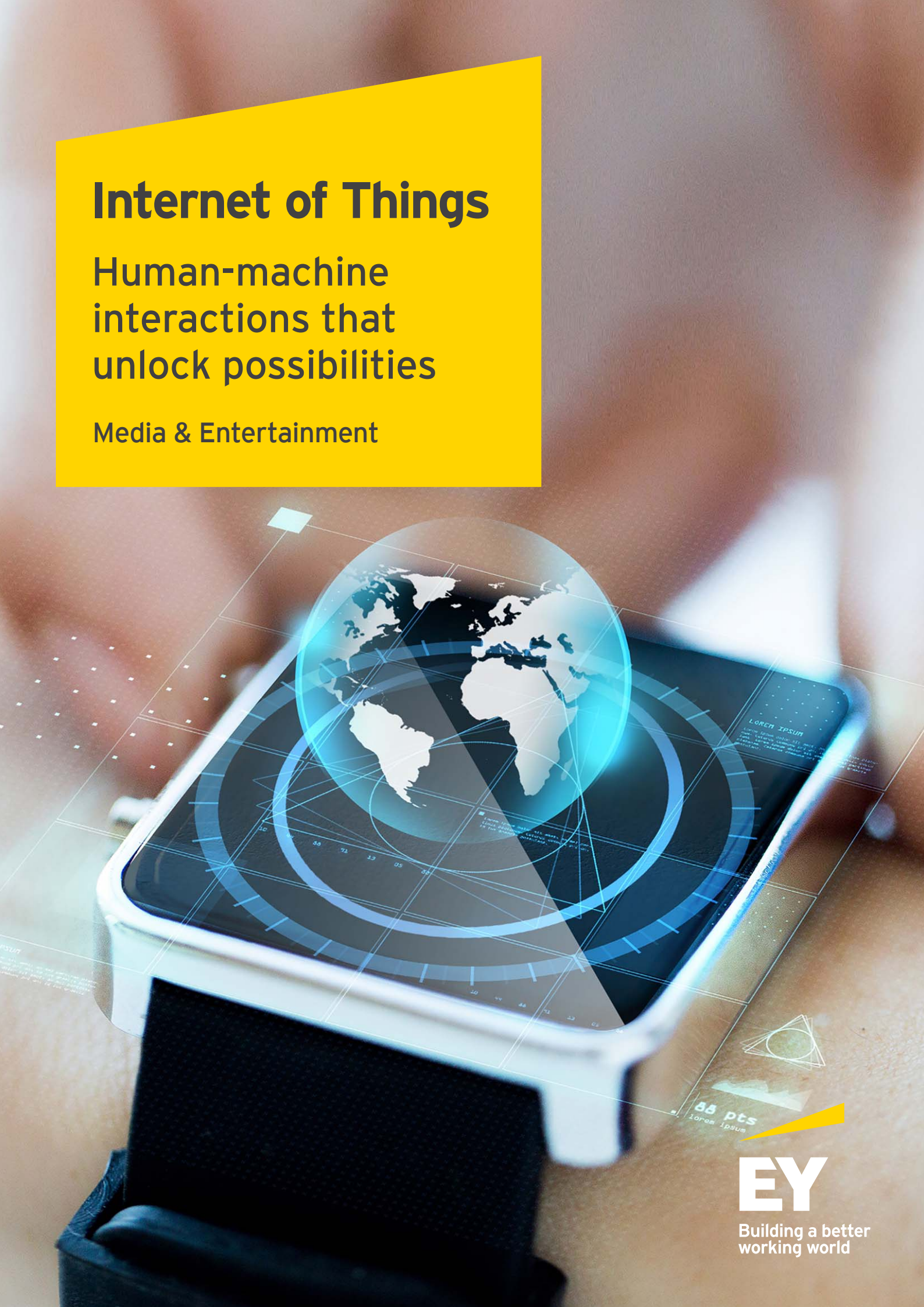
Internet of Things

Human-machine interactions that unlock possibilities

Media & Entertainment



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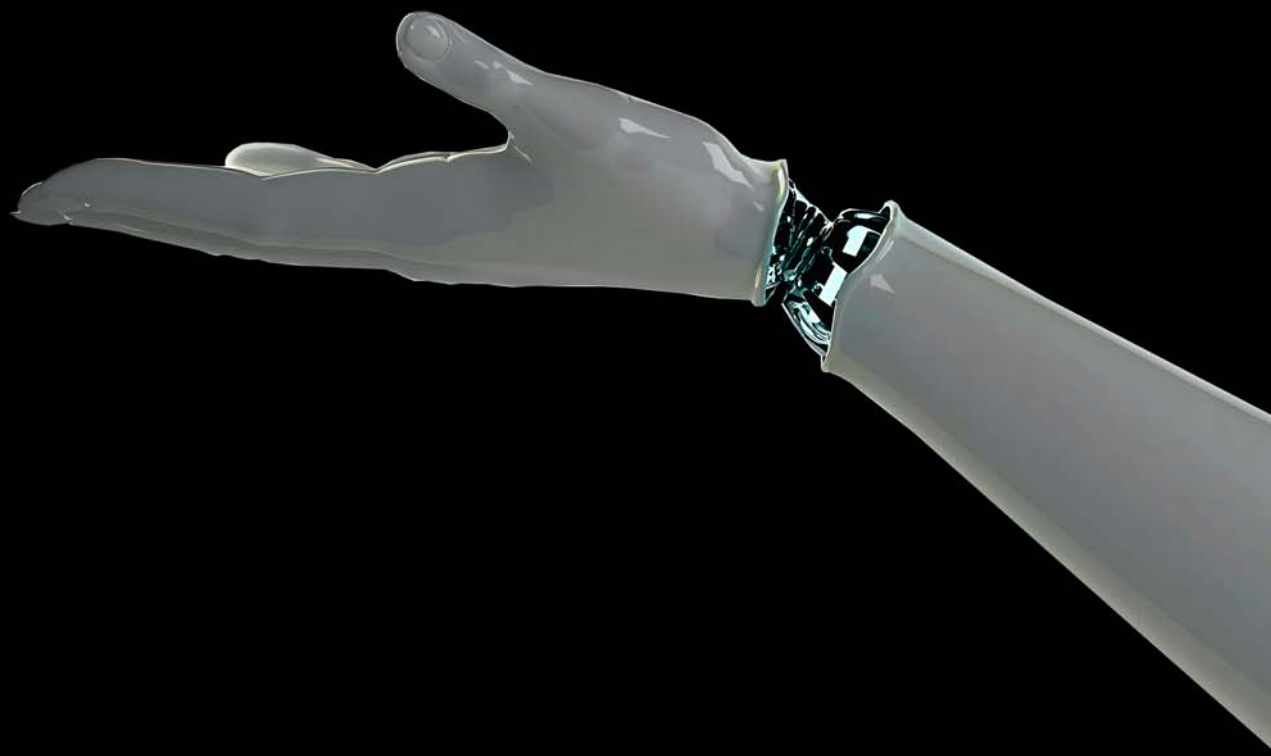

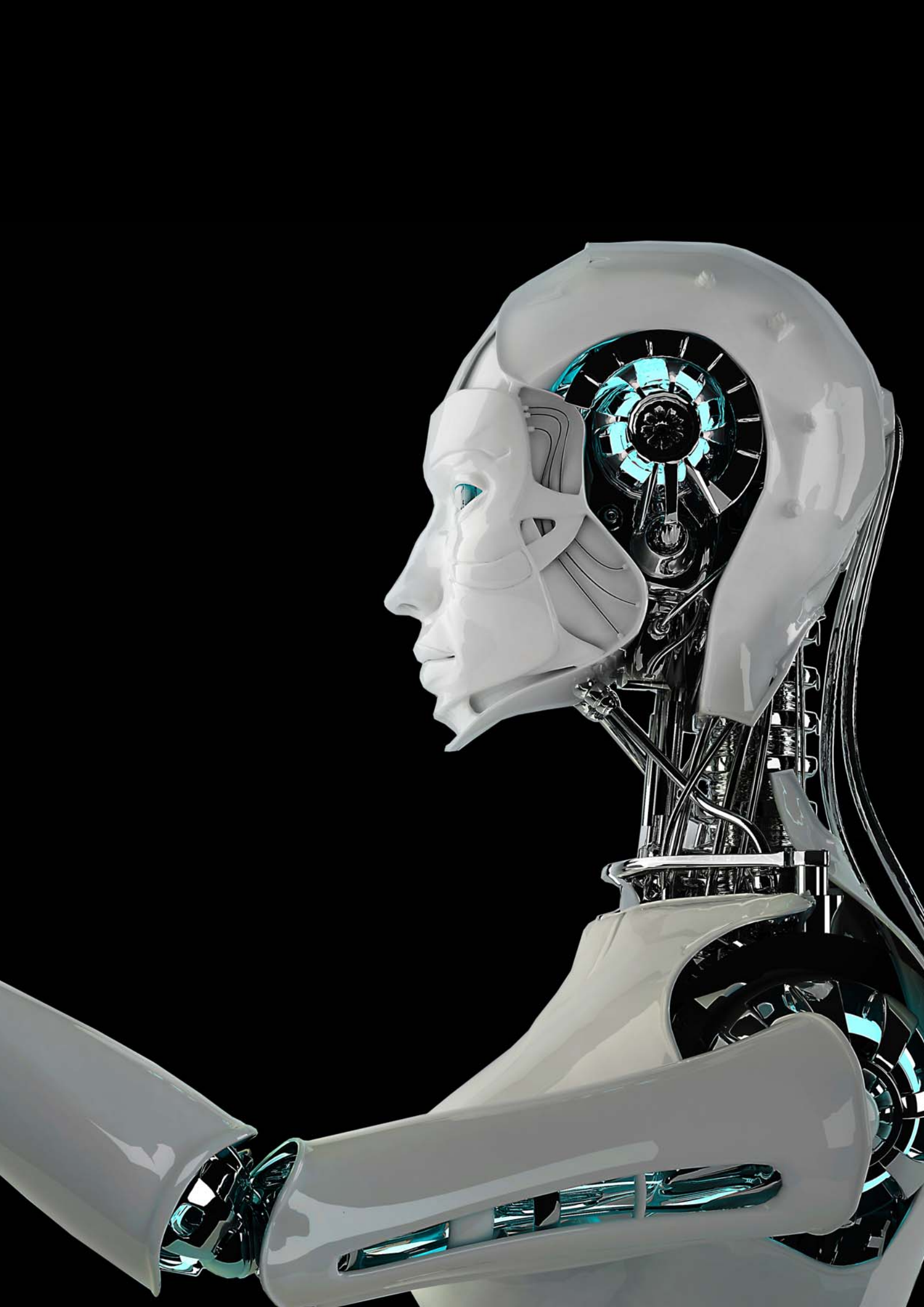

IoT: interactions between human and machine that unlock possibilities

What is IoT?

The Internet of Things (IoT) describes the connection of devices – any devices – to the internet using embedded software and sensors to communicate, collect and exchange data with one another. With IoT, the world is wide open, offering a virtually endless array of opportunities and connections at home, at work or at play.

In the sci-fi classic "The Matrix," the protagonist, played by Keanu Reeves, has the power to manipulate physical objects with his mind. Although that futuristic vision was pure fantasy in 1999, the reality of the Internet of Things (IoT) today presents many parallels. Technology is being inserted into everyday physical objects, and while we can't yet stop bullets by concentration, we can teach objects to respond to our presence, motion, vocal commands, eyeball tracking, and even autonomic physiological behaviors such as heart rate or sleep patterns.

IoT combines connectivity with sensors, devices and people, enabling a form of free-flowing conversation between man and machine, software and hardware. With the advances in artificial intelligence and machine learning, these conversations can enable devices to anticipate, react, respond and enhance the physical world in much the same way that the internet currently uses networks and computer screens to enhance the information world.

Although the potential for IoT is vast, its practical execution remains in its infancy. As a result, it's difficult to quantify the future impact with precision. International Data Corporation (IDC) estimates that there will be 30 billion connected devices in the market by 2020.[1] IDC also estimates the economic value of IoT to be around $1.46 trillion in 2020.[2] Gartner forecasts 20.8 billion connected devices and $3 trillion IoT economic value during the same timeframe.[3]

In a recent IDC IoT decision-maker survey, 73% of respondents indicated that they have already deployed IoT solutions, or plan to do so in the next 12 months.[4] Within the media and entertainment (M&E) industry, executives expect that IoT will lead to a 16.5% lift in revenue between 2015 and 2018, more than its effect on energy, consumer packaged goods, retail and automotive, but less than its impact on industrial manufacturing, high tech and banking and financial services. These early results suggest that although a 16.5% revenue boost may be a conservative estimate, M&E executives may not be placing as much attention on IoT as are other industries. We believe that they should.

The building blocks of IoT

IoT comes to life when its multiple building blocks simultaneously operate and communicate with each other:

Application and user interaction

Collaboration involving people, applications and business processes

Cloud server

Computing systems/platforms such as enterprise and cloud with real-time processing and data analytics capacity, storage and content delivery, application hosting

Network (connectivity)

Internet access: wireless/wired, Wi-Fi, Bluetooth, ZigBee, VPN, Cellular 2G/3G/4G

Gateway

Communication standards and protocols that enable connectivity down to the sensors and up to the network

Physical objects and devices

Objects are equipped with sensors and actuators and thus given the ability to emit, accept and process signals

- **Sensors**
  Convert information from the physical environment into a signal
- **Actuators**
  Act on the signal from the sensors and convert it into output

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[1] MacGillivray, Carrie, *Worldwide Internet of Things Forecast Update, 2015-2019*, International Data Corporation (IDC), February 2016.

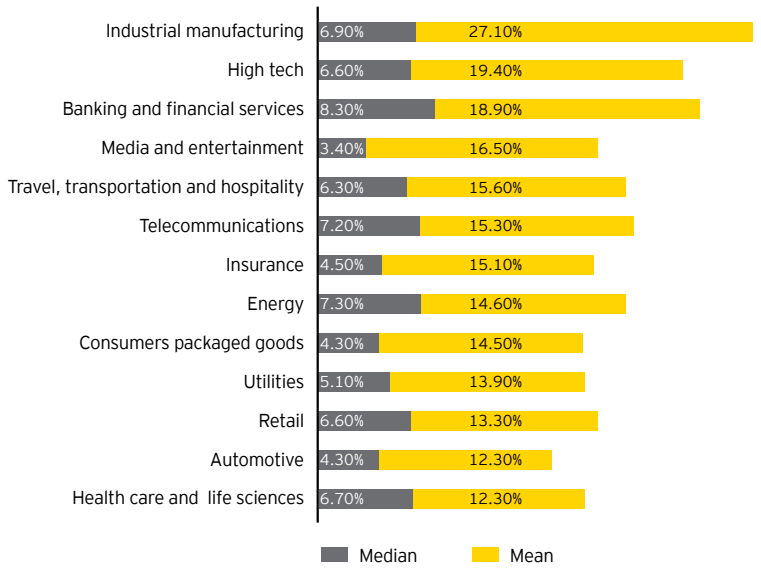
[2] Turner, Vernon, "The Internet of Things: Getting Ready to Embrace Its Impact on the Digital Economy," International Data Corporation (IDC), 2 March 2016, Directions 2016: San Jose, CA.

[3] "Gartner Says 6.4 Billion Connected 'Things' Will Be in Use in 2016, Up 30 Percent From 2015," *Gartner website*, 10 November 2015, http://www.gartner.com/newsroom/id/3165317.

[4] "IDC's New Global IoT Decision Maker Survey Quantifies the IoT Opportunity," *International Data Corporation (IDC) website*, 22 September 2015, https://www.idc.com/getdoc.jsp?containerId=prUS25923515.

[5] *Internet of Things: The Complete Reimaginative Force*, conducted by Research Now, Tata Consultancy Services, 22 July 2015, as cited by eMarketer.

How industries project the revenue impact of IoT by 2018



Source: *Internet of Things: The Complete Reimaginative Force*, conducted by Research Now, Tata Consultancy Services, 22 July 2015, as cited by eMarketer.

Much of the current development in IoT has focused on industrial opportunities. However, IoT for media consumers can open up new, intimate entertainment experiences. Consumers already have access to personal devices that can sync with their daily lives. For example, some smartphone applications automatically lock doors, arm the alarm and reset the thermostat when the owners leave the proximity of the house, tasks that users would have to manually perform on devices that don't "know" them. Taking this a step further, what if users could remove one frequent source of frustration and irritation – the password? Alphanumeric passwords have long existed as a means to control access and security to technology. However, they are not a biologically intuitive way to prove identity. A more natural and secure method would come in the form of sensors that can read personal attributes such as a fingerprint, or a heart rate. This is the type of man-machine interaction that becomes easier with IoT and can solve for use cases including over-the-top (OTT) authentication. The increasing sophistication of the sensors embedded in technology makes it possible for devices ("things") to read, gauge and understand consumers at unprecedented levels.

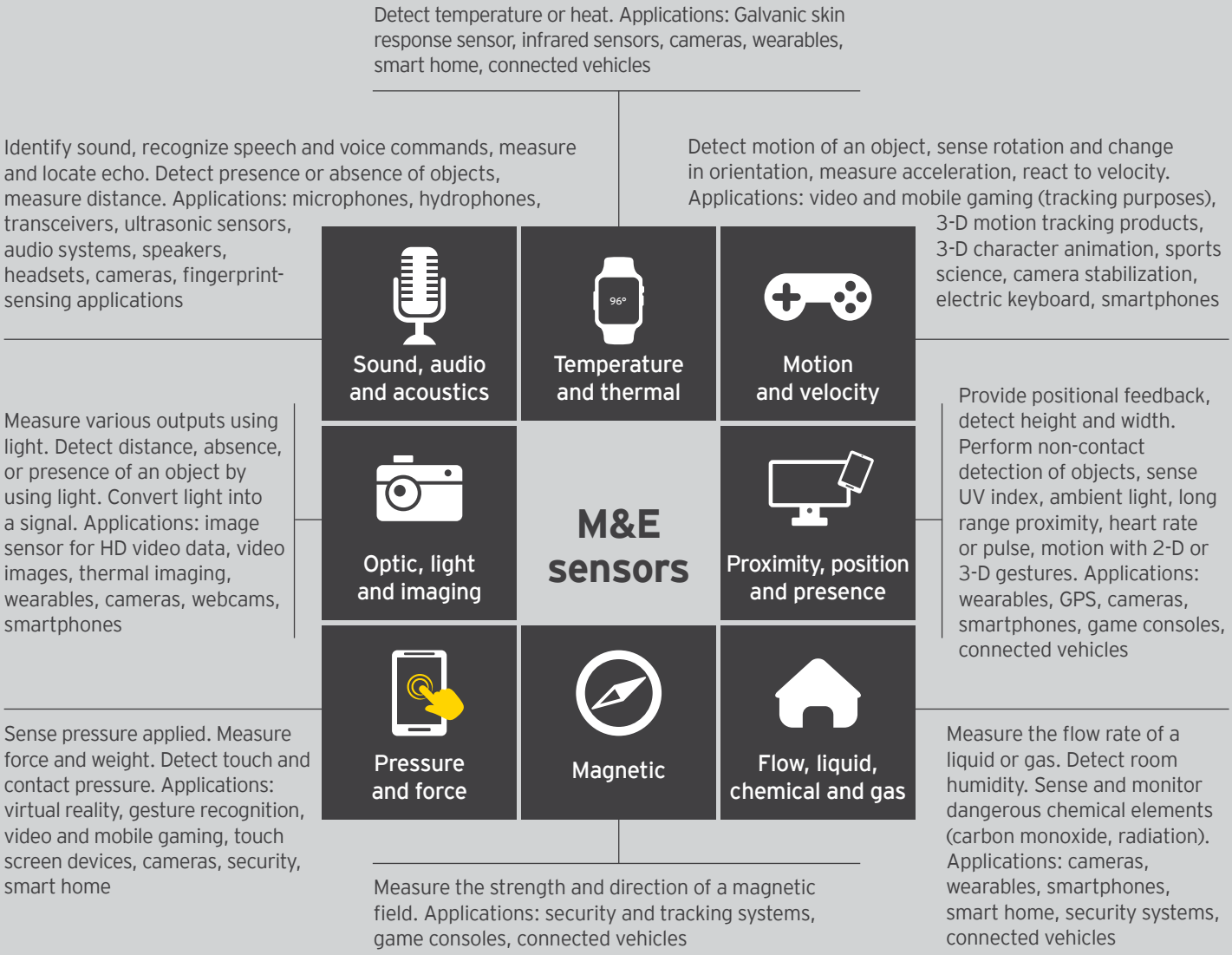
This is only one example of what could be possible with IoT. The total potential for IoT in the M&E space is expansive – to create, deliver, and tailor content for new platforms; to improve metrics that go beyond time and measure the context of media consumption; and to cooperate with other IoT ecosystem players to further evolve IoT.

The sensors that will drive IoT expansion for M&E

Sensors will be one of the key drivers of IoT expansion. Sensors measure physical inputs and transform them into raw data, which is then digitally storable for access and analysis. Miniaturization has enabled sensors to integrate into smart devices, expanding their capacity beyond data measurement and analytics to transmitting information via the internet.[6] In today's context, sensors can measure anything from temperature, force, pressure, flow and position, to light intensity. And they are being embedded into everything, from electricity networks, roads and other infrastructure, to mobile, wearable, home automation and security devices.

Among the most discussed applications for sensors are all things smart: cities, environment, water, metering, security and emergency services, retail, logistics, industrial control, agriculture, farming, domestic and home automation, and e-health.[7]

Within the M&E industry, companies are using categories of sensors such as inertial, motion and image sensors used in animation, gaming, video images, camera stabilization, sports and 3-D. At the same time, multichannel video programming distributors (MVPDs) are experimenting with other areas of the IoT ecosystem – cloud computing, transmission and spectrum enhancement.



[6] BuddeComm, *BuddeComm Intelligence Report – M2M, IoT and Big Data – Key Global Trends*, 14 September 2015, via ThomsonOne © Copyright Paul Budde Communication Pty Ltd, 2015.

[7] Ibid.

Where vision meets execution: creating exceptional M&E consumer experiences

Although numerous opportunities for IoT in M&E exist, it is important for M&E companies to find the right balance between potential and necessity. IoT can enable some amazing experiences. However, it can just as easily become annoying. Personalization can become unwanted if it is perceived not to be relevant. (How often do web users continue to see display ads for products that they have already purchased?) Device integration can become a hindrance if it disrupts a user's experience: an end-of-cycle alert from a dryer to a smartwatch is helpful, but that same alert would be bothersome if it were to automatically pause the game during a Super Bowl party. M&E companies will want to take a customer-centric view when developing IoT strategies to calibrate experiences that charm consumers without crossing the line into intrusive.

IoT opportunities by vertical

	Broadcasters and cable networks and online video	Cable and satellite distributors (MVPDs)	Publishing and information services
Growth/ customer experience	▸ Seamless authentication of content rights and content access ▸ Increased content personalization ▸ Content discovery ▸ Recommendations ▸ Automated content distribution ▸ Contextual customer profiling ▸ Digital identity tracking ▸ Gesture-based commerce ▸ Community-based commerce offering	▸ Seamless authentication of content rights and content access ▸ Content discovery ▸ Digital identity tracking ▸ Improved interface of services ▸ Security for in home devices – dynamic multifactor authentication, remote monitoring ▸ Home automation ▸ Smart home	▸ Increased content personalization ▸ Content discovery ▸ Recommendations ▸ Gesture-based commerce
Efficiency	▸ Rights management ▸ Cloud-based content storage and distribution ▸ Distributed freelance equipment and labor pooling (similar to an Uber for cameras, production staff) ▸ Remote set fabrication (3-D printing)	▸ Predictive servicing of lines and equipment ▸ Fleet management and dispatch ▸ Truly integrated service offerings (including NFC payments) ▸ Secure data depositories	▸ Rights management ▸ Cloud-based content storage and distribution ▸ Smart supply chain and printing facilities ▸ Automated data collection and research (B2B)

Here are three IoT examples that M&E companies will want to consider. A fully executed IoT vision will incorporate elements of all three to create an interconnected experience.

1. Personalization at home and on the road

The explosion of subscription OTT services, on-demand options offered by broadcast networks, DVRs and mobile broadband have created the expectation that everyone can have access to any content, anytime and anywhere. Although the amount and quality of content have increased, true personalization has lagged behind and many consumers continue to suffer from the paradox of choice. In addition, excessive numbers of irrelevant and intrusive ads across all of these platforms and experiences have propelled consumers to increasingly adopt ad-blocking technology, which puts already strained revenue models at additional risk.

IoT may provide elegant solutions for these issues by using the data collected from new sensors to enhance personalization of content and advertising. Sensors can measure personal reactions to different types of programs. They can register frequency and time spent with the program and level of attention given to the program. M&E companies can also use the data to produce an estimate of the context in which the program is being consumed. By knowing specific attributes of the device owner, sensors can gather additional data that will enable media companies to deliver personalized experiences and advertising.

	Film, TV and gaming	Sports, theme parks and live events	Advertising and measurement
	▸ 4-D multisensory theater experience ▸ Immersive experience ▸ Audio fingerprinting to enhance consumer experience ▸ Content feedback to capture level of excitement ▸ Content discovery ▸ Demand-based customized release strategy ▸ Global connections for communities of franchise fans ▸ Post-event real-time merchandise-buying ▸ Pre-event food venue ordering and menu customization	▸ 4-D multisensory experience ▸ Personalized end-to-end experience ▸ Digital identity tracking ▸ Ad-hoc communities of interest ▸ Out-of-venue connectivity ▸ Pre-event food venue ordering and menu customization ▸ In-venue commerce ▸ Post-event promotion and marketing	▸ Digital identity tracking ▸ Increased personalization of ad type and format ▸ Contextual advertising ▸ Real-time consumer feedback ▸ Improved measurement ▸ Full life cycle attribution
	▸ Rights management ▸ Exhibitor window and schedule optimization ▸ Cloud-based content storage and distribution ▸ Remote set fabrication and robotic production ▸ Marketing and promotion optimization ▸ Food and beverage concession supply chain optimization and customization	▸ Predictive capacity planning ▸ Wearables/RFID wristbands tracking ▸ Real-time customer feedback ▸ Data analytics based on live audiences ▸ Inventory management ▸ Asset management ▸ Marketing and promotion optimization ▸ Food and beverage concession supply chain optimization and customization	▸ Real-time metrics ▸ Real-time data analytics ▸ Data depository ▸ Distributed freelance equipment and labor pooling (similar to an Uber for cameras, production staff) ▸ 3-D set production

The ups and downs of personalized ads

For advertisers, ads can be contextualized to the specific interests of an individual. For example, by using data gathered via IoT, advertisers can deliver an upbeat ad for cruise lines during a viewer's workout, but ambient lighting, a slower heartbeat and a shift in serotonin levels might trigger the advertiser to push a more sentimental ad near bedtime. Sensor data can be used to reach a scale audience that is right for a particular impression, not just an audience that all happens to be watching the same program.

True contextual-based advertising has a significant revenue upside — many marketers worldwide who have tried personalization across various channels report major uplift in conversion rates.[8] However, the degree to which consumers appreciate personalization varies significantly by geography. Close to one-third of US consumers surveyed stated that they like personalized ads and that the level of personalization is appropriate,[9] but European consumers are less enamored of personal data being used to drive relevant advertising.[10] This means that the real test of consumers' openness to contextually relevant advertising will come from the practical execution. If smart devices provide useful data to content providers that is perceived as non-intrusive and the resulting content experience correctly interprets consumers' current readings (mood, need, intention) in real-time, and then quickly respond to those needs with relevant and targeted advertising, the implications for improved brand loyalty could be vast.

One of the biggest initial hurdles M&E companies face when it comes to IoT is simple understanding of the implications for the industry. An IDC survey of US consumers' perceptions showed that only 15% of consumers are very familiar with the terms IoT and home automation.[11] The top areas of consumer interest within

[8] "Channels Where Client-Side Marketers Worldwide Have Experienced an Increase in Conversion Rates Since Implementing Personalization, Sep 2015," *Conversion Rate Optimization Report 2015*, Econsultancy in association with RedEye, 11 November 2015, as cited by eMarketer.

[9] "Primary Attitude Toward Personalized Ads Among Internet Users in Select Countries in North America and Western Europe, July 2015," "Marketing Channels," as presented at dmexco, Adobe Digital Index, 17 September 2015, as cited by eMarketer.

[10] Ibid.

[11] Tapper, David, *U.S. Consumer Requirements for Managed IoT and Home Automation Services and the Value Chain of Outsourced Opportunities from IoT to Business Process and IT*, International Data Corporation (IDC), August 2015.

the automated home category span energy management and security, followed by environmental monitoring, appliances and housewares.[12] This lack of awareness of the possibilities for media applications of IoT plagues both end-consumers and the media companies that serve them. A lack of understanding, combined with insufficient capabilities to accurately measure customer satisfaction has many M&E companies still sitting on the sidelines when it comes to IoT. If, however, M&E companies could help consumers reimagine new experiences on devices they already own, they could use the data consumers generate to create a virtuous feedback loop — one that highlights experiences that customers either enjoy or ignore. From there, M&E companies can more accurately target experiences.

Connecting in the connected car

In addition to using IoT to personalize experiences in the home, M&E companies will want to consider the vast opportunities available in the original mobile platform — the car. According to Statista's Digital Market Outlook, the connected vehicle market in the US is expected to grow at 31% CAGR for the period 2016-2020.[13] The number of connected cars in the US will almost triple in the next four years, from approximately 21 million in 2015 to almost 60 million in 2019.[14]

Connected cars offer increasing levels of connectivity and automation, such as dashboard interfaces for accessing email, music and video streaming, and social networks, and the promise of self-driving, self-parking modes. Americans spend about an hour each day in their cars, a figure that has steadily grown over the past three decades.[15] If the focus during that time were to shift from concentrating on the road to watching video, that equates to more than US$20 billion in incremental revenue for the video industry.[16]

[12] Ibid.

[13] "Report projects 30% growth in connected car market," *TR Daily*, 11 March 2016, via Factiva, © 2016 Aspen Publishers.

[14] "Connected Cars in the US, 2014-2019," *Mobile and Connected Devices Forecast and Monitor*, 451 Research, April 2015, as cited in company blog, May 19, 2015 and as cited by eMarketer.

[15] EY analysis based on data from "New Study Reveals When, Where and How Much Motorists Drive", *PR Newswire (U.S.)*, 16 April 2015, via Factiva © 2015 PR Newswire Association LLC.; "Average Annual Miles per Driver by Age Group," US Department of Transportation, Federal Highway Administration, Office of Highway Policy Information, 20 February, 2015, http://www.fhwa.dot.gov/ohim/onh00/bar8.htm; "Summary of Travel Trends," *2009 National Household Travel Survey*, U.S. Department of Transportation, Federal Highway Administration, 2009, http://nhts.ornl.gov/2009/pub/stt.pdf.

[16] EY estimates based on US 18-54 population from "Projections of the Population by Sex and Selected Age Groups for the United States: 2015 to 2060 (NP2014-T3)," U.S. Census Bureau, Population Division, December 2014; CPM for online video from "Average CPMs for US Total Media Ads, by Media and Format, June 2015," "The Media Monthly," Peter J. Solomon Company (PSJC), July 14, 2015, as cited by eMarketer.

2. Authentication and verification can unlock a personal portal

Although "TV Everywhere" and OTT services have grown in popularity over the past six years, challenges remain. A painful authentication experience is often cited as the main reason for the slow uptake of these services, along with poor marketing and inconsistent availability of the newest shows.[17] IoT can improve the experience, as well as the security for identification and verification. Sensors can easily deliver multi-level authentication, which involves many sensors to create complex verification that is simple for users. Furthermore, sensors improve or introduce a new level of continuity in the process of authentication and recognition. For example, certain sensors in devices that are constantly carried by the same person (smartphones or wearables) could be used as the main level of authentication at different places.

Ultimately, pay-TV operators have an opportunity to function as a broker, packaging and controlling individual rights to various content services, with an IoT offering the means for authentication. Through a fingerprint or eye scan, any device anywhere has the potential to become a personal portal into the content offerings that an individual has the rights to view.

Imagine, for example, getting into a driverless car or standing in front of a kiosk at the train station and having instant rights to your TV services without having to actively log in. Taken to the next level, big data algorithms could customize a large screen experience for a public group based on a combination of content the individuals have the rights to and the proclivity for. Experiences at live concerts, stadiums and theme parks would be utterly transformed. Any surface could become the mechanism for an instant, tailored viewing party, creating communities of interest around a brand or experience.

[17] TDG research quoted in "Turns Out TV Everywhere Authentication Isn't Too Tough," *MediaPost*, 24 September 2014, via Factiva, © 2014 MediaPost.com.

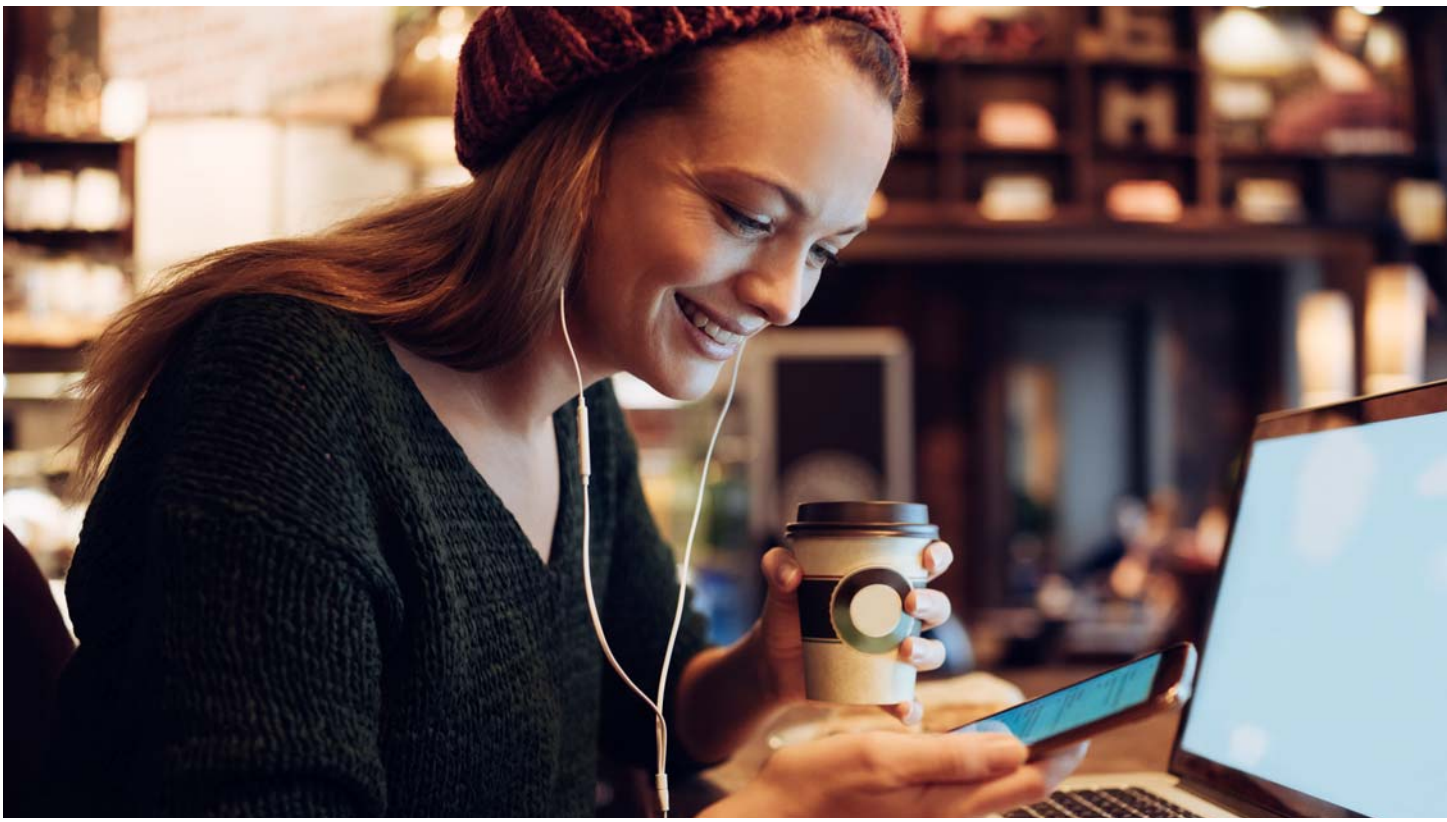
Pay-TV operators could also use IoT to insulate against cord cutting if they can operate the back-end verification infrastructure tied to a biometric recognition. This would enable permission-based access to content on any screen, including in public settings, on kiosks at transit hubs or in an Uber-owned, self-driving vehicle. This level of access-driven authentication might even help address some of the piracy issues by directly tying a stream or file to an individual.

Authentication and citizen journalism

Technology and social media have opened many channels for news gathering and dissemination. In an era of ubiquitous social media penetration, it is increasingly impossible for news organizations to beat social media to an early news story. As a result, many news organizations are beginning to embrace social media as part of the news gathering process.

However, with multiple streams of user-generated news from individuals who have no accountability to a network, news organizations are responsible for verifying the authenticity of the streams they receive, remaining accountable to their stakeholders and preserving the most precious feature of their brand — viewers' trust. Social media then presents a double-edged sword; it publishes news quickly but is not necessarily as reliable as formally trained journalists' work. In news delivery, time is of the essence. Being both first and right is crucial for news organizations.

IoT can help verify citizen journalism and accelerate the speed of investigating a story as it develops when every second counts. Sensors could pinpoint citizen journalists' location, identify the place of origin of multiple independent streams of news information and aggregate them to signal a news development. Furthermore, although there are privacy issues associated with protecting a citizen journalist's identity, sensors could both verify the reliability of news sources as well as the emotional tone of social media updates of the people near a developing story, helping to separate real news from hoax.



3. Wearables: when the clothes measure the man (or woman)

One of the most anticipated benefits of IoT is the treasure trove of data that it will collect. Today, measurement is sample based. The data can tell M&E marketers what, when and perhaps how a person watches a program. However, current tools cannot tell us "why."

Wearables have the potential to unlock new data that can both address deficiencies in the current measurement system, such as de-duplicating unique users across platforms, and enhance what marketers know about their audiences. According to eMarketer "the reliance on data analytics is only going to get bigger in the coming years. More than 7 in 10 marketing executives expected to increase their reliance on data analytics for decision-making over the next three years. Just 2% planned to lean on analytics less, and 14% wouldn't change anything."[18]

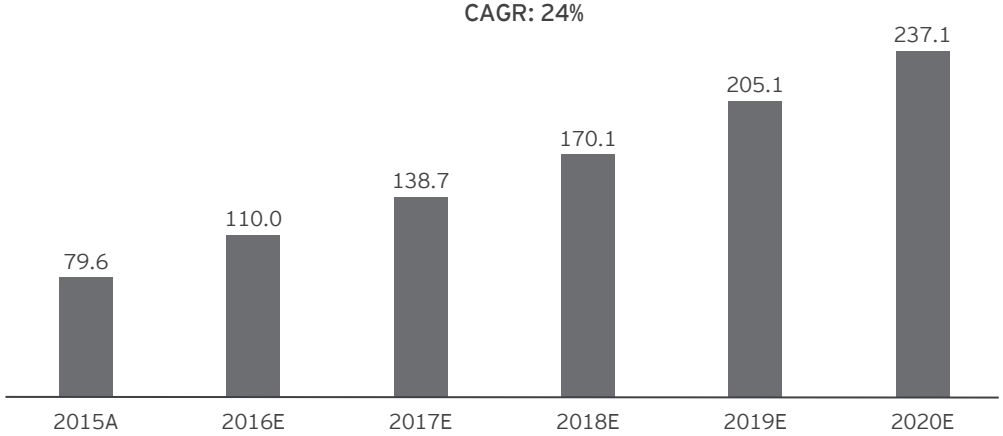
Through IoT, advertisers and media companies may be able to answer critical questions about consumer behavior, such as:

- How many exposures led to a conversion? In what context was an ad most successful?
- How many times did a person really "see" an ad?
- How many exposures are unique individuals vs. the same person on multiple platforms?

Answering these and other questions can improve both ad efficacy for consumers, and ROI for marketers.

IoT presents exponentially more ways for programmers and advertisers to collect data on a person's habits, preferences and most significantly, their context. Not only will media companies be able to understand what a person is watching, but they may have ways to measure how, where, why and with whom consumers are viewing.

Worldwide wearable device shipments 2015-2020 (millions of units)
CAGR: 24%

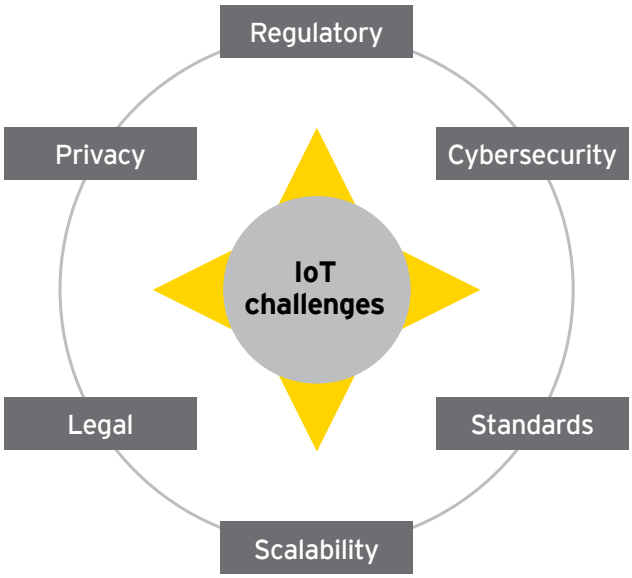


Source: "Worldwide Wearable Device Forecast, 2015Q4", "IDC Forecasts Worldwide Shipments of Wearables to Surpass 200 Million in 2019, Driven by Strong Smartwatch Growth and the Emergence of Smarter Watches," *International Data Corporation (IDC) website*, March 17, 2016, https://www.idc.com/getdoc.jsp?containerId=prUS41100116.

[18] "Data Analytics, So Hot Right Now," eMarketer, 19 January 2015, emarketer.com; "Data Driven and Digitally Savvy: The Rise of the New Marketing Organization," Forbes Insights in association with Turn, 8 January, 2015 as cited by eMarketer in "Data Analytics, So Hot Right Now," January 19, 2015.

Proceed with caution: beware the risks of IoT

For all of the opportunities that IoT offers, there are some significant risks that M&E companies need to address before they adopt IoT in full measure.



Regulatory hurdles

Around the world, legislators are trying to plug the regulatory holes that IoT is creating.

In late 2014, the European Commission published an opinion on IoT specifically focused on wearables and smart home devices. Among its recommendations was the requirement that users remain in complete control of their data; the opinion also addressed the activities that organizations need to consider to remain compliant with European Union data protection laws.[19]

Early in 2015 in the US, Congresswoman Suzan DelBene (D-WA) and Congressman Darrell Issa (R-CA) announced the launch of a Congressional caucus on IoT.[20] Its purpose is to educate members about both the opportunities and challenges IoT poses for health, transportation, home and work, and subsequently to find the balance between collecting data that IoT creates and protecting consumer privacy. Around the same time, the Federal Trade Commission released a report that recommended data minimization and self-regulatory programs to improve privacy and security practices.[21]

[19] *Opinion 8/2014 on the Recent Developments on the Internet of Things*, adopted on 16 September 2014, Article 29 Data Protection Working Party, European Union, http://ec.europa.eu/justice/data-protection/article-29/documentation/opinion-recommendation/files/2014/wp223_en.pdf.

[20] "U.S. Reps. Issa and DelBene announce Creation of the Congressional Internet of Things Caucus," *Congressional Documents and Publications*, 13 January 2015, via Factiva, © 2015 Federal Information & News Dispatch, Inc.

[21] "FTC Report on Internet of Things Urges Companies to Adopt Best Practices to Address Consumer Privacy and Security Risks," *PR Newswire (U.S.)*, 27 January 2015, via Factiva, © 2015 PR Newswire Association LLC.

Privacy in the age of IoT

In almost every consumer survey, privacy emerges as the No.1 concern. In an IDC US consumer survey, close to 55% of respondents identified "ensuring my privacy" as their top expectation of third-party providers of home automation services.[22] Similarly, a Forrester's survey of global enterprise decision-makers identified security and privacy among the top five concerns to IoT adoption and growth.[23] Privacy is a major challenge that organizations need to overcome as the IoT ecosystem seeks to collect enormous amounts of data and contextual inputs from sensors and other IoT solutions.

New targets for hackers increase pressure on cybersecurity

Cybersecurity remains a leading challenge for consumers and businesses alike — something that will become exponentially more difficult as IoT connects more devices, software, machines and humans. In a recent EY publication *Creating trust in the digital world: Global Information Security Survey 2015*, 88% of study respondents indicate that they do not believe their information security fully meets the organization's needs.[24] And yet, when asked about IoT, 68% do not consider monitoring their business ecosystem as an information security challenge.[25] Similarly, 67% do not see managing the growth in access points to their organization as a challenge to their information security.[26] These numbers would seem to indicate that many organizations underestimate the impact IoT may have on their business.

The setting of new legal precedents

IoT lives in the physical world. Operational failures resulting from connectivity loss or device malfunction are inevitable. These failures also create legal risks for M&E companies. Lawyers and judges across jurisdictions are grappling with some tough legal questions:

- Who is responsible for a connected device malfunction or resulting accident?
- Who is responsible for a data breach?
- How much are companies liable vs. the consumers themselves?

As individual cases make their way through the legal system, many of these questions remain unanswered.

Intellectual property rights

One of the biggest questions on everyone's mind is: Who owns the data? Is it the company that manufactures the sensor, the company that manufactures the device, the individual whose data is being measured and collected? Certainly, EU legislators are emphasizing the rights of the individual to own their data, but this is not the case in all jurisdictions. Even in instances where data ownership is clear, the duration for which owners can own the rights of collected data still needs to be addressed.

Standards — or a lack thereof

For IoT to progress, connectivity standards need to evolve. Similar to the communication challenges that people from different parts of the world face, in today's IoT ecosystem, devices, sensors, machines and people are often speaking completely different languages with one another. Without a common language or standard of implementation, IoT will remain limited in its application.

Scaling to reach critical mass

In the same way, the IoT ecosystem needs standard protocols and a single language to expand. It also needs consistency in device architecture for large-scale adoption. Only when IoT reaches critical mass can M&E companies reap the full financial benefits of their personalized content investments.

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[22] Tapper, David, *U.S. Consumer Requirements for Managed IoT and Home Automation Services and the Value Chain of Outsourced Opportunities from IoT to Business Process and IT*, International Data Corporation (IDC), August 2015.

[23] "The Internet of Things Has the Potential to Connect and Transform Businesses," a commissioned study conducted by Forrester Consulting on behalf of SAP and Intel, August 2015.

[24] *Creating trust in the digital world: EY's Global Information Security Survey 2015, EY, 2015*, http://www.ey.com/Publication/vwLUAssets/ey-global-information-security-survey-2015/$FILE/ey-global-information-security-survey-2015.pdf.

[25] Ibid.

[26] Ibid.

The next evolution: four steps to IoT leadership

As the pace of digital technology evolution accelerates, and the competition to bring new and innovative products and services to market intensifies, M&E companies have no time to waste when it comes to IoT. To be successful, M&E companies will have to rethink business strategies and reimagine business models.

IoT leaders will be the ones who stay connected with demanding and often unpredictable customers, listen to their evolving preferences and quickly innovate to respond to their needs. To become an IoT leader, M&E companies will want to focus on four key areas:

1 Create an innovation culture

M&E companies will need to develop competencies and a culture that fosters agile closed-loop innovation, leverage big data and analytics to identify new opportunities and evolve products based on customer usage information. M&E companies will also need to develop new internal capabilities to improve the customer experience in real time, while simultaneously collecting the feedback necessary to continually evolve products and services based on changing preferences.

It's important that M&E companies find a way to capture every moment that matters and imagine the potential of data and insights to create signature moments that enhance customer's experience. M&E companies may want to consider creating customer journey maps that enable them to assess every step of the customer experience, gathering feedback as appropriate through well-defined standard metrics and a scoring model.

2 Adopt a hybrid agile model

Over the last several years, product life cycles have continued to shorten, particularly when it comes to software. However, in the age of IoT, these product life cycles will have to hit hyperdrive. To meet this increasingly frenetic pace, M&E companies will need to adopt a hybrid agile model, borrowing key capabilities from the automotive industry and other sectors with high maturity and long life cycles, while accelerating the pace of release for key software components.

A robust prioritization framework to identify the right mix of capabilities for product delivery and rapid deployment will be the key to success.

3 Increase partner ecosystem

Given that IoT is inextricably tied to consumer device manufacturers, big data platforms and software enablement, M&E companies will have to create business application program interfaces (APIs) that enable them to plug into different IoT ecosystems. At the same time, they will have to rely on other parties to develop the products for delivery. We have seen an explosion of "as-a-service" capabilities, (software, platform, etc.). IoT may require "Media as a Service" (MaaS) that enables content providers to integrate their content products into complex ecosystems of technology to streamline delivery and delight customers. As the M&E industry has a legacy of Byzantine contractual arrangements, rights agreements and closed systems, this will require large changes to the underlying operating models within many organizations.

4 Manage the risks

For M&E companies, risk is rapidly becoming the fourth dimension of business (behind people, process and technology), particularly in the age of IoT. By embedding risk management throughout the organization, rather than isolating it in a risk or compliance function, companies can transform how they connect risk and opportunities to become a leader in IoT. At the same time, they can mitigate the vulnerabilities that, if breached, could irreparably damage their reputation and their business – financially and organizationally.

The future of M&E is IoT

IoT is both disruptive and inevitable. M&E companies are uniquely positioned to seize an early advantage given their position as both an enabler of IoT and a receiver. At its heart, IoT removes the friction from manual completion of mundane tasks, enabling people to spend time on the things they enjoy. If this time is spent consuming and engaging more deeply with content, the M&E industry will find real value in its IoT investments.

What can EY do to help you with your IoT readiness?

	A good defense	An even better offense
Prepare	▸ Understand security and privacy issues and threats ▸ Understand how to continually align data safety and accuracy ▸ Develop IoT risk strategy ▸ Determine rights implications of IoT world	▸ Evaluate potential of IoT data to customize and enhance customer experience ▸ Leverage IoT when developing the overall go-to-market strategy and market positioning ▸ Evaluate multi-level authentication in direct-to-consumer services and enhance micro payment capabilities ▸ Evaluate back-end systems scalability to prepare for massive IoT data ▸ Determine device strategy (partner/build/license) ▸ Develop robust identity management strategy tied to IoT services ▸ Develop concept for service interface design ▸ Develop advertising products and pricing aligned with contextual IoT delivery
Implement	▸ Enhance data protection and privacy infrastructure ▸ Draft policies and procedures around customer data and remediation ▸ Continually update map of critical data dependencies in product and services ▸ Make certain that the right data architecture is in place to support massive data storage and retrieval	▸ Design algorithms, models and programs that can turn collected data into meaningful customized insights ▸ Implement contextual profiling of customers ▸ Create databases and secure data depositories to host customer data ▸ Assess and upgrade infrastructure ▸ Design a product (software) that can use real time data input and data analytics to improve efficiency and optimize operations ▸ Develop in-product commerce and engagement experiences ▸ Develop algorithms for content discovery within one's own ecosystem and across others
Operationalize	▸ Conduct scenario testing and simulations of high risk situations where IoT data could pose incremental human reputation or litigation risks ▸ Conduct real-time monitoring for reliability and accuracy of critical data elements that drive IoT-dependent products and services	▸ Deliver exceptional and frictionless customer experience ▸ Continually innovate and delight ▸ Design KPIs that capture IoT impact and business growth ▸ Monetize data by offering it as a product to purchase or as a subscription service

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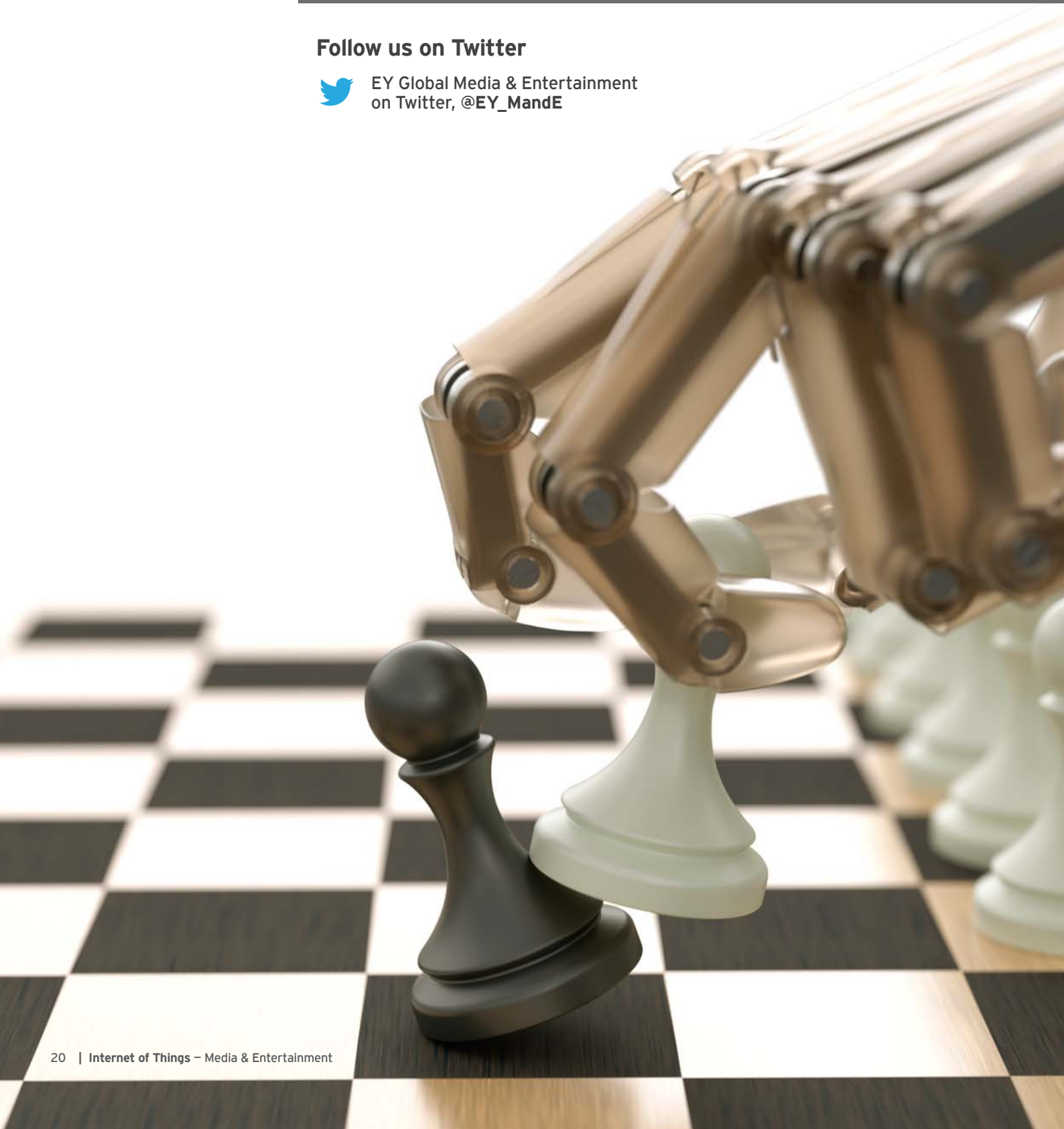

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How EY's Global Media & Entertainment Center can help your business

In an industry synonymous with creativity and innovation, the bar for business excellence is set high. You need to embrace new technology, develop new distribution models and satisfy the demands of a voracious and outspoken consumer. At the same time, it's important to manage costs, exceed stakeholder expectations and comply with new regulations. There's always another challenge just around the corner. EY's Global Media & Entertainment Sector can help. We bring together a high-performance, worldwide team of media and entertainment professionals with deep technical experience in providing assurance, tax, transaction and advisory services to the industry's leaders. Our network of professionals collaborates and shares knowledge around the world to deliver exceptional client service, leveraging our leading market share position to provide you with actionable information, quickly and reliably.

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