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Investigation and Prognosis on Technology Integration and Innovation through Internet of Things

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Abstract

This paper presents the scenario of fast growing technocratic world before the innovation of Internet of Things (IoT) and focuses on how this technology enables innovation and marketing among new-age entrepreneurs. It deals with the role of academic institutions in spawning new-age technologies for building new-age entrepreneurial society. It describes the application areas, strength and weakness and challenges of this technology. Moreover, this paper throws a light onto the opportunities and amenities provided for everyone and the scope in future with the advancement of technology integration and innovation. It also points out how the marketing became smart with the technology integration among new-age entrepreneurs or techno-preneurs.

Keywords—Internet of Things (IOT), smart technology integration, innovations, new-age entrepreneur.

1. Introduction

Internet of Things (IoT) integrates several technologies and communication solutions. It is an important innovation in the field of wireless communications. The conceptual framework of IoT is the foundation in the scenario of modern wireless communications. Technology is a major driver in the rate of change and play an important role in innovation in educational design and delivery. The idea behind the Internet of Things is to pervade the presence around us of a variety of things or objects such as RFID tags, sensors, actuators, mobile phones, etc. - which, through unique addressing schemes, are able to interact as well as co-operate with each other to attain some specific goals for the benefit of everyone and the nation at large [1]. Computer technology, Internet, Information technology, nanotechnology, CMOS innovations, and Biotechnology have a gigantic impact on entrepreneur ship. The whole world became an integral part of these new-age technologies.

IoT can be defined in simple way as "a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols" [1]. That shows IoT is a network of physical objects or things embedded with electronics, software, sensors and network connectivity, which enables the objects to collect and exchange data. IoT based systems achieved an improved efficiency, accuracy and economic benefit by the integration between physical world and computer based systems and also IoT augmentation with sensors and actuators. This technology became cyber-physical systems, which encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system. Things refers to a wide variety of devices such as heart monitoring implants, biochip transponders on farm animals, electric clams in coastal waters, automobiles with built-in sensors, DNA analysis devices for environmental, food or pathogen monitoring or field operation devices that assist firefighters in search and rescue operations. These devices are also capable of collecting useful data using existing technologies and then autonomously flow the data between other devices. Smart thermostat systems and washer/dryers that use Wi-Fi for remote monitoring are some instances in current marketing [8].

IoT has high impact on everyday life and behaviour of potential users. From the side of a new-entrepreneur, effects of IoT introduction will be visible in both working and domestic fields. It plays a leading role in different application scenario like assisted living, e-health, enhanced learning etc. Also the consequences will be equally visible in fields such as automation and industrial manufacturing, logistics, business/process management, intelligent transportation of people and goods [2].

This paper throws light onto basic idea of Internet of Things which made a digital revolution, the scenario before the innovation of IoT, how IoT and technology integration enabled the innovations of various products, the challenges and risk encountered during the transformation, the outcome and experience, benefits and future scope.

2. Scenario before IOT

Many technologies were changing the day today life of people even before Internet of Things. The emergence of

smart phones, eBook readers, 'Podcasts' and 'Vodcasts,' Internet and low-cost computers, solar electricity, cell phone access, and other technologies increased the opportunity to provide education to assist individuals and communities in places under-served by traditional educational institutes. Cell phones were used widely and text messaging became popular for work and personal communications. Computers and Internet enabled learners to access education through ODL (Open and Distance Learning); also known as e-learning/ online/ distributed learning (eg: interactive radio instruction (IRI), interactive audio instruction (IAI), online virtual worlds, digital games, webinars, and webcasts). Internet technology served a beneficial use for learners to communicate with other students or instructors across a city or around the world. In synchronous learning (like class room teaching), the various technologies used were Web conferencing, videoconferencing, educational television, instructional television, direct-broadcast satellite (DBS), internet radio, live streaming, telephone, and web-based VoIP. In asynchronous learning, oldest form of distance education is mail correspondence which made use of message board forums, e-mail, video and audio recordings, print materials, voicemail, and fax. Virtual libraries, World Wide Web and use of different simulation-optimization software enable teachers and students to access information and master technical as well as academic skills and to innovate new-technologies.

One of the technology categories came in latter stage includes IoT vision of IPSO (IP for Smart Objects) Alliance which was formed under a Forum in 2008 to promote Internet Protocol as the network technology for connecting Smart Objects around the world. Next the technology, Internet ø, came which reduced the complexity of the IP stack to achieve a protocol designed to route "IP over anything". This is observed to be a wisest method to move from the internet of Devices to Internet of Things. Consistent with these two technologies, IoT was deployed by modification of normal IP to adapt it to any object and make those objects addressable and accessible from any location of the world. Marketing in olden days were through showroom outlets, door-to-door delivery, exhibition/ expos, telemarketing etc before the emergence of IoT. The technological integration and innovation lead to the introduction of Internet of Things and the up-coming innovations. The next era of the continuing digital revolution, called the Internet of Things, has become a reality now.

3. How IOT enabled innovation

IoT has developed by making use of a convergence of multiple technologies ranging from Wireless communication to Internet and Embedded systems to Micro-electro mechanical systems (MEMS). Innovation of IoT is aroused in collaboration with various technologies such as traditional fields of embedded systems, wireless sensor networks, control systems and automation (including home and building automation). IoT is the interconnection between unique and embedded computer devices belonging to an existing Internet related infrastructure. IoT enables innovation by ushering automation in almost all fields through its advanced connectivity of computer devices, systems, smart objects etc., which is beyond M2M (Machine to Machine). These 'things' or objects will be a part of a connected digital grid that could affect every facet of daily life. A portfolio of various IoT enabled innovations are encompassed here [8].

For example, sensor devices will monitor our health, track our daily activity or remotely monitor an aging family member. A smart home, shown in fig (1), will reduce our monthly utility bills, tell us when to water our plants and there are barcode readers and QR code readers that work at the entry to home just like the check-out at local supermarket. Smart cities can light their streets more efficiently, receive instant reports on hazards, and even help residents find a nearby parking spot. IoT enables Industries and new-age entrepreneurs to optimize their operations and boost productivity by better tracking inventories and other assets while maintaining quality control and consistency in their products and services. Invention of IoT helped to monitor the environment for a better understanding and management of natural resources or to send us advance warnings of a pending disaster [5], [7].

There are already devices that can track location (mobile phone) and smart offices that will turn lights and air conditions ON and OFF depending on the presence of people. For instance, one startup company added smartphone-controlled lights into the shoulders and wrists of a jacket. GPS tracking from the phone automatically triggers the lights telling a bicycle or motorcycle rider which way to turn, while the lights on the shoulders notify anyone following which way the rider will be going.

The above said instances vindicate that the smart entrepreneur can intelligently integrate IoT in his marketing innovations, to monitor the distribution of his products, to get feedback from consumers and to satisfy his clients in terms of security, privacy and safety. An entrepreneur who keeps a vision in anticipation of developments in new-age technology is referred to as a techno-preneur. In creating such techno-preneurs, academicians in colleges, universities/institutes and research organizations play a major role by innovative research and imparting quality training in the form of workshops/ seminars/ symposia for dissemination of creative technological concepts [4].

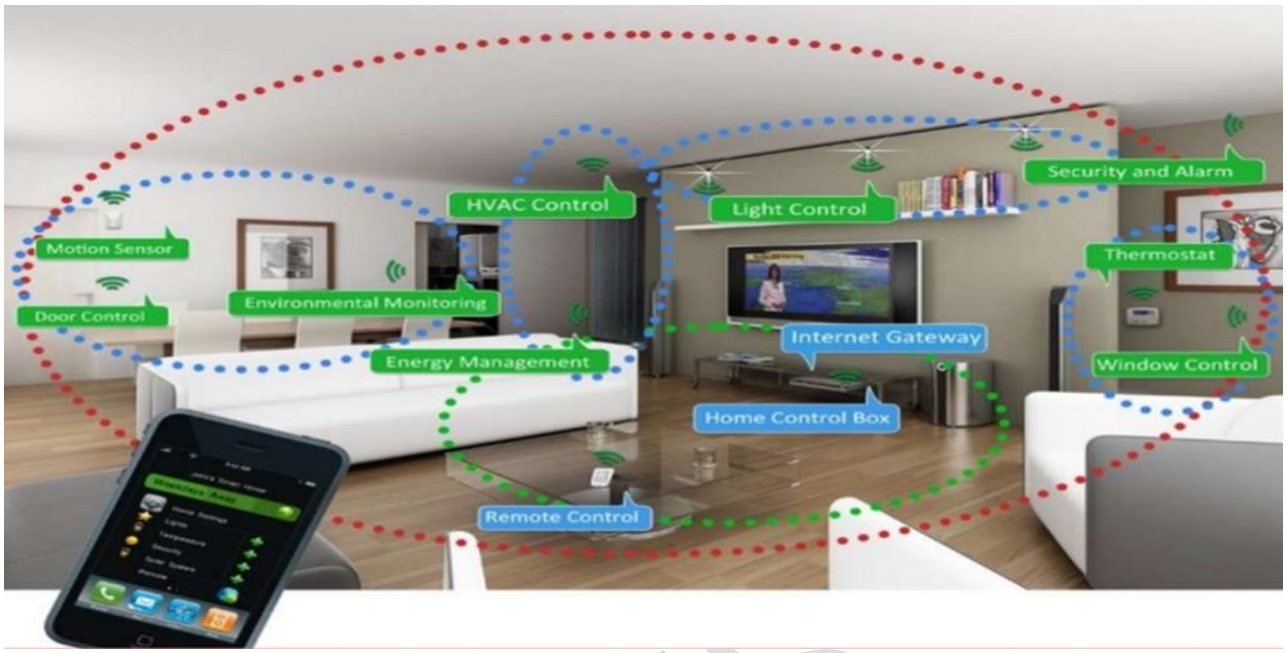

Figure.1 Smart Home representing Internet of Things (IoT)

4. Challenges & Risks encountered for IOT during transformation

One of the challenges is to ensure that innovation plays a constructive role in improving educational opportunities for billions of people who remain under-served in a rapidly developing world. Before IoT idea being widely accepted, it is necessary to untie both technical as well as social bonds. Fundamental issues related with IoT are making a full interoperability of interconnected devices possible, proving them with a high degree of smartness by enabling their adaptation and autonomous behaviour, while guaranteeing trust, privacy and security. IoT has various problems related to networking aspects too. As the things in IoT characterized by low computation and energy capacity resources, the solutions need to pay special attention to resource efficiency along with the scalability problems. Key issues related to how to represent, store, interconnect, search and organize information generated by IoT is very challenging. There was stress due to widespread use of such a technology which was emphasized that "to the extent that everyday objects become information security risks, the IoT could distribute those risks than the Internet has to date" [1]. The unique addressing of large number of objects is another challenging issue.

While using IoT, it is not easy to maintain consistency in the wireless connection between such a huge numbers of electronic devices. Hence, IoT necessitates the following to move up to the next level: Innovative ways of IoT are needed to sense complex environments, variety of connectivity standards are obligatory for addressing diverse application needs, a number of IoT applications need to be operated with batteries for years, user privacy and security is vital to protect and IoT applications requisite end-to-end solutions like cloud services. Development of IoT applications is not easy for all developers.

As entrepreneurship and innovation lack a single defining theory, there is constant, unresolved tension between theory and practice. This is particularly so regarding entrepreneurial and innovative marketing. Practical theory emerges from the implicit, intuitive, tacit and situated resource of practice, whereas academic theory is abstract, generalized, and explicit and seeks to be provable [3]. At the initial stage, entrepreneurs are supposed to take into account these points: business funding, market misunderstandings, creating right IoT business culture and recruiting IoT experts. Regardless of all these challenges, Internet of Things can assist start-ups add value and sustain it for a longer period, if adopted and implemented appropriately. In fact, IoT is anticipated to be the inevitable future of start-ups [6].

New-age entrepreneurs are likely to take care of all these challenges and ought to find a suitable solution in an economic way for good marketing.

5. Recent Trends and Future scope

Internet of Things, which reached at a golden place in the realm of the emerging technologies, have a great

influence on global businesses and it has grown to be a mega technological trend and is anticipated to be so in upcoming years. IoT makes companies data-driven, changes the type of products and services offered by companies, transforms the nature of business-critical operations for organizations and makes Data Management and Security a must [6].

According to Cisco, IoT devices would dominate the world by 2018. According to a Gartner Report, the number of IoT devices would increase to 26 billion by 2020. Some other experts estimate that the IoT will consist of almost 50 billion objects by 2020. The incremental revenue from IoT is predicted to reach $309 billion every year by 2020. Internet of Things, being one of the sprouting industries, especially in India, has got the potential of bringing in innovations in different fields leveraging disruptive technologies and open platforms. Researches express that IoT would have a noticeable impact on the global IT market as well as the way we live. The innovations that Internet of Things is prophesied to bring in are: Utility companies looks for a smart grid that can read remote meters, People requisite controlling cookers through internet (smart cooker) which can prepare meal while on their way back to home, Supermarkets are in need of smart fridges to help people with targeted shopping and Television companies wish to monitor the interested advisements watched by most of the people for delivering targeted advertising etc [6]. NIC (National Intelligence Council) expects that "by 2025 Internet nodes may reside in everyday thing-food packages, furniture, paper documents and more" [1].

Conclusion

In modern technocratic world, technology is driving innovation and creativity. The knowledge and the practical experience of various technologies determine the new-age entrepreneur's ability to compete in global marketing. Electronics industry is about to be driven by power-efficient electronics and miniaturization. Huge need of IoT hubs providing testing solutions and required infrastructure are arising. Global electronics brands like Cisco, Intel, Samsung and others are investing heavily in India through start-ups. International brands like Apple, Google, IBM, Oracle and many others are announcing IoT strategies for both consumer and enterprises.

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