भारत सरकार Government Of India
रेल मंत्रालय Ministry Of Railways
(रेलवे बोर्ड) (Railway Board)

Notes Recorded During Visit of TCS Research & Innovation Facility at IIT, Chennai By 'Mission Implementation And Coordination Committee (MICC)' To "Technology Mission For Indian Railways (TMIR)"

On Saturday, The 20th January, 2018

1. In terms of communication, dated 16.01.18, from Tata Consultancy Services, Chennai, visit to TCS Research & Innovation Facility at IIT/Chennai was made by the MICC to TMIR on 20.01.2018 for collaborative research in the priority areas of Indian Railways.

2. Following officials were present :

A.	**Members of The 'MICC' To 'Technology Mission For Indian Railways' (TMIR) :**		
(1)	Prof. N.S. Vyas, *Chairman and Prof./IIT-Kanpur*	*vyas.nalinaksh@gmail.com*	*9956292801*
(2)	Shri Alok Kumar, *Co-Chairman and CAO/C/NR*	*alokalokindia@rediffmail.com*	*9910487302*
(3)	Shri Sunil Sherlekar, *Industry Member*	*sunil.d.sherlekar@gmail.com*	*9663090004*
(4)	Shri Om Prakash Tantia, *Industry Member*	*tantiaom@gmail.com*	*9831008640*
B.	**Other Participants :**		
(5)	Shri Ravi S. Kochak, *Retd. AM/PU/R.Bd.*	*kochak@gmail.com*	9821461296
	From TCS :		
(6)	Shri K.A. Padmanabhan, *Advisor*	*ananthaster@gmail.com*	8008777664
(7)	Shri K. Ananth Krishnan, *CTO/TCS*	*ananth.krishnan@tcs.com*	
(8)	Dr. Siddhartha Sengupta, *Pr.Scientist & Head*	*siddhartha.sengupta@tcs.com*	
(9)	Ms. Sharmila Sahai, Shri CBM Mishra, Thanga Jawahar, B. Sridhar, B . Satish, S. Shripad		

3. Shri K. Ananth Krishnan, CTO/TCS welcomed the Chairman/TMIR and all the participants of meeting.

4. Prof. N.S. Vyas, Chairman/TMIR apprised the concept and eco-system of TMIR, as set up by the Ministry of Railways through consortium of three Ministries (Railways, HRD and Science & Technology) alongwith Industries wherever applicable –

- Ministry of Railways : Primarily RDSO and all Zonal Railways & Production Units
- Ministry of HRD : All CFTI institutions, like IITs
- Ministry of Science and Technology : DST and CSIR

4.1 Prof. Vyas listed out top three areas of interest, where TCS could contribute –

(i) Asset management and scheduling

(ii) Condition monitoring and Health Diagnostics

(iii) Materials for rolling stock & tracks, e.g. corrosion resistant coating

4.2 He pointed out that challenges are primarily in the building of solutions, not so much in the invention of technologies. He said that test bed for signaling & telecom is needed and integration of different technologies from different vendors to be done. There should be communication technology in the train, off the train, train to platform etc. and materials for rails, rolling stock.

4.3 He informed that multiple centres have been established/planned at IITs and Universities. TMIR brings in new ideas to RDSO and Tech transfer happens at around TRL 6 to Railways. This is pre-competitive.

4.4 He mentioned about huge investments expected in the Railways in next 5 years. So, very different perspective is required for scale & velocity. Substantial share of new investment will be in equipments.

4.5 Of the top 10 OEMs servicing Railways across the world, 2 each are in China, Japan and the US. The rest are in Europe. A different way of thinking about technology was needed for Indian Railways.

4.6 Safety is most important on Railways and so is reliability under increasing axle load and frequency of trains. There has to be condition monitoring for conventional plus new areas like tilting train.

4.7 He suggested that for the Industry component, TCS could become an industry partner and it could invent technologies till tech transfer, like scheduling; to form partnerships with other participants like Talgo, Siemens, IITs, Royal Institute of Sweden etc.

4.8 Scheduling itself has been used by China to increase capacity by 2.5 times and active train control being tried by the US. It was recognized that TCS has the technologies, but data are with Railways and both should be combined to create value. There is a need for smart tickets, automated receipts, as is being done by CRIS.

5. Shri Ananth Krishnan CTO/TCS said that TCS R&I has matured over the years to address industry problems at the intersection of Computer Science with other sciences (including Behavioral). Decision Science is now being widely practiced exploiting technologies including Cloud, Big Data, Analytics and Artificial Intelligence. He mentioned that specific R&I initiatives including IoT, Drone are getting matured into business operations

6. Ms. Sharmila Sahai informed that a digital transformation roadmap has been developed with Railway Board & CRIS which covers passenger experience, freight & logistics, asset management, energy management, operations & management. TCS/CRIS have identified 120 plus IT initiatives, down to ROI estimates. Its key business objectives are Revenue, Cost and Customer experience. There has been 12000 crores investment, 6x benefit projected. Some solutions are already with TCS, others need to be developed. CRIS is coming out with an EoI's & RFP's this year.

TMIR could help in demonstrating a couple of pilots, say wagon utilization or fog vision safety to trigger more success and enquired, if TCS could pick 1-2 projects for detailing?

7. Shri CBM Misra elaborated on initiatives taken by TCS in Railways like Real time train tracking system; Onboard unit based solution, Nirdeshak; Using GPS from multiple sources including Gagan; Link to many collision avoidance & safety programs like TCAS, Overall traffic management planning & advisory to driver, station manager, traffic planner, operations manager. Similar system has been productized for airlines with SIA and for ships (safety of life at sea, SOLA for DG shipping). It was requested that a meeting may be arranged with Member Traffic to discuss throughput, punctuality and asset utilization.

   He said that GPS data should not become another information silo, an integrated data view was needed to make information available in real time to all stakeholders. He mentioned that active rake monitoring, Bridge condition monitoring are few potential data source which can be taken up. Drones are also being looked at for data acquisition for fog vision and unmanned railway crossings. These can be done through TMIR.

8. Presentation was given on IoT and engineering by Shri Thanga Jawahar. He suggested that Digital TWIN be built at every level using FMEA as components, subsystems, systems and super systems level. Energy management, Smart bearings, Rail cloud, with data and possibility of this being a 5G project in national forum are worth consideration.

9. Presentation was also made on Condition monitoring by Shri B. Sridhar. He suggested that Railways operations and infrastructure – like Signaling, Rail network, Rolling stock, Track infra, Station infra should be digitized. He said sensing for track condition monitoring is complex and can be re-architected as a process at acquisition and analysis, learning from network rail experience.

10. A rail cloud for data and then analytics would be needed for actionable intelligence, across multiple applications. This may be started with an active region or zone and TMIR could fund the starting demonstrator. This project may be introduced to Member Rolling Stock.

11. There was a consensus that the foundational elements need to be realized; the solution architecture be conceived, which should be scalable. The initial pilot projects should be made successful. The following areas of work could be included :

    (i) Adapter Gateway development to address the interoperability challenges
    (ii) Scheduling
    (iii) Condition Monitoring - Rolling Stock
    (iv) Instrumentation / Sensors for detection of cracks in track
    (v) Corrosion Resistance Paints / Coatings using Nano Technology
    (vi) Steel for High Speed Tracks (using TATA Steel Corus Technology)
    (vii) Introduction of technologies for modernizing manufacturing / maintenance facilities

12. It was recommended by TCS that regional level engagements should also be identified to make these initiatives successful. 'Technology Mission for Indian Railway' would help identify the right stakeholders and provide reference. RDSO alongwith Industrial Partner (TCS) and Academic Partners would be part of the solutions to make TMIR successful.

13. It was decided that further meetings may be arranged with the CRB, Member Engg., Member Rolling Stock, Member Traction, Member Traffic, CRIS for further possibilities of collaboration with TCS for Technology Development under the provisions of TMIR.

14. The proceedings of this visit were discussed with Dr. Neeraj Sharma, Member/TMIR and Adviser/DST (Ministry of Sc. & Tech.) and he expressed his satisfaction stating that DST would be happy to provide support to and endeavour in this direction.

15. Meeting concluded with closing remarks by Prof. K Padmanabhan and Shri K.A. Krishnan.

(No. 2017/Committee/TMIR/02, New Delhi, Dated 16.02.2018)

16/02/18

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- Chairman and all the Members of MICC to 'TMIR' (Technology Mission For Indian Railways)
- Director General, RDSO, Lucknow for information please
- CMD/TCS, Bengaluru for information please.
- All the participants of the meeting.