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How future trends are shaping key Internet of Things (IoT) spend areas?

As the physical and digital worlds come closer, IoT will have a huge role to play in the time to come. But how are business leaders reacting to the IoT phenomenon? What are the key IoT trends in different industries? These are a few questions we are here to answer...

Data is not just an output or a by-product. It is the fuel for digital transformation

It's not surprising that companies are doing everything they can to make their data relevant considering that data is having a direct impact on the company's bottom line. Consider this...

> **If a Fortune 1000 company enables a 10% increase in data accessibility, it will witness $65 million increase in net income.**

Data is taking customer experience up a notch with new concepts like AI, Machine Learning, hyper-personalization, and now, IoT. As billions of devices and systems get interconnected with each other, there's been an explosion of data generated from IoT. Combined with low cost sensors, high computational powers, and advanced AI algorithms, IoT has huge potential in different industries.

But what is IoT?

As the physical & digital worlds converge, IoT is going to gain more significance in the time to come. If you look around, you can find examples of IoT in -

Sensors

Driverless cars

Fitness trackers

Smart homes

> The Internet of Things (IoT) is a network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.
> **Gartner**

Companies think IoT is critical for success...

In a survey conducted by Microsoft, companies agreed that IoT is positively affecting profitability by helping them leverage modern cloud & networking technologies. Of the 3000 IoT decision makers surveyed, here are a few findings

94% said that IoT adoption is in the pipeline by the end of 2021

88% said that IoT is a decisive factor in their company's success

30% the ROI that companies are expecting on their IoT projects

97% have security concerns regarding IoT but are not discouraged by it

The current state of the IoT Market...

Organizations in all industries are spending on IoT efforts to improve business processes, mitigate risks, and enhance customer experiences. Here's a glimpse into the state of IoT market 2019

15%
Growth in the global IoT spending in 2019 ($745 billion) over that of 2018.

86%
Organizations surveyed in 2019 who said they had the intention of increasing their IoT spending in the time to come. (Intelligent Enterprise Index)

38%
Organizations that had company-wide IoT deployments in production in 2019. (Intelligent Enterprise Index)

49%
Enterprises that have set on a journey to become an Intelligent Enterprise & are making efforts in scaling the integration of their physical & digital worlds.

Key Industries are stepping into the Digital Future with IoT

Various industries are demonstrating the IoT-at-scale and generating actionable intelligence to fuel higher levels of efficiency, innovation and new business models.

Smart Manufacturing With IoT

" Industry 1.0 was the invention of mechanical help, Industry 2.0 was mass production, pioneered by Henry Ford, Industry 3.0 brought electronics and control systems to the shop floor, and Industry 4.0 is peer-to-peer communication between products, systems and machines. "

- Stefan Ferber, Director of IoT at Bosch Software

From mechanical to smart manufacturing

1700's-first Industrial Revolution

Mechanical
Technology was steam and water powering the first factories

1800's – second Industrial Revolution

Electrical
Electricity made possible the division of labor and mass production

1900's – third Industrial Revolution

Automated
IT enabled programmable work & an end to reliance on manual labor

Today Fourth Industrial Revolution

Connected
Cyber-physical systems, powered by IoT and fuelled by data, create a fully interconnected society

87%
Extreme experiences
Percentage of customers looking for a more seamless experience

75%
Digital natives
By 2025, the makeup of the workforce is projected to be majorly digital native

50B
Connected chaos
Internet connected "things" by 2020 including sensors, RFID chips etc.

35Days
Unprecedented pace
For a new technology to reach a critical mass of 50m users

Source: EY analysis

Smart Manufacturing With IoT

IoT has been the driving force behind the Industry 4.0 phenomenon. With smart sensors for temperature, moisture, and vibration control on critical factory equipment, industries are optimizing workflows, predicting failures & improving operational efficiencies.

IDC reports that the Discrete Manufacturing sector emerged as the top-most industry when it comes to IoT spending in 2019 with a total estimated investment of $119 billion.

IIoT (Industrial IoT) platforms are are taking over traditional MES including production maintenance, quality control & inventory management. Industry 4.0 will consume information and communication technologies to bring higher level of both automation and digitization.

Global IIoT spending in the Manufacturing Sector

CAGR 40%

Year	Value
2018	1,670
2019	2,424
2020	3,429
2021	4,842
2022	6,718
2023	9,248
2024	12,448
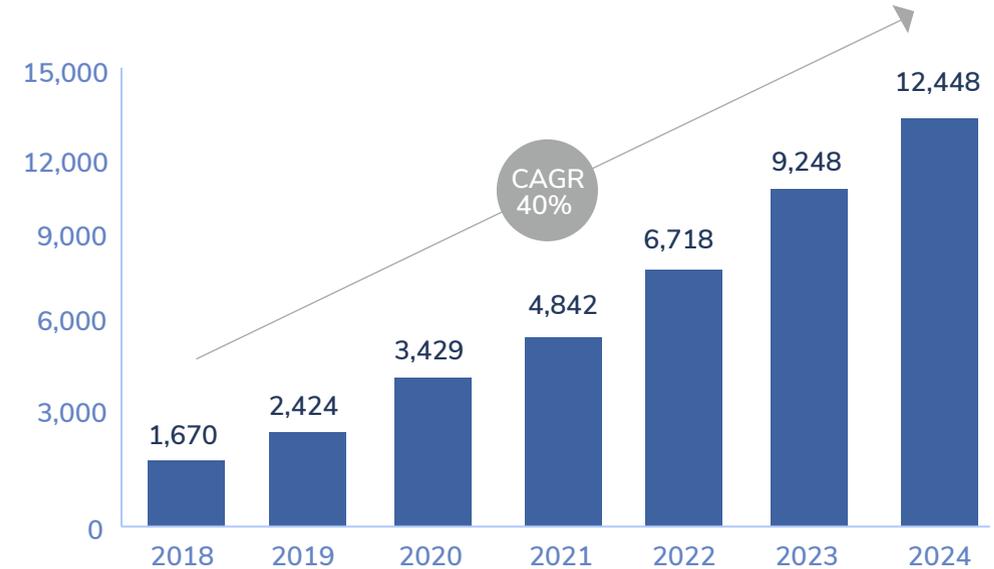
From $1.67B in 2018 to $12.44B in 2024, the global IIoT spending is set to increase by a CAGR of 40%.

Source: IoT Analytics, 2019

Internet of Things fundamentally changes the transit equation

The transportation industry is increasingly leveraging IoT with connected cars, fleet management, vehicle to vehicle and vehicle to infrastructure communication, self-driven vehicles. This development is being fuelled by enhanced visibility & lower latency that IoT systems bring to the table clubbed with more cloud storage options & omnipresent connectivity.

Intelligent transportation system opportunities abound across a wide range of industries and market segments. Examples include:

Fleet telematics and management solutions.

Reservation, toll, and ticketing systems.

Transport logistics applications.

Peer-to-peer services like car sharing.

Guidance and control systems.
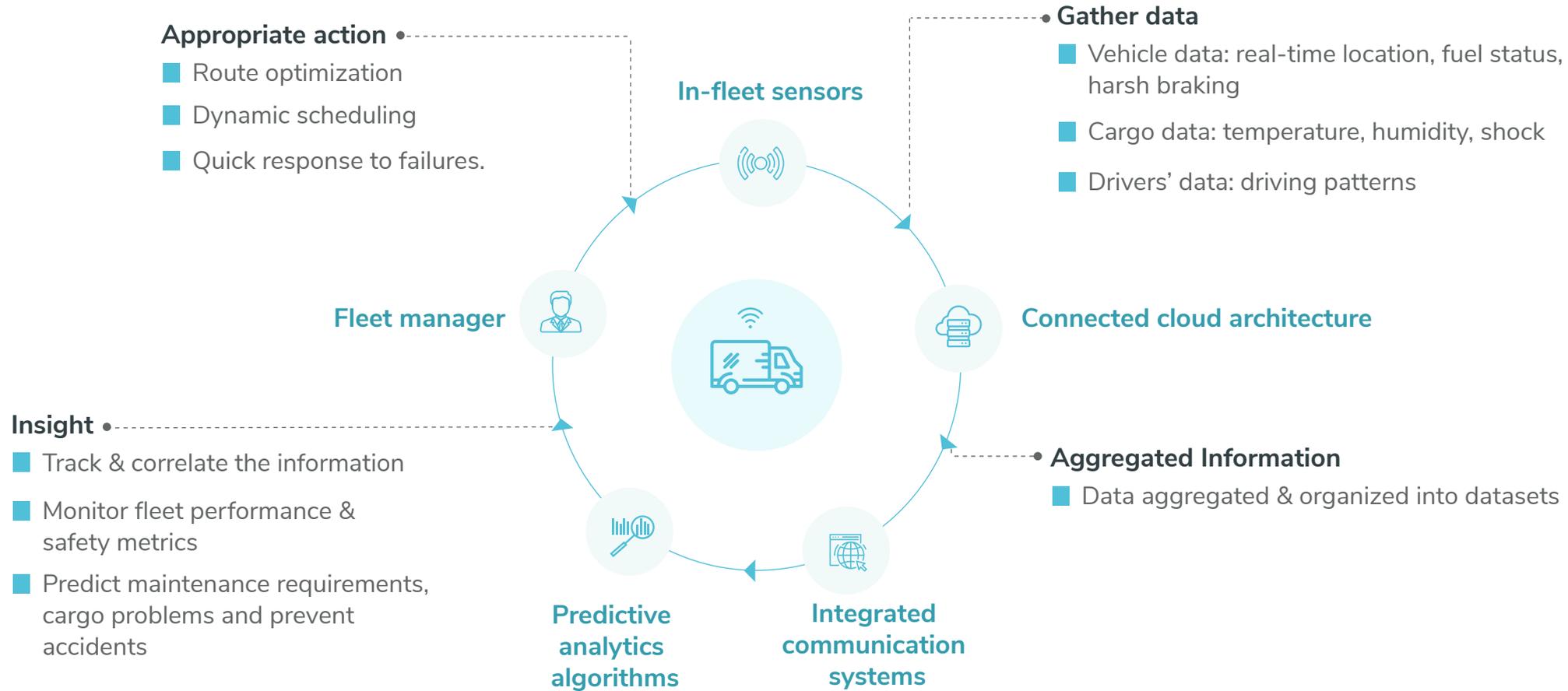
Security and surveillance systems.

Inventory and supply chain management solutions.

Smart vehicle applications.

IoT ecosystem in transportation

Here we explained how a information flow in a truly connected IOT ecosystem

Appropriate action
- Route optimization
- Dynamic scheduling
- Quick response to failures.

In-fleet sensors

Gather data
- Vehicle data: real-time location, fuel status, harsh braking
- Cargo data: temperature, humidity, shock
- Drivers' data: driving patterns

Fleet manager

Connected cloud architecture

Insight
- Track & correlate the information
- Monitor fleet performance & safety metrics
- Predict maintenance requirements, cargo problems and prevent accidents

Aggregated Information
- Data aggregated & organized into datasets

Predictive analytics algorithms

Integrated communication systems

IoT for Smart Healthcare

As healthcare data goes on to increase with the advent of AI & Machine Learning, new possibilities are rising with the value of healthcare data being unlocked in newer ways such as proactively diagnosing ailments and creating personalized treatments.

The objective of IoT in healthcare is not just early detection of diseases, but analyzing patient information in real-time to anticipate health conditions & administer time-sensitive treatments. Health monitors and RFID wristbands, for instance, help to track critical information like blood pressure, temperature, heart rate and that data is used by medical care provider

20.8 BILLION
connected things by 2020

500+%
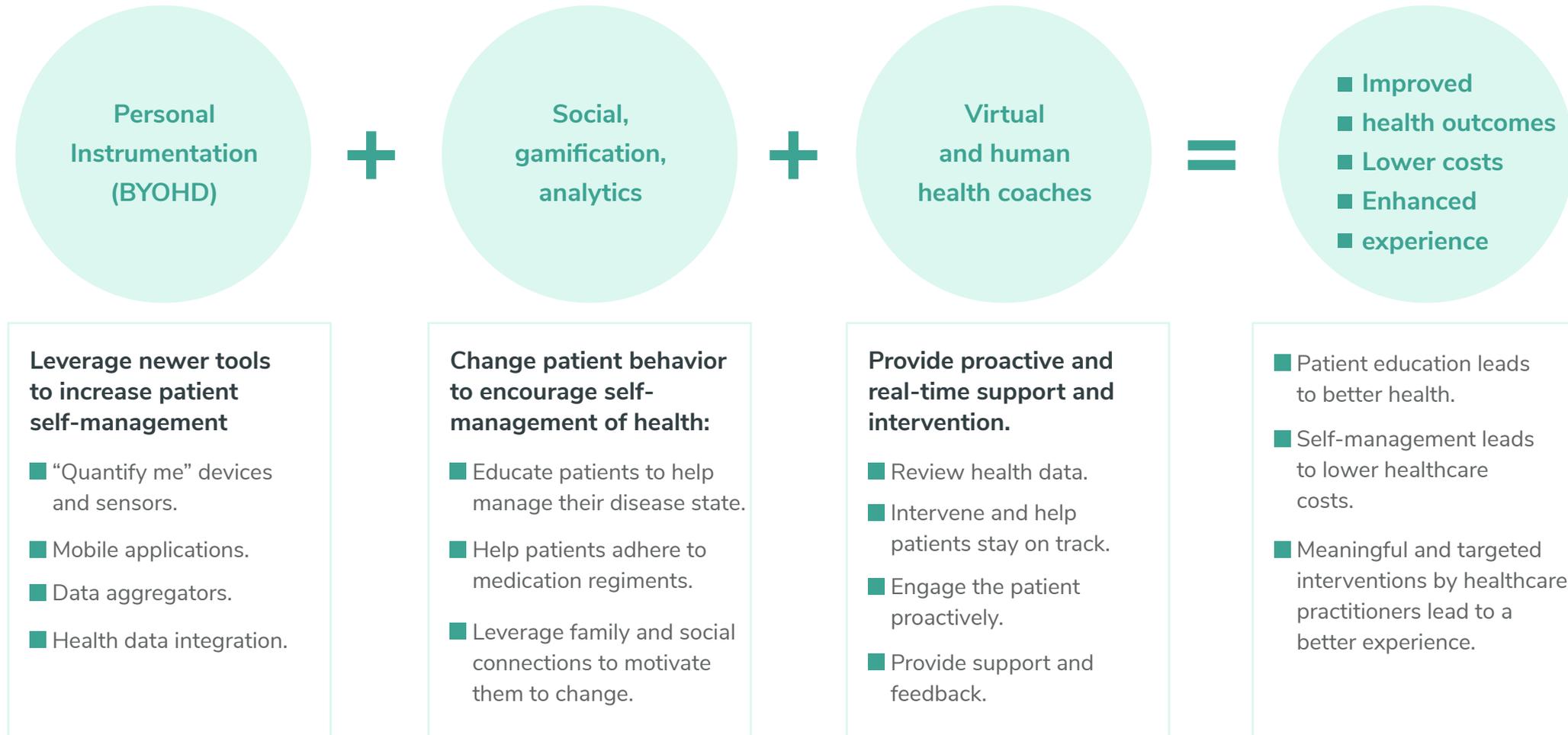Growth in health consumer IoT connections from 2015-2020

$188 B
Global IoT in healthcare market size anticipated in 2024

680%
Growth of installed base of healthcare IoT devices in 2020

HEALTHCARE WITH IOT

Knoldus' hypothesis of connected healthcare

Personal Instrumentation (BYOHD)

+

Social, gamification, analytics

+

Virtual and human health coaches

=

- Improved
- health outcomes
- Lower costs
- Enhanced
- experience

Leverage newer tools to increase patient self-management

- "Quantify me" devices and sensors.
- Mobile applications.
- Data aggregators.
- Health data integration.

Change patient behavior to encourage self-management of health:

- Educate patients to help manage their disease state.
- Help patients adhere to medication regiments.
- Leverage family and social connections to motivate them to change.

Provide proactive and real-time support and intervention.

- Review health data.
- Intervene and help patients stay on track.
- Engage the patient proactively.
- Provide support and feedback.

- Patient education leads to better health.
- Self-management leads to lower healthcare costs.
- Meaningful and targeted interventions by healthcare practitioners lead to a better experience.

HEALTHCARE WITH IOT

Transforming the Utility & Energy sector with IoT

This motivation behind the massive growth in the IoT market in the Utilities sector is that it helps in improving efficiency, enhance revenue, and better utilize enterprise resources. Here are a few use cases in this sector -

Smart meters
These IoT devices are attached to buildings and further to smart energy grids that aid in better energy management for these buildings. They have massive utility in smart cities.

Water management
Water sensors help in smart water management by tracking water quality, pressure, temperature, consumption patterns, and more.

Electricity grid management
Traditional electric grids can be made smarter using network capabilities & computing intelligence which aids in real-time information on power requirements & quick response.
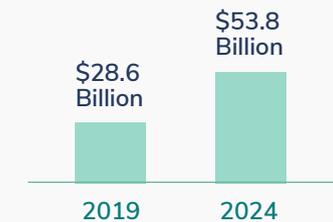
Oil & Gas
62% business leaders in the oil & gas sector plan to increase their investment in digital technologies in the next 3 to 5 years (Business Insider Intelligence)

37%

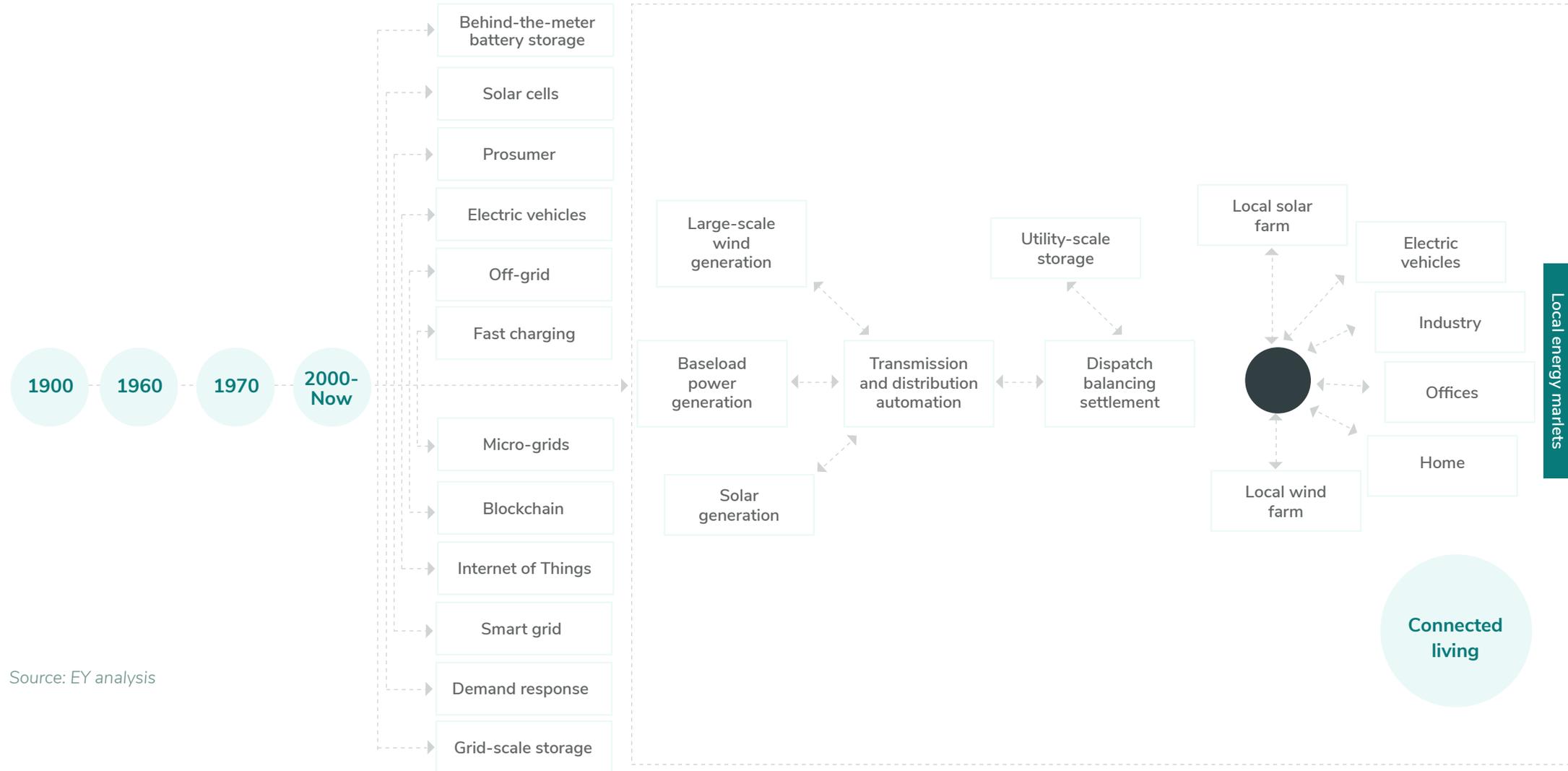Global energy demand is set to rise by this number by 2040

$28.6 Billion — 2019
$53.8 Billion — 2024

Expected size of the Global Utilities market in 2024 from just $28.6 Billion in 2019

Source: MarketsandMarkets

UTILITY & ENERGY WITH IOT

Transforming the Utility & Energy sector with IoT

From the energy journey over the last century	To the birth of a new distributed digitally driven energy system

Behind-the-meter battery storage

Solar cells

Prosumer

Electric vehicles

Off-grid

Fast charging

1900 · **1960** · **1970** · **2000-Now**

Micro-grids

Blockchain

Internet of Things

Smart grid

Demand response

Grid-scale storage

Large-scale wind generation

Baseload power generation

Solar generation

Transmission and distribution automation

Utility-scale storage

Dispatch balancing settlement

Local solar farm

Local wind farm

Electric vehicles

Industry

Offices

Home

Local energy markets

Connected living

Source: EY analysis

UTILITY & ENERGY WITH IOT

The Internet of Things for Smart Cities

Smart cities are the future. It defines a world where cities will be equipped with communication networks & highly-distributed wireless sensor technology to solve challenges. Here's how the smart cities market looks like -

1. As per Bloomberg, the global smart cities market is all set to reach $252.56 B by the end of 2025

2. It will experience a CAGR of 16.53% between 2019 and 2025

3. APAC is set to have the largest smart cities market share by 2023

4. The remote monitoring segment of the smart cities market has been found to lead in the period between 2018 to 2023

A few factors which have been driving this growth are rising number of government initiatives, public-private partnership, and the emerging 5G technologies that will ensure higher speeds & lower latencies.

How do IoT ensure smarter cities?

Smart Traffic management
Real-time data from traffic sensors & cameras help in dynamic traffic management to prevent bottlenecks

Smart health
IoT has transformed healthcare with EHRs, sensors, connected devices & sensors, AI-powered apps for better diagnosis & prevention

Smart environment monitoring
IoT helps to constantly monitor, productively manage, and proactively control environment sensors to respond effectively to changes in environment.

Smart meter
Monitoring consumption of electricity, gas, water with automated meter reading and billing in real-time.

Smart Lighting
Automated lighting control using illuminance sensors & motion detectors to dynamically detect requirement

Waste management
Optimize waste collection schedules & routes based on remote monitoring of waste-container/bin fill levels

Smart water supply
Smart water management solutions with leakage detection in real-time, managing water usage with sensors, tracking factors like real-time water pressure, water levels, temperature, flow etc

Smart parking
Managing parking spaces, informing drivers of space availability, and e-billing

SMART CITIES WITH IOT

Agriculture: Smart farming with IoT

There will be a growing need in the world for food, as the United Nations predicts that there will be a requirement of 70% more by 2050 to feed the growing population. IoT technologies can play a key role in making this possible by helping the agriculture industry optimize its resources and increase efficiency.

20.9 B
The expected size of the agriculture IoT market by 2024

12 M
Agricultural sensors to be installed globally by 2023

1/2 M
No. of data points that an average farm can generate per day

Source - MarketsandMarkets, Business Insider Intelligence, and IBM

Revolutionizing the Retail with IoT

The IoT movement offers retailers opportunities in three critical areas: customer experience, the supply chain, and new channels and revenue streams. While the IoT may seem like science fiction, it is becoming reality faster than most of us can comprehend. Retailers that hesitate to develop and execute an IoT strategy will open the door for competitors—old and new alike—to swoop in and capture early IoT mind share and market share

IoT-enabled transformation across the planning and execution functions in a retail supply chain, and the customer value it can generate.

Retail Supply Chain Process Area	Future Trends with IoT-Enabled Transformation
Forecasting	Forecasting demand based on consumption patterns rather than historical sales
Sourcing	Choosing suppliers with high integrity and performance
Replenishment & Allocation	Proactive reordering rather than reactive
Order Management	Prempting orders based on predictive analysis of customer preferences
DC & Fulfillment Operations	Dialog-based interaction among humans-robots-machines
Logistics/Last Mile	From tracking (drivers) to controlling (truck movement) to empowering (end customers) with real-time updates of their orders from farm to fork

Revolutionizing the Retail with IoT

$410B to $1.2T USD

Economic impact of IoT adoption in the retail setting per year in 2025.

94 B

Expected global market size of the retail IoT market (includes sensors, RFID, beacons & wearables) by 2025

21.5%

CAGR for the years between 2016 and 2025.

It is interesting to note that about 80% of retailers have set aside a considerable amount of budget to invest in IoT and other related technologies. And a few retail giant has already deployed IoT.

They deployed IoT sensors in refrigeration units to detect in advance food spoilage and has plans of using IoT extensively in customer behaviour. Other applications include automated checkout, beacon technology, personalized discounts and smart shelves.

The US retail giant exploits a customer's location proximity through the beacon technology to send promotional offers & alerts in their smartphones once they enter the brand's store.

The clothing manufacturer joined hands with Intel to develop a near real-time inventory monitoring solution with the help of RFID & cloud-based analytics. This significantly brought down inventory cost and helped the brand with efficient inventory management.

RETAIL WITH IOT

Planning to develop an IoT application?

If you are planning to build an IoT solution for your organization, Knoldus experts can help.

We helped HPE create greater value from their data center infrastructure solutions with near real-time insights gained from close to 20 billion sensors deployed in data centers all across the globe. This has been one of our most significant projects in the area of IoT.

Further projects include a conference monitoring system developed in Rust programming language that keeps track of conference attendees using Image recognition with **AWS Rekognition Service.**

We've also developed Hawk, a security system also built on Rust. It makes use of **AWS S3**, Rekognition, and Lambda function.

IoT is the future and if you're looking for similar solutions to step into the next level of digital transformation, let's connect for a consultation call.

Schedule a call

About Knoldus:

Knoldus is the world's largest pure-play Scala and Spark services company. We modernize enterprises through cutting-edge digital engineering by leveraging Scala, Functional Java and the Spark ecosystem. Our mission is to provide reactive and streaming fast data solutions that are message-driven, elastic, resilient, and responsive

Knoldus is fortified by an expansive network of certified strategic partners including Lightbend, IBM, Datastax, Confluent, and Databricks; helps enterprise clients – including many Fortune 500 companies – to create the next-generation capabilities that setthem apart and create new opportunities. With a team of 115+ seasoned experts, Knoldus is headquartered in Canada with delivery centers in Chicago, New Delhi, Noida, Pune and Singapore.

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