Data-driven Business Model Innovation for “5G & Beyond "

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Agenda

- Evolution towards 5G & Beyond
- Wish list of 5G & beyond technologies
- Crystal gazing the new busines opportunities made possible by 5G & Beyond technologies
- Importance of harnessing ‘Real-time Data” to create value.
- Challenges in harnessing value from Data
- Overcoming the challenges in harnessing value from data
- “Data-driven Business Model Innovation” in creating sustainable business.
  - “Data-as-a-Service BM
  - “Information-as-a-Service” BM
  - “Answers-as-a-Service” BM
- Intelligent Transport System Data-driven Business Model Innovation
- Conclusion

Application Wish List of "5G & Beyond"

There will always be on-going demand for more higher speeds and data, both from business and consumers which can give rise to new use cases and many other new domains which could be impacted. This will pave the way for the need for technologies 'beyond 5G' going forward into the next decade.

The application wish list include:

- More data intensive applications
- Mission critical and time critical applications
- Industries 5.0 – to enable humans to work along with machines
- Applications utilizing all 5 senses –Optical/ Aural/Olfaction/Gustation/ Tactile
- Collaborative teamwork – Product design team working across different geographies arriving at co-ordinated product designs
- Virtual meetings/ parties with remote family/friends, with ability to interact on an emotional level
- Seamless provision of services provided everywhere including remote areas, on-board ships, aircrafts (in-flight services), moving trains etc.
- Ability to be able to control appliances with gestures.
- Mind-to-mind communication or 'Telepathy'.- Ability to interact with people without having language barriers.

Future research beyond 5G…..

6G is a popular term used in the industry for looking beyond 5G.
This could include:

1) **Human Bond Communication** - Applications utilizing all 5 senses –Optical/ Aural/Olfaction/Gustation/ Tactile to allow more holistic sensory information exchange.
2) **Mind-to –Mind communication** -Telepathy -communication will involve major advances in sensing emitting and receiving technologies and training of the human brain. There could be a ability to communicate through emotions.
3) **5G to Satellite connectivity**
4) **CONASENSE -**Integrates **CO**mmunications, **NA**avigation, **SEN**sing and **SE**rvices

or could be a combination of all of these. It could form a framework of a fully connected world of low-cost, extremely high speed internet service and ability to tap satellite communication networks.

It should

- Provide a fully integrated system consisting of Cellular communications, space-and –air based communications, wireless local and broadband based communication.
- Enable Ultra- fast edge connectivity
- Low latency or real time connectivity. mS latency provided by 5G, may not be sufficient for some time critical applications and further enhancement of the communication capability is required.
- Super IoT – Unlimited connected devices
- Integration with Data and AI to get insight from data situation context leading to Smart Operation.

NEW BUSINES OPPORTUNITIES MADE POSSIBLE BY 5G & BEYOND

The expected features of 5G & beyond, could give rise new opportunities and use cases.

1] Further -Enhanced mobile broadband (FeMBB): High speeds 10 times faster than 5G -> **100 Gbps transmission rates** – Communication in **THz frequencies .**

This feature could enhance or enable the following use cases

- ❑ Real-time AR/VR Services
- ❑ Enhanced in-building broadband service / Crowded or dense area service
- ❑ High definition cloud gaming; Content streaming
- ❑ Fixed Wireless Access service.

2] Advanced Ultra-reliable communications (AuRLLC) : High reliability and **low latency down to 0.01ms** E-2-E**.** This is also called as Mission Critical Services - facilitates real-time capabilities and performance to support services which require greater monitoring and control.

This feature could enhance or enable the following use cases

- ❑ Autonomous vehicles, Drones
- ❑ Robotic applications, Industrial IoT
- ❑ Health monitoring system / tele-health,
- ❑ Smart grid
- ❑ Intelligent transport Systems

NEW BUSINES OPPORTUNITIES MADE POSSIBLE BY 5G & BEYOND

3] Enhanced Massive Machine Type Communications (EmMTC) – Trillions of devices

This feature will unlock further potential of IoT by enabling more connections at once at very low power. It will make a "truly connected world", a reality. It will support trillions of machines and several billions of applications.

Some of the potential use cases under this category are:

- ❑ Smart cities;
- ❑ Energy/ utility management ; Smart grids and metering
- ❑ industrial automation
- ❑ Smart logistics; Smart retail
- ❑ Smart surveillance and video analytics

4] Accessibility –high speed, low latency satellite broadband feature – Will enable greater and deeper coverage to people outside urban areas.

5] Reliability of 99.99999% -This is very important to further enhance the capabilities of industrial automation

6] Greater Energy Efficiency – 10X w.r.t 5G -This is very important, especially with the increase in the number of Data Centres and the energy used by them.

Further Data Explosion through 5G & Beyond

Features like EmMTC, AuRLLC and FeMBB gives rise to new applications across multiple domains, capable of generating humongous amount of data in various applications across different domains. Eg:

- Connected vehicles, Autonomous vehicles, UAVs are also large sources of data. They are equipped with hundreds of sensors, integrated with a great number of smart technologies
- Smart Cities has a city-wide sensor network
- Factories of the future
- Security & Surveillance
- Utilities
- Healthcare etc

- IoT devices and sensors capable of real-time information collection, coupled with advanced analytics technology has made reliance on real-time data practical.
- Will enable higher quality video across different verticals. Eg- stadiums, shopping malls etc which would result in huge increase in amounts of data used and generated by the consumers and systems.

These data have to be accessed in near real-time and processed instantaneously to derive maximum benefits of the data.

Sources of Data - Connected Vehicles

Connected vehicles are equipped with hundreds of sensors, integrated with a great amount of smart technologies. Connected vehicles communicate with the driver, other vehicles, roadside infrastructure, and the cloud. They are collecting immense amounts of internal and surrounding data

Sources of data in a connected vehicle:

- Internal technical working -- ECUs control several sensors inside the vehicle –
  - Eg--Door opening/ closing, amount of oxygen in the engine cylinders etc.

- External environment data
  - Sensors picking up weather and temperature.
  - Cameras & Radars generating data about road conditions, pedestrians, other road vehicles etc
  - Shared data between other connected vehicles.

- External data fed from outside through cloud – traffic/ weather data , music etc

Sources of Data – Smart Cities

City-wide sensor network wherein all points which needs to be monitored and controlled are installed with

- CCTV cameras/ Sensors / RFID tags / Mobile devices/ Embedded SIMS/ Actuators etc.

These points could include

- Traffic junctions,
- Bus stands,
- Train stations,
- Utility poles,
- Water, Power supply lines etc .

Apart from above, Cities will have humongous amount of data from

- Intelligent Transport systems,
- Healthcare systems,
- Smart grids,
- Smart infrastructure etc.

These real-time data across various verticals are very important for success of Smart Cites.

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This should be available under any conditions manually to City officials or automatically to any systems which need them, so that appropriate action can be taken.

Challenges in harnessing value from data

- Data created daily – Approx. 2.5 Quintillion bytes.
- 90% of the world's data today has been created in the last 2 years alone.
- Big Data includes both structured and unstructured data including text, sensor data, audio, video, log files.
- 90% of data generated is unstructured data that computers cannot easily interpret. Difficulties in harnessing the unstructured data can hamper discovery of hidden insights. For eg: Social media data, photos, customer/public perception etc
- Lot of valuable information is hidden in the "dark data' which is not easily visible or accessible.
- Data will be ingested from various sources and will not be similar in structure. Data acquisition and integration is a challenge as it will be required to connect legacy well-structured data to semi-structured or unstructured data that is not easily understood.

Challenges in harnessing value from data

Summarizing, the challenges include:

- Lack of human and system abilities to properly ingest, analyse and manage these data and information.
- The data volume would be huge, and the companies will have to be able to access it in real-time, analyse and act on that instantly. Systems should be capable of handling any amount of data very quickly
- Inability to harness data effectively to get actionable insights due to limitations of the traditional data analytics platforms
  - too complex to build,
  - very slow,
  - have limitations on handling dark data and
  - are not scalable.
- Lack of effective data-driven strategy. The organization processes and current business models may not be data-driven.
- Lack of the right resources and skills to bring data, analyse it, get actionable insights.
- Cost of implementation of harnessing value from data

Overcoming the challenges in harnessing value from data

The above limitation can be overcome by

- **Scalable Data Analytics platform** which can do the predictive and prescriptive analytics of structured. unstructured and semi-structured data

  The features of the data analytics platform should include:

  - Ability to have AI across all layers – at data ingestion. Data cleansing and data visualization
  - Should be optimized for high-performance to ensure scalability
  - Should have built-in data anonymization for personal data protection
  - Should have data encryption for enhance security
  - Should be Standard based
  - The entire solution should be cost-effective and should not increase the cost of harnessing data than the value generated by it.

- **Data-driven culture & Strategy** . Organizations and people tend to take decisions based on biases and beliefs if they do not base their decisions of data. Data replaces beliefs and provides competitive advantages.It is very important for Organizations to embrace a data-driven culture and strategy and implement data-driven business model innovation.

Gartner global CIO survey - Big Data & Analytics as the most disruptive force in enterprise technology

Data –driven business Model Innovation

- Data -considered the new oil due to tremendous possibilities it can bring in the business world through predictive & prescriptive analytics, providing actionable insights to business owners helping them to develop sustainable business models.

- Can be used to analyse consumer behaviours and develop new customer insights.

- Can be used in B2C, B2B, B2B2C B2G, G2Citizen applications. Very much needed for the success of Smart Cities. Can be used to plan product types and target markets.

- Well-known companies have become successful, due to data-driven business model innovation rather than product innovation- disrupting markets or created new markets by using business models designed with insights from data analytics. Eg--Google, Facebook, Amazon, Netflix, Uber, Airbnb, Zara, Flipcart, OLA etc.

- Organisations using big data and analytics within their innovation process are 36% more likely to remain competitive and sustainable. [IBM}

- Data-driven marketing is increasingly adopted and claimed by 65% of marketing executives as crucial to success. (Selerity)

Data –driven business Model Innovation

Some examples--Vehicle manufacturers can change their BMs from product-oriented strategy of selling more vehicles, to a customer and service –oriented strategy –like "custom design for individual" enhancing customer experience.

Data-driven Business Model Innovation can better harness data by:

- Improving customer experiences – This is the number one way in which businesses plan to better utilize their data in the future. Smaller and newer businesses can compete with established businesses.
- Personalising products and services to customers
- Tracking business performance
- Making strategic decisions – Harness data to gain insights into markets & customers.
- Gaining insights into markets, customers and clients
- Targeted advertising
- Improve internal efficiencies
- Improve supply chain efficiency.
- Recording behaviours and activity to track accountability and improve security.

Data-driven BMI would be very important to harness the opportunities enabled by 5G & Beyond and ensures businesses to remain competitive and sustainable.

Data –driven business Model Innovation

They are categorized on their 'value proposition' and 'customers' as (BMI)

1. 'Data-as-a-Service Business Model',
2. 'Information-as-a-Service Business Model' and '
3. 'Answers-as-as Service' Business Model

"Data as a Service' BM - Describing this as per the 'Seven dimensions of business models'

- **Value proposition** – "Data as a Service' -aggregated, and anonymized data to Customers to create their own solution, who can utilize this as per their needs.
- **Customers or Users** – Developers of Products or commercial solution providers who may want this data to enhance their product features or develop special applications to their end consumers
- **Value chain functions** – Data ingestion, data aggregation, data anonymization
- **Competencies** – Data expertise, Data analytics platforms
- **Networ**k – These could be online portals, publishers, and 3rd party data sources.
- **Value formula** – This could be free, or subscription based
- **Relations –** Online service, self-service, social -media forums etc.

This model has a relatively low cost in creating market and selling and has low revenue stream. Examples of users of this model could be Government open data sites etc

Data –driven business Model Innovation

‘Information- as a Service’ BM

This business model is about converting data into information for customers who may pay for some customized information.

Describing this business model as per the ‘Seven dimensions of business models

- **Value proposition** – “Information- as a Service’ -Processed, aggregated, anonymized data, further analysed to extract some information/insights specifically of use to Customers, , who may not have the expertise/ resources for this or do not want to do it themselves
- **Customers or Users** -Consumers or commercial solution providers who could use these insights for their own use or further selling an idea based on certain information.
- **Value chain functions** – Data ingestion, data processing, data aggregation, data anonymization and data visualization.
- **Competencies** – Data expertise, Data analytics platforms, Data analysis expertise.
- **Network –** These could be 3rd party data sources, data analytics platform providers
- **Value formula** –Could be subscription based, Advertising revenues and usage fees.
- **Relations** – Direct Sales, Online service, self-service, etc.

Data –driven business Model Innovation

‘Answers- as a Service’ BM

Provides an accurate answer to specific questions of the customers, who may need this for making an immediate decision. The company must have the ability to create real and trusted value in the answers it provides to customers, who in turn relies on this answer to take important instant decisions and hence is willing to pay a higher price for this.

Describing this business model as per the ‘Seven dimensions of business models’

Value proposition – “Answers- as a Service’ -Processed, aggregated, anonymized data, further analysed to extract some information specifically of use to Customers and perform analytics to provide accurate answers to specific customer’s requirements.

Customers or Users -Consumers or 3rd party advertisers and corporate decision makers.

Value chain functions – Data ingestion, data processing, data aggregation, data anonymization, Data analytics, data visualization, what-if scenario development, predictive analytics.

Competencies – Data expertise, Data analytics platforms, Data analysis expertise, deep customer and market knowledge

Network – These could be 3rd party data sources, data analytics platform providers

Value formula – Product sales, advertising revenues

Relations – Direct contact, interactive engagement, direct sales, online service etc

Data –driven business Model Innovation – Intelligent Transport Systems

Some use cases enabled by 5G & Beyond technologies :

1] Advanced Driver Assistance systems : based on 3D imaging and built-in sensors

- Passenger infotainment requiring simultaneous high capacity and high mobility
- Vehicles capable of detecting safety critical situations, guidance on alternative routes.
- AR dashboards which overlay information on top of what a driver is seeing through the front window,

2] Autonomous Vehicles : - which rely not only on their own sensors, but also on those of other vehicles, and will need to cooperate with each other, rather than make decisions on their own.

3] Smart Parking" -With real-time info. available about empty on-street parking spaces,

4] " Bird's view" – Ability to see vehicles coming from side roads at junctions.

5} "See through front vehicles " Ability to see though front vehicle, so that the driver is quite aware of what lies ahead and can be better prepared.

Data –driven business Model Innovation – Intelligent Transport Systems

Conventional business models of vehicle manufacturers –Product oriented strategy -Sell more vehicles.

Data-driven models -- Customer and service-oriented strategy. In a connected vehicle ecosystem, abundance of data will be created which can potentially provide insights into vehicle health and customer behaviour. The business models should enable the system to collect this data, leverage it to infer context, and create bold, revolutionary solutions, thereby enhancing monetization.

This enables:

- Shift from selling “Physical” vehicles to “custom design for individual” i.e. allow the customer to specify lot of convenience in the vehicle as per their preference. With personal context at the forefront, the driver and rider experience are becoming the true market differentiator.
- New concepts of ridesharing, next gen mobility
- Provides seamless, personal, relevant experience to the user.
- **Creation of a highly contextual, adaptable experience introduces a new paradigm: one where automobiles are no longer commodities but intimate, personal platforms**

Data –driven business Model Innovation – Intelligent Transport Systems

Data-driven BMs enables services through vehicle data analytics which are valuable to vehicle OEMs, vehicle users, 3rd party service providers and government agencies:

- Predictive maintenance - predict future failure of vehicle parts and direct users to service centres before parts can malfunction. -- Continuous monitoring and predictive analysis can enable maintenance even before a serious problem occurs. Vehicle recalls can be prevented, predicted, or minimised. In cases where problems are software related, possibilities for over-the-air software updates reduce the need for recalls as problems can be fixed without the need for recalling the vehicle at all.
- Improve Vehicle Health – through driving statistics, self-diagnosis, remote diagnosis, and real-time vehicle information.
- Usage-based insurance - analysing drivers' capability and usage patterns.
- Location based services – analysing driver's personal preferences and behavioural data.
- Usage-based tolling and tax
- Connected navigation services & Remote control of vehicles
- Driver's condition monitoring service

Value creation - Connected Vehicle Data

Enhances driver's experience-

- With real-time traffic and weather conditions helping better navigation
- Reduce potential crashes with other vehicles and pedestrians
- Brings possibility of looking ahead of vehicle in front, by sharing front vehicle's screen

Benefits to Vehicle manufacturers -

- Increase internal efficiency, quality, and product differentiation -calibrate their own vehicles and redesign them according to the insights they got about vehicles performance.
- Data can be used to make smarter decisions about when to replace wear components
- Can monetize data streams by allowing access to specific streams of anonymized real-time data to third party developers to build new applications enhancing driving experience and applications like real-time traffic route guidance, through royalties charged to the third parties.

Benefits to Traffic and department–

- can use such data to improve traffic systems and prevent traffic congestions.
- Weather and road condition survey throughout different regions.
- Disaster management and emergency services

Enable new businesses like 3rd party vehicle ride sharing services

Value creation - Connected Vehicle Data

- Business models for the vehicle OEMs include creating partnerships between Telcos, App.providers and other 3rd parties, to create value for them outside their current value chain, where they will need to package data in ways that make it attractive.
- Revenue models could include the costs of data monetization being bundled in the vehicle price or offering a subscription price.
- Other players can also harness vehicle data for monetization -- Telcos, infrastructure providers, insurance companies, third party mobility aggregators etc.

Business opportunity value from Connected Vehicle data.

- $ 47 billion by 2023, (harbour research)
  - ~20% from applications like location, routine diagnostics and monitoring,
  - Rest include vehicle performance, in-vehicle experiences and V2X, V2V etc

An example of Data-driven Strategy implementation for enhancing safety:

An Indian state is implementing data-driven systems approach to road safety for reaching goal of 50% reduction in road fatalities by 2030 and eventually to zero deaths from road traffic accidents and build a data driven trauma care.

Value is created by generating revenue, reducing costs and enhancing safety & security

CONCLUSION

- Data is becoming the lifeblood of the modern economy and a strategic asset for business. The companies that does not collect it and harness it in the right way will soon be at risk of quickly falling behind their peers.

- 5G & beyond technologies enable new uses cases across multiple domains which will further add to data explosion happening currently in the enterprise area. This will generate humongous amount of data which needs to be accessed and harnessed very quickly

- It is extremely important to harness data in real-time or near-real time to create value. Organizations are unable to harness data effectively to get actionable insights due to:
  - Limitations of the traditional data analytics platforms which they use and
  - Absence of data-driven organizational culture.

- The above challenges can be addressed by
  - Utilizing advanced AI-based data analytics platforms overcoming the limitations of traditional data analytics platforms.
  - Implementing data-driven business model innovation

CONCLUSION

- Data-driven business model innovation is very important to harness the opportunities enabled and ensures businesses to remain competitive and sustainable. This ensures that business become “future ready”.

- Data-driven business model innovation will differentiate from traditional businesses, in the way of revenue generation and customer relationships. Businesses should build data in at the heart of their business model ensuring security, resilience and sustainability

In a “5G & Beyond” technology world, generating huge amount of data across different verticals, “Data-driven Business Model Innovation” is the key to the success of businesses to remain competitive and sustainable

THANK YOU