

IoT and Modern Marketing: Its Social Implications

Anooksha Yogesh Rathod*, Shubham Pandya*, Nishant Doshi*

*Computer Engineering Department, Pandit Deendayal Petroleum University, Raisan, Gandhinagar, Gujarat, India
anooksha.yogesh.rathod@gmail.com, shubham.pce17@sot.pdpu.ac.in, Nishant.Doshi@sot.pdpu.ac.in

Abstract— The advent of the Internet of Things and digital marketing has changed the way businesses operate and their interactions with consumers. The digital economy has percolated a wide range of industries and smartphones have ingrained into the consumer's lifestyle. The demand for customized services and goods has increased. However, this leaves the consumers' privacy at stake. Current researches have been conducted on IoT and its security threats, its utility in specific retail space for customer marketing. This kind of research has been limited to certain industries and marketing paradigms. A need to summarize IoT and the marketing potential it offers and the social impact this has on consumer behavior is a research gap we aim to address. The current paper's primary purpose is to reflect upon the concept of marketing 4.0 and the fact that the ever-increasing number of IoT devices are connected and transmitting enormous personal data regularly, to determine a person's personality traits and influence their decisions. Further IoT related ethical marketing strategies are outlined.

Keywords—Big data, Cognitive technology, IoT and Marketing trends, Human-computer-interaction, Personal Data, Social impact, Targeted marketing.

I. INTRODUCTION

Do you think customization and technological development has made a customer "the King"? This paper is an attempt to resolve this paradox and will help businesses adopt cutting edge technologies to thrive in the market and the customer's mind. Computerized change is one of the key territories of exchange development and information is the key factor underway for the advanced economy. All around IP-associated PC systems, sensors, actuators, machines, and gadgets structure the essential idea of IoT. This is blurring the lines between the physical and virtual world of the internet.

Sensors structure incredible systems. However, their bare network doesn't reveal the unpredictable interrelationships between individuals, places, and items that drive the economy and the organizations. Cognitive IoT technologies will help business leaders leverage and understand the world more deeply.

IoT can be classified into first and second generation based on functionalities achieved on deploying the systems. The first generation of IoT technologies made achieving operational efficiencies phenomenal by delivering us humongous information.[1] The second-generation primarily focuses on making versatile and broad networks of gadgets that offer data. A larger context of information is interpreted and overseen by individuals who utilize subjective frameworks and expertise. Incorporating Intellectual advances, for example, natural language processing, AI, and video, picture and content investigation to IoT portfolio is getting imperative. These technologies can aid in overcoming the loss of data gathered by sensors, counts for 90% for a plethora of reasons. [1] The top two reasons for loss of data are bandwidth limitations and security and privacy. Implanting knowledge into systems and processes will empower organizations to do things more proficiently, and improve consumer loyalty, find new business openings, and envision dangers and dangers so they can all the more likely arrangement with them.

Disruptive technologies have given rise to new business models. Marketing 4.0 was developed in response to the "Fourth Industrial Revolution" and technologies like IoT, etc.... Marketing 4.0 is the confluence of offline and online marketing strategy. This paradigm helps establish human touch in an age of automation and digital boom. Further in the paper, we will summarize a few effective principles of marketing 4.0 to navigate in this era of IoT, AI, and disruption.

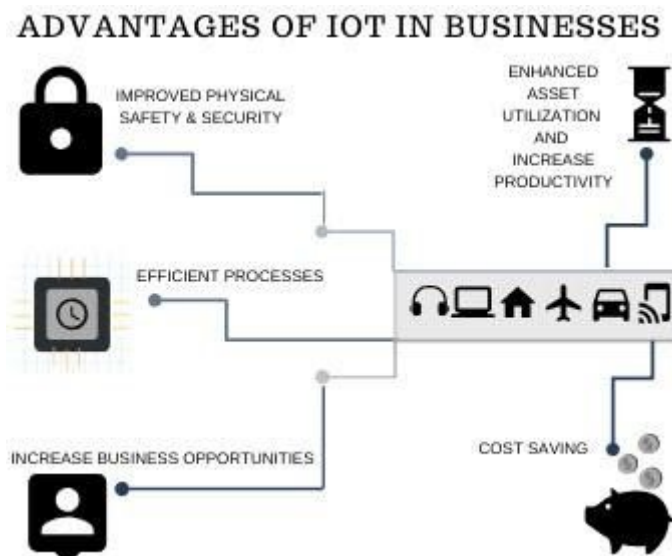


Figure 1. Merits of IoT in different facets of a business

Every coin has two sides, such as the case with IoT and its applications. The usher of the internet and connectivity of the entire world, the joys that it has brought is starting to be outweighed by the adverse effects of this connectivity in everyday life. Until recently, the internet was part of only PCs and cellular devices but with recent trends in making everything smarter by connecting to the internet, most of the devices in our homes including shoes, watches, refrigerators, even light bulbs are now internet-enabled making them “smart”. Internet is responsible for many psychiatric conditions such as depression, social phobia, panic disorder, generalized anxiety disorder, insomnia, and irritable bowel syndrome among others”. [4]

This large amount of harmless data can make its users highly vulnerable if the compromised data is rigorously analyzed. This vulnerability can end up predicting user’s behavior as well as his/her personality when clubbed with his/her digital footprint in the online world, which could be exploited by malicious intentions such as to dictate a biased future for a nation. The rise in the amount of new technology being developed and the number of devices being deployed using this technology is ending up creating a technology divide among the people where the people can afford the latest technology or not decides their social status.[5]

IoT software is being distributed across cloud services, edge devices, gateways, and modern micro-services. To combat the cybersecurity aspect of IoT we will need to understand the major element and links which are vulnerable and troubleshoot possible solutions. This aspect of the technology has been studied intensively in the literature. We will just consider this drawback and solution elements required to formulate the marketing aspects of cognitive IoT.

IOT SOLUTION ELEMENTS

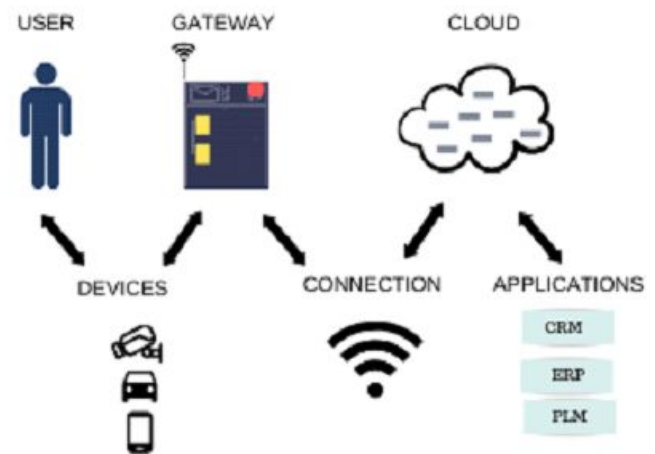


Figure 2. Components to be considered while creating and analyzing IoT solutions

II. OPPORTUNITY AND CHALLENGE SURVEY

A. IoT Problems-Marketing Analysis

The Internet has caught the audience's attention. Moreover, the quick development of the present-day data economy is fuelled by the worldwide network, which has become one of the paramount moments in development and user experience. Studies have indicated that the quantity of gadgets associated with the web has expanded significantly to the degree that it surpasses the Earth's populace. [2,6] Hence, experts have coined the term "Internet of Things", which justifies the worldwide network that connects people and their things.

As indicated by Cisco, "the pattern of the improvement of the Internet of things will proceed. As per the Cisco researchers' opinion and study, the number of gadgets associated with the Internet will arrive at 50 billion in 2020".[2,3,6] Fact being, the generous number of gadgets won't be PCs, cell phones or tablets which will interface individuals, however manual and not astute machines like vehicles, transports, sun oriented batteries, electric engines, robots, and so on. We are going towards a universe of "associated machines (things) with one another without direct human intercession. It has been referred to that the Internet of Things market will arrive at a limit of \$19 trillion". [2,3,6]

I would like to propose that markets for products and services, their innovation and product policies in a variety of industries and, most importantly, within the trade business will be driven by the development of the IoT. Along these lines, it's important to work out the

plausibility of utilizing the Internet of things to support the intensity and sound forcefulness of enterprises.[6]

B. Challenges and Barriers for IoT Deployment

The three biggest obstructions which can possibly slow the advancement of IoT are:

1) **Deployment of IPv6:** It was predicted that the world might run out of IPv4 addresses and was estimated that “this doom might occur in February 2010”. The general public may have not seen the impact, IoT's advancement can be abated since the conceivably billions of sensors will require unique IP addresses. IPv6 has the highlights of auto-configuration abilities and improved security which can make the administration of systems simpler.

2) **Power for sensors:** Self-sustaining sensors aid IoT to reach its full potential. One cannot envision changing batteries in billions of gadgets sent over the planet and even into space. Clearly, this is absurd. Need of the hour is to have a system for the sensors to produce power from natural components, for example, vibrations, light, and wind stream.

3) **Agreement on Standards:** A critical advancement has been made in the field of standards, more is required, particularly in the areas of security, privacy, architecture, and communications. Organizations like IEEE try to come up with standards to solve the new age challenges by ensuring the rout ability of IPv6 packets across different network types.

III. CURRENT PRODUCTS AND SERVICES

We are summarising the vast IoT services and products offered currently in the market and their impact on consumer choices and lifestyle. This insight will help us appreciate the vital role IoT plays with traditional marketing strategies.

A. Automation in Industry

More efficient use of assets by analyzing data to improve decision making about the use of resources, and delivering less costly solutions with the onset of Industry 4.0. With the rapid advancement in the field of IoT, AI, Cloud computing and digitizing of the companies, IoT has taken an irreplaceable place in the industries. “The Internet of Things and Industrial 4.0 are ruling patterns in the mechanical segment, with hardware and gadgets being associated by means of the internet.” The number of gadgets rose to 20.35 billion in 2017 from 15.41 billion in 2015 and expected to reach 51.11 billion by 2023”. [13] Industrial robots have increased over four times from 2009 and will continue to increase at the same pace. [7]

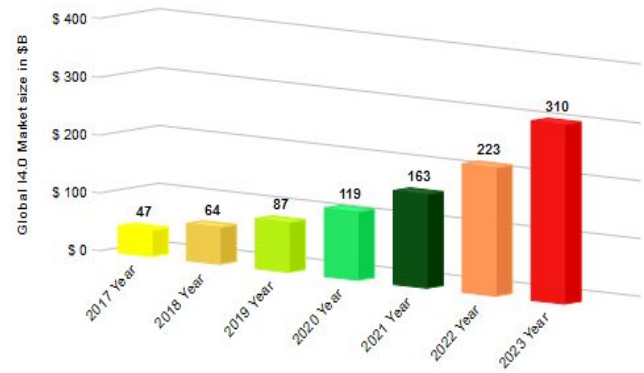


Figure 3. Industry 4.0 Market Size and trend analysis from 2017 till 2019 and prediction till 2023

The data collected from the sensors in the industries help them not only automate tasks but also make their process and production far more efficient. Industry 4.0 has brought a shift by transforming manufacturers into digital enterprises.

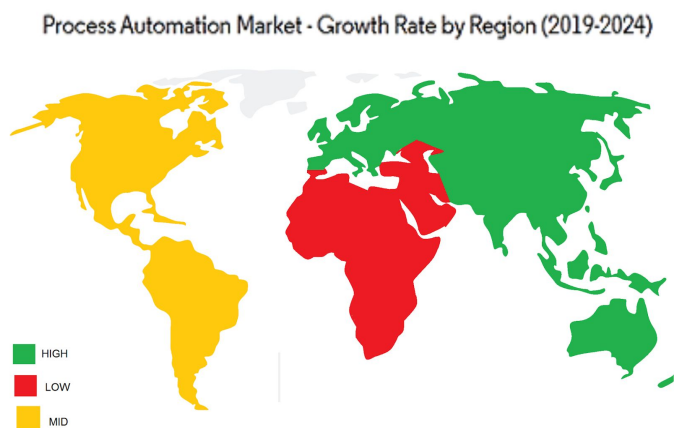


Figure 4. Automation adoption during 2019 and prediction till 2024 – Growth Rate by region

As per the trend, major parts of Asia and Europe are going to adopt automation with open arms to meet their multitudinous population's requirements. This advancement has led to many people losing their jobs to automation. The decline in jobs will continue as automation advances as per the trend, major parts of Asia and Europe are going to adopt automation with open arms to meet their multitudinous population's requirements. The decline in jobs will continue as automation advances with the help of IoT. This has contemplated mixed emotions among the people in the community where semi-skilled and unskilled laborers are being replaced by automated machines. Many continue to

argue that the IoT industry has created plenty of jobs. On the flip side, it has also resulted in the decline of many more jobs due to automation. This poses a big threat for the future where if most jobs are going to be automated, where will semi-skilled or unskilled workforce work.

B. Surveillance

Surveillance has been a vital part of enforced security. Previously, due to its bulk size and cost of operations, it was available only to organizations and governments. Smart surveillance has helped common gentry to avail of this service for their domestic and commercial purposes. This is needed especially in the current scenario where we live a nomadic life. The users are always on the move. These internet-enabled cameras help the user to see the camera's feed from anywhere in the world using an internet connection and secures the users with a live feed of the camera. This technology, when used by small shop owners who are under constant fear of being robbed, has helped them feeling far safer about their assets. This adds to the psychological relief which directly impacts their social interactions.

Spain has found yet another utility with a surveillance camera and drone technology. They have implemented it to reduce road accidents. Road traffic deaths claim the innocent pedestrian, motorcyclist and cyclists' lives. With this technology drivers could be provided with a "sixth sense". This solution has been tested with Perico Delgado, a former professional cyclist. [14]

Smart surveillance has an important social application. With the rise of nuclear families and working parents, smart cameras are used to monitor infants and young children. This social application has enabled parents to place portable cameras around the house to monitor their infants and young children when they are away for work. These findings have reduced many cases of child brutality when infants and young children are left with their caretakers. This intervention will help us bring up children in a safer environment. This, in turn, can mitigate the negative behavioural and criminal instincts developed due to troubled childhood. Recent advancements in IoT such as portable cameras transmit live feed, it has helped parents worldwide achieve peace of mind to know they can see their child's state at any point in time. The same concept is applied to surveillance in smart cities where police have access to plenty of cameras to keep the city in check using live feed.

C. Domestic Spaces

Internet-enabled light bulbs and such appliances, and the need to control all of these at one place has allowed a lot of top tech companies to compete in this space with the production of the devices such as Google Home, Amazon Echo, etc. that completely control all the interconnected devices. Physical presence which had been a barrier for this nomad lifestyle generation, has gained a lot of control to

operate independently from the physical location of the appliances. These devices are voice-controlled apart from the app on the user's phone. Voice-controlled devices have their independent virtual assistant that interacts with the user to make it a seamless experience.

This futuristic technology which is now becoming a common household phenomenon and will soon become a necessity. The data the virtual assistant collects is stored in the company's servers over which the user has no rights. This data is used to model the user's preferences based on his/her constant interaction with the device helping third party companies target the user based on his interest and preferences to advertising in a manner that would provoke him/her to buy the item or opt for the service.

This seems to be a very effective way for companies to advertise to the target demographic but the means in which the data is being collected is a complete invasion of privacy.[8] Many of device's privacy policy states it beforehand that the data will be sold to the third party and constantly interacting with these devices helps the companies to understand the user's psychology more and more over time[8]. A prime example of the analysis of the harmless data invaded and utilized to sway the masses can be seen during elections worldwide. Here, voters are easily persuaded to vote for a specific party by often being exposed to content that either supports the specific party/ leader or scrutinizes the opposing party or leader.

Cyber security and privacy being the major concerns for all people around the world, we need to re-evaluate the implementation of these smart devices which are voice-enabled for they can always be listening to user's conversation in the background so as to pop up to the service as soon as the user enunciates the phrase to activate the virtual assistant. This convenient feature leaves the user wondering whether the device is listening to the conversation or not and even if it's listening whether it is storing that data or if it's being heard by someone else.[9] These devices can become weapons for cyber terrorists and adversely affect the social lives of people using them. Another issue is that devices control other devices that are connected to it and if not secured properly it can give hackers access to multiple devices thus accessing user's personal data. The Constant fear of such intrusion in the lives of users adds additional anxiety of being spied on by other people.

These days technology can help a person make the house feel like home through interactions based on social support and companionship. This companionship between devices may significantly improve users' positive feeling. [10] People's dependency on the virtual assistants has led them to be constantly over-dependent on technology for every day's mundane tasks leading to loss of productivity. [11]

D. Lifestyle Luxury

Smart watches are an extension of smartphones in the root sense and just facilitate monitoring. They monitor physical

aspects such as heart-beat, sleep time and stress levels. The downside being, monitoring leads users to use this data to overstimulate their brains. The need to monitor the basic aspects contributes insignificantly to make the user's life better. Rather on viewing the imperfect data, he/she takes unpleasing steps to please the device. The human mind is turning into a captive to these gadgets, enabling them to screen each second of their day. The vast majority set wellbeing objectives on their gadgets to keep up a more advantageous and better way of life however frequently wind up defining ridiculous objectives set out by others or those prescribed by their gadgets.

The constant urge to monitor oneself and feedback has led to the rise of the "Phantom rings" phenomenon. The symptoms for this include constantly checking phones for notification as if one would have heard a notification sound, even though the phone didn't make any sound and neither any notification would have arrived. When a smartwatch makes a noise, it produces mental and physical reactions in the user, he/she grows increasingly antsy to look at the screen to see the notification and its content. This reaction is so ingrained that it kicks in even without a prompt because the brain is telling you to check in so as to not miss out due to the overstimulation of information it has been receiving. This constant feeling on your wrist of your watch buzzing with notifications is a psychological drawback that has moved from the user's phone to his/her smartwatch and in worst case maybe both, leaving them paranoid all the time.

E. Data Utilization and Marketing Possibilities

Certain foundations to include as a part of digital marketing and sales program are:

- *Create a sales-ready website*
- *Define new personas*
- *Develop a thought leadership program*
- *Implement an inbound marketing program*

Inbound marketing means is a business methodology to create valuable content and experiences tailored for customers. The various facets of marketing used are content marketing, social media marketing, search engine optimization, and branding. This prevents dumping irrelevant data on customers. Inbound and Industry 4.0 both rely on data; both aim to improve the buying experiences of your customers.

The education industry is flourishing. Unicorns like BYJU'S and various other start-ups and companies can utilize the data to customize as per the young mind's need. Since the advent of the institutional system, they have approached the "one size fits all" method to impart knowledge. This must be revamped to tailor learning as per the child's capabilities and talent. The child's sleep cycles and interests could be detected using these surveillance cameras. The safety aspects need to be looked into.

Voice-based technology can help ease the life of handicapped and aid the blind, help in tackling autism. Smart home devices can be vital provided companies give security and reward for the conceptual sharing of limited data.

The fitness and health sector could make strides in providing better services by utilizing this information. Targeted marketing will be possible and more fruitful. Hospitals and the governments could gather a sense as to which locations would require a certain type of medication and specialist to target the right patients in time. This boon of IoT could make medication and emergency access to hospitals easier.

F. Security concerns

The value addition in the form of user privacy is an ethical aspect that must be integrated during the designing and development of IoT products and services. This survey has helped us identify that the need of the hour is to create tools and frameworks to aid in providing ethical development and design in practice. This will support developers and their projects. Regulations such as "General Data Protection Regulation (EU GDPR) set forth by the European Union set firm guidelines about the collection and usage of data processors, storage and release of customer data, restricting the big data accessibility to digital marketers and research companies.

G. Policies

The observations and recent trends suggest that lack of technology and knowledge, misplaced incentives from an economic point of view have led to business failure of privacy protection solutions like Privacy Enhancing Technologies (PET) and Privacy Enhancing Measures (PEM).[15] Legal frameworks alone will do no good. They can be strengthened by providing users "ethical choices." Users are willing to pay for quality services like security which will ensure balance within the digital architecture. [17]

Privacy protection is contextual and relies upon where the client operates. Contexts are formed by "innovation, strategic approaches, and industry area or different highlights like geographic area, relationship, place, space, understanding, culture and religion, and existing administrative frameworks". [16]

H. Trends

Access to the consumers' lifestyle trends data can help marketers gauge customer interaction and their rationale to purchase specific products or services and why, how, when are being utilized.[18] As a part of moral entitlement users/citizens must have a say to choose their values. This choice must be well beyond the user's preferences policies.

- 1) **SEO trends:** *This will have a great impact on e-commerce and in general on the whole trade online as well as offline. Web pages ranking will see a paradigm shift from mere inclusion of keywords, to*

focus on natural language that is contained within its content and intention-based writing. [18] This will be a major aspect of IoT landscape.

- 2) **Market research:** *This forms the heart of marketing strategy formulation and its success. B2B enterprises have already accepted IoT as an industry norm, a similar trend will be seen in IoT for B2C market. The consideration of IoT-empowered gadgets in the homes will give a rich wellspring of information to break down. This flood of information will enable advertisers to streamline their procedures and arrive at specialty crowds in new ways.[18]*

Marketing professionals will be able to perform better predictive analysis of their target customers evolving wants and needs with connection between the IoT and the cloud.

IV.CONCLUSIONS

Customers place value and respond positively to targeted ads and marketing strategies, provided their sense of privacy is maintained. Targeted marketing could be made robust with the use of IoT networks and cognitive technology. We drew the following points about the general products and services available today and how we could better utilize the humongous data obtained:

- *Analyze customer's purchasing habit across the platforms they use, respecting their privacy at the same time.*
- *Antecedence of information pertaining to interaction with devices, products and among the "connected devices" themselves .Previously this data was unobtainable.*
- *Predicting the mindset and stage of customer's purchasing journey with a better insight into the buying journey.*
- *Provide Real-time interactions, POS notifications and targeted ads.[12]*
- *Apply the data insights in customer service field to quickly resolve issues.*

Invasion of user's privacy will remain an important concern for all applications of IoT. With the advancement of IoT, it'll result in more loss of jobs due to automation, which can have a negative social impact in the forthcoming time. However, with time and as history suggests new job roles shall be created. This shift in the employment scenario might not be received with open arms. Advances in this sector have resulted in great benefits for industries in terms of profit and productivity. It has had plenty of positive social impact in sectors such as surveillance and healthcare. Everything that is being connected to the internet doesn't necessarily change people's lives for good and plenty of unnecessary features and collection of data are leading to its misuse.

Marketing aspects of IoT are still in the nascent stage. With the further evolution of this technology, we will become better equipped to handle its applications for marketing with security. Consumers place value in the security provided in times when it is not common.

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REFERENCES

- [1] Green-GM, H., & IoT, W. (2015). Cognitive IoT: Making the Internet of Things Deliver for All of Us.
- [2] Dave, E. (2011). How the next evolution of the internet is changing everything. The Internet of Things.
- [3] LeHong, H., & Fenn, J. (2012). Key trends to watch in gartner 2012 emerging technologies hype cycle. Gartner Inc.
- [4] Rozental, A., Andersson, G., Boettcher, J., Ebert, D. D., Cuijpers, P., Knaevelsrud, C., ... & Carlbring, P. (2014). Consensus statement on defining and measuring negative effects of Internet interventions. *Internet interventions*, 1(1), 12-19.
- [5] Bibri, S. E. (2015). Aml and the IoT and Environmental and Societal Sustainability: Risks, Challenges, and Underpinnings. In *The Shaping of Ambient Intelligence and the Internet of Things* (pp. 163-215). Atlantis Press, Paris.
- [6] Ianenko, M., Stepanov, M., Ianenko, M., & Iliashenko, S. (2019, March). Peculiarities of product policy in the internet of things. In *IOP Conference Series: Materials Science and Engineering* (Vol. 497, No. 1, p. 012119). IOP Publishing.
- [7] Bahrin, M. A. K., Othman, M. F., Azli, N. N., & Talib, M. F. (2016). Industry 4.0: A review on industrial automation and robotics. *Jurnal Teknologi*, 78(6-13), 137-143.
- [8] H. Dutton, W. (2014). Putting things to work: social and policy challenges for the Internet of things. *info*, 16(3), 1-21.
- [9] Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. *Business Horizons*, 58(4), 431-440.
- [10] Lee, B., Kwon, O., Lee, I., & Kim, J. (2017). Companionship with smart home devices: The impact of social connectedness and interaction types on perceived social support and companionship in smart homes. *Computers in Human Behavior*, 75, 922-934.
- [11] Du, K. K., Wang, Z. L., & Mi, H. O. N. G. (2013). Human machine interactive system on smart home of IoT. *The Journal of China Universities of Posts and Telecommunications*, 20, 96-99.

[12] Arumugam, V. (2019). Business Aspects, Models, and Opportunities of IoT. In *Edge Computing and Computational Intelligence Paradigms for the IoT* (pp. 69-99). IGI Global.

[13] Process Automation Market: Size: Trends: Forecasts (2019 - 2024). (2019, April 1). Retrieved from <https://www.mordorintelligence.com/industry-reports/global-process-automation-market-industry>.

[14] Semeleder, L. S. G., & Ingeniero de Telecomunicación por la Universidad Politécnica de Madrid. (2019, September 12). Now cycling is safer thanks to drones and IoT. Retrieved from <https://business.blogthinkbig.com/now-cycling-is-safer-thanks-to-drones-and-iot/>.

[15] Alessandro A. Privacy and security of personal information. *Economics of Information Security*. 2004;12:179–186. doi: 10.1007/1-4020-8090-5_14. [CrossRef] [Google Scholar]

[16] Nissenbaum, H. (2015) Respecting context to protect privacy: Why meaning matters. *Science and Engineering Ethics*, 2015, 1–22. (online preview) <http://link.springer.com/article/10.1007%2Fs11948-015-9674-9>. Accessed November 2, 2015. [PubMed]

[17] Baldini, G., Botterman, M., Nisse, R., & Tallacchini, M. (2018). Ethical design in the internet of things. *Science and engineering ethics*, 24(3), 905-925.

[18] Gaskin. (2019, March 21). How the Internet of Things Is Disrupting Digital Marketing. Retrieved from

<https://digitalmarketinginstitute.com/blog/19-03-2018-how-the-internet-of-things-is-disrupting-digital-marketing>.



Anooksha Y. Rathod is currently pursuing her B.Tech degree in *Computer Engineering* at Pandit deendayal Petroleum University. She completed her school in Kuwait at Indian Community School Kuwait. She has applied for an IPR and has a keen interest in the confluence of business and technology. She is an active member of CSI.



Shubham Pandya is currently pursuing his B.Tech degree in *Computer Engineering* at Pandit Deendayal Petroleum University. He completed his school from Rajkot, Gujarat. He is an accomplished musician and holds a visharad in vocal.



Dr. Nishant Doshi is an assistant Professor *Engineering* at Pandit Deendayal Petroleum University. He holds a masters in *Algorithms* from Dhirubhai Ambani Institute of Information and Communication Technology, Gujarat (2009) and has a Phd in *Cryptography* from Sardar Vallabhbhai National Institute of Technology. He is a professional member of IEEE, ACM, CRSI and CSI.