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Research Article

THE PROMISE AND PITFALLS OF THE INTERNET OF THINGS IN INDIA

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ABSTRACT

To date, most Internet applications focus on providing information, interaction, and entertainment for humans. However, with the widespread deployment of networked, intelligent sensor technologies, an Internet of Things (IoT) is steadily evolving, much like the Internet decades ago. In the future, hundreds of billions of smart sensors and devices will interact with one another without human intervention, on a Machine-to-Machine (M2M) basis. The manufacture and selling of IoT infrastructure will have less impact than the vast possibilities their use will unleash, but generating insights from IoT's firehose of data will require highly specialized talent that's in short supply in India. This paper will focus on challenges, opportunities and risks of Internet of things in India and provide few recommendations to overcome these challenges and risks.

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INTRODUCTION

The Internet of Things (IoT) brings a vast amount of opportunities to the horizon. By collecting and analyzing data from all kind of connected devices, sensors and machines, and using the insights in our processes, we can understand our business and customers better than we have ever done before [1]. While fitness trackers and autonomous cars have dominated the media and generated buzz about the Internet of Things (IoT), they only provide a hint of the social and economic impact of a thoroughly network-connected physical world. While Cisco calls IoT the "Internet of today," the true impact of IoT will only be revealed over time [2]. Leading research firm Gartner has predicted that by 2020 Twenty billion machines and devices connected through the internet will be used across a range of industries. Preventive solutions are being developed, such as sensor which automatically send out a warning when a machine malfunctions. Smart cities arise with smart parking, helping its citizens and visitor to find a free spot to park their car and preventing traffic jams to block the roads of the city[3]. From Statista we came to know that with over 460 million internet users, India is the second largest on line market after china and by 2021, there will be about 635.8 million internet users in India [4]. Global ICT industry is estimated to be nearly around US\$ 4 trillion in 2015 where India has generated revenue worth US\$ 146 billion during the same period. IT exports account for roughly two-third share in

industry's revenue in India and makes it world's largest sourcing destination of IT services. The USA is the largest export destination of Indian IT products & services, followed by European countries and other developing countries[5].

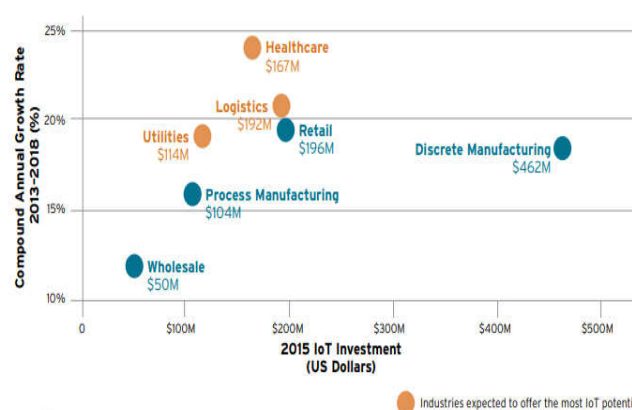


Figure 1 IoT's project growth[6]

IDC, a leading market research firm, forecasts that worldwide spending on the Internet of Things will grow at a 17.0% compound annual growth rate (CAGR)-from \$698.6 billion in 2015 to nearly \$1.3 trillion in 2019.

From above figure we can see the growth of IoT in different sectors. Maximum growth will be seen in industries that are dominated by physical products/assets that must be IoT

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enabled. Industries such as discrete manufacturing have already made significant investments. Others, such as logistics and healthcare, have a lesser stake, but are expanding quickly (see Figure 1) [6].based on my studies and above data of the Internet of Things, we can say that this sector is just in the first steps of development it has lot of potential development and it is really going to shape our future and transform our business.

Promises of the IoT

The promise of the IoT is that devices can now connect together (and with people) to enable new actions – to do something they couldn’t before; like to warn you when your resting heart rate is too high, or learn how cool you like your house and when you get home, and adjust the temperature before you get there.

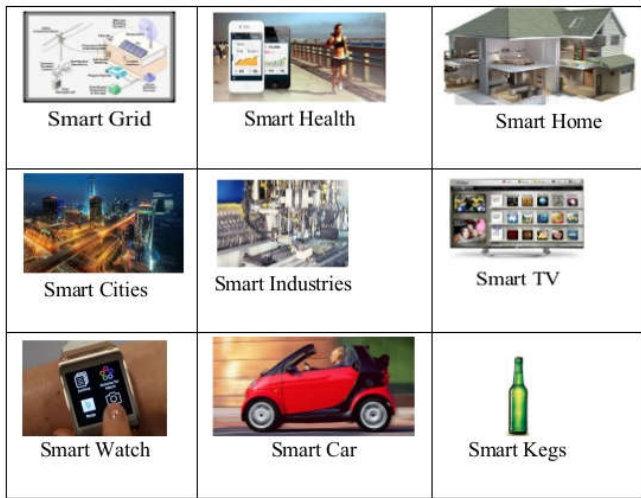


Figure 2 promises of IoT

The IoT is not something in the far-off future. In fact, it has been evolving already for years in many industries. You will often see the term ‘smart’ [fig 2]added to an existing industry application to define an IoT use case, like smart homes, smart cities etc.Many of these smart applications are already in motion. ‘Smart’ transportation logistics, for example, speak to the benefits of managing interconnected vehicle fleets to improve routing times, fuel consumption, etc., and companies like FedEx and UPS do this today. It also describes what retailers like Wal- Mart and Target do today to manage inventories across locations.

Also contributing to IoT’s emergence are the factors that enable businesses to leverage existing technologies instead of building everything themselves. Tapping this ubiquitous connectivity to realize the promise of the IoT, however, is not without challenges [7].

Understanding the challenges and opportunities [8]

IoT devices with limited functionality have been around for at least a decade. What has changed recently is the ubiquity of connectivity options (WIFI, 3G, and Bluetooth etc.), cloud services and analytics, which are great enablers for IoT. The Cloud provides a platform for hosting intelligent software, networking a large number of IoT devices and provisioning them with a large amount of data. This enables smart decisions to Made without human intervention However, there are still some current challenges limiting the adoption of IoT which are given below

Security vulnerabilities (privacy, sabotage, denial of service): Regular hacking of high-profile targets keeps this danger constantly in the back of our minds. Obviously, the consequences of sabotage and denial of service could be far more serious than a compromise of privacy. Changing the mix ratio of disinfectants at a water treatment plant or stopping the cooling system at a nuclear power plant could potentially place a whole city in immediate danger.

Regulatory and legal issues: This applies mainly to medical devices, banking, insurance, infrastructure equipment, manufacturing equipment, and in particular, pharmaceutical and food related equipment. Today, this mean complying with laws such as CFR 21 part 11, HIPAA, Directive 95/46/EC and GAMP 5. Etc. This adds to the time and cost needed to bring these products onto the market.

Determinism of the network: This is important for almost all areas where IoT can be used, such as in control applications, security, manufacturing, transport, general infrastructure, and medical devices. The use of the cloud currently imposes a delay of about 200 milliseconds or more. This is fine for most applications, but not for security or other applications that require a rapid, almost immediate, response. A trigger from a security monitoring system received five seconds later could be too late.

Lack of a common architecture and standardization: Continuous fragmentation in the implementation of IoT will decrease the value and increase the cost to the end users. Currently, aside of the products mentioned above, there are also Google’s Brillo and Weave, AllJoyn, Higgs, to name but a few. Most of these products target very specific sectors. Some the causes of this fragmentation are security and privacy fears (privacy through obfuscation and the fear of “not invented here”), jostling for market dominance, trying to avoid issues with competitors’ intellectual property, and the current lack of clear leadership in this area.

Scalability: This is currently not much of an issue, but it is bound to become an issue mainly in relations to generic consumer cloud as the number of devices in operation rises. This will increase the data bandwidth needed and the time needed for verifying transactions.

Limitations of the available sensors: Fundamental sensor types, such as temperature, light, motion, sound, color, radar, laser scanner, echography and x-ray, are already quite performant. Furthermore, recent advances in microelectronics, coupled with advances in solid state sensors, will make the bare sensors less of an issue in the future. The challenge will be in making them more discriminating in crowded, noisy and more complex environments. The application of algorithms that are similar to fuzzy logic promises to make this less of an issue in the future.

Dense and durable off-grid power sources: While Ethernet, WIFI, 3G and Bluetooth have been able to solve most connectivity issues by accommodating the various devices’ form factors, the limitations of battery life still remain. Most smartphones still need to be charged every day, and most sensors still need regular battery changes or connection to the grid. It would make a difference if power could be broadcasted wirelessly to such devices from a distance, or if power sources

that can last for at least a year can be integrated into the sensors.

Recent initiatives such as “Open Interconnect Consortium”, “The AllSeen Alliance” and the proposal from IBM (Adept) for the use of modified Bitcoin block chains in IoT. A blockchain is a distributed public database that maintains a continuously-growing list of data transactions, protected against tampering and revision. It grows linearly and chronologically as new completed blocks are added to it (see Baris Yeldiren’s article on ‘Blockchains – the next big things’). Blockchains hold promises in helping to resolve most of the above problems and in alleviating integration challenges. Bitcoin blockchains take a lot of computing power to generate. IBM proposes to increase speed and scalability by partially replacing the “proof of work” part of the block by a “proof of stake”, which require far less computations.

Challenges and risks [9]

There are different challenges and risk to implement IoT in India which are discussed below

Internet availability: Even today Internet connectivity, Internet connection reliability, and availability of required connection bandwidth are still a major challenge in India. The density of the internet connection and users are very low in India and telco are still struggling to provide required bandwidth internet connection in remote areas and an IoT consumer adoption – this can remain the most important challenge.

Cost of IoT: Indians consumers in respect of any technology are very selective in terms of investment in convenience and technology India and price is a major factor.

Lack of vendor activity: Global vendors are generally or by mistaken assume that Indian consumers are not ready for advanced devices or product. This is very much obvious in case of adoption of technology and IoT space, with rarely any kind of vendor activity today.

Lack of skilled resource in India: IoT adoption is also constrained by the unavailability of a skilled workforce for implementation of nationwide IoT enabled systems. According to the report of Labor Bureau Report of 2016 the skilled workforce in India is only two percent of total population, which is much lower when compared to some other developing nations.

Executive acceptance: The attractiveness of IoT solutions for Indian executives is primarily the potential for increased productivity and reliability, with tactical deployments such as asset tracking and security monitoring being the most common use cases. Indian executives are having difficulty understanding how to deploy IoT technology in their organizations.

Legacy infrastructure: While called the *Internet of Things*, within the entire system several technologies provide connectivity: radio-frequency identification (RFID), near-field communication (NFC), wireless Internet, Bluetooth and other wireless sensors. Not every device requires an Internet Protocol (IP) address-in some cases, large networks of devices will route through one-but IP address availability is still a consideration for IoT.

Privacy, security, standards and governance: The world of ubiquitous connected devices will present a considerable departure from conventional engagement with the Internet, shifting from active, self-directed communication and content search to passive participation with connected devices that operate and collect information without intervention.

This presents new challenges for data governance and maintaining the confidence in the Internet that’s necessary to maximize Internet-enabled business opportunities and processes. Innovation is likely to outstrip policy, but what about private incentives?

The some risk factors, which are a big threat since one year also making some hurdles in adopting the IoT in India, are hacking and data ownership. With the increase in Ransom ware in the past few years, the security is the biggest threat and if any devices are attacked by hackers and controlled by them, and make its harsh usage will lead to the big losses to the organization. The second big risk will be data ownership, if the IoT based application running on cloud servers, and the ownership of received data on servers through these sensors from the device still not has clarity.

Recommendations

Understanding the challenges and opportunities we identified five recommendations for governments, business and post-secondary institutions that will allow consumers and businesses to take advantage of the opportunities provided by IoT.

1. Industry and Higher Institutions need to collaborate directly to develop programs that meet the needs of companies today.
2. Encourage knowledge sharing among citizens, educational institutions, investors, IoT product and service suppliers and industry.
3. Government should design and implement strategic employment and investment plan related to IoT, including Issues of talent and labour mobility.
4. MSME (Micro, small and medium enterprises) should view IoT and big data as an evaluation of business analytics.
5. Every organization must anticipate the inevitable security threats, and work on maintaining an up-to-date security crises response plan.

Understanding the above risk factor few Recommendation is given below.

1. Risk assessment: Create proof of concepts, and offer incentives to customers for adoption of IoT partner with relevant industry players and develop smart devices.
2. Risk detection and claims processing: make best use of real time data collected from smart products
3. Risk prevention/mitigation, building a partner ecosystem: Include third-party data providers in the system; develop risk mitigation models that can process real-time data.
4. Re-thinking business models: Shift the emphasis to value-added services and insurance products and target new markets.

CONCLUSION

IoT must not be regarded as simply a new technology. It will rapidly change business models, disrupt industries and become ubiquitous across the world similar to the way mobile capabilities have over the past decade. At this time, Indian businesses are lagging in IoT awareness and adoption, but there is no opting out if they wish to remain competitive. The IoT wave is coming, and there's a significant opportunity cost to falling behind.

Adoption of IoT must start in the boardrooms and at the senior management level of Indian companies, addressing real, pressing business needs. Awareness of the transformative potential of IoT must be gained in order to both capitalize on opportunities and defend against would-be disruptors. Government has a role to play in this by convening stakeholders, nurturing the early development of markets for connected devices through procurement, and investing in programs related to IoT that align with innovation agendas. Post-secondary institutions and industry must also come together to fill the talent gap that threatens to limit the adoption, use and development of IoT and data analytics in Indian companies.

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