



IIT Techfest 2007 Mumbai
28th Jan 2007

Billions of rupees value lost by Technology Deficit in India's Infrastructure Development Initiative!

In Rashtrapathi Bhavan



B. Rajaram M.Tech., FIE., FNAE
Former MD Konkan Railway, Indian Rly Service of Engineers
DIRECTOR, Atri KEI Lab.(P) Ltd., HYDERABAD 500001



India needs to forge ahead

- We are in a hurry to improve infrastructure
- Transport
 - Urban transport
 - People
 - Cargo
 - Inter-city transport: High speed >200 kmph
 - Sea-ports
 - Air-ports
- Water supply/sanitation
- Power supply & distribution
- Health care
- Education
- Residential & commercial real estate
- Agriculture/ irrigation facilities

30th Nov 2006

www.atrilab.com

2



Current Scene

- Infrastructure delivery is a function of
 - finance
 - a sound and efficient design based on competitive technologies.
 - Project management
- But in the name of proven systems or time tested technologies,
 - even when the economic life cycle for a technology is over,
 - demands unviable levels of funding,
 - requires artificial gap funding by governments
 - private parties are being roped in for delivering the infrastructure and run the same.
- This is cross-subsidising an economic activity,
- distorts our investment decisions
- blocks innovation to improve technologies to compete on own strength relative to economy , and be sustainable.

30th Nov 2006

www.atrilab.com

3



Intellect is the asset

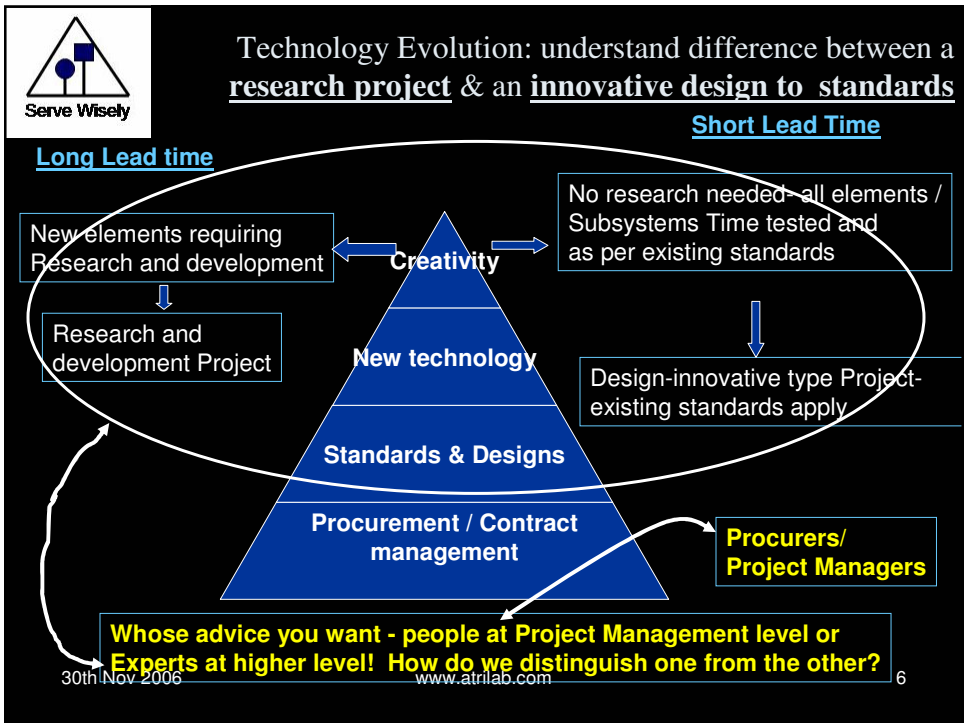
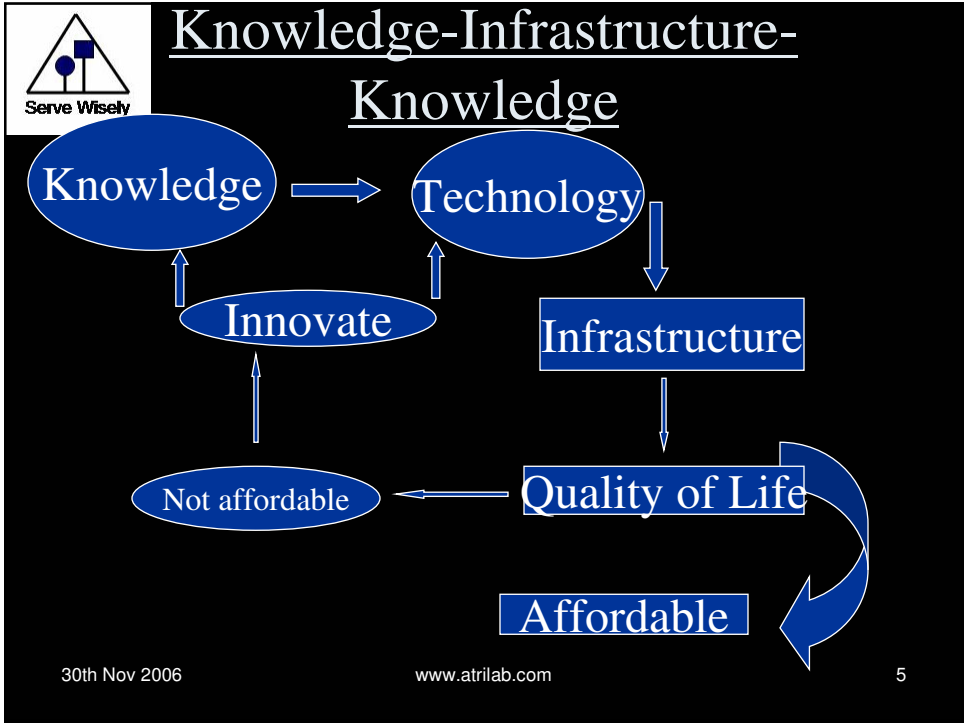
- The most precious gift given to us, humans, is intellect.
- The way we make use of the same with proper attitude makes all the difference to the prevailing quality of life in terms of food, shelter, transport and communications.
- Intellect has no barriers, nor limits – it is an eternally renewable resource.
- India has, perhaps, the strongest resource base of intellect, in the world.

[Dr AN Khosla memorial lecture, Indian Engineering Congress 2004 by B.Rajaram](#)

30th Nov 2006

www.atrilab.com

4





Serve Wisely

Fear of unknown-new technology

- Confusion prevails with normal day to day managers and maintainers compelled to act as technical experts to take the role of technology assessment- unable to differentiate an innovative design project from a new research project!
- Simple pedestrian logic couched in technical terms and with power granted by the ill-informed administrators, actually blocks any advantage the society can gain from country's innovations.

30th Nov 2006

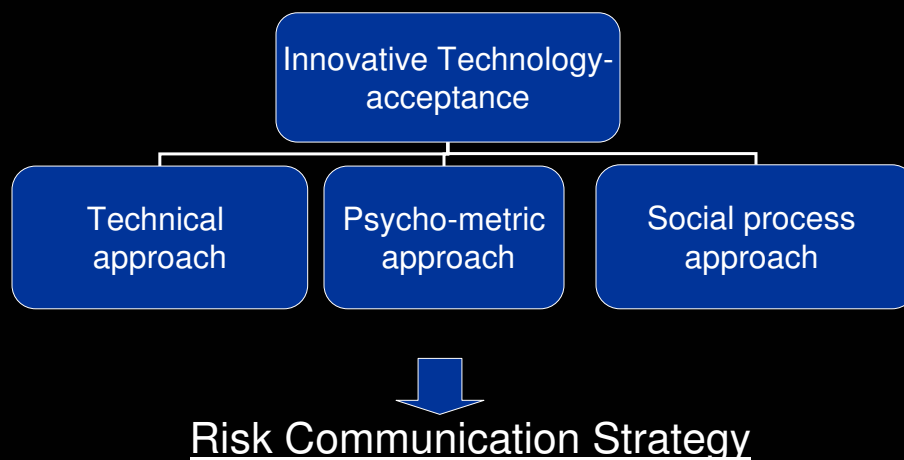
www.atrilab.com

7



Serve Wisely

Every new technology should assumed guilty until proven innocent ! ...Adams



30th Nov 2006

www.atrilab.com

8



Inherited conception of science as the facts

Inadequate to meet the challenge posed by policy related science issues.

Characterised by:

- Uncertain facts
- Disputed values
- High stakes
- Need for Urgent decisions.

30th Nov 2006

www.atrilab.com

9



What we lack

- In our country we are lacking the technical certification process with third party safety analysers and certifiers.
- Also we lack laid down technical & social process to manage innovation to improve our lives
- While innovation itself takes hardly less than 90 days to prove scientifically with live prototypes, managing to push through the barriers for commercial use, can take more than 9000 days!
- We need better delivery policy mechanisms!

30th Nov 2006

www.atrilab.com

10



How do we remove the fear?

- This fear is now sought to be removed by bringing in the expertise from those nations with established norms for technology assessment for safety and certification- like say, magnetic levitation, so that our innovations get the international standard safety assurance
- We must learn and stabilise these processes in our country-not just import technologies!
- We aim at world market and India is one sector.

30th Nov 2006

www.atrilab.com

11



Next generation technologies for transport sector

- The new technologies envisaged by Mr B Rajaram, inventor of Anti-collision & Skybus technologies, willing to be supported by TuV Rheinland Germany
- causes paradigm shift to all rail guided systems, to be now applicable to be used
 - in cities,
 - between cities as well as to
 - link agricultural and industrial production centers,
 - Design & construction of air-ports,
 - Design & construction of sea-ports
- both for cargo as well as people.

30th Nov 2006

www.atrilab.com

12



What is Skybus?

- In 1989 Mr B Rajaram presented first time Sky-wheels concept in Bologna Italy at World Railway Research Congress.
- Century old railway is the technology used in Skybus too , with a difference, unlike railway, the coaches in Skybus cannot escape railway tracks!
- All elements are the same proven metro rail sub-assemblies, re-designed optimally.

[More Details](#)

30th Nov 2006

www.atrilab.com

13



Skybus Standard Gauge Metro Railway

National Geographic USA Covers Skybus

- Skybus standard gauge railway is
 - as pre-certified as the heavy metro rail,
 - delivers the same scalable capacities, but
 - safer improved railway,
 - carries cargo too,
 - For Mumbai adds precious urban space 950,000 Sq.m but
 - costs for a 100 km network, only Rs 6500 cr, compared to Rs 24,000 cr needed by old technology!



- [1. Guide-lines to States](#)
- [2. Skybus Rail specifications](#)
- [3. Visit \[www.atrilab.com\]\(http://www.atrilab.com\)](#)

- [4. Mumbai Network](#)
- [5. Typical worksheet Financials for 10 km route](#)

30th Nov 2006

www.atrilab.com



Inter-city high speed transit for people and cargo-Skyjet

- For typical distances of 500 km like Mumbai Goa/ Mumbai- Ahmedabad we can have
- Skyjet high speed railway at 250 kmph, cutting down travel times to less than 2 ½ hrs,
- to carry not just people but cargo too like 10,000 containers a day-
- causing a paradigm shift to transport scene and business models get re-defined.
- It will prove to be financially viable at current affordable economical rates.

30th Nov 2006

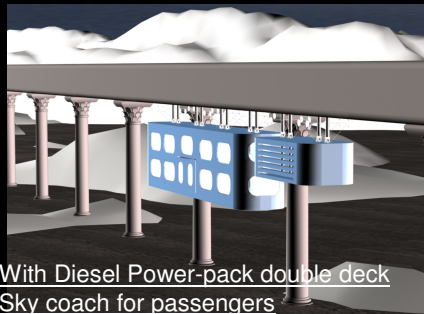
www.atrilab.com

15



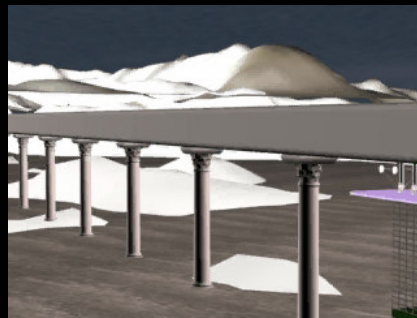
Sky-wheels in mountains

[A case developed for Jammu & Kashmir](#)



With Diesel Power-pack double deck Sky coach for passengers

Military movements-
tank getting transported across



30th Nov 2006

www.atrilab.com

16



Serve Wisely

Air-ports- new generation:

- The new knowledge embedded rail guided system like Skybus, causes a paradigm shift in setting up an airport- the future airport is
 - practically an invisible entity away from habitats but
 - accessible within city at all major habitats.
 - The passenger gets into Skybus close to his place of living and gets his boarding card
 - straightaway takes him to the doorway entrance of the aircraft, seamlessly, including his luggage.
- You will not find any major infrastructure near the runways of airports as you see today- no major buildings nor facilities to handle waiting passengers, nor car parking problem!
- Entire city becomes air-port reception area!
- The savings in time and comfort to passengers can easily be imagined. The economies of airport transport infrastructure and business model again will face sea-change for better. Again a financially viable and better alternative emerges.

30th Nov 2006

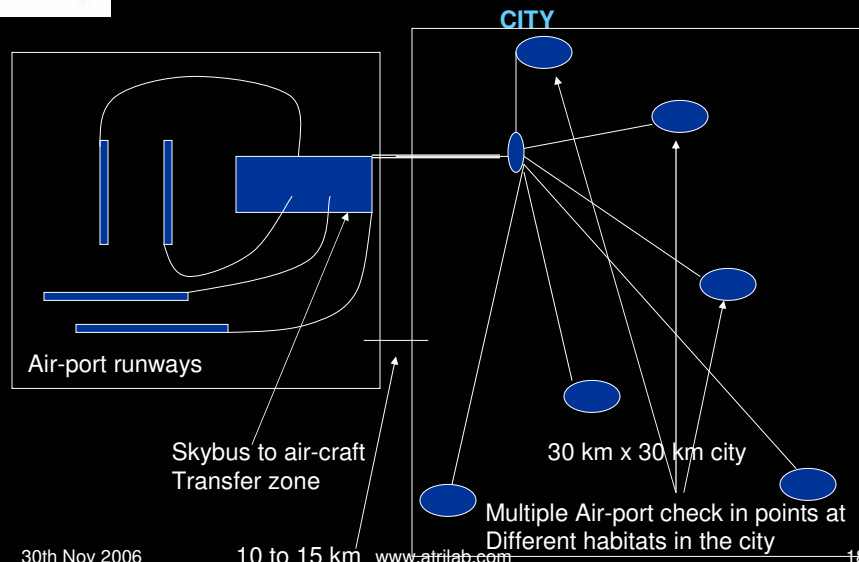
www.atrilab.com

17



Serve Wisely

Future Skybus bridged air-ports



30th Nov 2006

www.atrilab.com

18



Sea-ports- including container and non-containerised bulk material handling:

- The sea-port practically becomes invisible as
- there wont be any need to have vast areas close to shore lines for material handling
- nor jetties into sea linking land to ship.
- Actually ships are made to anchor at optimum locations in away from land, in sea where required draft is available with
- least dredging, and
- the Skycon systems, will have capacity to bridge the unloading and loading operations at ship to modal transfer points like railway yard located outside cities faraway – and
- the savings in terms of
 - avoiding the area development at shore lines,
 - avoiding the expensive jetties, dredging costs, and
- more than everything the productivity levels for material handling which is at 5 to 6 times more than the current best available systems, will again redefine the ports as we know and make them more efficient at lower capital costs, which translates to beating the competition in the world.

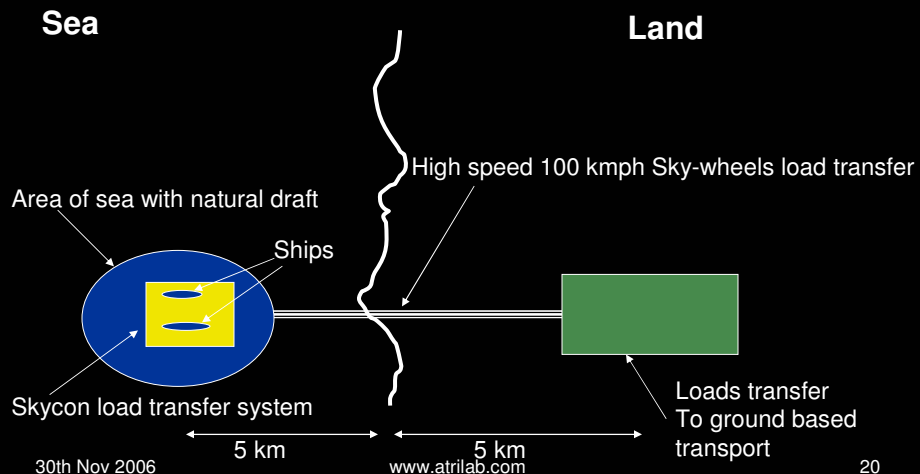
30th Nov 2006

www.atrilab.com

19



New generation Sea-ports



30th Nov 2006

www.atrilab.com

20



World Intellectual Property Office, Geneva & National Geographic USA coverage for ACD technology.

APRIL 2006

PCT PORTRAITS The People Behind the Patents

More than 1.2 million international patent applications covering new technology of every description have been filed since the Patent Cooperation Treaty (PCT) began operating in 1978. In our series of snapshots, WIPO Magazine selects a few of the inventors and seeks out the people behind them. In this edition, we find innovative engineering techniques applied to architecture, neuroscience and train travel.

On Track for Safer Trains



The Raksha Kavach anti-collision device is now installed on all routes of India's Konkan Railway.

Mumbai, 1999 – another train collision on India's western coast shook the Konkan Railway Corporation. Something had to be done. We could not allow another life handed to us in trust to be lost in another accident routinely classified as human failure," declared Boji Rajaram, then managing director of the railway.

Mr. Rajaram, an engineer with a track record of innovation, refused to believe that no technical solution could be found. Surely, he thought in this age of instant radio communication, microprocessors and Global Positioning System (GPS) technology it must be possible to devise a fail-safe system. Setting himself a "war like target" of 90 days to produce a prototype, he began work on a device which, mounted on two approaching

trains, would enable them accurately to assess each other's course and, in case of collision risk, to initiate an automatic braking system.

"The toughest challenge," Mr. Rajaram relates, "was how to make the GPS, which has only 20 – 30 meters accuracy, differentiate tracks which are only five meters apart." With no local GPS equipment or expertise to draw on, Mr. Rajaram bought a GPS over the internet late one night, plugged it into his laptop, and enlisted the help of his five year old grandson to wander around the garden with it, while he scrutinized its capabilities. His resulting "Deviation Count theory" confounded the skeptics, and led to his anti-collision device, Raksha Kavach. In January 2006, the Indian Railway Ministry announced that the device, already installed on all Konkan Railway routes, and many Northeast Frontier Railway routes, was to be extended to the entire broad gauge rail network by 2013.

And why the PCT? "Because," said Mr. Rajaram, "I wanted to save public expenditure, and to take the most cost-effective manner of protecting in a fair manner the IP rights." He cites a total of 17 patent applications, and potential royalty streams estimated by Price Waterhouse Cooper at up to Rupees 8000 crore (over US\$1 billion) over three years. Uninterested by personal profit, however, Mr. Rajaram chose to assign all patent rights to the Indian nation via the state-owned Konkan Railway Corporation.

Now retired, Boji Rajaram has lost none of his fervor. "I believe," he writes, "it is in the realm of reality to make food, travel, communication and dwelling virtually free to all humans through the bold application of science and technology to infrastructure development."

For more see: <http://www.watrlab.com/>



com

21



Anti-collision Device technology – future growth path

Comparative Features of Different Levels of Configurations of ACDs.

Raksha Kavach
PROVEN IN FIELD
TRIALS: ALL
THE 11 TYPES
OF ACCIDENTS
PRESCRIBED
TO BE TESTED
AGAINST. THE
SYSTEM
SUCCEEDED.

Train Control & Protection System
READY

Moving Block System
to be tested, if a non-running line is nominated.

Intelligent Rail Transport System
30th Nov 2009

Additional Safety layer:
does not replace: can function without any inputs from the existing systems. No track based equipment used.

Additional Safety layer:
acts as datalogger to take input from station track circuit and block instrument

Proactive with additional input from
tachometer and additional repeaters

Station working and train working interlocked:
eliminates all fixed line side signals.

No human input for ensuring safety: but, for operational efficiency limited acknowledgement action required from drivers.

No human inputs required for safety as well as for ensuring operational efficiency.

Cab signalling / with mutual interactive train control: No human intervention needed for safety or operational eff.

No station masters nor Drivers needed to operate: fully automated guided transport.

All head-on/rear end/side collisions prevented in block sections and low speed impact allowed in stations.

All collisions between trains prevented and even at stations low speed impact prevented.

Total safety and quantum jump in line capacity.
Train formation- two locos one in rear and one in front-ACDs coordinate

Driver and station master become supervisors: all actions are automated and programmed.

22



Business Scope

- The business opportunity in the world in the above areas is of very high order as
- estimated by PwC as well as ICRA, when Mr Rajaram as MD Konkan Railway got the valuation done for the technologies he invented, and assigned the patent rights to Konkan Railway-
- the royalties discounted upto 70%, add to NPV of nearly Rs 10,000 cr. The business itself in NPV terms is Rs 100,000 cr.
- Over next 5 to 7 years we can get infrastructure of a value of Rs 50,000 cr developed through healthy sustainable BOT route using these technologies.

[Business Plan for Atri KEI Lab., Ltd- an outline.](#)



30th Nov 2006

www.atrilab.com

23



What we together can do to cause a paradigm shift to transport infrastructure

- Over the last three years the urban Ministry has finally cleared an important policy statement, making Urban Transport independent of Ministry of Railways, for safety and technical clearances, paving the way for private BOT operators adopt Skybus technology also. Skybus is included in the policy.
- The world renowned TuV Rheinland Group Germany providing the missing expertise of our country in adopting innovative technology in the matter removing the fear of unknown
- The result is a win-win situation for all – including our nation!

30th Nov 2006

www.atrilab.com

24



A unique opportunity driven by insurmountable & inexorable forces of economics

- The new technologies present unique value to make critical infrastructure financially viable & sustainable
- The digitally empowered transport technologies will cause a paradigm shift to life style in the world in this century.
- The partners who can make it happen will share the unique excitement !

30th Nov 2006

www.atrilab.com

Thanks for your time! 25