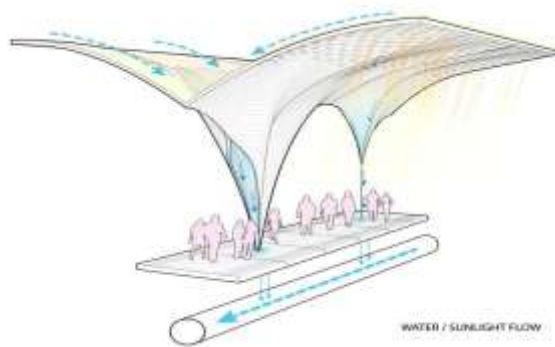


Fig-17: showing inward accumulation of rain water



Fig-18: showing collection of rain water through outward flow

6.3 ELEVATED STRIPS (RAMP)

As in Indian railway system the level of the railway coaches remain to be elevated from the level of the platform which result in level difference of 350mm which causes difficulty for physical handicapped passengers to access the rail coach, (As shown in figure 19) Thus partially a designated ramp or the elevated strip for the disable passenger with a landing of 800 mm to access the railway coach without the help of any other people could come out a solution for the redeveloping station and must be provided only in front of the disabled coach at each platform

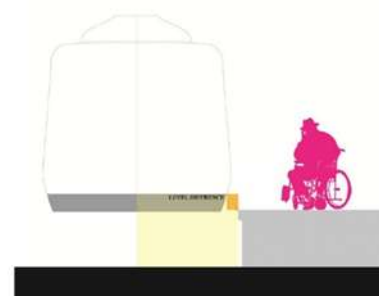


Fig-19: showing level difference

so as this whole will provide a particular space for disable to alight or board the train easily. This area must be specific and nearest to the any VCE's that could be accessible by disable passenger (As shown in figure 20 and 21).

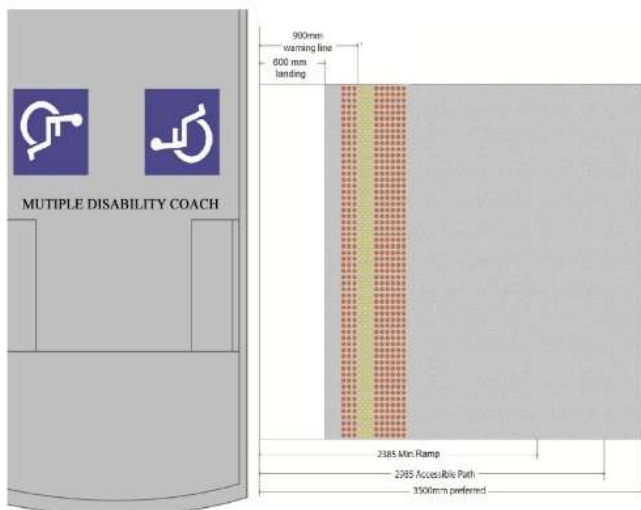


Fig-20: showing proposal of ramp in plan



Figure-21: showing proposal of ramp in elevation

6.4 ARCHITECTURAL ELEMENTS AT PLATFORMS, FLOOR AND CEILING

The designer elements at platforms could be brought by aesthetically appealing finish material for floor and ceiling, variation in floor pattern, multiple entertainment option for departing passengers at platform, creative design pattern on stairs, live display of train moment on platform, instalment of fibre optic lighting system, smart furniture along the platforms, interactive terminals at platforms which should be intuitive and easily accessible by all groups of passengers.

Fig-22



Logroño high-speed train station
Location: Logroño, Spain
Architect: Abalos+Sentkiewicz Arquitectos

Fig-23



Tianjin West Station
Location: Tianjin, China
Architect: von Gerkan, Marg

Fig-24



Bijlmer Station
Location: Amsterdam, The Netherlands
Architect: Grimshaw

These following figure represent the architectural interaction to the railway station platform by the retrofitting of new materials under redevelopment of these station such as use of artificial lights, open-ended spaces, sky light, diagrid structure, space frames, interrelation between conventional building material and advance P.V.C-prefab materials which result out in extensive beautiful livable space for the passengers at railway stations. (As shown in figure 22, 23, and 24)

7. CONCOURSE

7.1 SEGREGATION OF ARRIVAL AND DEPARTURE AREA

Arrival and departure concourses should be centrally located below or above the platforms respectively for complete segregation of arriving and departing passengers so that lesser interaction between incoming and outgoing passengers (As shown in figure 25). This is needed to be necessary provided on newly developed railway station and on the station to be redeveloped solution could be by expanding width of present foot over bridges which will act as a departure concourse connecting main entrance to platforms (As shown in figure 26).

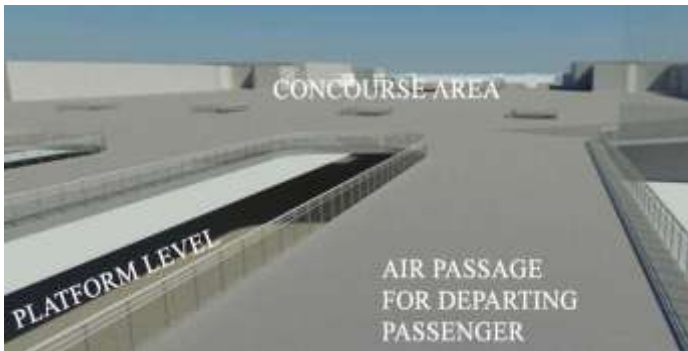


Fig-25: showing proposal for new railway stations

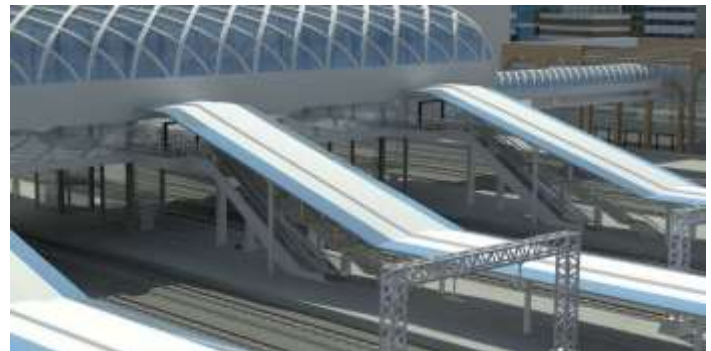


Fig-26: showing proposal for redeveloping railway stations

7.2 CLEAR AND UNOBSTRUCTED ROUTES

From the concourse areas to the platforms by the mean of elevated air passages by providing clear unobstructed route with clear visibility to signage of particular platforms with distinctive exit gate from every elevated air passage to particular platforms which will result in early division of the passengers flow for designated platform from their particular exit gate provided at each elevated air passages (As shown in figure 27)



Fig-11: showing movement of passengers towards platform

7.3 INTERIOR ELEMENTS AT CONCOURSE/ENTRANCE LOBBY

The concourse area should be retrofitted by interior elements such as passengers information systems, seating lounges, lighting, advertising, handrails, MOR (Ministry of railway) shops-kiosks, maximum amount of natural light feasible from façade, wall and ceiling finishes which do not create echo and further enable an environment that allows all public announcements to be audible to people everywhere during the peak hour, digital signage's which are easy to be adjustable as if any change in arrival or departure of train, provision of various vertical circulation elements (VCE) like escalators, travelators, lifts,

introduction of *Biophilic spaces* inside the station area which will result in healthy and liveable environment inside the station area.(As shown in figure 28)



Fig-12: showing interior elements of concourse area

7.4 INTERIOR ELEMENTS AT CONCOURSE/ENTRANCE LOBBY

To avoid the condition of overcrowding hence segregation of the flow of departing passengers is needed to be provided by the division of the railway stations mainly into three zone. (As shown in figure 29) which will provide passengers a sequenced and linear flow within reach to all needs of passengers while travelling.

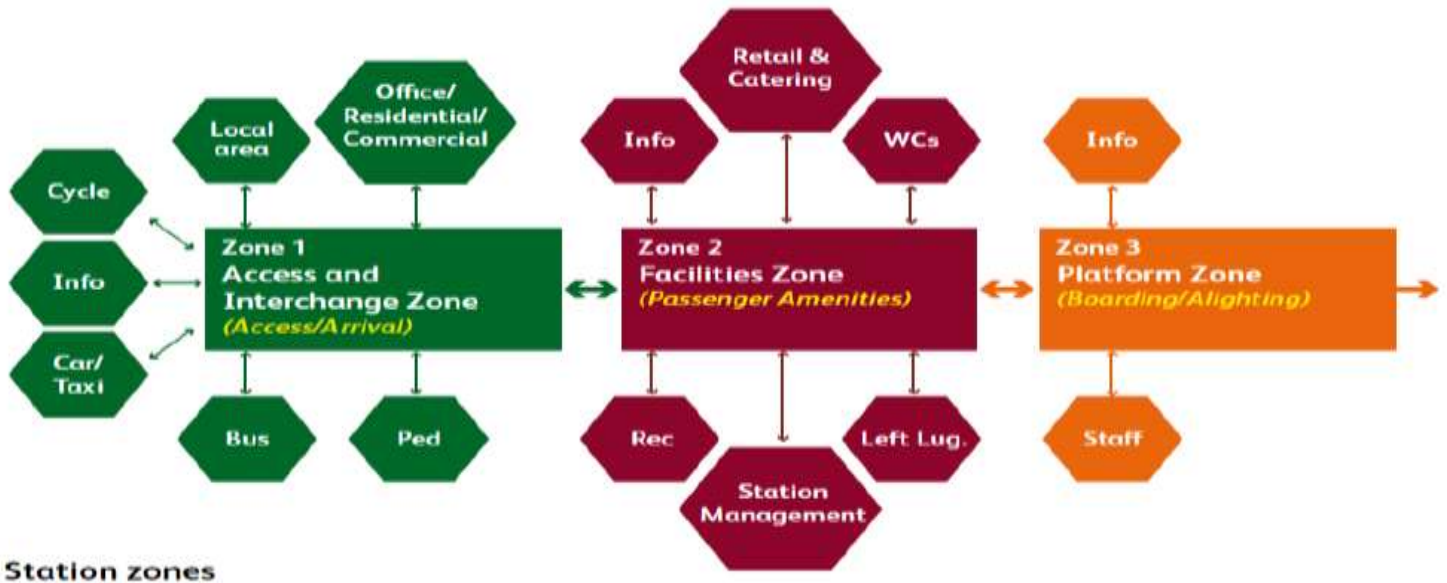


Fig-13: showing division of station in mainly 3 zone

7.5 ACCESS CONTROL

As the safety and security are the very important concern for any public building thus restriction to the unauthorized entry in the railway stations should be controlled by division of station in three categories **1.Entry/Exit 2.Unpaid area 3.Paid area** (As shown in figure 30) .The adequate provision of security gates before each entrance to unpaid-paid area at which security cabin, luggage scanner machine and metal detector points must be provided with CCTV cameras. The entry for paid area could be accessible through the flap barriers by the QR codes provided over the passengers train ticket or token that could replace the

manual platform ticketing system thus it must necessary for all passengers accessing the paid area it will reduce the unwanted passengers over the paid area and platforms (As shown in figure 31)

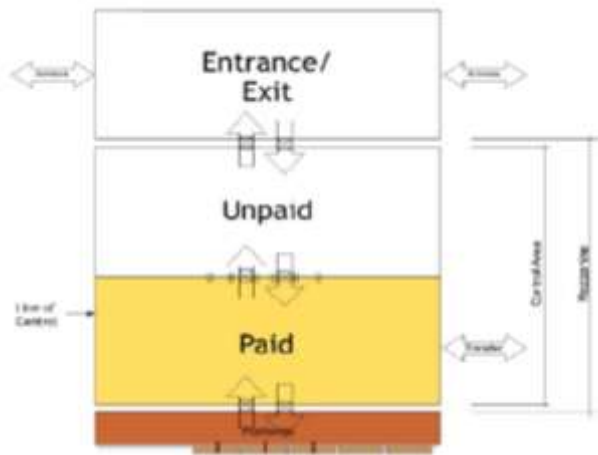


Fig-15: showing division of passengers into categories at station



Fig-14: showing entry through flap barriers

8. CONCLUSION

As the railway part a significant and essential role in the preferred mode of transportation from very early 1800 hundred till 21st century both the railway administration and station has undergone into various possible interchanges by modern time which undoubtedly resulted in the integration of railway system with innovative and ideal technologies to collaboratively develop the enhanced experience and satisfaction of the passengers better towards railways. Hence many developed countries have implemented this modern language of **Station architecture** very early and served as a benchmark of the modern **World class station** above the more initial language of station architecture used in India, so the Indian railway program has also started to adopt precisely the modern language, constants of the world-class station and look forward to providing the pleasantest railway experience to the passengers by enhancing amenities, innovative development of iconic structure with adapting character of the cities, seeking positive customer experience and apart from this the commercial utilization of surplus land of the railway under the (PPP) preferred mode of development i.e. public-private partnership, hence the innovative contribution of the architects, developers, designers will work out as a more satisfactory and improved transportation system and better passengers experience. The challenges for the designer or architects are not only to provide a space according to the standards of the railways though it should further erect an iconic architectural building which must be user-friendly and satisfy the expectation of the passengers. Design elements and strategies as discussed in a paper like retrofitting of interior space will create a more pleasing station environment and will work in recreating the tarnished image of the Indian railways system and railway stations.

“You lose the knowledge behind when you start chasing for the best gather knowledge that you can get around you and then come out with the best from it”

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