Dear Sir,

Thanks for your initiatives on following consulting issues. I would like to bring to your notice following points for improving the QoS and growth of Internet in India. The growth of Internet traffic and Internet services in India depends on multiple factors: (a) rise in the number of users, (b) the development of communication technology, (c) the development of infrastructure and devices not only in urban zone but also in rural India, (d) business model innovation and (e) increasing knowledge, skill, education and trust of the users – how to use internet rationally and intelligently for more benefits. Another critical point is the access control mechanism of Internet technology : can satellite communication replace mobile and wired communication schema in future to access Internet!

Issues for consultation

Q.1 How should \Internet traffic" and providers of \Internet services" be understood in the NN context?
(a) Should certain types of specialised services, enterprise solutions, Internet of Things, etc be excluded from its scope? How should such terms be defined?
(b) How should services provided by content delivery networks and direct interconnection arrangements be treated?
Please provide reasons.

(a) The scope of Net neutrality is a broad domain. It is essential to classify Internet traffic and Internet services into various categories based on analytical and logical reasoning (a) Corporate information system (e.g. e-commerce, m-commerce, e-business, internet phones; e-entertainment : internet TV, e-music, e-films, e-sports); (b) Enterprise solutions (e.g. Decision support system [DSS], Transaction Processing System [TPS], ERP [Enterprise Resource Planning], SCM [Supply Chain Management], BI [Business Intelligence system] and KMS [Knowledge Management System], (c) Corporate Governance System [E-governance, Defense, SCADA, E-voting], (d) IoT for smart cities and smart villages (e.g. Transportation Management System [TMS], climate monitoring system, e-agriculture, environmental pollution control system, disaster management system) and (e) emergency services. The basic building block of this classification is a multi-dimensional parameter which includes objectives, constraints, application domain; computing, networking, data, security, application schema, EAI, user's rights, content, devices to be connected and malicious practices. Different types of regulatory practices like traffic management, business strategies, operations management (e.g. quality of service), revenue and profit management may be applicable to different categories of internet services.
(b) In fact, the QoS of Internet services is associated with data schema (e.g. data storage space), networking schema (network speed, continuity of service, IaaS), application schema (e.g. SaaS, PaaS) and security schema. It can be explored through intelligent threat analytics. The pricing function of internet services may be defined and computed accordingly with fairness, correctness and accountability. Let us consider test case 1. There is risk of fake news broadcast and false data injection attack from content delivery networks such as news portal / media. It is basically data corruption. On the other side, there is risk of denial of services from web mail applications. A sender sends e-mail from his account to a recipient. The e-mail is not delivered actually. It may be due to the technical faults of web mail system or due to the interference of the system administrator. Even today, internet accessed through mobile phones often face various threats such as 'connection failed', 'website not found', 'time out', slow speed etc. It is not possible for the users to identify the real causes of quality problems – infrastructure, technical faults, malicious business intelligence, demand-supply gap…..

Q.2 In the Indian context, which of the following regulatory approaches would be preferable:
(a) Defining what constitutes reasonable TMPs (the broad approach), or
(b) Identifying a negative list of non reasonable TMPs (the narrow approach).

A rational traffic management approach is expected to address several critical factors: regulatory compliance, network traffic congestion, demand-supply gap, risk of coremelt attacks, network security in terms of availability, integrity, confidentiality (i.e. encrypted traffic), access control and privacy. In fact, the definition of broad and narrow approach is not very transparent from the perspectives of business

intelligence. A broad approach is expected to be adopted for the basic scope of net neutrality to address network management in an efficient and flexible manner maintaining a specific standard of quality of service. But, specialized internet services should demand a discriminatory and profitable incentive based traffic management approach (though it may be called narrow!). However, unhealthy competitive intelligence is a serious concern of many service providers for sustainable business operations.

Q.3 If a broad regulatory approach, as suggested in Q2, is to be followed:
(a) What should be regarded as reasonable TMPs?
(b) Whether and how should different categories of traffic be objectively defined from a technical point of view for this purpose?
(c) Should application-specific discrimination within a category of traffic be viewed more strictly than discrimination between categories?
(d) How should preferential treatment of particular content, activated by a users choice and without any arrangement between a TSP and content provider, be treated?

It is rational to adopt application specific discrimination approach. Broad approach may be adopted for the following categories of traffic.
Broad approach : (a) Enterprise solutions (DSS, TPS, ERP, SCM, BI and KMS (b) Corporate Governance System [E-governance, Defense, SCADA, E-voting], (c) IoT for smart villages (e.g. climate monitoring system, agriculture, environmental pollution control system, disaster management system) and (d) emergency services.

Q.4 If a narrow approach, as suggested in Q2, is to be followed what should be regarded as non reasonable TMPs?

Narrow approach: (a) E-business (e.g. e-commerce, m-commerce, internet phones); Entertainment (e-music, e-films, e-sports, internet TV), (b) IoT for smart cities (e.g. Transportation Management System). It is essential to validate : Telecom service providers should not be allowed to price different kinds of internet services differently thereby segmenting the Internet. Any differential pricing for a priority set of services that are deemed to be in public interest such as emergency services, own maintenance, billing, Wi-Fi hotspots should be offered only on the basis of explicit directives and approval of the regulation. Transparent business models are expected that don't segment the Internet. But, Internet world is already segmented based on free and paid services. There are different types of plans provided by the service providers based on bandwidth, data speed, 3G or 4G services, downloadable data size etc.

Q.5 Should the following be treated as exceptions to any regulation on TMPs?
(a) Emergency situations and services;
(b) Restrictions on unlawful content;
(c) Maintaining security and integrity of the network;
(d) Services that may be notified in public interest by the Government/ Authority, based on certain criteria; or
(e) Any other services.
Please elaborate.

It is required to define the domains of emergency services, lawful content and any other specialized services to maintain security and integrity of Internet constrained by freedom of expression. Exemptions may be required for emergency services such as prioritization in traffic management (analogy: ambulances are always given top priority in transportation traffic management system). Blocking and throttling are essential to counter terrorist's attacks or cyber warfare or hacking by enemies. These issues are discussed in answering question 7.

Q.6 What could be the principles for ensuring nondiscriminatory access to content on the Internet, in the Indian context?

The concept of non-discriminatory unrestricted access is vague. Many poor internet users (e.g. students, researchers) are not getting the access to high quality digital content in the academic world. So, their democracy is limited in present online world. For example, in academic and research community the websites of Sciencedirect, IEEE and ACM are not free; the users have to pay online to download desired full text article or they have to pay annual subscription fee. It is not applicable for the academic communities of branded technical and management institutes. The general online users can read only the title, abstract and keywords of a research paper at free of cost.

Another critical issue is how much of the internet the online community gets to use. That is the range of access: whether it is limited or unlimited! In unlimited access world, the online users roam helplessly without any guidelines; they face difficulties in searching paid and unpaid services. A service consumer must be able to choose a set of specific application domains subject to his or her needs, objectives and constraints. The basic service may include online retailing services through e-commerce sites for IT skilled workforce of urban zone. A farmer needs the data on agriculture process and practice, pricing of crops and weather forecast. He may not need the access to the website of academic scientific journals in computer science. Should the school kids be allowed to visit adult sites? In every society, there are certain services that are so important for the well being of the people that we expect everyone to be able to access freely. The biggest barriers to connecting the people are affordability and awareness of the Internet. Many people cannot afford to start using the Internet. And even they could, they don't necessarily know how it can change their life.

Q.7 How should the following practices be defined and what are the tests, thresholds and technical tools that can be adopted to detect their deployment

(a) Blocking;

(b) Throttling (for example, how can it be established that a particular application is being throttled?);

(c) Preferential treatment (for example, how can it be established that preferential treatment is being provided to a particular application?)

Some applications such as online examination and digital libraries needs restriction on blocking, throttling and prioritization. It is also not applicable for the basic services (e.g. education, healthcare, communication, jobs, women's rights, social security, farming, food, clothing, home, energy, utility, culture). Exemptions may be required for emergency services such as prioritization in traffic management. Blocking and throttling are essential to counter terrorist's attacks or cyber warfare or hacking by enemies.

Internet services may face different types of vulnerabilities such as hacking, virus attack, cross site scripting, injection flaws, malicious file execution, insecure data object reference, cross site request forgery, information leakage, improper error handling, broken authentication, session hijack, insecure cryptographic storage, insecure communication and failure to restrict URL access.

How much the online community use the internet: it is the interest of internet service providers since it maximizes the revenue of telecom service providers. It is not the interest of the internet service providers whether the online community is involved in watching horror flims, chatting and gossiping or just entertainment. A child may watch adult site or violence site or video games hours after hours Telecom operators may not care of these ethical issues. An entity whether it is public or private must be responsible to decide what the kids can read or watch. The ultimate objective of Internet should not be information overloading of the online community to maximize revenue and profit of the service providers.

Q.8 The quality of Internet experienced by a user may also be impacted by factors such as the type of device, browser, operating system being used. How should these aspects be considered in the NN context? Please explain with reasons.

The quality of Internet experience depends on various factors : technology, type of devices, browser, operating system and financial constraints of the users. All the users may not be so educated, skilled, knowledgeable, sophisticated and rich to enjoy high quality of Internet services. It is essential to maintain the minimum standards.

Q9 Which of the following models of transparency would be preferred in the Indian context:
(a) Disclosures provided directly by a TSP to its consumers;
(b) Disclosures to the regulator;
(c) Disclosures to the general public; or
(d) A combination of the above.
Please provide reasons. What should be the mode, trigger and frequency to publish such information?

The models of transparency may be applicable to options (a), (b) and (c) to avoid conflicts of interests the service consumers and service providers on periodic basis and during any change. Where is the transparency in pricing of Internet services? It is basically a shadow pricing. We don't know whether the web mail service is really free or the hidden service charge is computed at the back end with zero knowledge proof.

Q.10 Please provide comments or suggestions on the Information Disclosure Template at Table 5.1? Should this vary for each category of stakeholders identified above? Please provide reasons for any suggested changes.

It looks enough. How to verify the authenticity, correctness and fairness of published data?

Q.11 What would be the most effective legal/policy instrument for implementing a NN framework in India?
(a) Which body should be responsible for monitoring and supervision?
(b) What actions should such body be empowered to take in case of any detected violation?
(c) If the Authority opts for QoS regulation on this subject, what should be the scope of such regulations?

(a) TRAI having net neutrality cell;
(b) Regulatory compliance actions;
(c) Business practices, user's rights, data content, technology schema, payment function, contractual clauses.

Q.12 What could be the challenges in monitoring for violations of any NN framework? Please comment on the following or any other suggested mechanisms that may be used for such monitoring:
(a) Disclosures and information from TSPs;
(b) Collection of information from users (complaints, user-experience apps, surveys, questionnaires); or
(c) Collection of information from third parties and public domain (re-search studies, news articles, consumer advocacy reports).

It is possible to monitor violations in net neutrality through an intelligent feedback management system. Feedback may be collected from the service consumers, service providers, consulting firms, research organizations through online surveys, research papers, news articles and reports. It is essential to verify the authenticity of collected information, fairness, correctness and rationality.

Q.13 Can we consider adopting a collaborative mechanism, with representation from TSPs, content providers, consumer groups and other stakeholders, for managing the operational aspects of any NN framework?
(a) What should be its design and functions?

(b) What role should the Authority play in its functioning?

(a) Forum : Multiparty negotiation through effective collaboration seeks dynamic and responsible participation from various stakeholders : service provider, service consumers, content providers, ministry of IT, electronics and telecommunication, experts from technical, legal and management institutes : Electronics & Telecommunication engineering, Management Information Systems, Public policy, cyber laws, Economics and Social science. Can we think of a quality forum like supply chain council or VICS CPFR?
(b) Role: consulting, research, event management (e.g. workshop, seminars, conferences), policy making, implementation, audit, system monitoring and control, coordination and interaction with corporate governance.

Q.14 What mechanisms could be deployed so that the NN policy/regulatory framework may be updated on account of evolution of technology and usecases?

Even today, the concept of net neutrality is at an early stage; not matured enough; weakly defined based on common sense and random casual entrepreneurial thoughts, bias and hype. The desired mechanisms should get proper support from intelligent reasoning, critical thinking in vision, critical success factors (CSF), value chain and cost benefit analysis. It may be interesting to validate whether following mechanisms support the deployment of an effective NN policy / regulatory framework in future:

a. Total Quality Management (TQM) & CRM
b. Statistical Quality Control (SQC) based on system performance measurement
c. Collaborative Planning, Forecasting and Replenishment (CPFR)
d. R&D cell comprising experts of technical, legal and management institutes from multiple domains: Electronics & Telecommunication engineering, Management Information Systems, Public policy, cyber laws, Economics and Social science. It may not be rational to copy the western models blindly and adopt perception based readymade solutions.
e. Technology management cell : assess and mitigate risks, understanding opportunities and threats of digital technology
f. It is not justified to perform simulation games which often embarrass and hackle common people (e.g. students, job seekers).

I have been using Internet for last seventeen years in India. I have worked in industry; have attended Fellow Progarmme at IIM Calcutta with major in Management Information Systems and Minor in Strategic Management and also have consulting experience in IT industry. I have given aforesaid feedback based on my personal experience.
Thanks and regards.
Sumit Chakraborty
Fellow (IIM Calcutta), BEE (Jadavpur University)