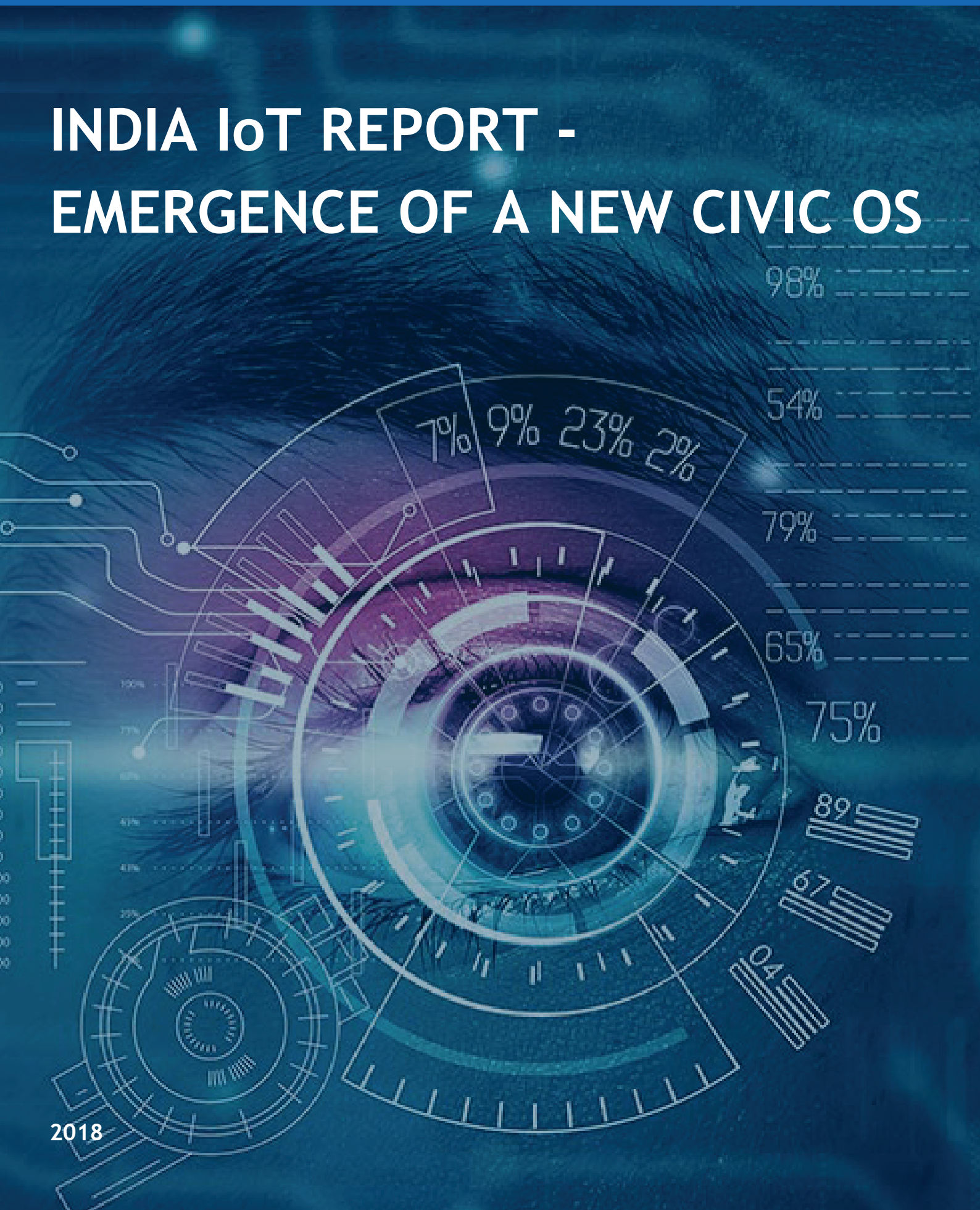
TATA COMMUNICATIONS

INDIA IoT REPORT - EMERGENCE OF A NEW CIVIC OS



2018

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1

EXECUTIVE SUMMARY

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Lately, the Internet of Things (IoT) has been receiving its fair share of attention as the world turns more and more digital. There is no doubting the value it has unlocked so far and its potential to change life as we know it today.

2018 is being heralded by several notable organisations[1] as a year of good tidings and synchronised global economic growth. Reports are bullish about India's participation in the global economy's recovery and are pegging India's economic growth at 7-8%[2].

At the heart of this growth story lies the inherent change policymakers, enterprises and citizens are driving to create and steer a truly digital economy. Perhaps Neuromancer author William Gibson is spot-on with his insight, "The future is already here. It's just not evenly distributed." Change is under way, but in different ways dependent on geography, culture, economics and politics.

Most reports indicate that the full potential and value of the Internet of Things will be achieved with a juxtaposition of both the developed and emerging economies[3]. India already has more than 100 smart city initiatives planned[4] - cities to be equipped with state-of-the-art communication capabilities and ubiquitous connectivity to enable seamless communication not just between humans but also machine-to-machine (M2M), and thereby machines to humans.

The Internet of Things presents an opportunity to transform society and establish a new ecosystem built to serve not merely humans, but humanity. In this new world, people will receive uniquely personalised services on demand, while societies will benefit from optimised resource use and minimised negative environmental impact. The Organisation for Economic Co-operation and Development (OECD) compares IoT's significance and potential ubiquity to the advent of household electricity[5] and sees it extending beyond technology and commerce to redefine our social, cultural and professional relationships.

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The following report sheds light on the nature and speed at which these developments will be realised in India, both in collective understanding and individual expectations of life. To co-create a sustainable and lasting impact, the higher the awareness of the technologies at hand, the greater the chance that end consumers will be able to enjoy them and custom-shape their everyday lives in significant ways.

We spoke to more than 2,000 respondents across 12 cities in India and reviewed their responses to arrive at an estimate of their current awareness and knowledge of IoT, their expectations and what they believe is in store for the future.

The findings provide a unique insight into how Indians perceive this technology, how it can shape their daily lives, and their preferred priorities. In compiling this report, we accompany our primary data with reputable third-party figures to validate and shed more light on our insights.

A key concept in our thinking is the idea of Civic OS, which we define as the ability of humans and machines to coexist and to cohabit and communicate seamlessly - all part of the definitive roadmap of the fourth industrial revolution unfurling at the moment.

The Civic OS represents a fundamental change in norms and mores in society: a change in the way we conduct both our businesses and our relationships, as well as our everyday lives in times to come.

As IoT connectivity broadens and markets evolve, how we live, how we use technology and interact with each other, and our expectations from these innovations, are all being redefined. This new civic society will be fuelled by data and optimised by machines collaborating with each other for the benefit of citizens.

This change will be underpinned by a robust technical construct through which public and commercial services can be delivered directly to individuals by and through a range of connected devices, from wearables and domestic appliances to vehicles and smart meters. The Internet of Things will not only change the way we work but also transform the way we live, thereby giving rise to a new way of life.

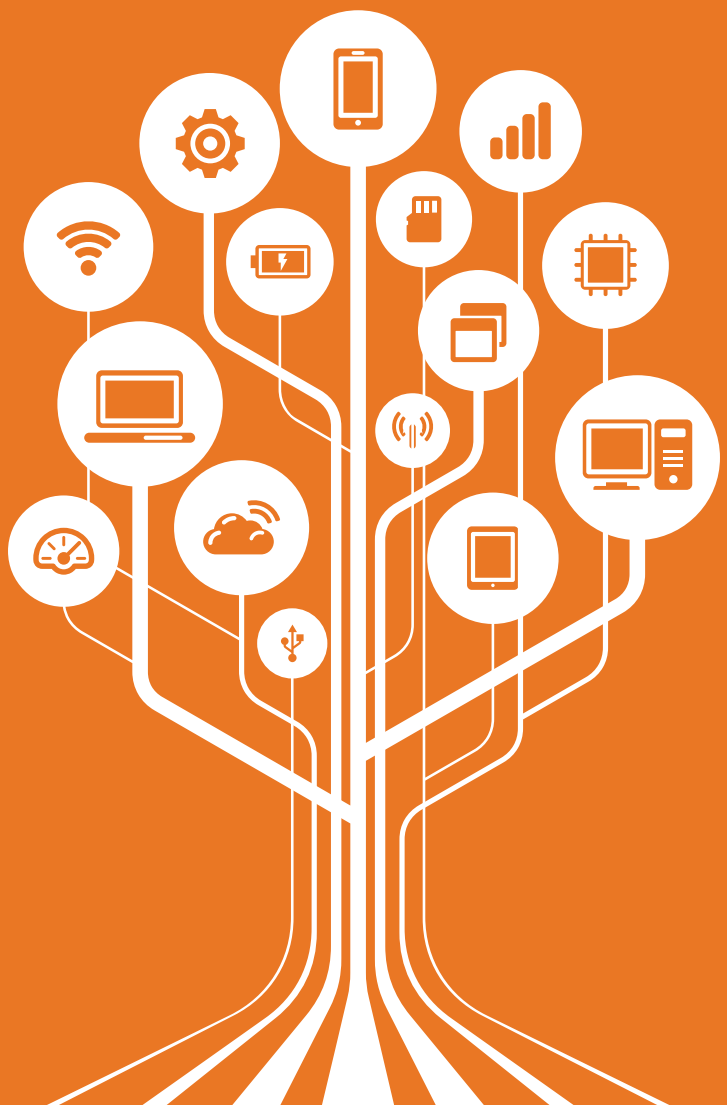
Finally as a prelude, below is a summary of the key findings of the Tata Communications inaugural India IoT Report[6]:

- ✓ Perception of IoT's full impact and engagement with it is still in its infancy, as one in three respondents still believes that IoT is equivalent to smartphones only.
- ✓ On the household front, more than 90% would be interested in applying IoT to the challenge of managing household chores. To illustrate, more than 50% of those surveyed said they regularly run out of milk, so a connected fridge that automatically helps re-stock essentials would be a boon.
- ✓ When it comes to public services health tops the priority list with over 80% expecting IoT to help improve family healthcare services in India.

What do these findings mean for the future of IoT in India? And what are the opportunities and barriers faced during widespread deployment in India? Read on to find out!

2

THE CIVIC OPERATING SYSTEM



THE CIVIC OPERATING SYSTEM

A new humanism

There are currently 7.6 billion people on Earth[7]: 3.7 billion are connected to the Internet; almost 50% of that connected population lives in Asia, 24% of whom reside in India[8]. Investment in digitisation and urbanisation and friendly regulatory policies hold the key to ensuring that India continues to advance on its path of socioeconomic progress. The market potential of all things IoT in India alone is predicted to be $9 billion by 2020[9]. India is one of the key countries poised for large-scale implementation of IoT projects - not only to be able to set new standards but also as a key geography to anticipate the emergence of a new humanism embracing people and devices.

In India, advancing ubiquitous connectivity is changing the dimensions of every social group. This emergence of a new societal operating system reflects both today's technological impact and also an evolving concept of citizenship: a change in the way citizens access services and relate to life. This is the fundamental basis of what we call the new Civic OS.

As we move forward, IoT will continue to alter society, as we know it today, establishing new variables and a new value chain which embraces both humans and machines as our significant others as the two become evermore inseparable. This change warrants a new set of protocols and behaviours to be able to function within the new norm, which in turn, continues to shape the Civic OS. This operating system, powered by IoT solutions, will enable economies to run more efficiently, securely and productively.

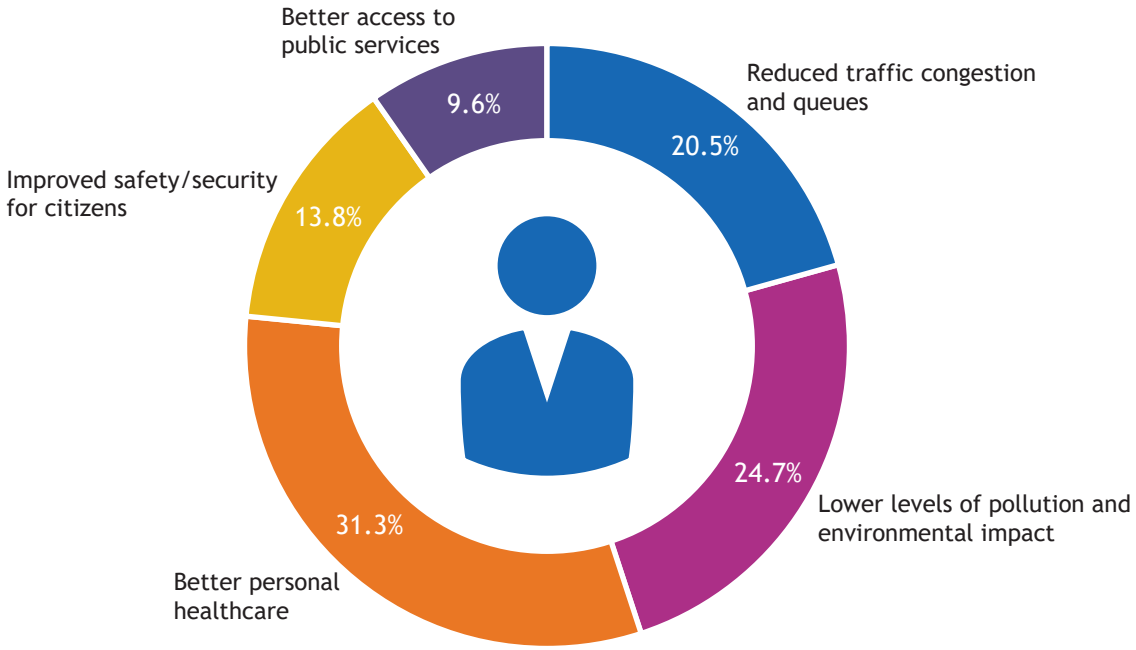
According to our research, there is a nascent understanding of how IoT will benefit individuals in Indian society today:

- ✓ 31.3% of the respondents expect IoT to deliver improved levels of healthcare.
- ✓ Around 20.5% of respondents anticipates better traffic management and 24.7% expect a reduction in air pollution.
- ✓ 14.5% of Indians see an immediate association of IoT in the delivery of improved public services leading to a better quality of life.

In this paradigm, technology and infrastructure become key differentiators in global economies, whose GDPs will depend less on access to raw materials and commodities and more on their capacity to share, store and access information. Ideally, such economies will be able to optimise their resources and build inclusive and affirmative communities while also minimising negative environmental impact.

This chart summarises our broad conclusions - we will return to it as the account of our conclusions progresses below.

Fig. 1 | Consumer Expectations from IoT



3

CONNECTED DEVICES

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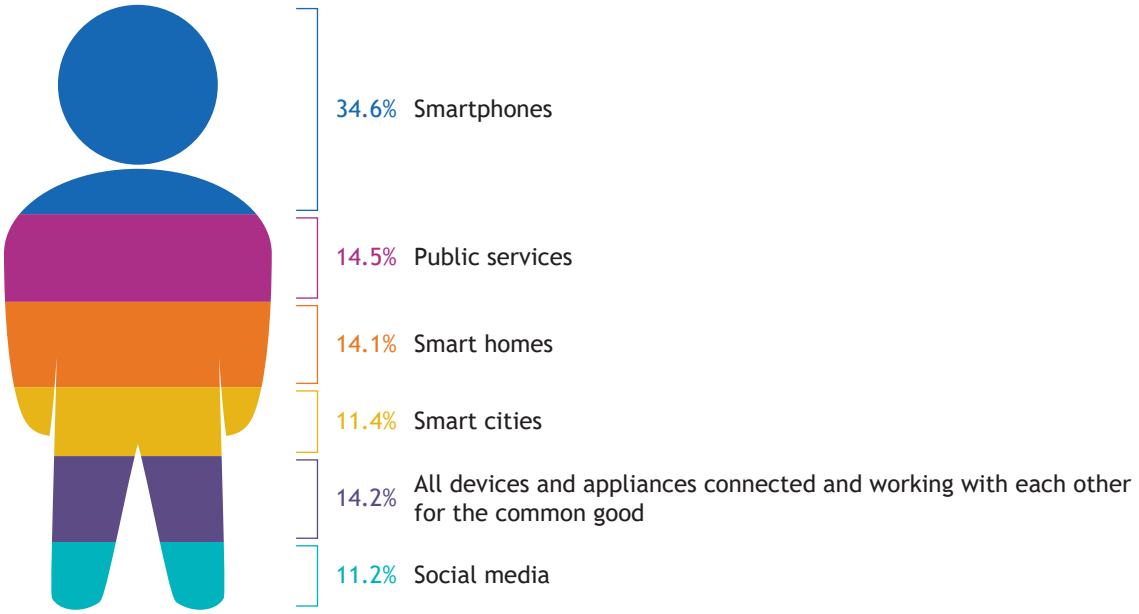
The Smartphone Paradox

According to our research, (34.6%) of Indians associate IoT primarily with smartphones. Smaller proportions cited public services (14.5%), smart homes (14.1%) or smart cities (11.4%). Only (14.2%) of respondents picked 'all devices and appliances connected and working with each other for the common good' as the best descriptor of IoT.

Fig. 2 | Consumer Insight | IoT by association



India has seen robust growth in wearable technology, with IoT applied in the fitness, healthcare, lifestyle and infotainment sectors. Market for all things IoT is expected to grow exponentially according to several industry reports[10].

Clearly, the smartphone with its high-impact mobility features is not only the most visible, but also the most understood IoT device in the Indian context.

6Wresearch[11] calculates that India's IoT market is projected to grow at a CAGR of 28.2% in 2016-22, with 'Industrial IoT' accounting for the most growth in sectors such as manufacturing, production and logistics. According to IDC[12], more than 50% of India's corporate leaders believe IoT to be imperative to remaining 'digitally fit' and 60% see it as being imperative to driving a competitive advantage.

In 2017, the World Bank cited the Government's Digital India campaign as a key driver to making firms more competitive through the application of IoT technologies[13].

Clearly, common perceptions of what constitutes IoT need to advance through education and training for society to build a sustainable ecosystem in the future.

India is a largely agrarian economy. The agricultural sector that employs nearly 50% of the country's population has a huge impact on the overall growth of the country[14]. This sector stands to reap massive benefits from IoT-driven solutions that create improved output - thereby enhancing the value of the sector. Large farmers are already deploying 'precision farming' techniques that use field sensors to monitor agricultural operations[15].

Imagine the impact IoT can have in introducing better predictability to farm yields, better control over soil dynamics to be able to achieve a better harvest, and even better quality of food for citizens – in turn resulting in healthier citizens. Healthier citizens lead to a healthy economic outlook.

The promise of IoT in the manufacturing sector is evident in ensuring a smarter process map across the value chain[16].

The real story of IoT in India goes well beyond the smartphone – but people's perception don't reflect that yet.

The impact of the disparity between popular perception and the reality of IoT is clear in people's expectations of IoT in the future. Only 14.5% of respondents see enhanced public services as a potential benefit from the technology.

This is the essence of the 'smartphone paradox' revealed in our findings. A critical element of India's Civic OS would be to build awareness of the impact of IoT for all segments of society as an enabler of greater understanding, uptake and construction.

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4

IoT IN HOMES

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Dealing with FOLO (Fear Of Lights On)

More than half of the respondents (54.5%) admit to forgetting to replenish essential supplies such as milk at least once a month. (22.7%) revealed that they run out of milk on a weekly basis. More than three-quarters of the respondents (75.3%) would be tempted to purchase a technology which meant that they would never have to worry about running out of groceries again.

Fig. 3 | Consumer Insight | Essential Supplies

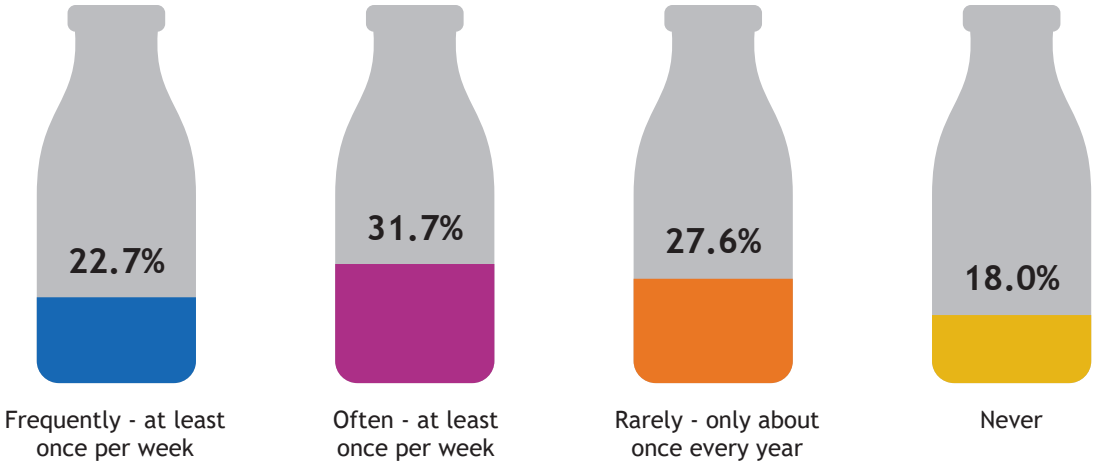
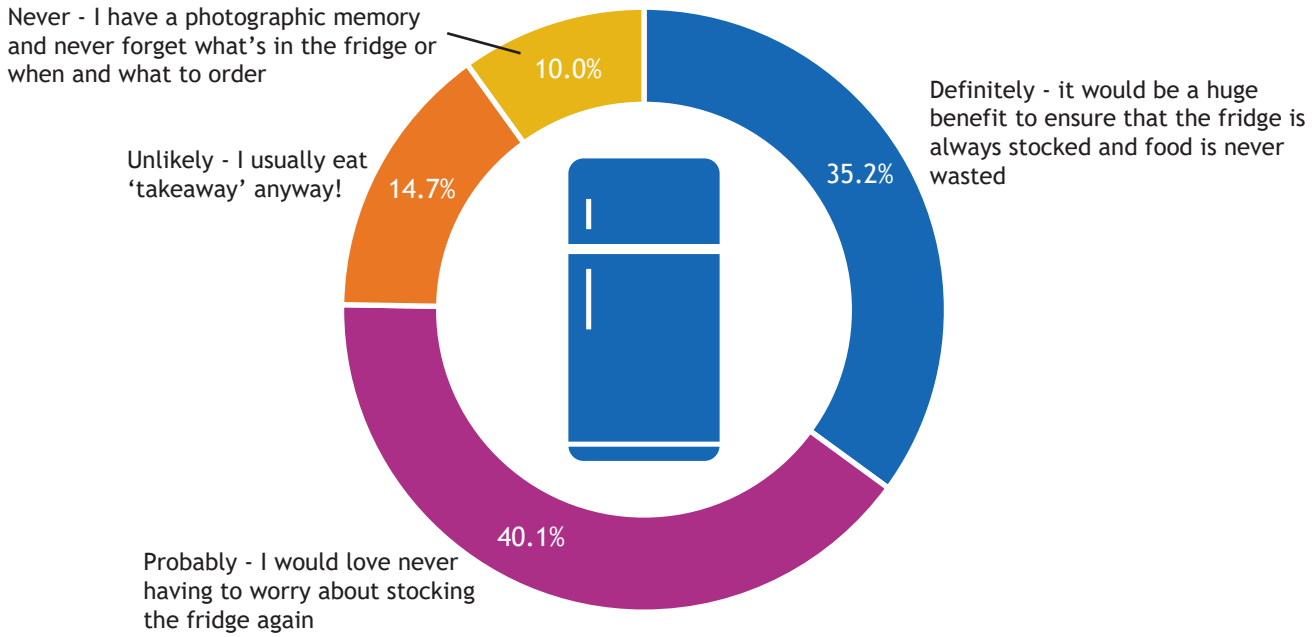
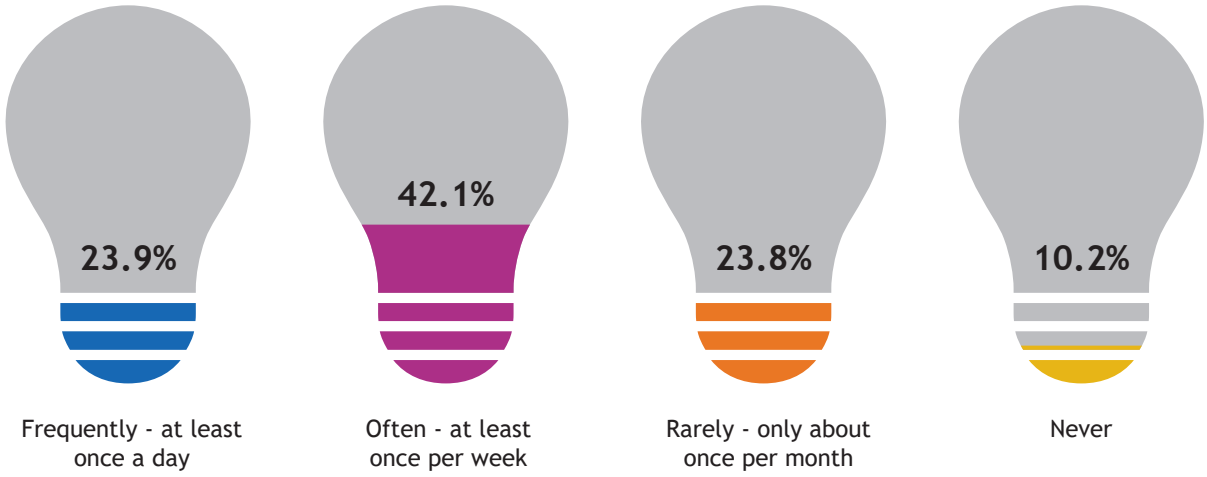


Fig. 4 | Consumer Insight | Acceptance of new technology in homes



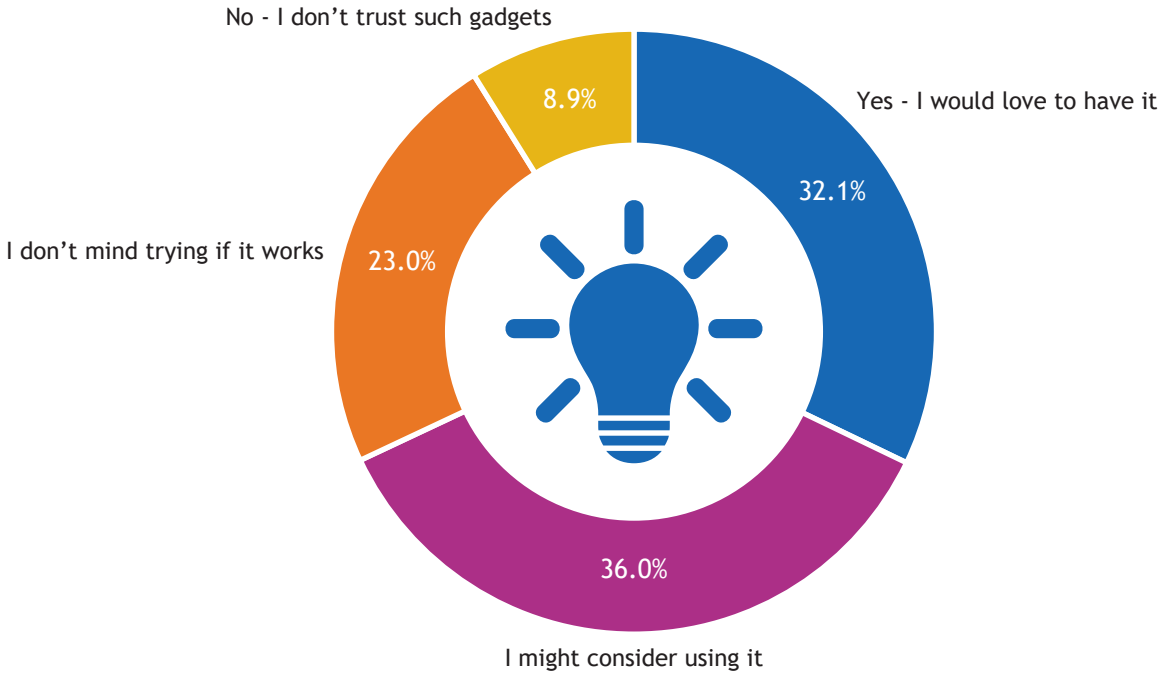
It is interesting to note that 35.2% of the respondents cited better food management as one of the key takeaways from such a purchase.

Fig. 5 | Accepting FOLO (Fear Of Lights On)



According to our research, (65.9%) of Indians worry that they've left the lights on (FOLO) or the gas on back home when they are away at least once a week, and nearly a quarter (23.9%) worry about the issue at least once a day. That is a lot of accumulated anxiety!

Fig. 6 | Consumer Insight | Acceptance of technology in managing FOLO



More than 9 out of 10 Indians (91.1%) are open to experimenting with a gadget that helps them monitor their home appliances in real-time basis; a third (32.1%) would definitely subscribe to such a service.

According to NASSCOM, the IoT market in India is expected to reach $15 Bn by 2020[17]. A house featuring intelligent technology is meant to simplify and automate everyday activities and is capable of doing things autonomously. Today, an assortment of Wi-Fi enabled white goods and appliances is available in the market, from washing machines that can activate grocers to send detergents, to robotic, self-guided vacuum cleaners that live under the couch.

Access-agnostic and completely interoperable, intelligent appliances are beginning to capture the imagination and, in due course, may well establish critical mass.

While the transformative nature of IoT to a family of perhaps four is obvious, the broader impact on society from an environmental point of view is also palpable.

When questioned about the possibility of automated fridge restocking, 35.2% respondents referenced the reduction of food wastage as a resulting benefit.

The reality is that the positive impact of a genuinely connected home extends way beyond eliminating food wastage. One recent study conducted by the Consumer Technology Association (CTA) suggests that using connected devices in a home environment could reduce domestic energy consumption by at least 10%[18].

In India, a Civic OS policy could be designed to make smart devices more accessible and affordable for the home and to incentivise the commercialisation of home IoT kits that address a particular issue, from resource optimisation to home security.

Given the growing levels of weekly and daily stress caused by forgetting to re-stock the fridge or leaving the lights on, the strong psychological benefits of IoT within Indian homes could also be considered over the longer term – an immeasurable soft benefit.

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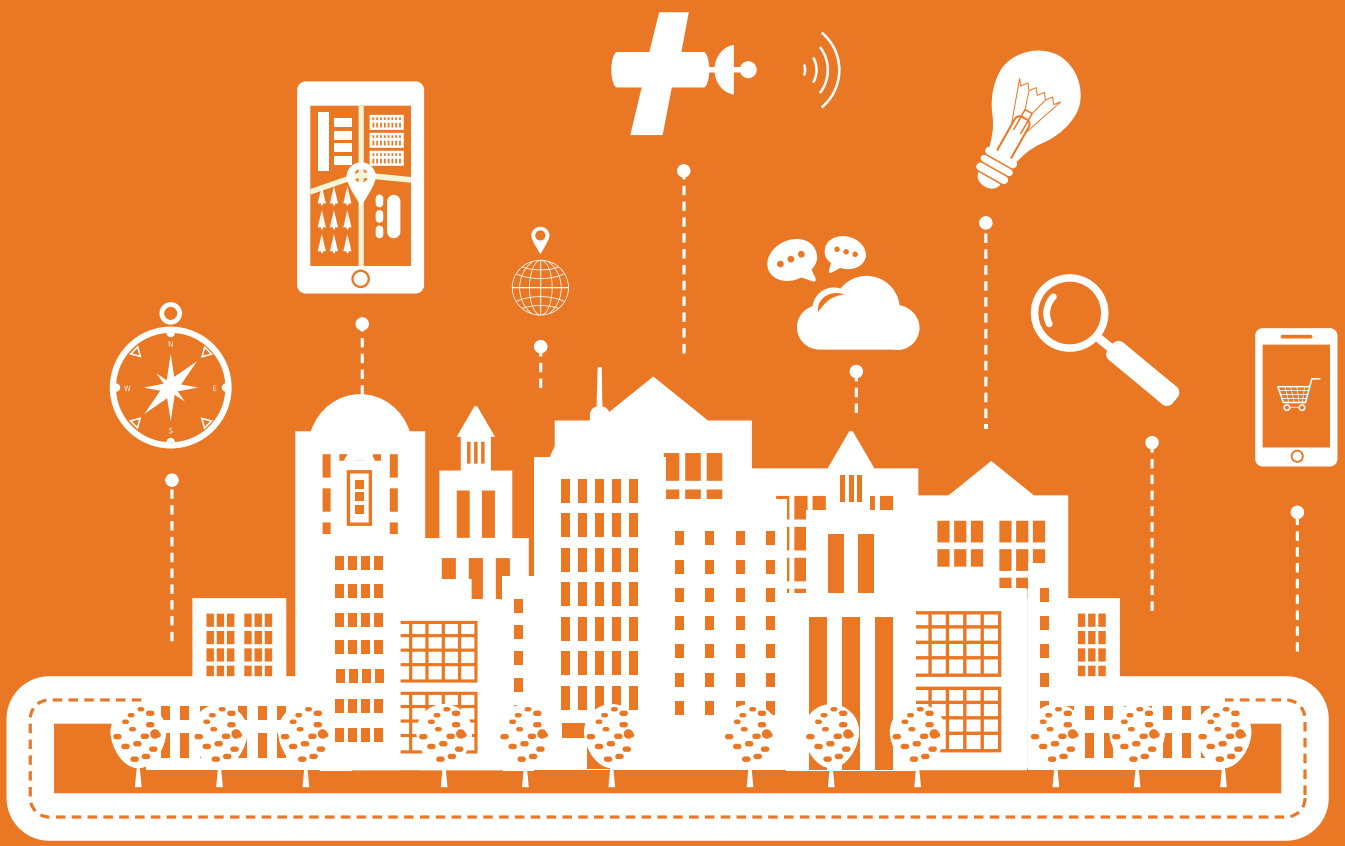
IoT IN PUBLIC SERVICES



IoT IN PUBLIC SERVICES

IoT's public service blind spot

The Government of India is one of the few that has clear and enabling IoT-related policies and regulatory frameworks in place[19].

India's Department of Electronics and Information Technology (DeiTY) has already published a draft IoT policy document to ensure the country captures a 5-6% share of the potential $15 billion global bonanza by 2020[20]. The paper covers IoT-specific training provisions, as well as research and development initiatives to support new IoT-enabled products and services.

An essential element of any future Civic OS will be to ensure that a collective good is derived from such IoT initiatives. However, it will have to balance the right of access to data for the public good with the right to privacy and confidentiality.

The ripple effect of an efficient IoT system in public administration translates into a better-connected, more secure and cost-effective standard of living. IoT is the pathway to creating smart grids that lead to better management of natural resources such as water and energy.

According to our research, healthcare is the number one priority for 29.1% of respondents, followed by reduced traffic congestion 28.7% and lower pollution levels and environmental impact 24.2%.

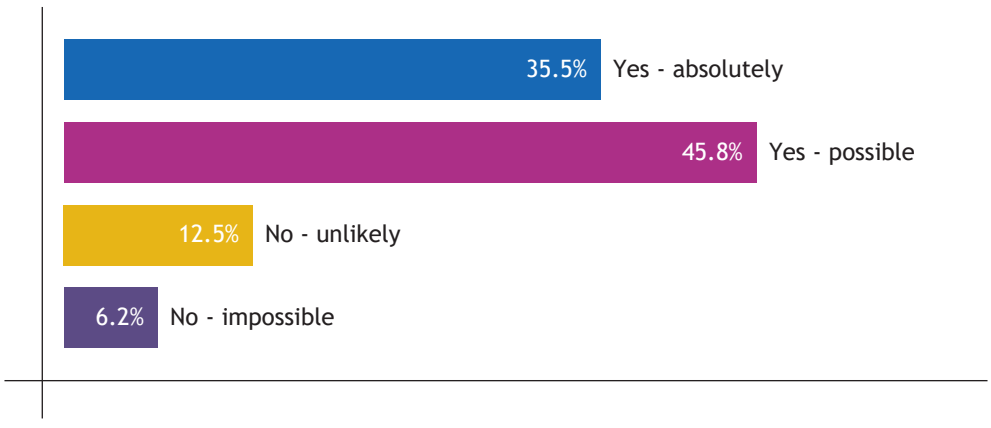
Survey respondents' appetite and expectation for what IoT can do for health services provision are compelling. (81.2%) respondents believe that in the future their children's health records will be stored and accessed remotely by the relevant health practitioner via IoT. This will enable parents to receive automated reminders about vaccinations and other routine interventions, resulting in better time management for the healthcare ecosystem at large.

Survey respondents' concerns and expectations about how IoT can alleviate issues such as air quality and traffic congestion are perfectly understandable. In India, almost half of all drivers spend more than 12 hours a week inside their cars[21].

In terms of the wider association of IoT and public services, a perception gap remains about the role and opportunity for the technology. Only (6.1%) respondents cited 'better access to public services' as a priority for IoT, fewer than one in eight (14.5%) currently associates IoT with the provision of public services, and fewer than one in ten (9.6%) considers that IoT could increase access to public services.

This blind spot in people's understanding and expectations about IoT's potential benefit to public services risks inhibiting its implementation in India. Again, an essential element of a balanced Civic OS would include educating citizens on the opportunities that IoT presents to enhance the quality and availability of public services, as well as their rights regarding the same. It would be critical in the evolution of society.

Fig. 7 | Consumer Expectations | Automation of children's medical files



6

FUTURE OF IoT

FUTURE OF IoT

Picture a world where everything in our lives is connected to the Internet and to every other thing, from smartphones and computers to our homes' lights, windows, thermostats, and water systems. A world where all of these devices can be in constant communication and remotely controlled by users. With the rapid growth of the IoT, this level of home automation is becoming a reality. IoT was never intended to be a fancy gizmo that would touch just a few areas of life. It is an all-encompassing technology that is finding its way into every conceivable activity.

Furthermore, transmission of data from machine-to-machine or from machine to infrastructure will be the next big monumental change. For technology to reach the proportions of a revolution, it needs to have far-reaching consequences, and by virtue of its extensive applications, IoT is the best current claimant, setting the stage for a new Civic OS.

It is this all-pervading nature of IoT technology that makes it one of the key drivers of future economies. It will not be long before it becomes a case of 'participate or perish'. Nothing succeeds in a vacuum, and IoT is the perfect example of how a connected business or a connected city creates the conditions for enhanced development and improvement. Nations have realised that there is huge potential in what we call a Civic OS, and are chalking up ambitious plans for smart cities, retrofitting infrastructure to make them smarter and more connected. Therefore it comes as no surprise that IDC predicts that by 2020, revenues of $9 trillion will accrue from devices tethered to the Internet[22].

History reminds us that the impact of any political, technological, or environmental developments are best assessed by the effects witnessed in society - and IoT may surpass all other influences. For instance, populous India has a dismal doctor-to-patient ratio of 1:1674[23], and the skewed urban-rural ratio sometimes denies treatment to patients. This is where IoT can make a life-saving difference through wearables, remote diagnosis and the monitoring of health parameters.

Similarly, latency in assembly line processes can be pre-empted through IoT in manufacturing processes[24], which will monitor progress in real time.

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By triggering responses that would have been expensive and difficult to achieve through traditional means, manufacturing becomes more cost-effective and efficient with cascading effects on society. We have already seen the huge potential playing out in agriculture. This is the IoT of the future.

Our research reveals that while expectations of what IoT can deliver run high, perceptions of what it entails still lag, with most relating it purely to their smartphone. Most respondents have yet to grasp the role this technology can play in the delivery of public services, even if they have a growing appreciation of how a smart home can simplify their daily lives and help de-stress.

If we are to deliver the benefits IoT promises – from more equitable sharing of healthcare services to connected homes (with permanently stocked fridges) to self-optimising production lines and super-productive farms, there is an inherent need to educate the population on everything IoT comprises and what they can expect in their futures.

Co-creating and embracing the new Civic OS that IoT heralds depends on the concepts being fully understood, and then fully embraced, across myriad groups and sectors. But once it is, we are well on our way to creating a universe of infinite connections - and surely that way true interconnectedness lies.

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TATA COMMUNICATIONS

ABOUT TATA COMMUNICATIONS

Tata Communications is a leading global provider of network, mobility, cloud and security services. With a leadership position in emerging markets, Tata Communications leverages its advanced solutions capabilities and domain expertise across its global network to deliver managed solutions to multi-national enterprises and communications service providers. The Tata Communications global network includes one of the most advanced and largest submarine cable networks and a Tier-1 IP network with connectivity to more than 240 countries and territories across 400 PoPs, as well as nearly 1 million square feet of data centre and colocation space worldwide. Tata Communications' depth and breadth of reach in emerging markets includes leadership in Indian enterprise data services and leadership in global international voice communications. Tata Communications Limited is listed on the Bombay Stock Exchange and the National Stock Exchange of India.

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