30th June 2022

Shri Asit Kadayan
Advisor (QoS)
Telecom Regulatory Authority of India
Mahanagar Doorsanchar Bhawan
Jawahar Lal Nehru Marg, (Old Minto Road)
New Delhi – 110002

Subject: **Consultation Paper on "Rating of Buildings or Areas for Digital Connectivity".**

Dear Sir,

This is in reference to the Consultation Paper dated 25th March 2022 on "**Rating of Buildings or Areas for Digital Connectivity**".

In this regard, we, Tata Teleservices Limited (TTSL) and Tata Teleservices (Maharashtra) Limited [together called "**TTL**"] hereby enclose our response to the questions raised in your above-mentioned Consultation Paper. We hope our response will be given due consideration.

Thanking you and assuring you of our best attention always.

Yours sincerely,

Satya Yadav
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At the outset, Tata Teleservices Limited and Tata Teleservices (Maharashtra) Limited [together called "**TTL**'] express our sincere gratitude to Telecom Regulatory Authority of India (TRAI) for releasing the "Rating of Buildings or Areas for Digital Connectivity" and calling for stake holders' comments.

We, TTL would like to submit our response to the issues and concerns as mentioned in the Consultation Paper is as follows:

Q.1. How can an ecosystem be created to design, deploy and evaluate DCI with good connectivity in a cohesive and timely manner? What would be the typical role and responsibilities of actors of the ecosystem? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Digital Connectivity technologies powered by Telecommunication systems is ever evolving area of technology. Wireless and wired connectivity advances in terms of speed as well as applications. The eco-system should be able to understand the growing needs of connectivity to support digital applications of telecommunication as well as broadcasting. This need experts in these areas to be part of the eco-system to study, define and review the system requirements which should go into the Building By Laws. A central authority from DoT can guide MoHUA in creating mandatory guidelines for different types of buildings and reviewing them on a regular basis.

The eco-system need should have authorized evaluators, who are certified DCI experts, who are trained and possess necessary tools to evaluate the DCI capabilities.

Data collection and monitoring systems also should be developed and installed, with AI/ML based analytics system to assess DCI capabilities of buildings.

Property Managers should be made aware of the requirements and should be made responsible to maintain the minimum DCI qualifications, which should be evaluated every few years.

DCI evaluation shall be done in a stipulated time period, which can be a subjective and objective based evaluation.

Q.2. How would the ecosystem proposed in response to Question no.1 ensure that created infrastructure does not get monopolized? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Monopolizing of the infrastructure will benefit one TSP or a service provider in exclusion of other TSPs or service providers who need DCI to deliver their services. This could happen due to Property

Manager providing exclusive rights to an IP provider or TSP to manage the DCI of the building. Higher cost or differential cost of access for different TSPs will also lead to monopoly.

Regulation creating an upper limit for DCI infrastructure like IBD, campus wiring, should be released and property managers should be held responsible for adhering to the regulations.

To clarify further that telecom services are essential services, the property manager should maintain transparency to provide access to TSPs in a non-discriminatory manner.

Q.3. How would the ecosystem proposed in response to Question no.1 enable DCI Designers to factor in the digital connectivity requirements of the existing and/or prospective users of the network? How can such requirements be gathered at the stage of construction of a new building or at the time of upgradation or expansion in case of pre-existing DCI? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The requirement per type of building in terms f Wired and wireless connectivity shall be defined by the guidelines. Designers of the DCI shall be guided by these guidelines, which can be about reach of fiber within building, within rooms, Wi-Fi Hotspots and Mobile coverage within building premises.

Q.4. How would the ecosystem proposed in response to Question no.1 enable DCI Evaluators to get requisite information to evaluate and ensure that the designed or deployed network would meet the requirements of end users? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The data collection sensors or devices may be used to check the quality of wireless network within building. The test reports of the wired connectivity in terms of signal strength should be captured in every fiber or LAN 6 cables used within the premises at the time of construction. Evaluators should validate the reports for building clearances. There should be a grievance tracking mechanism for users to register complaints about the DCI quality.

Q.5. How would the ecosystem proposed in response to Question no.1 ensure that upgrades and expansion of the DCI are done from time to time and continue to meet rising demands? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Post Building handover evaluation carried out on a regular time period as decided by the regulatory guideline shall enable upgrades and expansions if the user requirements are not getting met. As

the upgrades and expansions require capex, the decision may be left to the building's management authority.

Q.6. How would the ecosystem proposed in response to Question no.1 ensure that the TSPs' networks are planned, designed, deployed, and upgraded to serve the DCI requirements in a timely manner? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The TSPs shall be guided by minimum QoS regulations made by Telecom regulator, which will also include the quality of Mobile connectivity inside the building. The Sensors or mobile quality sensors installed inside the premises shall be used to monitor the quality of Wireless network. The data collected from mobile handsets of voluntary users also can be analyzed using AI/ML systems to evaluate the quality of TSP's Network.

Q.7. How can an ecosystem be created to build capacity requirements of skilled professionals such as DCI Designers, DCI Engineers, DCI Evaluators? What would be the typical role and responsibilities of actors of the ecosystem? Please justify your response with rationale and suitable examples, if any.

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Q.8. How would the ecosystem proposed in response to Question no.7 ensure that relevant training courses are available in the country? Please justify your response with rationale and suitable examples, if any.

TTL Response:

DCI purpose is to provide seamless connectivity for Telecom and Broadcast services in the building considering it as an essential requirement like water supply and electricity. The requirements will vary from building to building. For example, for a High rise (30+ floor) business building availability of Wi-Fi or mobility could be a requirement in the elevators, whereas it may not be essential requirement in low rise residential complex.

We also would like to submit here that there are several DCI training and certification courses in the telecom domain. The present training infrastructure available in the telecom sector may be utilized to offer such courses. TEC may also take up certification of products related to inbuilding solutions.

Hence, the certifications giving emphasis on the guidelines for different types of buildings technologies that can be used, system integration guidelines including safety and aesthetic aspects, should be evolved.

These guidelines should be made part of curriculum of Civil and architecture engineering, The certification course including should be created and should be made part of private and public technical institutions to build.

Q.9. Whether the training courses proposed in response to Question no. 8 are already being offered by any organization or institution that can be recognized for the purpose? If yes, please provide a list of organizations offering such courses. If not, how specialized courses can be designed to meet the requirements? Please justify your response with rationale and suitable examples, if any.

TTL Response:

We would like to comment here that, in telecom domain, there are already training, and certification courses are available to plan, design and deploy DCI. Mentioned below are some of such courses offered by various organizations.

- Certified IP Telecom Network Specialist (CIPTS) offered by Telecommunications Certification Organization (TCO).
- International Association for Radio, Telecommunications, and Electromagnetics (iNARTE) offers certification program includes the Telecommunications Technician and Telecommunications Engineer credentials.
- Master Technician Certification offered by NCTI.
- The Registered Communications Distribution Designer (RCDD) certification offered by Building Industry Consulting Service International (BICSI).
- The WIRED certification offered by Wired Score.
- Certified Network Infrastructure Technician (CNIT) offered by CNET.
- There should be a specific Certification course and not a degree program. Certification course should be voluntary and not mandatory.

Q.10. Is there a need to establish a council on the lines of "Council of Architecture" (CoA) to regulate minimum qualifications, additional specialized courses and practice of DCI profession in the country? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Guidelines and certifications will help in ensuring quality and minimum standards for the DCI implementation. The certified professionals will be able to provide relevant and timely guidance to the property managers in accordance with the regulatory changes, if any.

Q.11. Whether the requirements of additional specialized courses and practices of profession would vary depending upon the size of work or kind of work involved in a particular DCI project? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The work involved in DCI can be broadly categorized into Wireless and wired, Passive and Active elements, Applications and performance monitoring and analysis. Each of these categories requires specialized training and skills to deliver service. The size of the project will also vary from nature of the building and user requirements. Complicated and large projects may require multiple technologies, and training courses should enable the DCI professional to work on any project. Different levels of expertise should be built into the training courses.

Q.12. Whether creation of a digital platform to hire services of professionals would help Property Managers in creation of DCI? Should there be a feedback mechanism to assess quality of services delivered by professionals? Please justify your response with rationale and suitable examples, if any.

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Q.13. Whether creation of a digital platform for procurement of certified products would help Property Managers in creation of DCI? How would the certified products for the purpose of DCI be identified and updated on the platform? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Creation of digital platforms as marketplace for services will help property managers for widen their source of Services, and hence will help them to get quality service providers and provide larger platforms for DCI professionals too.

Certifying the products will ensure the quality of the network and service support for future. A Web platform which provides information about the products will help bridge property managers as well as the product vendors, and improve quality as well provide opportunity to vendors across geography. Procurement can be a additional feature on this platform, but may not be used because the implementation includes delivery of products as well as system integration.

Availability of certified products in the public domain will enable network designers to consider them when designing solutions and procuring such products. Hence this should be encouraged.

Q.14. What may be the possible models of DCI ownership and its upkeep? Whether co-ownership models would help in aligning incentives in realizing connectivity that would meet expectations of the end users from time to time? Should there be a need to specify terms and conditions for

entities owning and responsible for upkeep of DCI to function in a fair, transparent and non-discriminatory manner? Please justify your response with rationale and suitable examples, if any.

TTL Response:

DCI ownership may be given to the end user, like the Resident's Organization who understand the requirement and can take decisions on managing and enhancing network as per the requirements of users.

Q.15. As one solution might not be suitable for all types of buildings, whether current requirements stipulated in the National Building Code of India, 2016 would be required to be evolved and prescribed ab initio to make it more appropriate for DCI requirements? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The National Building Code of India, 2016 has provided broad level guidelines for creating Common Telecom Infrastructure. Detailed guidelines will be required to be created to meet the technical design, deployment and performance tracking and correction methodologies and procedures need to be added. The same is required to ensure quality of deployment as well as scalability to meet specific requirements of each type of building.

Q.16. Whether NBC needs to prescribe a separate classification of buildings for the purpose of DCI? If yes, which factors should be considered to make such a classification? If not, how to accommodate DCI specific requirements in the existing classification of buildings by the NBC? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Classification of buildings given by NBC in Annexure VI covers all the possible classifications. DCI specific requirements may be accommodated in terms of availability of RoW to the building for fiber connectivity.

NBC may be required to come up with more detailed guidelines on digital connectivity infrastructure that employs wireline and wireless systems that can meet the desired coverage and capacity. This will require referring to the specific standards for telecom and ICT as well as Best Current Practices (BCPs).

Standards for DCI should be open and ready to accommodate futuristic standards evolving from time to time. Such standards will be required to be made applicable to special areas and organizations like Railways, Defence estates, Cantonment areas etc.

Q.17. Whether there is a need to include DCI Professionals as Persons on Record as typically done in building bye laws or development regulations? Or registration with the Council proposed in Question no. 10 would suffice to practice profession across the country as followed in the case of Architects? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Registration with the Council proposed in Question no.10 shall be sufficient. Architect of the project shall be the persons on Record for the entire project.

However, professionals referred in NBC for telecom or ICT planning and installations are only Electrical Engineers, with the competency in LV (Low Voltage) systems. They are not experts in telecom or ICT.

Q.18. How can the clearances or approvals required for DCI at various stages of construction of building may be incorporated in building bye laws? In typical building bye laws, there are provisions for getting clearances from central government, for e.g., in case of Civil Aviation, Defence and Telecom being a central subject, what role can be played by the central government in giving such clearances or granting such approvals? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Different milestones can be made for DCI implementation.

(i) Centralized fiber termination and connectivity to designated floor and rooms.
(ii) Access to TSP's.
(iii) Provision for Power and space for TSP's.
(iv) Digital monitoring systems.
(v) Provisions for Active elements like Wi-fi Access Points and in building Booster for Mobile etc.

Central Government can support for faster SACFA clearance for Towers if required to be installed in the building premises as part of DCI readiness.

TRAI and DoT should also play an active role in getting incorporated in building bye laws, the clearances or approvals required for DCI at various stages of construction of building. TRAI and DoT should play an active role in getting clearances from central government e.g., in case of civil aviation, defence and telecom being a central subject etc.

Q.19. Is there a need to introduce a special class of Infrastructure Providers to create, operate and maintain DCI for a building or cluster of buildings in ownership models suggested in response to Question No. 14? What should be the terms and conditions for such special Infrastructure

Providers? Should such terms and conditions vary depending upon type, size and usage of buildings? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The certified professionals or organizations should be allowed to create, Operate and maintain the DCI, as per the selection by the owner of the DCI following due processes of vendor selection. Certified Design Professionals should be part of the vendor selection panel to guide the owner in selecting the vendor.

Q.20. What are the initiatives or practices being taken in other jurisdictions outside India with regard to rating of buildings from a DCI perspective? Please share details and suggest how similar processes can be created in India?

TTL Response:

Rating of buildings from DCI perspective is done by WiredScore and is presently present in North America, Europe, and Australia. These initiatives are private in nature. The practices may be studied and adopted to suit India's requirements.

Q.21. Is there a need to introduce Rating of buildings from the perspective of DCI that may help in nudging the Property Managers to strive for collaboration with other stakeholders to meet the digital connectivity expectations of the users of the building? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Digital connectivity Infrastructure will become essential requirement of any building. Hence the user needs to know the DCI capability of the building before choosing to buy or rent in the building, Rating of buildings will help nudge the Property Managers to strive to collaborate and create DCI infrastructure to meet user requirements.

Q.22. In case, rating is introduced as a voluntary scheme, is there a need to monitor the progress? If progress is not satisfactory, would there be a need to launch campaigns and awareness drive to encourage Property Managers to come forward for rating? Please justify your response with rationale and suitable examples, if any.

TTL Response:

If rating is implemented, it should be monitored as it can be one of the parameters which a user will consider in his decision to buy or rent a premise. Awareness campaigns will inform the users about the concept of DCI rating, thus can influence the buying decisions and thus market demand will nudge more and more Property Managers to adopt rating, as per the demand.

There are various benefits that can be foreseen by introducing the rating system:

Benefits to Property Managers: Good connectivity would most likely result in increasing the value of the property including rental value as it increases productivity, improves satisfaction, and boosts commercial activity making the property more attractive.

Benefits to the end-users: Real estate buyers and tenants looking for high quality digital infrastructure would be able to make informed choices and thereby put pressure on builders and property managers to build and maintain good quality digital infrastructure.

Benefits to TSPs: In order to get good ratings, property managers would offer support to TSPs to put infrastructure or get it deployed to ensure good quality digital connectivity and make the property attractive.

Q.23. Should the voluntary scheme of rating be extended to cover cities, towns and villages and even states? Would such a scheme help in encouraging local and state authorities to facilitate TSPs in creation or in improving outdoor as well as indoor DCI? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Rating of local areas for the support given to manage and operate the DCI can trigger discussions with TSPs to understand the needs of TSPs and respective local bodies will be able to support TSPs in operating their network. This will also help make local body administrations to understand the criticality of DCI, especially the Fiber network and usage of Steet Furniture's which are required used for 5G Networks.

Q.24. If in response to the Question No. 23 answer is yes then what framework should be introduced to rate cities, towns, villages and states, and how weightages can be assigned to different aspects of indoor and outdoor connectivity? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Ratings can be given on Time to clear the RoW, Ease of getting approvals, Availability of common ducts and Street furniture for 5G.

Q.25. Is there a need to make rating a mandatory requirement for specific classes of buildings such as public transport hubs, government buildings or any building of public importance etc.? If yes, which type of buildings should be covered under this category? Please justify your response with rationale and suitable examples, if any.

TTL Response:

With more and more services going to ride on Digital transactions, public spots need to have good Digital Communication infrastructure to support services. The rating criteria need to be defined for such buildings which may be different from another class of buildings like residential buildings. These buildings which support public services should be part of this class. Mobile connectivity with high density of users, good fiber access to ensure very high uptime for connecting government offices etc. can be some of the parameters for rating of this class of buildings.

Q.26. What should be the time plan to rate buildings falling under the mandatory category and is there a need to prioritize some buildings within the mandatory category to make it more effective? Whether existing buildings falling under such classes are required to be dealt differently? Please justify your response with rationale and suitable examples, if any.

TTL Response:

A sandbox approach developing and improvising and finalizing the rating methodology need to be finalized, based on which time plan can be created.

Q.27. Is there a need to designate a nodal official for building(s) falling under the mandatory category to comply with the rating related requirements? What actions are proposed to be taken in case of non-compliance? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Compliance for buildings under mandatory category should be tracked. Ratings shall be updated to reflect the DCI quality and shall be reported to the respective ministries in the case of Governmental buildings.

Q.28. Is there a need to amend legal provisions under various laws, bye laws dealing with development of land and buildings or areas including forest areas, cantonment areas, port areas, panchayat areas, municipal areas etc. to facilitate creation of DCI and ratings of the buildings or areas? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Laws which are impacting Right of Way should be amended to make it zero cost to the TSP's.

Further, there is there a need to amend legal provisions under various laws, bye laws dealing with development of land and buildings or areas including forest areas, cantonment areas, port areas, panchayat areas, municipal areas etc. to facilitate creation of DCI and ratings of the buildings or areas.

Q.29. In case a voluntary scheme for rating is to be introduced or rating is notified as mandatory for specific classes of buildings then what should be the role of TRAI or DoT? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The TRAI and DoT to play an active role and can provide guidelines for every class of building in terms of design, implementation and performance monitoring and update the same as per emerging technologies.

Q.30. Whether creation of "Regulatory Sandbox'' to carry out experiments or demonstrate capabilities of innovative solutions to improve digital connectivity would be helpful to make changes in existing policies, laws or regulations? What should be the terms and conditions to establish a regulatory sandbox? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Creating a "Regulatory Sandbox" to carry out demonstration capabilities of innovative solutions to improve digital connectivity will be useful to make new policies, methodology and test them to create a framework for DCI rating. Regulatory framework may study the wired and wireless requirements of different classes of building to meet quality of experience for various digital applications and requirements of user groups to arrive at appropriate rating framework.

Q.31. Is there a need to establish a Certificate Issuing Authority to award ratings to buildings from DCI perspective? If yes, what should be the structure of such an authority? If not, who can be assigned the role to perform this function? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Establishing a Certificate Issuing Authority will help to evaluate buildings under the same standard. Certificate Issuing Authority will need to have Certified Professionals.

Appellate Authority - There may be instances of disagreement of the Property Manager with the rating assigned to his building based on the measurement and the evaluation done. There is need for the provisions where the property manager can appeal against the decision of the Certificate Issuing authority, for review and reconsideration. Hence there may be a need to have Appellate Authority

Q.32. Whether the authority suggested in response to Question no. 31 may use reports from DCI evaluators to award ratings? To ensure reliability of reports from DCI Evaluators, should

Certificate Issuing Authority need to conduct periodic audits of DCI evaluators? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Certificate Issuing Authority will need to have Certified Professionals who can evaluate the reports from DCI Evaluators. Issuing Authority also may conduct periodic audits of DCI Evaluation. Users or residents of the DCI facilities should also be given opportunity to report any degradation in services to Certificate Issuing Authority, post exhausting options to resolve the problem with Property Manager or Administrative controller of the building.

Q.33. What should be the terms and conditions for using ratings awarded to a building(s) from a DCI perspective? What should be the validity period of awarded ratings? Do you envisage any situations under which an awardee of ratings might be required to get the ratings renewed before the validity period? Please justify your response with rationale and suitable examples, if any.

TTL Response:

If there is change in external or internal infrastructure in the DCI, like backup fiber path, or new Wi-Fi Hotspots, which enhances the service quality, the awardee should be allowed to request to renew ratings.

Rating can bring value addition to the concerned building and can be used to draw attention of all stakeholders especially end users.

Q.34. Whether in the initial stages of introduction of the rating system, validity should be for a shorter time period, and later it may be increased over time as evaluation system matures? Should the validity period be dependent on the type of buildings? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The rating period can be fixed at optimal number of years looking into aspects of amount efforts required to evaluate old and new buildings. The number of years can be decided post sandbox testing, Validity period can be defined depending on the class of building; building with commercial and industrial or providing public services requiring Digital connectivity, may have a shorter validity period.

Q.35. Whether the process of renewal of rating should be the same as the process defined to get rated first time or it may be incremental? Or renewal process may be dependent upon the grounds on which it is being renewed, e.g. expiry of validity period, introduction of new

technology, introduction of new spectrum band(s), introduction of new services(s) etc.? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The renewal process should validate the capabilities of existing services. If by virtue of regular performance monitoring, existing services can be validated for quality, the same can be taken as the evidence for validation of existing DCI capability.

Introduction of new technology, introduction of new spectrum bands, new services also can be the basis for renewal of the rating.

Q.36. Whether the provisions to make an appeal should be introduced to give an opportunity to the applicant to make representation against the decisions of the Certificate Issuing Authority? What should be the time frame for preferring the appeal in case of disagreement with the rating assigned and its disposal? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Provision to make an appeal should be introduced, to give an opportunity to the applicant to make decisions of the Certificate Authority. The time frame for preferring in case of disagreement with the rating assigned and its disposal can be arrived based on the experience of time taken to do a Certification process and should be less than the same, as the appeal could be only about certain parameters of rating. In this regard, an objective methodology of rating with specific marks for various parameters, can help in avoiding disputes.

Q.37. If somebody is found to be using ratings in an unauthorized manner, what legal actions are proposed to be taken against such entities? Please justify your response with rationale and suitable examples, if any

TTL Response:

The Regulatory Authority may incorporate penal provisions in the Regulations/policies which can be monetary in nature or other actions could also be considered like blacklisting the developer. This would discourage the property managers from any such malpractices.

Q.38. Whether creation of a digital platform that allows stakeholders to co-design and co-create DCI would be helpful to realise better, faster and cheaper solutions? Whether technologies and tools such as AI, ML would be helpful in achieving this objective? Please justify your response with rationale and suitable examples, if any.

TTL Response:

AI/ML tools may be deployed in public spots to evaluate the service quality and improve upon the same if required. Co-design and co-creation by stakeholders can be supported by having a digital platform to track resources in the public space can help co-design and co-creation of DCI by stakeholders, by dissemination of information to stakeholders in a transparent manner.

Q.39. What should be the typical process to rate a building? Whether terminologies and steps involved in the rating process need to be standardized? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The Property manager shall request for ratings through the competent authority of DCI Evaluator, by responding to the rating criteria.

Application shall be evaluated and inspected for the DCI infrastructure, basis which rating certificate may be given.

Rating of a building may be looked from different aspects like and not limited to -

(i) Fiber access to the building with its redundancy.
(ii) Provision to connect multiple TSP's.
(iii) Provision to extend fiber to common space and individual floor, rooms etc.
(iv) Provisions of Wi-Fi Access.
(v) Provisions for Power, space, power backup for common space etc.
(vi) Access to the building for TSP.
(vii) Provision for Mobile Network Tower.
(viii) Quality of equipment used. (Certified or not certified equipment).
(ix) Coverage in elevator and corridors and common space.

Q.40. Whether the process of rating would vary based on the types of buildings? If yes, then what factors or aspects of a building would matter or impact the outcome of rating? Please justify your response with rationale and suitable examples, if any.

TTL Response:

The service and user requirement will vary between classes of building. The buildings for public meetings will have different requirement (good mobile overage and Wi-Fi coverage in a hall) from a residential building (Broadband mainly and Mobile coverage within home). Hence the rating weightage points for different aspects of DCI should be different for different classes of buildings. This needs larger discussions.

Q.41. Which objective methods should be used to evaluate the DCI? How can various aspects of performance to evaluate the quality can be combined together? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Parameters in the response to Question no.39, but not limited to them may be considered to evaluate DCI. Basic requirement like access to fiber, equal availability of IBD and access fiber to all TSPs equally, should be given highest weightage. Other parameters may be given lower weightage depending upon the criticality of those parameter for the services to the users in the building.

Q.42. Which subjective methods should be used to evaluate perceived quality of DCI? Whether survey techniques can be improved considering penetration of smartphones? Whether improved techniques can help in providing insights and actionable items to improve DCI? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Users may be given a portal to give provide their feedback using a GPS enabled app, which can capture the service quality of Mobile Network as well as common Wi-Fi Access Network, speed of Internet from the spot of problem and report online.

Q.43. Would combining the parametric values or results of objective and subjective methods be helpful in assessing digital connectivity that is closer to the perceived quality of experience? Please justify your response with rationale and suitable examples, if any.

TTL Response:

Specific objective parameters like packet drops can be identified with customer co-operation who may use Mobile apps to capture and send performance data. Alternately keeping sensors for sending dummy traffic for performing service quality testing can help in capturing the datapoints in regular interval. However, it will be difficult to capture QoE for various applications like streaming, data transfers, video calls etc. without appropriate solutions for capturing the same.

Q.44. How advanced technologies such as Artificial Intelligence (AI), Machine Learning (ML) etc. might be useful to make the evaluation process more nuanced and suitable for the purpose? How can AI/ML models evolve from the inputs of measurement and evaluation being carried out in other parts of the city, state or Country? Please justify your response with rationale and suitable examples, if any.

TTL Response:

AI/ML based applications can be used to run analytics on data collected from multiple performance monitoring sensors or performance monitoring app on user's mobile. By mapping the customer's mobile GPS position, building, Fiber access Network, TSPs etc. and other service parameters like IP Address rich data can be collected and analysed to initiate improvement activities.

Q.45. Any other issue which is relevant to this subject? Please justify your response with rationale and suitable examples, if any.

TTL Response:

No comments.