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Profitable Solution to Emerging Market Challenges through 'Internet of Things'

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ABSTRACT

The world is undergoing a dramatic transformation, rapidly transforming from isolated systems to ubiquitous internet-enabled 'things' capable of generating data that can be analysed to extract valuable information. Commonly known as the internet of things (IOT), this new reality will enrich everyday life, increase business productivity, improve monitoring of traffic, control crime and improve government efficiency, etc. The IoT is based on the integration of billions of different things, from tiny sensors to video cameras, from cars to production machines. The main objective is to integrate or connect things that can be used as sensors or actuators.

Developing & under-developed economies constitutes about 80% of world population. This paper talks about how these strata of population can benefit from Internet of Things, which according to Ericsson vision of Networked society will connect some 50Bn devices across the globe by 2020.

Keywords: IOT, Profitable Solutions, Smart Environment, Smart Business Solutions, IOT Operations

1. INTRODUCTION

1.1 Internet of Things

The vision of the Internet of Things has evolved due to a convergence of multiple technologies, ranging from wireless communication to the Internet and from embedded systems to micro-electromechanical systems. This means that the traditional fields of embedded systems, wireless sensor networks, control systems, automation (including home and building automation), all have contributions to enable the Internet of Things (IoT)

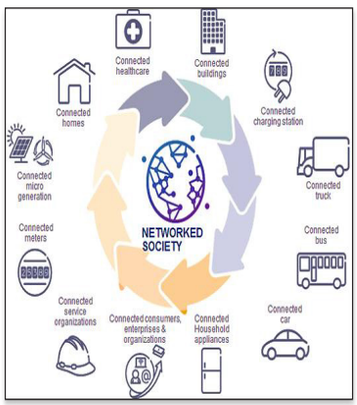

Fig. 1: Ericsson's Vision of Networked Society

1.2 IOT: Future of Human Progression

Study shows that the Internet doubles in size every 5.32 years. Using the below mentioned figure in combination with the number of devices connected to the Internet in 2003 (500 million, as determined by Forrester Research), and the world population according to the U.S. Census Bureau, Ericsson has estimated the number of connected devices per person.

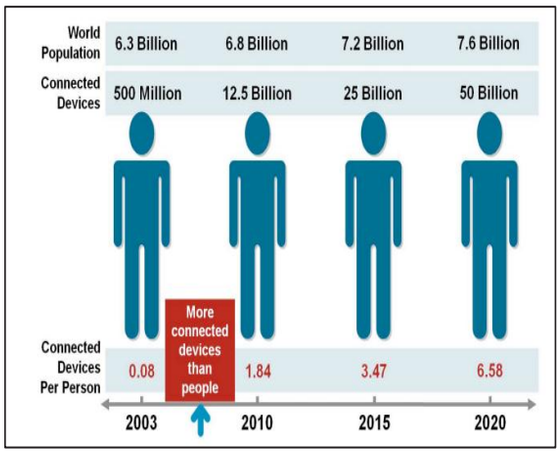

Fig. 2: No. of Connected Devices Per Person

Source: Ericsson

Prediction tells that there will be 25 billion devices connected to the Internet by 2015 and 50 billion by 2020. It is important to note that these estimates do not take into account rapid advances in Internet or device technology; the numbers presented are based on what is known to be true today. IoT is something that is common amongst Nature, Animals, Vehicles, and People. When we crossed the threshold of connecting more objects than people to the Internet, a huge window of opportunity opened for the creation of applications in the areas of automation, sensing, and M2M communication.

Traffic free roads for Ambulance!Where: A moving ambulance can be monitored by central traffic management department and signals can be made free by stopping vehicles from other side to cross, allowing the ambulance to reach hospital faster.

Holy Cow! In the world of IoT, even cows will be connected. Implanting sensors in the ears of cattle will allows farmers to monitor cow's health and track their movements, ensuring a healthier, more plentiful supply of milk and meat for people to consume.

In fact, the possibilities are almost endless. With the knowledge we have acquired for working in emerging markets & IoT, we are confident that a lot of challenges faced by these counties can be mitigated to a significant extent by leveraging IoT.

At high level we have clustered the use cases (which are potential business offerings) in two core themes which are central to a sustainable future of emerging markets societies:

- **Environmental** challenges faced due to climate change or pollution and how IoT can help solve the same
- **Societal** cases deal with the real life challenges in law and order

Benefits, operating model and *monetization model* are highlighted for each of the use-cases/offering. Different Use-case will have different operating model and monetization models and thereby different technology requirements for communication, sensing instruments and their effectiveness, complexity of the NOC as well as the other business and operational processes.

2. Environmental Use-Cases

2.1 Control the Extent of Natural Calamity

Global warming and Climate change is leading to unexpected natural occurrences. This is our 1st use case where Sensor apparatus could have informed about cloud burst, flash floods, earthquakes or Tsunamis that can help the authorities to take pre-emptive control and property. In the era where drones, balloons and satellites can help us communicate, use case will become a reality soon.

Fig. 3: Massive Wave Illustration

Source: blogspot.com/

2.1.1 Background

Flash floods in 2014 in Kashmir & Uttarakhand, India; have led to massive devastation of life, environment. The loss in terms of damage to property rises up to USD 16Bn. It killed more than 500 people in Jammu & Kashmir, India and more than 4500 people in Uttarakhand, leaving thousand other homeless. The federal government sent more than$164Mn for relief and reconstruction in Jammu and Kashmir alone. Tsunami in 2004 in the Indian Ocean was the deadliest one was caused by a 9.0 magnitude earthquake, killing more than 250,000 people in a single day.

2.1.2 Benefits

The extent of disaster could have been avoided had there been effective information on the impending calamity, saving precious lives and property to an extent

2.1.3 Operational Model

Strategically placed sensors sensing an unpredictable event like movement of tectonic plate, formation of disastrous cloud, underground volcanic movement can trigger a quicker disaster control response and if acted upon on time it has the potential to save precious life & property.

- Sensor would communicate with Satellite for ex-changing information
- In case of any disaster forecast by the sensors the NOC alarm would be triggered with disaster man-

agement instructions. This would help in taking pre-emptive measures for evacuation

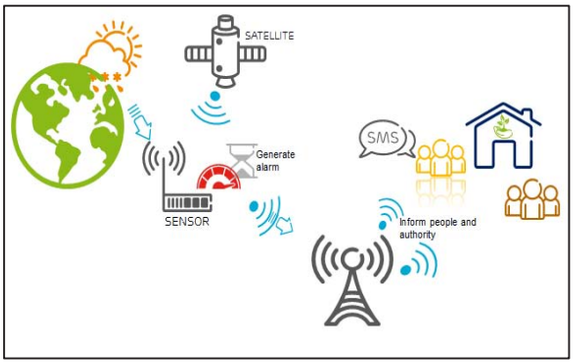

Fig. 4: Communication Network for Natural Calamity Alert

-It can be integrated with area specific mobile telecom system to generate SMS/alerts to inform people and provide direction for evacuation.

2.1.4 Monetization Model

Currentl.y the Government spends Millions of dollars post any disaster. Telecomservice provider can offer an integrated technology solution to the government in a managed services model.

2.2 Smart Field, Green Environment, Happy Farmers!

Field shall tell the farmer 'I am thirsty'. So can a lawn or a garden to a gardener. The idea is to install soil specific sensors that can measure the dryness of soil, the minerals required, ambient temperature and thereby informing the water and mineral requirements to the owners or simply transmitting them to a water pump receptor which would automatically start watering the field.

Fig. 5: Agriculture Field Sensor: Illustration

2.2.1 Background

Fresh water resources are limited and with rise in temperatures glaciers are melting faster. At the same time agriculture intensive emerging economies also need to produce food and use water. Idea is to optimize the water needs, to draw only the amount of water needed and at a time when required.

2.2.2 Benefits

Saves water, reduces electricity usage and thereby the carbon emissions. With the kind of scale of cultivation and gardening (5% of total earth area). This will have a profound positive impact on environment.

2.2.3 Operational Model

Sensors have to be placed in the field at suitable spatial intervals in a mesh style which will send the readings to a central intelligent unit. Based on the data received, the unit will decide when to start the watering process, in which part of the field and for what duration.

Sensors can communicate with the intelligent unit using appropriate communication technologies. Also, the sensors are not required to send frequent readings to the Central Unit and therefore the data requirements and extent of data processing are not of the highest order, thereby helping in the viability of the solution.

- To reap economies of scale, the intelligent unit can be centrally placed at Service provider premises and operated in a virtualized cloud based multi-tenanted model.

-NOC alarm can be raised if sensor is out of order and the fault notification shall be sent to the land owner and the service provider for correction.

2.2.4 Monetization Model

Farm owners, gardeners, co-operatives as well as irrigation ministry and government can all be the clients for this kind of futuristic solution. The operator can keep the pricing of such solution based on the number of sensors installed or the area of the farmland.

3. Societal Use Cases

3.1 How Can IoT improve Biker's Safety?

According to the World Health Organization, road traffic injuries causes an estimated and remains unacceptably high at around 1.3 million deaths worldwide in a year.

Only 28 countries, representing 449 million people (7% of the world's population), have adequate laws that address all the risk factors. Even if the riders are aware of the safety norms, many a cases they avoid wearing helmets.

What if even without the traffic law a technology was in place which makes sure that riders wear helmet?

3.1.1 Background

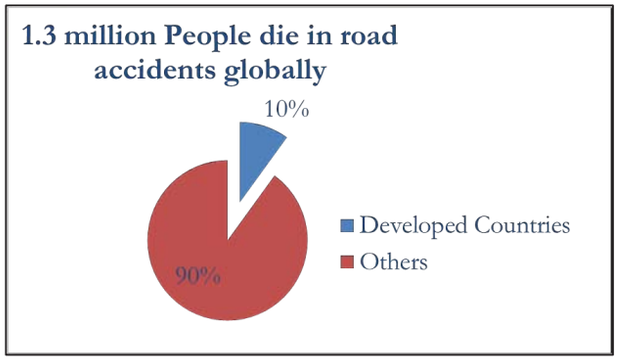

Fig. 6: Road Accident Comparison

Source: www.who.int

- Over 90% of all road fatalities occur in low and middle-income countries.
- The number of motorcycle rider deaths is nearly 30 times more than drivers of other vehicles
- Major reasons of death on the spot include brain hemorrhage, internal injury to organs or due to blood loss
- Riders wearing an approved helmet reduce the risk of death by 37 percent

3.1.2 Benefits

Instead of trying to stop someone from violating safety norms by not wearing a helmet, we would have a technology in place which won't allow them to do it in the first place. Fatal injuries to the brain can be avoided.

3.1.3 Operational Model

The helmet is to have sensors which would tell the motorcycle whether the motorcyclist and the pillion has worn helmet or not.

3.1.4 Smart Helmet

Helmet to have a chip integrated which would generate radio signals. The helmet is authenticated via one of the several antennas in the motorcycle's bodywork. The motorcycle with a smart helmet can disengage the immobilizer and automatically unlock the bike.

Fig. 7: Illustration: Bike Proximity Sensor

A secondary proximity sensor can sense whether a pillion is sitting or not and whether the pillion is wearing an approved helmet

3.1.5 Human Body Capacitance

Treadmill safe key, capacitive touch phones, calorie/speed monitor devices and many others use human body capacitance as the medium to transmit signal. The small chip for the security system can be embedded on the helmet inner surface. As soon as the rider wears the helmet and touches the handle of the motorcycle, the body will act as the capacitor completing circuit between the helmet and the bike. This will activate the ignition without inserting a key in the ignition. The push button when pressed will ignite the engine

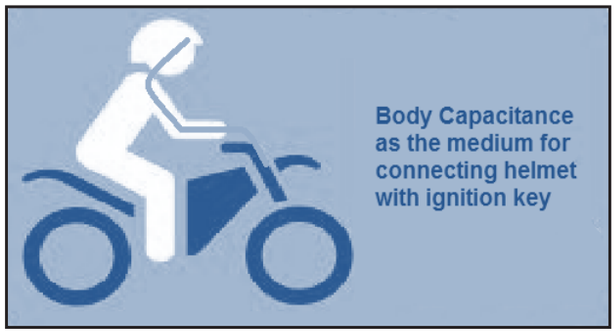

Fig. 8: Illustration: Body Capacitance as the Ignition Activation Medium

3.1.6 Monetization Model

Production & Marketing

- The market for branded helmets (ISO certified) all around the world and especially in developing and under developed countries is much smaller compared to the unbranded ones, which do not provide safety from fatal accidents.
- Just like a car manufacturer's tie-up with a tire manufacturing company, if motorcycle manufacturing companies have tie ups with helmet manufacturers, it will be a win-win situation for both. Consumers will have access only to branded ISO certified helmets. Helmet manufacturers will be able to sustain well with better quality products as competition from the unbranded market will die out.
- If one loses ones helmet or if it is damaged, one can simply call up the customer care to block the access of the helmet and issue a new helmet within a day. Simply walk into the nearest dealer, give your credentials and once the seller encodes the chip inside helmet and gives the access to the bike key, walk away with a new helmet.

3.1.7 Eco-system

- Government mandate can make the motorcycle manufacturers include this feature in their vehicle by default. If the entire eco system is developed, no user (rider) can skip a helmet.
- Also, this can lessen the theft of bikes as just a mechanical key won't be the access to start a bike. Electronic key with unique identification and key numbers (just like a credit card) can provide good amount of security towards theft of bike.

3.1.8 Financial Viability

- Financial viability is one big concern, but the way price for touch sensors in mobile phones or simcards have come down, paying a small premium for security from life threatening accidents should not be a matter of great concern.
- Government can reduce taxes on helmets and motorcycles having this feature.

3.2 Crime Control through Real-time video Surveillance with Smart Cameras

3.2.1 Background

Income inequality has given rise to sharp increase in crime rates and is a major concern for law makers and parents of school going children, corporate bodies in BPO industry where staff travels during nights and in general women safety in buses. Cameras installed inside vehicles are a deterrent but the stored video clips come handy for investigations post any crime. What if the cameras can be connected through wireless networks that can not only multicast real-time feed to be viewed by multiple stakeholders with personal safety interest but also send alarm to nearest police vehicle/station with location coordinates and other details. Thus raising the deterrence level manifold

3.2.2 Benefits

Online remote surveillance will provide real time feed to which security officer / parents / corporate bodies can subscribe and monitor the vehicle and kids' activities. Smart relay of vehicle condition would help in taking informed decision of whether to travel in the vehicle or for the owner to get servicing done.

- Improved vehicle monitoring
- Improved kids/traveler's safety
- Crime control by monitoring the inside activities of the bus
- These surely are the USP & differentiation for transport provider

Fig. 9: Real Time Feed from Bus

Source: Google Pics

3.2.3 Monetization Model

Service provider can monetize by selling the service to entities including schools, transport operator, parents etc. The revenue models can be of various type including fixed fee/ fixed and variable fee / monthly fee/ transaction based fee etc.

3.3 Pollution Free Air to Breathe In!

Monitor & notify air quality at pre-determined locations so that authorities can take measures to control, commuters can take informed decision on their planned visit, Alternate routes display for navigation.

3.3.1 Background

One of the greatest problems that the world is facing today is that of air pollution, increasing with every passing year and causing grave and irreparable damage to the earth. Leave aside other flora & fauna, people especially children are hugely affected by air pollution. It is thus important to curb air pollution and also important to avoid the regions with high amounts of nitrous oxides, carbon monoxides, Sulphur dioxides, lead, and biological pollutants.

Fig. 10: Illustration of Pollution Free Zone

3.3.2 Benefits

Informed decision to pollution control board would help them in understanding the exact nature of the pollution, reason for it and how to control and curb it. Parents can take informed decision for visiting a particular place or taking a particular route, to safeguard their children from deadly pollutants.

3.3.3 Monetization Model

Sensors installed across places and localities, factories, mills would generate data about the contents of the air and send it across to the central body where the data can be processed and can generate real time reports for each area. Pollution control board, NGOs, general population can buy these reports or log on to websites where real time reports are published. A premium can be charged accordingly.

4. Business design Essentials

Ideas and use-cases are good only if they can be technologically implemented, manageable and scalable.

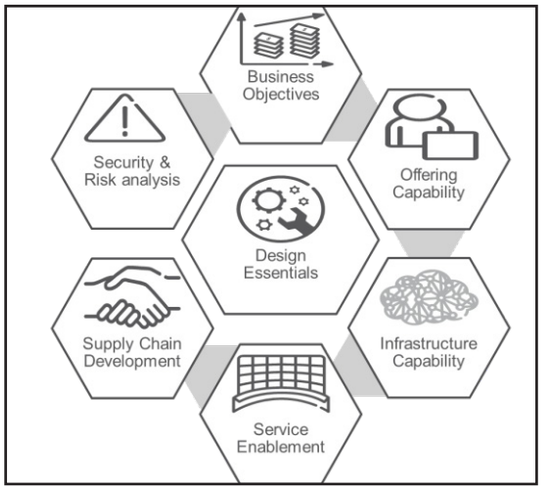

Fig. 11: Ericsson Design Essentials

This section discusses some of the fundamental design aspects that an organization would need to follow intending to capture one or more IoT opportunity:

- Outlines the strategy and policy to get into 1 or more IoT growth areas based on the Analysis of Local market and regulatory environment,
- Identifies target Business Segments and GTM offerings and works to develop the capability to offer those Products & Services
- Identifies and develops the Resource Infrastructure with appropriate capabilities required to create the products. This can range from creating the following:
- Cloud platform to offer services (offering scalability, multi-tenancy, etc.),
- Suitable communication infrastructure (Operators are showing keen interest in using Wi-Fi capabilities due to the higher data rates, no spectrum fee. However, other technologies might be more relevant example satellite communication for remote rural reach.

Fig. 12: Guiding Principles

Source: Ericsson IOT

- Identifies the Activation and provisioning of services to fulfill the market offerings
- Finalizes build-buy-partnership decisions and forges partnerships to create e2e supply chain
- Identifies the risks to the business and take actions to control the risks.

5. Guiding Principles for Building an IoT Application

- *Small Changes* can make a lot of impact provided they are delivered right and at the right time
- *Smart experience:* Only work if easy & intuitive to use

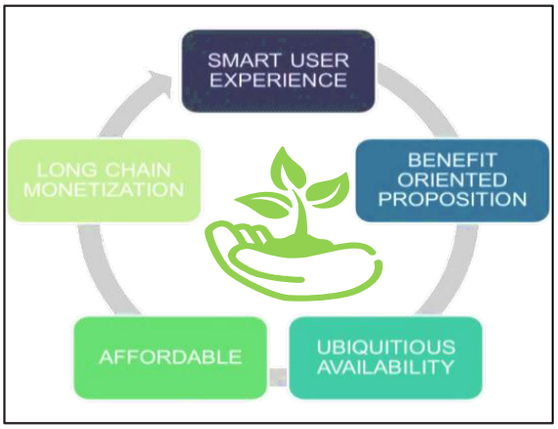

Fig. 13: Guiding Principles

Source: Ericsson IOT

- *Success Mantra:* Benefit and end usage focused propositions. Should help in solving real life difficulty
- *Long tail monetization:* Make tit reach the mass market, the cost of solution & offering has to be affordable
- *Easily Available:* Smartphone App, Smart TV, Web interface etc. Application that gives whole gamut of services: Front end followed by tabs for each of the area ex tab for Home Energy usage

6. Conclusion: Next Step

As discussed in this paper, 'Internet of Things' is at a stage where disparate networks and a multitude of sensors must come together and interoperate under a common set of standards. This effort will require businesses, governments, standards organizations, and academia to work together toward a common goal.

There are a few hurdles in the road to a 'Connected World' which have the potential to slow the development of IoT. The three biggest barriers are the deployment of IPv6, power for sensors, and agreement on standards. It is important to note that while barriers and challenges exist, they are not insurmountable. Given the benefits of IoT, these issues will get worked out. It is only a matter of time.

Next, for IoT to gain acceptance among the general populace, telecom operators, service providers and others must deliver applications that bring tangible value to peoples' lives.

In conclusion, IoT represents the next evolution of the Internet. IoT has the potential to change the world as we know it today - for the better. How quickly we get there is up to us.

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Amardeep is a Senior Consultant at COE, Ericsson with 15 years of advisory experience in Information & Communication Technology value chain (OEMs, System Integrators, Telecom Service providers & IP Players). He has led CXO level consulting engagements in Competence domains OSS, BSS, Cloud, M2M, Big data, etc. with business skills in the Business Model Innovation, Planning and Strategy, M&As, Green-field & Brown field Transformations across the globe.

He is a thought leader with Go-Getter attitude and is backed with solid credentials from reputed institutes (MBA, Computer Engineering and Professional certifications)

Swarnabha is an Operations Consultant at GSI Consulting-Ericsson. He has over 8 years of diverse experience of working with leading Telco Operators, and Service Providers across geographies in a cross functional environment in the areas of Business Process Assessment & Re-engineering, Financial Analysis, Business Case Development, OSS/BSS, IoT etc.

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