Subject: Response to Consultation Paper on *Digital Transformation through 5G Ecosystem*

To,
TRAI

Please find my response below on consultation paper

Q.1. Is there a need for additional measures to further strengthen the cross-sector collaboration for development and adoption of 5G use cases in India? If answer is yes, please submit your suggestions with reasons and justifications. Please also provide the best practices and lessons learnt from other countries and India to support your comments.

While 5G promises lower latency and higher bandwidth, there are mix view on its differentiation compared to 4G for industry use cases. Consumer business landscape has yet to find compelling opportunities which justifies the business case of using 5G over existing 4G services. However, enterprise business is witnessing higher adoption of private wireless network through 5G driven platforms. There are opportunities emerging using edge computing and 5G where cross-sector collaboration is witnessing use case adoption in mature markets. Even hyperscalers are utilizing their edge computing and power of 5G to launch private networking solutions for enterprises. This is one area which is witnessing Co-opetition (competition and co-operation) between telecom operators and hyperscalers. For example, smart factory is one such example where 5G can enable low latency use cases around robotic automation, smart security, etc in a manufacturing set-up. Even Automotive industry is witnessing experiments like Autonomous Vehicles using 5G platforms. While the permissions for Cruise by GM initiative has been revoked by State of California as we speak due to safety reasons, these experiments were conducted to find new innovative use cases using power of low latency. Whether these truly require 5G or 4G is still a debatable point.

Q.2.Do you anticipate any barriers in development of ecosystem for 5G use cases, which need to be addressed? If yes, please identify those barriers and suggest the possible policy and regulatory interventions including incentives to overcome such barriers. Please also provide the details of the measures taken by other countries to remove such barriers.
[2.63]

There are no comments for this section

Q.3. What are the policy measures required to create awareness and promote use of 5G technology and its infrastructure so that the citizens including those residing in rural and remote areas may benefit from the 5G use cases and services to create

new economic activities and increase employment opportunities and thereby promote economic growth of the country?
[2.64]

I would like to take a contrarian view on this question and focus more on the 'Why' and end-user need instead of trying to force feed 5G solution to the market.
Using a persona driven approach, if we look at typical user of data services in rural or remote area in India, there is no need for low latency use cases yet. They are primarily using data for entertainment (streaming, movies, etc), education, banking transactions, video calls, weather services, business through UPI, OTT apps like Whatsapp, Mobile Apps which has average latency need. These use cases can be easily catered through 4G or 4G+(marketed as 5G non-standalone) speeds. In general, one can pickup any existing use case to discover that it can be delivered over 4G with good user experience.
Moreover, many of these household and user has decent broadband connectivity options which easily caters to these needs.
While creating new economic activities and employment generation are a noble cause, these can still be achieved very much with 4G and broadband services. 5G services really to provide a differentiated 'need' for user to adopt 5G and/or pay for any differential charges. The main beneficiaries in the value chain for forcing users towards 5G are device manufacturers.
One recommended solution for 5G value chain entities including regulatory bodies can be utilizing Design Thinking method and learn what are other set of problems within a Day-in-a-life of users in these regions.
There maybe opportunities in the professional side of activities of these users. For ex, do we have low latency use case which can help a farmer use edge sensors in their farm towards higher produce. I would like to highlight that mere force fitting a complex solution is not going to help, since there has to be a business case, true differentiation vs 4G and ability & willingness of user to migrate.
Even operators are searching for these solid use cases and we are yet to witness proactive migration to 5G by users unlike what was witnessed during 3G to 4G migration(there was an apparent difference in speed for existing use cases).
Metaverse users are waiting for better alternatives and experience compared to ones which are provided through expensive devices for Indian market. Even these expensive device currently deliver required experience only on WiFi (99% time) vs 5G hotspots or connectivity.
The challenge of finding relevant 5G use cases is a global one and not limited to India. Indian market and operators should also be ready to witness same business scenario like 3G (low adoption, high investment) only to be followed by faster 4G adoption.
It maybe too early to comment but 6G maybe the next platform for step-up adoption of higher speed use cases.

Q.4. What are the policy measures required to promote use of IoT technology and its infrastructure so that the citizens including those residing in rural and remote areas may benefit from these 5G enabled IoT smart applications and services to create new economic activities and increase employment opportunities and thereby promote economic growth of the country?

As mentioned in response to Q3, entities really adopt Design Thinking approach and explore if there is a true need for 5G for these use cases when they can be easily delivered through 4G. While telecom is definitely an economic driver of a country, adoption of new technology requires strong business case, user awareness and a true need in situations where N-1 version can easily provide an equivalent service.

Q.5. What initiatives are required to be taken by the Government to spread awareness among the citizens about IoT enabled smart applications? Should the private companies / startups developing these applications need to be engaged in this exercise through some incentivization schemes?

For any potential opportunity, there has to be an identified problem. For start-ups to enter this arena, first there has to be an understanding of existing problems and a big enough potential market. One way for government to enable this can be through sandbox and permissions for new experiments. While incentives are definitely useful, it is more about approvals than funding which start-ups require from government. This also require a mindset change in governance bodies especially in rural markets for them to allow new forces explore and create new opportunity through low-latency uses cases.
Just providing financial incentives will not be a magic wand for 5G adoption because first there has to be a need to identify the problem statements followed by the relevant use case solutions.

Q.6.Industry 4.0 encompasses Artificial intelligence, Robotics, Big data, and the Internet of things and set to change the nature of jobs.
(a) What measures would you suggest for upskilling the top management and owners of industries?
(b) What measures would you suggest for upskilling the workforce of industries?
(c) What kind of public private partnership models can be adopted for this upskilling task?
Please reply with proper justification and reasons and also by referring to the global best practices in this regard.

a- It is important to understand why before what measures are defined. Top management and owners of industries would be interested in Industry 4.0 if there is either revenue or bottom line incentive through the adoption or some measure of labor welfare benefits. Top management are focused on strategic as well as long term approach. Upskilling for that group should be towards alignment of Industry 4.0 adoption towards their business roadmap. They can be provided with executive workshops or consultative approach of how technology can be instrumental for their strategic objectives with clear business case behind such adoption. Owners are more focused on expansion and scale and any incentives towards financial benefits. Owners can be provided incentives for either being open for experiments or gaining financial adjustment through use of Industry 4.0. Identifying GST driven measures of

adjusting initial capex as incentives can be one such example. Even if 20% of target segment become an early adopter, it will solve 80% of the push.

b- Key incentive for workforce for such trainings is either through a payroll incentives or career related. There can be industry level badge launched for Industry4.0 where such certification provides them direct opportunities with Industries who register for experimentation. This badge can be linked to centralized database like Nasscom NSR or equivalent in relevant industries.

c- Public-private partnership can enable for provide mapping of workforce supply with demand. Industry 4.0 badge approved workforce can provide a steady talent pool to companies who are early adopters. Companies can also utilize their CSR funds to launch industry specific learning programs to groom talent. Financial institutions which provides MSME loans can also bundle light version of 5G Industry 4.0 solutions as a complementary add-on (more like a starter pack) which can upgraded later based on use case success. There can be a mechanism to provide rebates on interest rates if MSME agrees to adopt and launch atleast 1 solution in Industry 4.0 area within a specified time.

Q.7.What are the policy, regulatory and other challenges faced by MSMEs in India in adoption of Industry 4.0. Kindly suggest measures to address these challenges. Provide detailed justification with reasons along with the best practices in other countries.

Some of the key challenges faced by MSMEs are related to safety approvals due to new technology and risk rating.
Upfront capex can be a burden for adopting new age technology with a risk of failures due to new technology adoption.
Education and training are another set of challenges for finding the right talent. Given these are set of new technologies, there are not many experienced talent pool and hence there is a need to not only upskill talent but also get them matched to the employer pool.
New technology is always seen with a lens of doubt with respect to its impact on employment. For example, there is a lot of discussions on AI and its potential impact on human job. Therefore, workforce often resist such adoption of new technology. Education and training are required for this topic highlighting that Industry 4.0 is not a threat but an opportunity to create new and large-scale solutions and employment.

Q.8.What additional measures are required to strengthen the National Trust Centre (NTC) framework for complete security testing and certification of IoT devices (hardware as well as software) under DoT / TEC. What modifications in roles and responsibilities are required to make NTC more effective? Kindly provide your comments with justification in line with the global best practices

There are no comments for this section

Q.9.IoT security challenges and requirements vary significantly across different industry verticals. Is there a need to develop sector-specific IoT security and privacy guidelines?

I recommend creation of a Common IOT security framework at Level 0 which should be seen as a foundation. This Level 0 foundation should then be used by various industries to bring sector specific guidelines based on how regulated the industry is, kind of workforce talent, learning & education required, level of opportunities and levy on security measures.

Q.10.If answer to Q.9 is yes, is there a need for a common framework and methodology for developing such sector-specific guidelines.

Yes, as highlighted in response to Q9 beginning with Common Level 0 framework followed by sector specific guidelines.

Q.11.Please suggest regulatory and policy interventions required to ensure privacy of the massive amount of sensitive user data generated by IoT applications specifically in light of the Digital Personal Data Protection Act, 2023. Kindly provide justifications along with the global best practices.

Digital Personal Data Protection Act, 2023 provides a comprehensive framework on privacy which can be seen as a foundation and tweaked to each sector depending on sensitive user data.

Q.12.What additional policy and regulatory measures are required to encourage research and development of IoT use cases in various sectors? Is there a need to incentivize startups for research and development of IoT enabled use cases in various industry verticals? If yes, kindly suggest measures for the same.

Even school kids are using GenAI today for their homework. We should channelize the learning ability from the school level and expose them to 101 nuances of Industry 4.0. School and colleges can conduct Hackathons on this theme to ignite the curious young minds.

Q.13.What measures should be taken to encourage centres of excellence to handhold startups working in the development of use cases and applications in 5G and beyond technologies? How can the domestic and foreign investors be encouraged to invest for funding the startups for these kinds of development activities?

This is an interesting and important question and I would divide the response into two parts- Funding and handholding start-ups
I will begin with funding and highlight that investor's primary motive is how to capitalize on emerging or potential opportunity. Instead of taking development route, there is a need to showcase the potential opportunity and this can be achieved by creating a market as explained in Answer 6A. Once there is a seed

market, investors (domestic and foreign) will be interested to invest in start-ups in this area. We also have to upgrade bank loans criteria and definition to ensure Industry 4.0 ideas qualify for Mudra loans , etc. Role of JCOR will be important to work across industry regulator for any revisions.
This is where accelerators or COE becomes important to help start-up with sandboxes, workspace, approvals for their first launch and enabling product-market fit.

Q.14.Whether there is a need to make changes in relevant laws to handle various issues, including liability regime and effective mechanism for redressal and compensation in case of accidents, damages, or malfunctions involving IoT, drones, or robotic systems. If yes, give detailed suggestions.

In principle the answer is Yes. There are important elements of ethics, liability and security which need to assesses as new technology solutions are rolled out.
Upcoming Judicial reforms is another opportunity through which legal amendments can be addressed. I would like to highlight that role of JCOR will be important.

Q.15.Is there a need to have a separate security mechanism for Multi-access Edge Computing (MEC)? If yes, please give your inputs and suggestions with regard to policies, rules, regulations and guidelines.

There are no comments for this section

Q.16.What are the policy measures required to create awareness and promote use of Metaverse, so that the citizens including those residing in rural and remote areas may benefit from the Metaverse use cases and services to create new economic activities and increase employment opportunities and thereby promote economic growth of the country?

Key elements for metaverse adoption are relevance of use cases and device affordability. India's per capita Net National Income (NNI) is ~$1000/INR 80K in 2023 and assuming 50% for rural area, it will be $500/INR40K.
Average price of Meta Oculus in India is ~INR 40K will be equal to net income in rural area. Adoption of new technology in western market is heavily driven by device subsidy by Telecom operators or partners along with pricing with is ~10% of net income even on the higher side. For example, one of the key reasons even for an expensive iPhone($1200) adoption is highly subsidized deals by operators and monthly financing options. However, these deals often come with lock-in features. India on the other hand is an open market for devices and the key adoption push is through attractive pricing strategy by device brands.
Metaverse devices are a pure luxury product in India and it is a long runway for economies of scale to make it an attractive proposition for rural India.
One way to create affordability can be partnership opportunities however given past experiences in India, these partnerships should not violate net-neutrality concept.

Relevant use case is another big factor for adoption. Given operators are still struggling to carve out 5G use cases for rural India, finding one for Metaverse is next level of challenge.
Education industry is one opportunity for metaverse looking at an exponential growth of virtual education industry. There are new age companies like Physicswalla, Byju, Akaash and other edtech companies which have created very effective virtual platforms. However, there is still no imminent business case for these platforms to scale up to Metaverse given the sheer volume and device affordability variables. Even universities like Stanford in US with billions of endowment funds are still in early stage of Metaverse experiment with investments from their side and yet to witness next scale. There has to be a strong business case for any university or govt entity to invest in Metaverse.
We also need to stay clear from past approach where government funds were used for distribution of free devices. There has been an instance in past where one state government distributed free laptops to school students in name of tech adoption but resulted in a net failure. There were issues around support, device quality and other challenges even after investing millions of dollars in the scheme.
There is a need for academia, universities, start-ups, operators and device owners to explore joint use cases and find those golden opportunities feasible at scale.

Q.17.Whether there is a need to develop a regulatory framework for the responsible development and use of Metaverse? If yes, kindly suggest how this framework will address the following issues:
i.How can users control their personal information and identity in the metaverse?
ii.How can users protect themselves from cyberattacks, harassment and manipulation in the metaverse?
iii.How can users trust the content and services they access in the metaverse?
iv.How can data privacy and security be ensured in the metaverse, especially when users may have multiple digital identities and avatars across different platforms and jurisdictions?
[4.66]

There are no comments for this section

Q.18.Whether there is a need to establish experimental campuses where startups, innovators, and researchers can collaborate and develop or demonstrate technological capabilities, innovative use cases, and operational models for Metaverse? How can the present CoEs be strengthened for this purpose? Justify your response with rationale and suitable best practices, if any.
[4.68]

As someone who has been part of Metaverse experiment at Stanford university, I would like to share my first hand experience of Metaverse in education context. It is definitely a level up over the virtual collaboration. However, it is most effective when Metaverse is adopted after 1-2 in-person meetings. It is still not there for breaking the ice if social interactions are initiated purely in Metaverse.

Even enterprise businesses are selectively experimenting with Metaverse and looking at low risk-high gain use cases for adopting XR. For example, knowledge and training, remote operations, digital twins are some of the areas where industry is showing interest. They are still taking a cautious approach to ensure all steps around data, privacy, regulatory and risk are fully understood and addressed before scaling the journey. Some enterprises like Walmart have started customer side use case however the results are a mixed bag. Metaverse, today is more like a prized trophy which everyone wants to showcase but not keen to adopt at a larger scale.
Industry needs to collaborate not only for convergence use cases but also work with other players in value chain for created an optimum, affordable, efficient and a financially viable solution.
There is a need to establish experimental campuses where startups, innovators, and researchers can collaborate and sharpen these base models.

Q.19.How can India play a leading role in metaverse standardization work being done by ITU? What mechanism should be evolved in India for making effective and significant contribution in Metaverse standardization? Kindly provide elaborate justifications in support of your response.

Given India is playing a leading role towards 6G planning, 5G standalone expansion along with new age technology adoption in various sectors, it can provide platform for players to launch experiments in the world of Metaverse.

Q.20.
(i) What should be the appropriate governance mechanism for the metaverse for balancing innovation, competition, diversity, and public interest? Kindly give your response with reasons along with global best practices.
(ii) Whether there is a need of a national level mechanism to coordinate development of Metaverse standards and guidelines? Kindly give your response with reasons along with global best practices.
[4.74]

Introducing any regulation or policy intervention often binds the innovation. It has been a roller coaster ride for Metaverse over 3 years. Post covid market boom in US witnessed huge wave in start-up world and Metaverse was one of the favorite themes in 2021 which resulted in even enterprises adopting pilot use cases. Market correction in 2022 tanked the investments in Metaverse. Even the key FAANG company Meta which was betting huge on Metaverse pivoted hard towards AI in 2022 and went through org. structural changes to re-align their metaverse roadmap. Apple launched VisionPro in 2023 however its adoption at a price point of $3599 is yet to see signs of success. Metaverse itself is witnessing new set of definition where augmented reality is being seen to deliver the experience on 2D devices. This will also help in creating more affordable devices and solutions.
These trends are being followed with a change in market cycle towards huge GenAI wave. Today, GenAI has high attention at a CxO level discussion even more than Cloud and Metaverse agenda has taken bit of a beating towards a lower priority.

Definition of Metaverse in 2023 and beyond is still evolving. There are new products like Humane.AI pin being launched which is a combination of MVNO +AI + Metaverse. Metaverse is also being experimented on 2D devices through Augmented Reality to create near-zone experiences.
My point is market forces are still trying to figure the product market fit of Metaverse for various industry use cases and it maybe too early for regulation to jump in with standards and guidelines.
While Europe has taken steps for expanding their GDPR and legal guidelines and bring some Metaverse guidelines (privacy, legal, data, etc), markets like US are still letting it evolve through market forces. Silicon valley is still not witnessing any pressure from regulators with a boundary of Metaverse rules.
There are base guidelines available in Indian context including recent data regulations law which provides indirect mechanism to control any abuse within Metaverse context. Given we don't have even 1% adoption of Metaverse, it is important that start-ups and academia figure India specific products and use cases before regulation observes any gaps and chime in with guidelines.

Q.21.Whether there is a need to establish a regulatory framework for content moderation in the metaverse, given the diversity of cultural norms and values, as well as the potential for harmful or illegal content such as hate speech, misinformation, cyberbullying, and child exploitation?

Ethics, misinformation and personal/data exploitation is a challenge for any new-age technology adoption. The rules in these areas may not be very different than what already exists for likes of social media, internet. For example, The US state of Utah recently enacted requirements for social networks to secure parental consent before any child account is created and to set curfews on child accounts, preventing access between 10:30 PM and 6:30 AM.
Some of the base guidelines for harmful content and activities such as hate speech, misinformation, cyberbullying, and child exploitation can be recommended for companies to be compliant as they evolve the product. There maybe specific issues for example, who is responsible party(user, operator, device brand, etc) in case of any crime given most of the entities like avatar, location and medium is largely virtual and tackling areas like crime jurisdictions etc maybe a challenge. Identifying crime jurisdictions is still a big challenge even today for a physical crime, these kinds of challenges maybe much bigger in Metaverse context.

Q.22.If answer to Q.21 is yes, please elaborate on the following:
i.What are the current policies and practices for content moderation on Metaverse platforms?
ii.What are the main challenges and gaps in content moderation in the Metaverse?
iii.What are the best practices and examples of effective content moderation in the Metaverse or other similar spaces?
iv.What are the key principles and values that should guide content moderation in the Metaverse?
v.How can stakeholders collaborate and coordinate on content moderation in the Metaverse?

[4.77]

Boundaries of Metaverse is still evolving including new elements of edge computing. Ownership and landing zones of data itself is fast evolving.
While fundamentally the answer is yes, Metaverse is still in a half baked state and it will be too early to publish content moderation guidelines.
Existing social media and internet guidelines are a good baseline to let Metaverse evolve to a maturity for further content moderation.

Q.23.Please suggest the modifications required in the existing legal framework with regard to:
i.Establishing mechanisms for identifying and registering IPRs in the metaverse.
ii.Creating a harmonized and balanced approach for protecting and enforcing IPRs in the metaverse, taking into account the interests of both creators and users of virtual goods and services.
iii.Ensuring interoperability and compatibility of IPRs across different virtual environments. Kindly give your response with reasons along with global best practices.
[4.80]

Most of the Metaverse capabilities are being created today with active partnerships. Platform players like Meta, Apple are investing and partnering with the eco-system to develop content, apps for various use cases- gaming, health, education, commercial, etc
IPRs are depending on individual partnership agreement depending on who invested for creation of IP and/or whether role of platform is mere hosting, customer ownerships, etc.
There are gaming products being run on platform which own the IPs and operate on revenue-sharing agreement whereas some apps are build on the platform where these platform own the IPRs and provide a % of revenue either upfront or staggered over time to the app owners. Products owning IPs often provide their services across platforms and runs in similar context like operating Whatsapp on iPhone or Android.

Legal framework should be largely valid given scenarios are standard product development. Any learnings based on future learning maybe added as observed.

Q.24.Please comment on any other related issue in promotion of the development, deployment and adoption of 5G use cases, 5G enabled IoT use cases and Metaverse use cases in India. Please support your answer with suitable examples and best practices in India and abroad in this regard.

Most of the data use cases in Bharat are run on Wi-Fi today and I would recommend not to strongly link Metaverse with 5G because of challenges with respect to dedicated speed(upload/download), battery time of hotspots to run data for these MV devices, etc.

Private wireless is an emerging opportunity for 5G IOT including network slicing which has scope for 5G enterprise use case adoption. Consumer 5G use cases still require compelling use cases other than free higher speeds.

Thank you for launching this collaboration exercise

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Disclaimer: Views expressed are my personal opinion