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Role of IoT in digitization of Data

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Abstract - Digital India is a dream project of our Indian Government started by Honourable Prime Minister Sri NarendraModi for transforming the India into a digitally empowered society. In this project, the implementation is mainly concerned to convert the entire information which is maintained manually into the digitized form. Digitization is nothing but processing of data which means the process of representing an image, an analog signal or an object, as a series of integers. However these digital representations are discrete and digitization can only approximately represent a signal but without any loss of information. The digitization process involves reading of an analog signal at periodic intervals which is known as sampling. It is also possible to convert these series of integers back into the original analog signal. The quality of digitization will vary depending on the type of sampling rates etc. Old libraries that have multitudes of manuscripts and books that have accumulated over the ages are now being scanned and digitized all around the world. Now digital libraries are fast replacing the conventional libraries. In this paper I want to discuss the different solutions which were proposed by many economists, academicians and researchers.

I. INTRODUCTION

Internet of Things, popularly recognized as IoT, is an emerging disruptive technology of the 21st century. Quite simply because "smart objects" can now freely "talk" to each other and generate enormous volumes of data, spread across disparate communication networks. Interconnectivity, coupled with what sensors can now capture, has now reached a very high level of maturity. Given the volume, velocity and variety of this data and out of seeming randomness, the Analytics engine can be powered to cull out critical information about consumer behavioural patterns, from just about any industry vertical.

It's a mammoth opportunity for the world, as much as it is for India. In five years, the global opportunity is likely to touch 300 billion USD and in comparison, India too would boast of a 15 billion USD market in IoT. It needs fostering with utmost care. Towards this, The Centre of Excellence for IoT- a combined initiative of Department of Electronics & IT, ERNET India and NASSCOM - is expected to promote an IoT ecosystem, which is vibrant & at the same time innovative, which will help our country attain a leadership role in this field.

II. NEED OF IOT

The Internet of Things (IoT) is an all-encompassing term for a network backbone that will host billions of devices and sensors that communicate intelligently. The 'things' that make up the IoT range from smart phones, RFID chips, sensors built into vehicles, medical devices, buildings (basically anything that needs to be monitored) - all with a unique identity on the network and with the ability to 'machine talk'.

This ecosystem of interconnected things and the technology that manages them is expected to have a market potential of $15 billion by 2020 in India alone. The IoT is in fact the inflection point that is expected to transform the global economy, and specifically those economies that plan around it. The Indian government believes in the tremendous opportunities that the IoT presents, and is planning a close synergy between the Digital India programme and the IoT, and has already drafted it into policy. The IoT will be part of the broadband highway that will deliver a wide range of e-governance and citizen services to all corners of the country.

Clearly, the IoT will play a major role in the transformation of India into a digital economy - as the catalyst that empowers our citizens by providing them with transparent governance and services (education, health, legal, financial and safety) at their fingertips. At the heart of this transformation will be a re-engineering and digitising of government processes, using IT and supporting database and cloud infrastructure to simplify, improve and optimise the various government functions.

Beyond that, the larger perspective is a population that now has access to digital channels and communication pathways enabled by IoT. An increasing amount of commercial activity now happens online as businesses revamp operations to support this new digital model. Since access to goods, products and services is no longer limited by geography, markets have expanded drastically, presenting significant opportunities.

Building and expanding the IoT creates a thriving ecosystem around it: the hardware manufacturers who create the myriad devices that live and talk on the IoT, the vendors and enterprises that provide the enhanced services (cloud infrastructure, databases, etc.), and software that manage the communication and intelligent automation of these devices. The result is a wide range of solutions for almost every aspect of human life and endeavour.

The private sector's contribution to this transformative undertaking will be indispensable. It brings in the expertise, field experience and thought leadership that is crucial for the successful execution of IoT projects. Digital India projects like Smart Cities are already going forward using the public-private partnership (PPP) model and will showcase IoT-based solutions for almost all aspects of personal and work lives of Indians. For example, smart traffic and parking solutions to address the pressing urban problem of congestion, smart buildings that automatically manage lighting and ambient temperature based on occupancy, and solid waste management using sensor and location intelligence are a few examples of IoT enabled solutions that directly improve the quality of life of citizens.

IoT-based solutions are not just for urban India; they offer rural citizens access to services that were earlier out of reach. On the premise that a well-connected nation is the first step towards a well-served nation, the first objective of the Digital India programme is providing digital infrastructure as a basic utility to all citizens, so educational, health, governance and financial services can be delivered to otherwise underserved areas.

Most patients in rural areas don't have access to medical specialists. Several large hospitals in Indian metros are now offering remote consulting services to underserved areas, using media-rich network capabilities so their doctors can see and interact with patients in remote telemedicine centres, with the case history and medical data automatically transmitted to the doctor for analysis. Leveraging similar technology, the Karnataka government plans to launch remote education services to supplement Maths, Science and English teaching for high school students.

The penetration of mobile phones in rural areas continues to increase exponentially. The IoT, which encompasses mobile networks, can deliver e-governance and lifestyle-impacting services to these areas. Areas without brick-and-mortar banks, for example, can still be provided with financial services through online and mobile channels. Weather forecasts, news and advisories vital to agricultural can also be provided in a similar fashion.

Empowering rural India is an essential step for the country to move forward on the world stage. Connecting rural India to the IoT provides the much needed bridge between urban and rural India, and is a sure-fire way of channelling the benefits of a digital economy to the largest part of the country. Connectivity offers a host of development opportunities to untapped areas, including manufacturing and e-commerce to market local and traditional products.

Digital channels provide farmers and artisans the ability to directly reach extensive national and even global markets. A host of 'localisation' technologies can help different regions communicate so language is not a barrier. Relevant information and updates are now provided in local languages and scripts. Rural India has demonstrated it is hungry for technology, and has rapidly and instinctively adopted it as quickly as it is offered.

III. DIGITIZATION OF DATA THROUGH IOT

Excitement around the Internet of Things continues to grow as manufacturers, vendors, and customers begin to realize the substantial benefits of embedding sensors in everything from vehicle tires to conveyor belts. The amount of information flowing to and from smart products and machines is staggering. According to a report by IDC and EMC, the data being generated is predicted to reach 44 trillion gigabytes by 2020. That means there will actually be more bits of information in our digital universe than there are galaxies in the physical universe!

Of course, data by itself is relatively useless. Companies need to have the intelligent systems and technology backbones in place to capture the data and use it to make smart, insightful decisions. Those that do are seeing substantial return on investment in the form of equipment up-time, reduced costs to ensure quality, optimized logistics, and much more.

Although the cement industry tends to be slower in adopting new technologies, the revenue and margin-impacting benefits experienced by other industries are too compelling to ignore. Some cement executives are under the false impression that bringing their companies into the digital world requires millions of dollars in upfront investment. In reality, the cost of embedded sensors has dropped significantly and learning how to utilize data can be a gradual step-by-step process. Below are a few real-world examples of how data is being used to change the business of manufacturing, beginning with a simple application and progressing to the more complex.

a) EQUIPMENT MONITORING: THE FIRST STEP

By 2020, Gartner analysts predict there will be 526 million pieces of manufacturing equipment capable of communicating through sensor-enabled networks, with 90 million of those designed specifically for the mining industry. In fact, the predicted 25% annual growth rate of connected mining products is among the fastest of the industries tracked by Gartner (WJS, 6/2/2015). These connected machines stream health and status data, which is captured by other machines or by monitoring systems. Should the data fall outside of normal parameters, alerts are triggered, allowing workers to immediately resolve the problem, or in some cases prompting the equipment to self-adjust. Real-time issue resolution or problem identification can save significant time and money.

Joy Global, an underground mining equipment manufacturer, provides an example of the cost-saving benefits associated with remote equipment monitoring. Installed at a customer's site, one of Joy Global's mining machines kept overheating. Engineers thought the power-and-speed adjustment control on one of the motors had failed. But after reviewing the machine's sensor data, it was determined a heat exchange device needed replacement — a much smaller repair job.

This approach can also be applied to the cement industry. Remote monitoring could be used to oversee operations of big vehicles in the quarries and to report on key metrics such as fuel consumption per ton, tons per shift, or operating hours. It could also be used in crane-to-crane communication to avoid collisions or to safely move containers.

b) PREDICTIVE MAINTENANCE

When analyzing equipment status and performance data to determine trends and even enriching the data set with manufacturing data such as the type of product being produced, it's possible to predict potential malfunctions and maintenance needs. Using this information, companies can proactively schedule maintenance during times of least impact and avoid unexpected, costly downtime.

Predictive maintenance has significantly lowered costs in the oil and gas industry. For example, when a piece of equipment on a remote oil rig, such as blowout preventers, mud pumps, or ship stabilizers, fails unexpectedly, drilling halts until the necessary repair parts can be delivered. This down-time can add millions of dollars to a well's cost. However, continuously monitoring and analyzing of data transmitted from the equipment, such as temperature, speed, and vibrations, is now being used to maintain consistent drilling. This same process can be applied to the operations of cement plants by improving up-time on critical cement equipment such as kilns and grinding mills. Also, sensor data from trucks and excavators can be combined with outside information like usage patterns to predict when a vehicle may fail.

IV. CONCLUSION

Complementing the Digital India programme is the Make in India programme to encourage local and foreign companies to manufacture IoT infrastructure in India, to supply local and global markets. Here again lies the opportunity to engage rural India by setting up units in these areas and training the local population to take on the employment opportunities that come with it. Providing local opportunities helps stem the rural-urban migration that results in pockets of overpopulation and the associated urban problems.

The IoT is a very real network that promises to bring together the vast and varied country that we are, so we can all move forward into a digital world without losing what makes us unique both at the individual and regional levels.

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