

# The Industrial Internet of Things in 2020

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Georgia Tech Manufacturing Institute (GTMI)

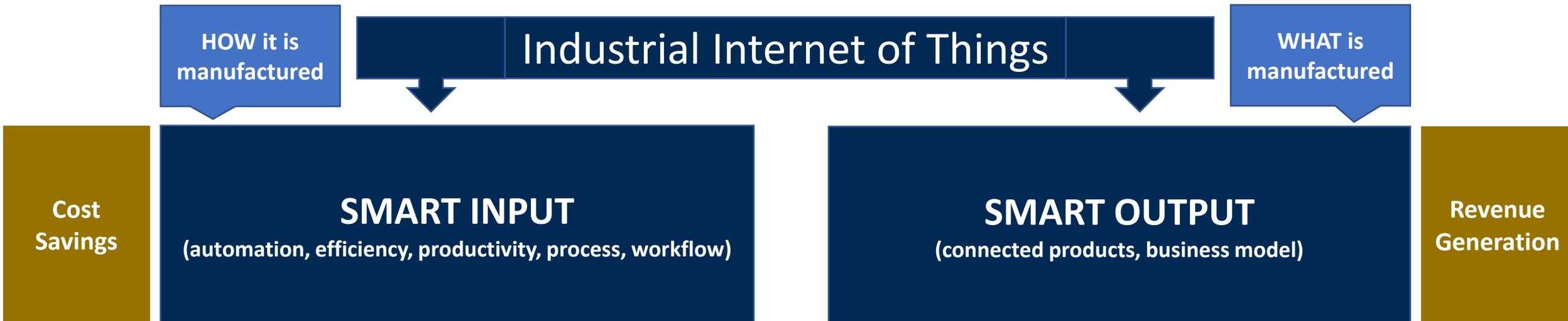
Atlanta, GA, November 11, 2020

## From Smart Manufacturing to Manufacturing Smart (\*)

Why manufacturing is a core enabler of the Internet of Things.

Author — Alain Louchez and Dr. Ben Wang

Jan 6th, 2014



## SMART MANUFACTURING

“Pune, Sept. 14, 2020 (GLOBE NEWSWIRE) -- The global [smart manufacturing market](#) size is expected to reach USD 506.33 billion by 2027, exhibiting a CAGR of 12.2% during the forecast period /.../ **Demand for Smart Manufacturing has increased drastically as COVID-19 tally soars /.../ One of the emerging trends for the market is the shifting focus of enterprises towards the deployment of industrial internet of things (IIoT) technology.** The implementation of IIoT assists to save maintenance costs, energy costs, and improve workforce productivity. Organizations are adopting IIoT solutions for manufacturing operational intelligence, enabling asset monitoring, remote servicing, predictive maintenance, and remote monitoring.”

Source: Fortune Business Insights, Press Release and Company Material, September 24, 2020  
<https://www.fortunebusinessinsights.com/smart-manufacturing-market-103594>

## MANUFACTURING SMART

*Example among others such as connected cars, digital healthcare devices, smart tractors, industrial pumps, etc.:*

“The global smart home appliances market size is anticipated to reach USD 92.72 billion by 2027, according to a new report [published on September 23, 2020] by Grand View Research, Inc., expanding at a CAGR of 14.1% from 2020 to 2027. **The market is likely to witness significant growth in the years to come on account of the growing geriatric population, improved M-2-M communication systems, new product development, and improvements in the Internet of Things (IoT).**”

Source. Grand View Research press release, September 23, 2020  
<https://www.prnewswire.com/news-releases/smart-home-appliances-market-size-worth-92-72-billion-by-2027-grand-view-research-inc-301136372.html>

# CAVEATS

# IoT Adoption Is Growing but the Path to Production Usage Is Still Long

A large majority (91%) of respondents have adopted IoT but only 25% are in production use. The time to go from learning to using is 12 months. The cycle appears to be getting faster than in 2019 but just marginally. The good news is 90% view IoT as critical to the success of the company and 64% plan more use in 2 years.

**EXHIBIT 3**  
**IoT ADOPTION AND VALUE**

							
	GLOBAL	US	UK	DE	FR	JP	CH
% IoT ADOPTERS	91%	92%	88%	94%	92%	87%	91%
% OF PROJECTS IN USE PHASE	25%	26%	24%	24%	25%	24%	25%
TIME TO USE STAGE IN MONTHS (MEDIAN)	12	11	12	14	11	12	10
CRITICAL TO SUCCESS OF COMPANY	90%	86%	81%	97%	93%	91%	98%
PLAN TO USE IoT MORE IN 2 YEARS	64%	69%	64%	54%	67%	64%	60%

***“Successful digital transformations are rare /.../ New BCG [Boston Consulting Group] research shows that 70% of digital transformations fall short of their objectives, often with profound consequences.”*** -- Source: BCG, October 29, 2020 <https://www.bcg.com/publications/2020/increasing-odds-of-success-in-digital-transformation>

Industry 4.0

## Shifting from Vision to Value: The Path to Scaling Smart Manufacturing

**“Use the lean innovation mantra: plan big, start small, and scale fast”**

Thierry Van Landegem

Oct 29, 2020

***“Smart manufacturing — also called Industry 4.0 or manufacturing 4.0 — has been around for some time. Great visions about the future of manufacturing are plentiful, and there are many proofs of concepts, but scaling the digital in manufacturing is significantly less represented.***

***Why? Because not enough attention is paid to the value creation aspect of smart manufacturing. In too many cases it is still seen as a techno spiel more than anything else.”***

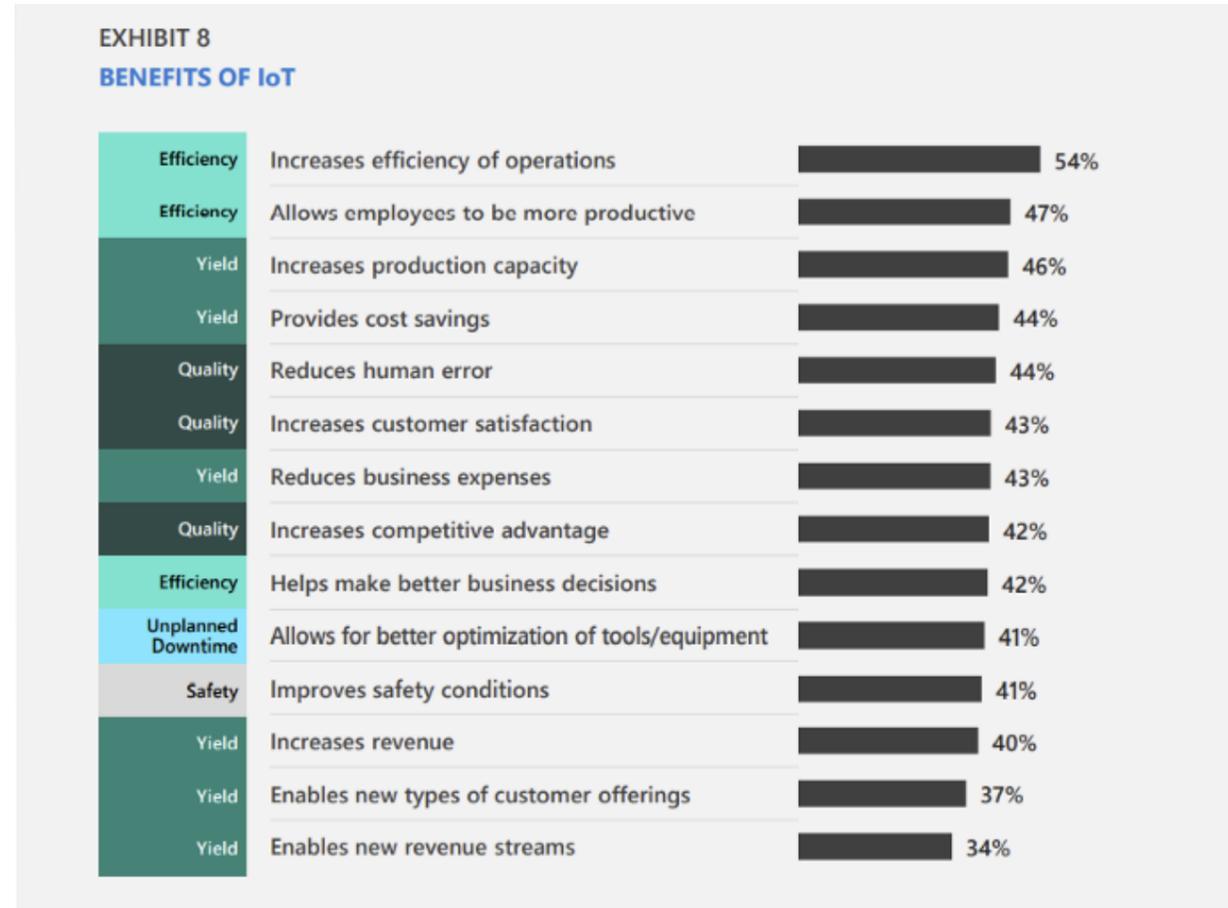
“As in so many other industries, one needs a crisis to get going — unless there has been a relentless drive by leadership for transformation. Research by ISG and Keypoint Intelligence show that COVID-19 is accelerating the adoption of Industry 4.0 products and services towards smart manufacturing and smart factories. Digital workflows and automation are becoming requirements, no longer goals.”  
[Thierry Van Landegem]

Source:

<https://www.thomasnet.com/insights/shifting-from-vision-to-value-the-path-to-scaling-smart-manufacturing/>

# Increase Efficiency Is Main Benefit

More efficient operation and more efficient employees are the main benefits of IoT. I find it interesting that increase revenue and new business models are at the bottom. In the early days of IoT, there were lots of discussions about creating new business models. It appears this benefit of IoT has been difficult to realize.



**EXHIBIT 6**  
**REASONS FOR IoT ADOPTION**

**“Sustainability is the elephant in the IoT room”**



# MAJOR SHIFTS HAPPENING IN 2020 - A Few Examples-

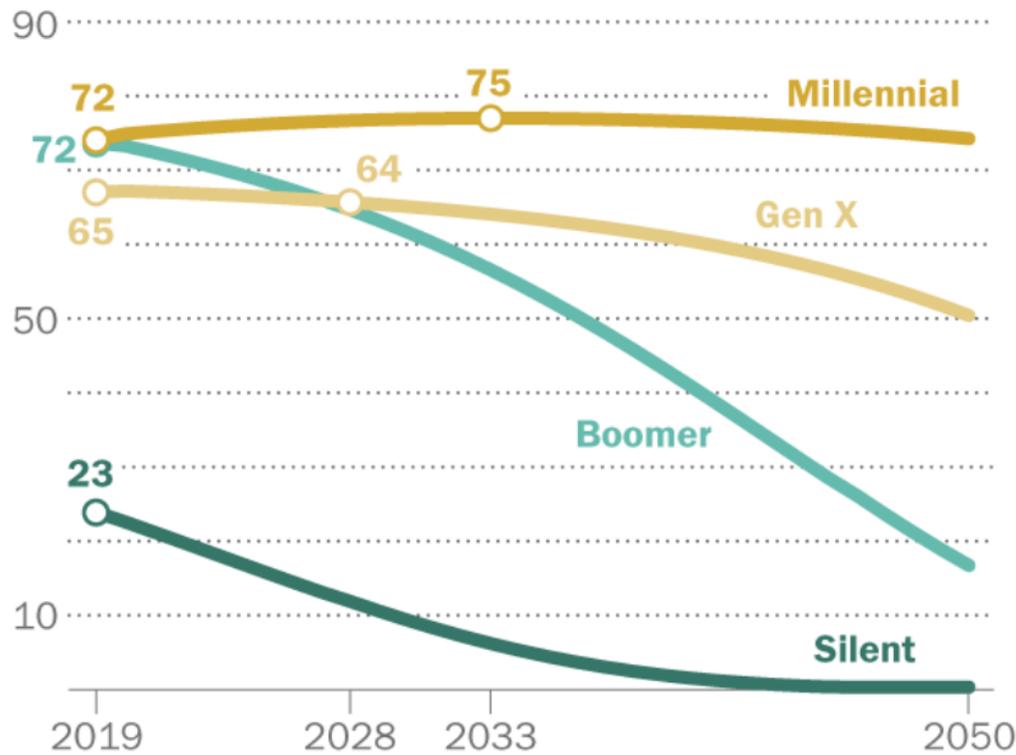
*The role of demographics and technology*

# DEMOGRAPHICS

- Technophile retired/retiring population (impact on demand)**
- Replacement of baby boomers (+ digital skills needed)**
- Accelerated adoption of robots**
- Critical impact of women in IoT**

# Projected population by generation

In millions



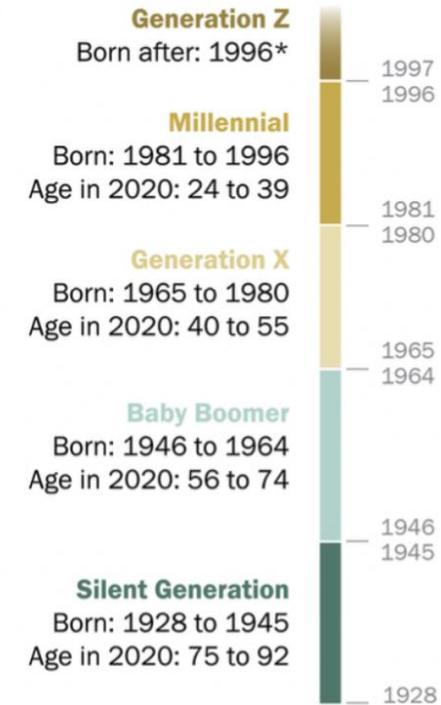
Note: Millennials refer to the population ages 23 to 38 as of 2019.

Source: Pew Research Center tabulations of U.S. Census Bureau population estimates released April 2020 and population projections released December 2017.

## PEW RESEARCH CENTER

Source: Richard Fry, April 28, 2020: <https://www.pewresearch.org/fact-tank/2020/04/28/millennials-overtake-baby-boomers-as-americas-largest-generation/>

# The generations defined



\*No chronological endpoint has been set for this group.

“On the Cusp of Adulthood and Facing an Uncertain Future: What We Know About Generation Z So Far”

PEW RESEARCH CENTER

Source: Kim Parker and Ruth Igielnik, May 14, 2020  
<https://www.pewsocialtrends.org/essay/on-the-cusp-of-adulthood-and-facing-an-uncertain-future-what-we-know-about-gen-z-so-far/>



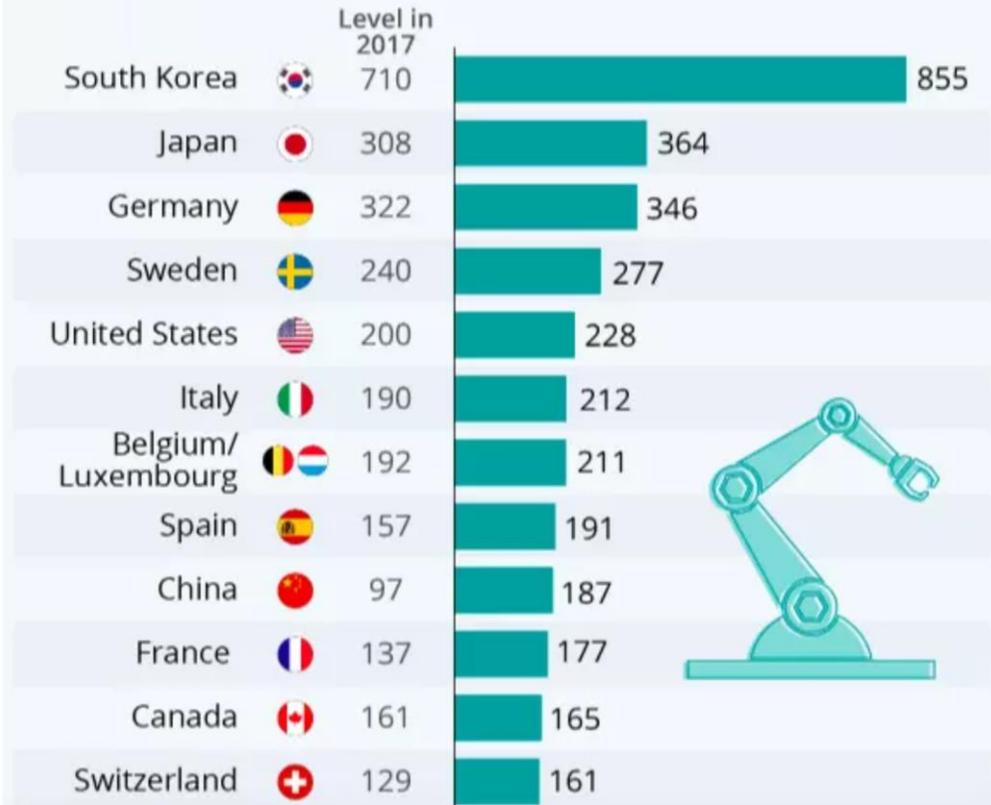
Microsoft launches initiative to help  
25 million people worldwide acquire the  
digital skills needed in a COVID-19 economy

To learn more, please visit  
[news.microsoft.com/skills](https://news.microsoft.com/skills)

June 30, 2020

# The Countries With The Highest Density Of Robot Workers

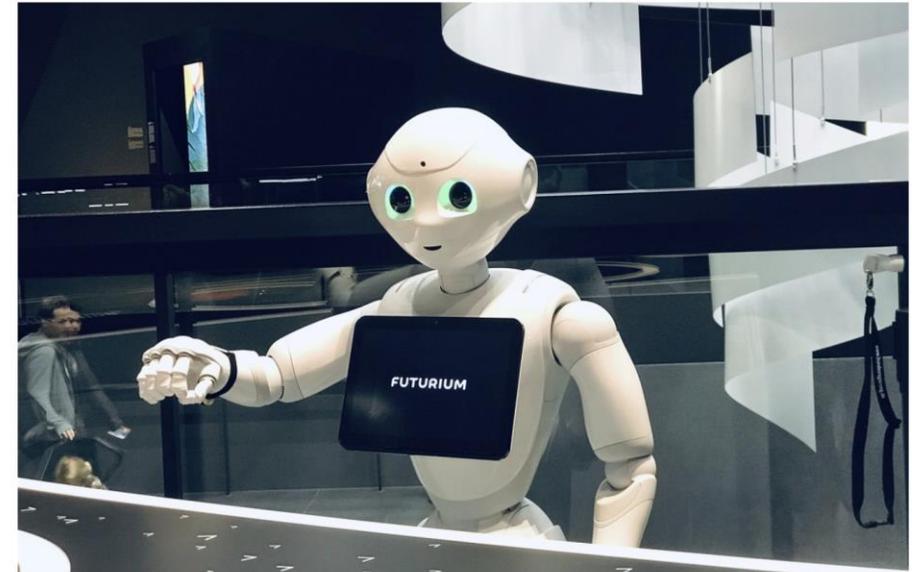
Installed industrial robots per 10,000 employees in the manufacturing industry in 2019\*



The countries with the highest density of robot workers. Image: Statista

Source: Niall McCarty, September 30, 2020 <https://www.weforum.org/agenda/2020/09/countries-comparison-robot-workers-robotics-change-tech-manufacturing/>

WEF: Inequality likely to worsen as robots set to do half of work by 2025



By Ryan Daws | 21st October 2020 | TechForge Media

Editor at TechForge Media. Often sighted at global tech conferences with a coffee in one hand and laptop in the other. If it's geeky, I'm probably into it.

A report from the World Economic Forum (WEF) predicts that robots will do half of all work tasks by 2025, with inequality likely to worsen as a result.

Concerns about the impact of automation on jobs are not exactly new, but most felt the timeline for significant change would be longer – providing more time for mass reskilling of the workforce.

***“The pandemic we find ourselves in is creating “a double disruption of jobs” with businesses reducing their employees while simultaneously speeding up the adoption of automation to make up for the lost productivity.”***

Source: Ryan Daws, October 21, 2020 <https://iottechnews.com/news/2020/oct/21/wef-inequality-worsen-robots-half-work/>

# Teleoperation and Telerobotics in Industrial Internet of Things (IIoT) Market 2020 Showcases Promising Growth After Covid-19 Pandemic with Top Companies ABB Group, Console, AGT Robotics, ARM Holdings, Bosch, AppFolio Etc.

By anita 2nd October 2020

Source: <https://thedailychronicle.in/news/2282949/teleoperation-and-telerobotics-in-industrial-internet-of-things-iiot-market-2020-showcases-promising-growth-after-covid-19-pandemic-with-top-companies-abb-group-console-agt-robotics-arm-holdings/>

## HOWEVER:

### Walmart reportedly ends contract with inventory robotics startup Bossa Nova

Brian Heater, Kirsten Korosec / 6:53 PM EST • November 2, 2020

 Comment

“Meanwhile, Walmart’s robotic experiments aren’t over. The company’s Sam’s Club subsidiary recently announced it would bring Tennant’s floor scrubbing robots to all of its 599 stores. Interestingly, the company is also exploring ways for these machines to double up and perform in-store inventory checks; it’s not clear if these will be used only in Sam’s Club locations or extend to Walmart stores as well.”

Source: <https://techcrunch.com/2020/11/02/walmart-reportedly-ends-contract-with-inventory-robotics-startup-bossa-nova/>

EDUCATION : CAMPUS NEWS

Previous story:

Next story:

Environmentally Friendly Construction more relevant in  
Coronavirus Pandemic times says Dr Niranjana  
Hiranandani

## New age Robots will be an inevitable part of Industry 4.0: IEEE

Published on October 30, 2020

**Bengaluru:** – IEEE, the world's largest technical professional organization dedicated to advancing technology for humanity, today concluded its virtual roundtable focused on how immersive technologies like Robotics & AI will be the driving force in India. With the post-pandemic scenario dawning upon us, IEEE curated a roundtable to discuss how these cutting-edge technologies are crucial for businesses, associations and societies to establish a strong foundation in these rapidly changing environments.

*[CEO of Asimov Robotics Pvt.] Jayakrishnan said “With the accelerated pace of automation adoption, robotics will transform the world by the introduction of digital work force in combining the major game changers – Computer simulation, AR VR, Rapid prototyping, Collaborative robots, Big data analysis, AI, IOT, High speed internet and Cloud computing.”*

## The Internet of Things needs more women, but do women need this IoT? “Internet of Silly Things”

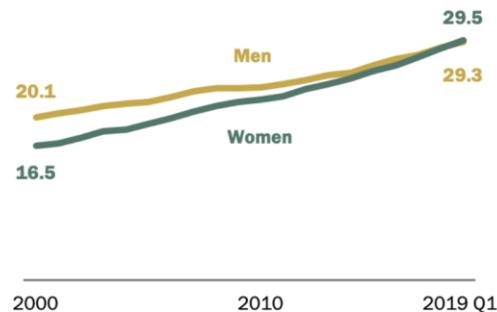
August 3, 2018 Guest Writer Views 0

**“We need more women in IoT for many reasons – a big one being that men apparently have no idea how to design IoT apps that take women’s needs into account – and when they try, the results can be silly, writes Teresa Cottam.”**

Source: August 3, 2018 <https://disruptive.asia/iot-needs-women/>

### Women are now half of the U.S. college-educated labor force

Labor force ages 25 and older with at least a bachelor’s degree (in millions)



Note: Labor force consists of people working or looking for work. First quarter, 2019 estimate not seasonally adjusted. Source: Bureau of Labor Statistics, based on 2000-2019 Current Population Survey.

PEW RESEARCH CENTER

Source: <https://www.pewresearch.org/fact-tank/2019/06/20/u-s-women-near-milestone-in-the-college-educated-labor-force/>

## The crucial role of women in IoT

The Atlantic

BUSINESS

### The Crisis Facing America's Working Daughters

Many are familiar with the challenges faced by working moms, but the troubles of women with aging parents are unseen and widely ignored.

LIZ O'DONNELL FEBRUARY 9, 2016



JONATHAN BACHMAN / REUTERS

Source:

<https://www.theatlantic.com/business/archive/2016/02/working-daughters-eldercare/459249/>

CONNECTED WORLD  
IT'S ALL ABOUT IoT

WOM2M  
WOMEN OF TECHNOLOGY

The Women of Technology/IoT Awards is comprised of some of the most powerful women in the technology sector, and representing many of the most innovative companies in the world. These women were selected because they each brought a unique lens to their respective companies that has helped push connected technologies forward.

Source: (Peggy Smedley) <https://connectedworld.com/awards/>

The future is female: How IoT is changing how tech handles diversity

**“The longer women are not involved in the conversations which shape future innovation, the more we limit the possibilities of the technology industry at large /.../ In an increasingly connected world, IoT offers promising potential to transform the way in which we manage society, and women’s issues is not a stone left unturned.”**

Source: Vodafone, November 19, 2019

<https://www.vodafone.com/perspectives/blog/the-future-is-female>

# TECHNOLOGY

- ❑ **Sensor/actuator cost-effective miniaturization**
- ❑ **Pervasive and powerful communication networks**
- ❑ **Independent energy source (towards self-powered IoT devices)**
- ❑ **Artificial Intelligence of Things (AIoT)**

# RFID Tag Costs Drop to About 3 Cents with Talkin' Things Products

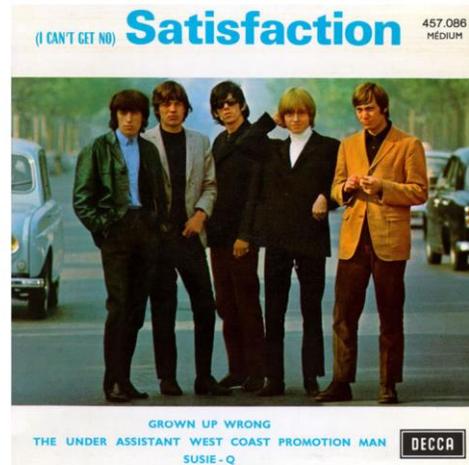
BY CLAIRE SWEDBERG

**The Polish company says it will be able to produce and ship about 170 million UHF, NFC and HF RFID tags a year to start, for use in smart packaging, with the aim of bringing nearly any product online.**

**Oct 07, 2020** Internet of Things (IoT) technology company **Talkin' Things** has released an RFID tag priced at between 3 and 4 cents apiece, which it says will be incorporated into fast-moving consumer goods, food and pharmaceutical packaging. The company promoted the new tags during the recent **RFID Journal Virtually LIVE!** conference and exhibition. Talkin' Things estimates the new price to be about 40 percent less than the cost of existing RFID tags, and the tags are designed to be incorporated into product packaging for which RFID traditionally has been too expensive.

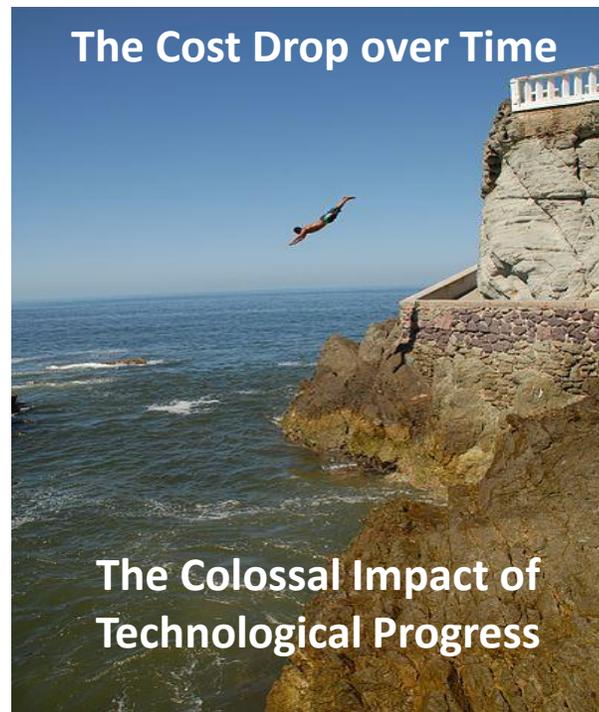
## (I Can't Get No) Satisfaction

When The Rolling Stones were at No.1 on the US chart with '(I Can't Get No) Satisfaction', in the UK the lyrics were considered too sexually suggestive.



On 10th July 1965, The Rolling Stones started a four week run at No.1 on the US singles chart with '(I Can't Get No) Satisfaction', the group's first chart-topper there. In the UK, the song was initially played only on pirate radio stations be-

Source: <https://www.thisdayinmusic.com/liner-notes/i-cant-get-no-satisfaction/>



**1965:** 1 MB of storage > \$2.5 Million

Note: Between 1965 and 2015, US consumer prices have x 7.5 times

GEORGIA TECH HISTORY GEORGIA TECH YELLOW JACKETS NEWS GALLERIES

## GALLERY: The Rolling Stones' Zip Code Tour Comes to Georgia Tech's Bobby Dodd Stadium

Check out these awesome photos from the concert!

By Joey Weaver | @FTRSJoey | Jun 12, 2015, 11:30am EDT

f t SHARE

Source: <https://www.fromtherumbleseat.com/2015/6/12/8765817/gallery-the-rolling-stones-zip-code-tour-comes-to-georgia-techs-bobby-in-atlantas-bobby-dodd-stadium>



The Rolling Stones Zip Code Tour in Atlanta's Bobby Dodd Stadium! | Photo Credit: Danny Kamik/Georgia Tech Athletics

**2015:** 1 MB of storage < \$0.004

Random Access Memory (RAM) Capacity and Price	
Years	\$/MB
1957	411,041,792
1959	67,947,725
1960	5,242,880
1965	2,642,412
1970	734,003
Oct. 1975	49920
Jan. 1980	6,480
Dec. 1985	300
Dec. 1990	45.50
Dec. 1995	30.90
Dec. 2000	0.90
Dec. 2005	0.1846
Dec. 2010	0.0122
Dec. 2015	0.0037
Dec. 2016	0.0046
Dec. 2017	0.0071
Dec. 2018	0.0046
Dec. 2019	0.0028
Sep. 2020	0.0028

Source: <https://jcmr.net/memoryprice.htm>

## Low-Power Wide-Area Network (LPWAN)

### INDUSTRIAL AUTOMATION

## Long Range and Low Power Now Reign in IIoT

The LPWAN-based MIOTY standard offers a range of up to 15 km and 868- to 928-MHz operating frequencies.

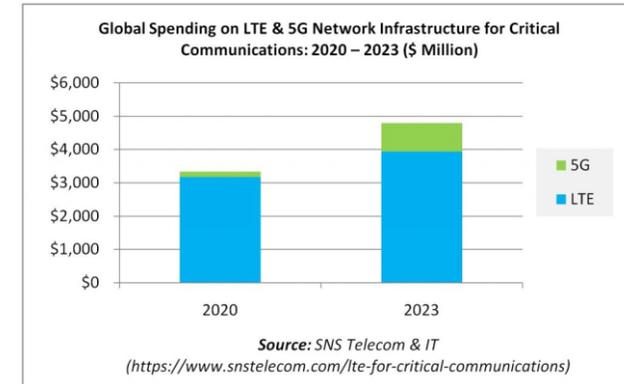
Lou Frenzel

MAR 26, 2020

***“The traditional wireless standards like Bluetooth, Wi-Fi, and Zigbee continue to thrive in the IoT world. However, some designers have slowly shifted their attention to the growing number of low-power, long-range, low-data-rate wireless standards. This is particularly true in industrial IoT. The most well-known standards are LoRa, LTE-M, NB-IoT, Sigfox, and Weightless. The almost unknown IEEE standard 802.11ah (HaLow) and 802.11af are also in the mix.”***

Source: <https://www.electronicdesign.com/industrial-automation/article/21127244/long-range-and-low-power-now-reign-in-iiot>

## 5G



***“Manufacturing is undergoing a major generational shift. Industry 4.0, the digitization and advancement of the manufacturing processes and ecosystem, is set to create far more flexible, efficient and sustainable production lines. 5G for IoT underpins this transformation by enabling manufacturing companies and their supply chain partners the opportunity to utilize emerging technologies such as AI and machine vision to give vastly improved visibility over all aspects of their business. The GSMA is focused on building the benefits of 5G IoT for manufacturing, by bringing together leading operators and manufacturing companies around the world.”***

Source: GSMA <https://www.gsma.com/iot/manufacturing/>



6G

## Press Room

*News and information about ATIS, including press releases, media advisories and media contacts.*

Press Room > ATIS Issues a Call to Action to Promote U.S. 6G Leadership

# ATIS Issues a Call to Action to Promote U.S. 6G Leadership

May 20, 2020

Source:

<https://www.atis.org/press-releases/atis-issues-a-call-to-action-to-promote-u-s-6g-leadership/>

# InterDigital and the Institute for the Wireless Internet of Things Launch Inaugural 6G Symposium

Posted on September 8, 2020 by [Telecompetitor](#) [Share](#)

Source: <https://www.telecompetitor.com/interdigital-and-the-institute-for-the-wireless-internet-of-things-launch-inaugural-6g-symposium/> See also October 20-21 symposium website <https://www.6gsymposium.com/>

## 6G and IoT

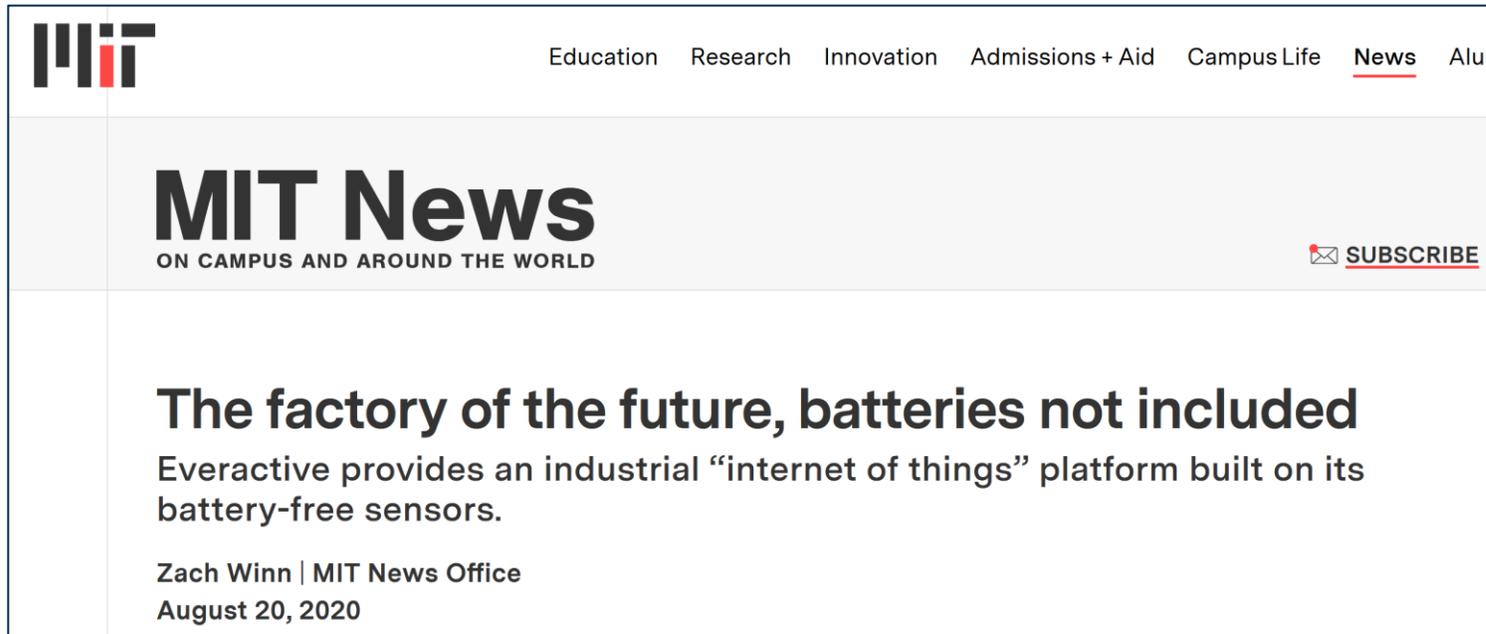
Source: <https://news.northeastern.edu/2020/09/03/what-does-6g-technology-hold-in-store-think-remote-surgery-shared-virtual-spaces-and-robots-on-the-battlefield/>

News@Northeastern



**WHAT DOES 6G TECHNOLOGY  
HOLD IN STORE? THINK  
REMOTE SURGERY, SHARED  
VIRTUAL SPACES, AND  
ROBOTS THAT SEARCH FOR  
DIRTY BOMBS.**

Photo by Matthew Modoono/Northeastern University



The image shows a screenshot of the MIT News website. At the top left is the MIT logo. To its right is a navigation menu with links for Education, Research, Innovation, Admissions + Aid, Campus Life, News (underlined), and Alumni. Below the navigation is a header section with the MIT News logo and the tagline "ON CAMPUS AND AROUND THE WORLD". To the right of the tagline is a "SUBSCRIBE" button with an envelope icon. Below the header is the main article title and a short summary.

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**The factory of the future, batteries not included**  
Everactive provides an industrial “internet of things” platform built on its battery-free sensors.

Zach Winn | MIT News Office  
August 20, 2020

Source <https://news.mit.edu/2020/everactive-sensors-0820>

***“Many analysts have predicted an explosion in the number of industrial “internet of things” (IoT) devices that will come online over the next decade. Sensors play a big role in those forecasts. Unfortunately, sensors come with their own drawbacks, many of which are due to the limited energy supply and finite lifetime of their batteries.”***

# How the “Artificial Intelligence of Things” Will Change the World as We Know It

Very few technologies are as exciting or important as artificial intelligence and the Internet of Things. But do we need the AIoT—the artificial intelligence of things?

Mark Lippett  
FEB 06, 2020

Source: <https://www.electronicdesign.com/technologies/iot/article/21122431/how-the-artificial-intelligence-of-things-will-change-the-world-as-we-know-it>

## Global Artificial Intelligence of Things (Technology & Solutions) Markets 2020-2025: Market will Reach \$65.9 Billion by 2025, Growing at 39.1% CAGR

NEWS PROVIDED BY  
Research and Markets →  
Oct 30, 2020, 19:15 ET

Source: <https://www.prnewswire.com/news-releases/global-artificial-intelligence-of-things-technology--solutions-markets-2020-2025-market-will-reach-65-9-billion-by-2025--growing-at-39-1-cagr-301164067.html>

The screenshot shows the Hindawi journal page for 'Artificial Intelligence of Things (AIoT) Technologies and Applications'. The page is part of the 'Wireless Communications and Mobile Computing' journal. The status is 'Closed', indicating that the issue is no longer accepting submissions. The submission deadline is 31 Jul 2020. The lead editor is Tien-Wen Sung, and guest editors are Pei-Wei Tsai, Tarek Gaber, and Chao-Yang Lee. The description states that AIoT is a relatively new term combining AI and IoT, used for data analysis and decision-making.

Hindawi Journals Publish with us Publishing

Wireless Communications and Mobile Computing

Journal overview For authors For reviewers For editors Table of Contents

Wireless Communications and Mobile Computing / Published Special Issues / **Special Issue**

**Artificial Intelligence of Things (AIoT) Technologies and Applications**

**This issue is now closed for submissions.**  
More articles will be published in the near future.

**Publishing date**  
01 Dec 2020

**Status**  
**Closed**

**Submission deadline**  
31 Jul 2020

**Lead Editor**  
Tien-Wen Sung<sup>1</sup>

**Guest Editors**  
Pei-Wei Tsai<sup>2</sup> | Tarek Gaber<sup>3</sup> | Chao-Yang Lee<sup>4</sup>

Show Affiliation

**Description**

AIoT (Artificial Intelligence of Things) is a relatively new term and has recently become a hot topic which combines two of the hottest acronyms, AI (Artificial Intelligence) and IoT (Internet of Things). IoT consists of interconnected things with built-in sensors and has the potential to generate or collect a vast amount of data. The data can be then analyzed and utilized with AI for problem solving or decision making. Without AI, IoT would have limited value. AI can multiply the value of IoT; conversely, IoT can promote the learning and intelligence of AI.

Source: <https://www.hindawi.com/journals/wcmc/si/867369/>

# Other Topics in the Industrial Internet of Things in 2020

## SECURITY

IoT Cybersecurity Act (Bill), “Shadow IoT”, etc.

<https://betanews.com/2020/02/25/shadow-iot-threatens-security/>

## PRIVACY

Tracking, Tracing, “Confidential Computing”, “Trusted Execution Environment” etc.

<https://www.ibtimes.com/confidential-computing-will-revolutionize-internet-things-3019376>

## RESILIENCE & CONTINUITY

<https://ipcarrier.blogspot.com/2020/10/iiot-for-business-continuity-during.html>

## DIGITAL TWINS

“Digital Twin Consortium”

<https://www.digitaltwinconsortium.org/press-room/10-06-20.htm>

## WiFi (6E)

“Foundational technology for the Internet of Things”  
FCC Chairman Ajit Pai

<https://www.assia-inc.com/wifi-6-will-have-a-big-impact-on-quality-of-experience/>

## EDGE & CLOUD COMPUTING

“Complementary architectures for powerful IIoT platforms”

<https://openautomationsoftware.com/open-automation-systems-blog/iiot-edge-computing-vs-cloud-computing/>

## BLOCKCHAIN

Security and Transparency

<https://iiotbusinessnews.com/2020/09/25/61010-4-ways-blockchain-is-supporting-the-iiot/>



# Backing IoT is a solid strategy for 2021

There are more user cases for the internet of things emerging and it is seen by those in the industry as an area for the channel to concentrate on more



By **Simon Quicke**, Microscope Editor

Published: **22 Oct 2020 11:27**

Source: MicroscopeUK <https://www.computerweekly.com/microscope/news/252490948/Backing-IoT-is-a-solid-strategy-for-2021>

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# Thank You!

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