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REVIEW

IoT

CONSUMERS AND THE INTERNET OF THINGS



IoT Experiences
Meaningful Consumption
IoT Stories
IoT Adoption
IoT As A Complex Network
AI and Augmented Intelligence
Reinventing Customer Centricity

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Editorial



While everybody seems to be talking about the Internet of Things, and lots of people own a smart this or a smart that, most consumers have yet to experience the frequently conjured up advantages of a truly connected life.

Up to now, IoT device adoption is happening mainly in the niche segments of technologically sophisticated upscale consumers and technology-focused DIYers. To reach a broader range of users, marketers must do a better job of understanding and offering the inherent value of smart products. Current marketing approaches are fragmented and tend to focus on individual products and single use cases. They may actually be underselling the consumer IoT. Most companies are wondering which combination of entry points – appliance and home entertainment control, energy management, pet monitoring, property protection, safety and security – make the most sense. But the mass market consumer is not buying a platform or devices controlled by an algorithm, they are buying an experience.

In this issue we discuss what it takes to create and market IoT experiences that bring real benefits and which consumer anxieties need to be considered. Do consumers actually enjoy being “freed” from daily tasks? Will humans soon be redundant in value creation processes? Is the IoT safe? Or is Alexa in fact a witch? IoT marketers should understand and communicate smart products as entities in a complex dynamic system. As an assemblage, they gain new capacities from ongoing interactions among products and consumers and enable new experiences. Marketers must focus on deeper meanings and communicate the value proposition inherent in individual consumer experiences. So, get ready to discover new facets of the Internet of Things and prepare yourself for a new era in marketing and, in fact, for life in general.

Yours,

A handwritten signature in black ink that reads "Donna L. Hoffmann".

Donna Hoffmann

A handwritten signature in black ink that reads "Thomas Novak".

Tom Novak

Washington, D.C., June 2018

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Executive Summaries

The Path of Emergent Experience in the Consumer IoT: From Early Adoption to Radical Changes in Consumers' Lives

Donna L. Hoffman and Thomas P. Novak

Up to now, IoT device adoption is happening mainly in the niche segments of technologically sophisticated upscale consumers and technology-focused DIYers. To reach a broader range of users, marketers must do a better job of understanding and offering the inherent value of smart products. Current marketing approaches are fragmented and tend to focus on individual products and single use cases. They may actually be underselling the consumer IoT. The mass-market consumer is not buying a platform or devices controlled by an algorithm, they are buying an experience.

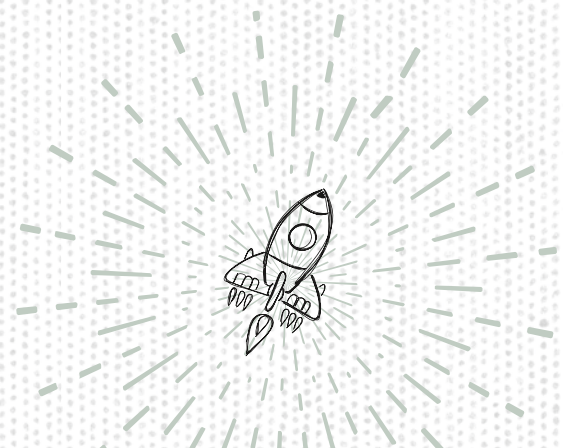
We need to ask, in what ways consumers and devices will interact with each other to create the experience they actually seek. Therefore, the main challenge is to implement a bottom-up approach that encourages users to experiment with their devices and their interactions and to integrate their individual experiences into everyday routines.

Amazing Machines and the Quest for Meaning in Consumption

Stefano Puntoni

The benefits brought to us by recent product innovations also come with potential burdens for people who are motivated to consume by identity motives – that is, by the desire to be the kind of person that they want to be. Being freed from a personally relevant routine might be undesirable. Therefore, IoT adoption will be more likely when the associated tasks are less relevant for identity signaling and less likely when the associated tasks are relevant for one's identity. However, people who oppose IoT application in one context might willingly accept IoT applications in others with less personal relevance.

Managers should not overlook that people's quest for meaning in consumption remains an important driver of buying decisions even in our age of amazing machines. Physical products won't completely disappear any time soon, especially when they are relevant for a person's identity.



IoT Stories: The Good, the Bad and the Freaky

Markus Giesler and Eileen Fischer

Consumers' perceptions of technology are less matters of product attributes and concrete statistical evidence and more of captivating stories and myths. Managers of IoT can instill consumer trust when they tell highly emotional stories about the technologically empowered self, home, family or society. The key benefit of this approach is that storytelling-based IoT marketing allows consumers to forge strong and enduring emotional bonds with IoT and, in many cases, to develop loyalty beyond belief.

However, stories aren't always positive. Negative stories and meanings about a technology that are circulated in popular culture can be dangerous and harmful to a brand or a new technology. Regardless of its source, marketers need to understand the nature of the doppelgänger images that may be circulating for their technologies. They can be regarded as diagnostic tools to better understand how consumers think about and experience their IoT solutions. Also, doppelgänger narratives are valuable raw ingredients from which marketers can cull new, more captivating IoT stories that nurture consumer adoption.

Internet of Things: How to Avoid Short-Term Errors and Ensure Lasting Adoption

Larry Downes

The pressure of delivering products in hyper-competitive markets often leads developers to ignore basic data management precautions, along with a failure to devote adequate resources to marketing. To assure that short-term errors don't cause long-term damage for the IoT, developers must adopt new strategies. Converging on a single IoT standard could foster adoption as well as better security protocols. To handle the sheer number of connected items and their need for constant interaction demands investments in high-performance networks. For IoT products to integrate deeply into consumers' daily lives, applications must be integrated into existing solutions from trusted brands. Finally, they must do more than simply replace existing and still-working items, but add new functions and new applications that existing technology can't possibly duplicate.

The Complex Network of Things: When Technology is Making the Deal

William Rand

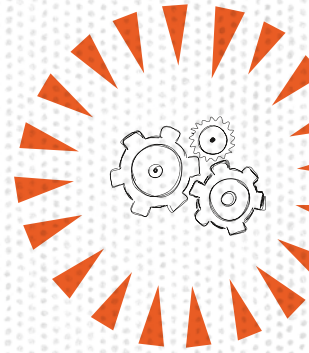
What consumers notice from the IoT is just the tip of the iceberg. Underneath the surface, dozens of applications are communicating and interacting with each other. A brand that wants to succeed in this complex environment needs to work within this network and make sure that its messages are the ones that filter all the way through and ultimately reach the consumer. IoT designers need to make sure that products and devices can only send and receive valid messages and consider the ramifications of those messages on the rest of the system. If security is underestimated, the whole system and the consumers are put at risk. Further, it is important to collect and examine the data that the interactions generate to better understand the usage of IoT-enabled products and their interactions with other elements of the complex network.

Internet of Things – Will Humans be Replaced or Augmented?

Paul A. Pavlou

Augmented Intelligence – effective human-computer symbiosis – has the potential to address emerging challenges successfully, possibly more so than pure AI. It integrates the unique abilities of human beings that cannot be replicated by AI. Large-scale IoT problems often cannot be solved by either computers or human beings alone. Therefore, there are significant opportunities in IoT applications that are coupled with the notion of Augmented Intelligence. Managers need to consider carefully for which task, in which way and to what extent IoT applications will be applied. They must make their choices based on the expected performance, cost and risk of autonomous IoT solutions that would operate without human oversight. For example, automated manufacturing, predictive maintenance and security IoT solutions may be cautiously fully automated. However, human-oriented applications, such as smart retail, could still maintain a certain level of human oversight.





Connecting Everything With Everything: The Sky is the Limit

Interview with Linden Tibbets, Co-founder and CEO of the services platform IFTTT, San Francisco, CA, USA

IFTTT is a neutral platform that offers easy and free ways to get all your apps and devices talking to each other. Millions of users worldwide have enabled more than 75 million Applets for over 600 services that already cooperate with the platform. Linden Tibbets, co-founder and CEO of IFTTT, explains that everything in the future will be a digital service. Connecting all these services is a tricky task and many companies are struggling with making these connections. Tibbets explains how the IFTTT platform tackles these interfaces and functions and how end users and companies can get more value from being able to connect just about everything with everything.

Connecting the World and Reinventing Customer Centricity

Rudolf Aunkofer

The classical customer journey with its touchpoints is transformed into a lifelong, interactive customer relationship within an IoT-based product-service ecosystem. The customer journey happens in multiple, partially automatic loops that make it significantly less predictable for manufacturers and retailers. For many product categories, the IoT is not going to take off until providers and retailers succeed in getting at what their customers really want. For one thing, they need to better understand individual usage behavior, and for another, there is a need to better personalize products and services, creating emotional and situation-specific customer experiences. Expanding the ability of digital products to communicate with each other, to record and analyze usage behavior and to implement concrete product improvements will be decisive. If customer centricity is reinvented in the IoT space, customers will see a real value and smart products will replace classical products in the next five to ten years.



The Path of Emergent Experience in the Consumer IoT: From Early Adoption to Radical Changes in Consumers' Lives

Donna L. Hoffman and Thomas P. Novak

KEYWORDS

*Consumer IoT, Smart Home,
IoT Experience, IoT Marketing,
Assemblage Theory*

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THE AUTHORS

Donna L. Hoffman

Louis Rosenfeld Distinguished Scholar
and Professor of Marketing,
The George Washington University School
of Business, Washington, D.C., USA
dlhoffman@gwu.edu

Thomas P. Novak

Denit Trust Distinguished Scholar
and Professor of Marketing,
The George Washington University School
of Business, Washington, D.C., USA
novak@gwu.edu

The emergence of something more /// R2-D2 is no longer science fiction. Talking devices, sensors, thinking systems, self-driving cars and drones have entered real life. Entire consumer categories including fitness, health care, automobiles and the home itself are now creating the consumer Internet of Things. We find ourselves in the midst of widespread, global deployment of universal connectedness. Smart devices will lead to innumerable changes in the ways that consumers experience everyday objects. Products that have had a clear historical identity will become "something more" than they have always been. The door lock, which served to prevent strangers from entering our home when we are away, now also serves to allow trusted people to enter our home and put away our groceries when we are not there! This change in the lock's identity will necessarily lead to a parallel change in consumer experience. While a consumer's experience of the lock was previously one of having a dependable guard that provided a sense of security, consumer experience of a smart lock could, instead, shift to a feeling of working with a trusted partner that enables rather than prevents access.

We believe that such scenarios will be replicated again and again in countless contexts in the smart home. Common household objects, such as a toaster or a refrigerator, can become active partners in interaction. Previously unrelated devices, such as a door lock, a security camera and household light bulbs, will work together as an assemblage. In the process they will be able to create experiences that none of these devices could do on their own. The scope of these changes challenges marketers and consumers alike.



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Products that have had a clear historical identity will become “something more” than they have always been.

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The more and the new – fascinating, but ... /// In this issue we explore a range of problems that marketers face as the Internet of Things disrupts consumer behavior, as well as some solutions to these problems. Stefano Puntoni (pp. 18) notes that while intelligent automated products can save time for consumers, there is a dark side as well. Consumers might be uninterested in these products when the task they

are freed from has been an important part of their own identity. Markus Giesler and Eileen Fischer (pp. 24) further analyze the dark side of consumers’ interactions with IoT devices. They describe doppelgänger images, consisting of negative stories and meanings about devices, that emerge when IoT products behave in unexpected and often disturbing ways. Marketers get recommendations for how to deal with negative images. Larry Downes (pp. 30) addresses usability and security problems that consumers encounter with the IoT and present strategies to navigate the minefield of early market failures and ultimately succeed in this hyper-competitive market. William Rand (pp. 36) suggests using the Theory of Complex systems to guide the not always easy to predict outcomes from a network of IoT interactions. Paul Pavlou (pp. 42) addresses the concern that IoT systems might make the entire human workforce redundant. He urges us to consider not just Artificial Intelligence, but also Augmented Intelligence, where humans and machines work together to solve problems neither could solve on their own. Finally, Rudolf Aunkofer from GfK (pp. 54) outlines how the customer journey changes in an IoT environment and how the concept of customer centricity needs to be reconfigured.



{ Box 1 }

Cracking the value code /// For consumer IoT adoption to expand beyond the niche segments of technologically sophisticated upscale consumers and technology-focused DIYers, marketers must do a better job of understanding the actual value of smart products. Currently, marketing focuses on individual and often expensive products like voice assistants, smart thermostats and smart light bulbs or curated “starter kits.” To be sure, some categories are finding some mainstream success. Smart speakers like the Amazon Echo and the Google Home are now in 20% of homes with WiFi in the United States. However, many consumers are struggling to find the value in replacing their current light bulbs, switches and monitoring devices with more expensive versions. The average Joe and Jill do not see much benefit beyond the novelty factor, and they worry about introducing additional technological complications into their lives.

Our research suggests that uncovering the value will take more than is currently being done and will need to involve messaging regarding what the consumer IoT means to consumers. Instead of talking about the smart products themselves, marketers need to focus on the kinds of consumer experiences that are likely to emerge from consumers’ interactions with their devices as their usage increases. Marketing to predefined product use cases is highly limiting because it does not focus on how to allow for the unique experience that is likely to emerge for each individual consumer. Rather than suggest use cases, marketers might encourage users to experiment and create their own experiences, much like the approach Steve Jobs took when he introduced the iPod (see Box 1).

Experiences emerge with a critical mass of devices /// One thing that continually arises in our conversations with managers on the front lines is that the value consumers seem to extract from smart devices depends on the number of devices that can interact with each other. A consumer may start off by purchasing one or two smart devices, say a Nest Thermostat and a Philips Hue Light Bulb. The devices are purchased because consumers believe they are likely to perform a single function well and they view them as separate entities. If those experiences go well, over time, the consumer buys additional devices, for example smart switches, a smart lock, and a hub or relay, and interaction among devices increases. Once the consumer has five or six devices, things start to change: As the number of owned smart devices increases to five to six devices, they start thinking about what would

“EVERYTHING YOU ALREADY UNDERSTAND, BUT MORE.”

WHAT IOT MARKETERS CAN LEARN FROM THE IPAD

The iPad wasn’t sold on the basis of use cases. Steve Jobs emphasized the “magical” and “revolutionary” qualities of the iPad, even as people mocked the name and seemed confused about how to categorize it (giant iPhone? iPod Touch? Kindle?). Apple marketed the iPad as something new, something you could use for “browsing the web, reading and sending email, enjoying photos, watching videos, listening to music, playing games, reading e-books and more.” It was marketed as “everything you already understand, but more.” It wasn’t limited to existing uses, but hinted at novel uses, if only you were willing to adopt one and give it a try. This opened the door to buying an iPad for many different reasons and applications, and as substitutes for everything from an e-reader to a gaming device to a TV.

It was not clear at the outset what the iPad would be good for. It had a lot of capacities, but there was little consensus on how they might be exercised. Early reviews emphasized ease of use and a better computing experience and compared the device to existing categories like laptops or netbooks. But it was also emphasized that the device appeared to represent a new category – even if no one could really say what it was. People did not really know what an iPad was when it first came out. But it started to become clearer with regular use.

The smart home use cases are like those initial iPad categories of use. Many consumers doubt the value of smart products. For example, what does it mean to have a “smart home”? Yet, marketing efforts are largely focused on telling consumers “buy this smart product if you want a bit more comfort,” instead of letting consumers experience for themselves which interactions do – and do not – lead to the emergence of an experience of comfort.

History of the iPad from: <http://www.imore.com/history-ipad-2010>

{ Box 2 }

IFTTT – CONNECTING DEVICES TO GET MORE

IFTTT is an online service that helps consumers connect devices so they can work together. The company name (pronounced like “gift” without the “g”) is an acronym for If This Then That.

The free web-based service lets consumers create easy scripts – if this then that – called applets. An applet is triggered by changes that occur within one service or device such as Gmail, Facebook, Nest or Alexa. For example, an applet may send an email if the user tweets using a hashtag, copy a photo on Facebook to a user’s archive if someone tags a user in a photo or make a LIFX smart LED light bulb turn pastel blue when it is raining.



Over 14 million registered IFTTT users have run 75 million applets since it launched, with more than 5,000 active developers building services and 140,000 developers building applets on the platform.



When IFTTT launched, the company did not promote specific experiences around these categories. It was a blank slate bottom-up platform that allowed consumer needs and corresponding experiences to emerge.

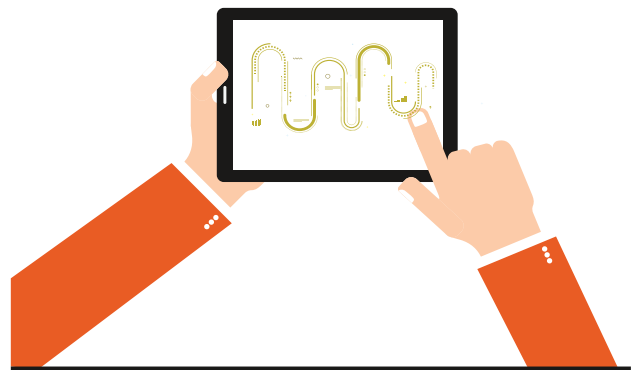


(see the interview with IFTTT CEO Linden Tibbets on pp. 48)

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Instead of talking about the smart products themselves, marketers need to focus on the kinds of consumer experiences that are likely to emerge from consumers’ interactions with their devices.

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happen if the devices could talk with each other. What seems to happen is that the interactions among the devices start to become more important to the consumer than the individual devices themselves. The meaning of what emerges from these interactions can vary across different consumers, since the consumer is part of the interaction. For example, one consumer might find blue lights vaguely depressing and modify an applet (see Box 2) so the lights are a warmer yellow color to counteract the depression. Another consumer might find that blue lighting evokes an appealing mood, and to complement this, they might further modify the applet so that mood music plays along with the blue lights when it rains. In both cases, something new has emerged beyond the intent of the original applet. The rise of the IFTTT platform (see Box 2), which helps consumers connect individual devices in a user-friendly and easy way, is strong evidence that consumers appreciate the ability to create their own individual IoT experiences.



Thus, marketing smart products merely as products that are smart may very well be underselling the consumer IoT. Consumer experience of the IoT is the result of a multitude of interactions, more than any individual interaction with any single smart product.

Insights for more effective IoT marketing /// Marketers face the immediate concern of uncovering the value proposition that will help the smart home expand to the mainstream mass market. Most companies are chasing use cases and wondering which combination of entry points – appliance and home entertainment control, energy management, pet monitoring, property protection, safety and security – make the most sense. But, as we have argued, the mass market is not buying a platform or smart products controlled by an algorithm, they are instead buying an experience. The following insights derived from our research can guide marketer action in the early stages of adoption and usage.

➤ **Market from bottom-up interactions, not just the top down**

/// The smart home will evolve from all the bottom-up interactions that are developed by individual consumers for their unique situations, not from a small set of five or six top-down use cases. Saying there are five use cases for the smart home is like saying there are five uses for the Internet. Configuring smart home starter kits and devices in a way that consumers can figure out for themselves how best to use them allows individual uses to emerge from the bottom up, rather than being dictated from the top down by marketers. We can't assume that consumers will experience a feeling of "safety and security" just because we tell them the components in the box represent that experience. Instead, we need to ask: In what ways will consumers and devices interact with each other inside of a given home to create the experience of feeling safe and secure?

The challenge in implementing a bottom-up approach comes down to finding the right balance between ease of

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use and rule complexity to permit experience to emerge. IFTTT, for example, is easy to learn and use, and while it can connect hundreds of different devices and online applications with each other, the individual rules are simple and straightforward if-then combinations.

- > **Encourage habitual repetition** /// Since we do not yet know what combinations of interactions will lead to particular experiences, it is critical to encourage habitual repetition of these bottom-up interactions in order to help stabilize consumer IoT assemblages. Habitual repetition involves performing routine behaviors over and over again until they become habits. For example, every time you leave the house, your Nest thermostat knows you're gone and lowers the temperature to 68 degrees; every time your laundry is done, your washing machine texts you; every time you run out of Tide laundry detergent, you press your WiFi-connected Amazon Dash Button to reorder.

When heterogeneous components – lights, thermostats, apps, appliances and people – interact over time in a predictable way, the behavior resulting from the habitual repetition will create a stable stream of interactions which in turn will stabilize the IoT experience for consumers. Without these ongoing interactions, there is no consumer IoT experience, just a collection of individual smart products. Marketers obviously need to stimulate purchase of individual devices, but the real focus should be on usage, encouraging regular interactions among those products as quickly as possible.

- > **Encourage boundary expansion** /// Marketers need to encourage habitual repetition of IoT interaction in the early adoption phase, but they must simultaneously find ways to somewhat destabilize the various IoT assemblages in order to encourage deeper adoption and usage. Yes, interaction with smart product assemblages must become routine; but

to keep consumers from getting bored as they gain experience with smart products, marketers must encourage consumers to experiment and go a step further with the IoT. So marketers must consider how to give consumers a gentle push, e.g., with new capacities of existing smart products, new rule engines, new products and so on, if they want consumers to move beyond single devices and starter kits. This will also be a key way to encourage habitual repetition.

- > **Pay attention to segments emerging from individual experiences** /// Our work predicts that many different individual consumers interacting with their unique constellation of smart products will seek similar experiences even though they may have taken very different paths to get there. Smart home data streams of device interaction from individual smart home assemblages will provide the raw material for inferring segments of smart homes that behave in similar ways. It is important for marketers to pay attention to these segments, because they provide important clues to the commonalities and general meanings of consumer IoT experiences. This may be contrasted with the current practice of the a priori segmentation of smart homes based on use cases. Thus, the process of market segmentation also proceeds bottom-up rather than top-down.

Think ahead /// The consumer IoT expands simple interaction between people and products to include much more complex patterns of interactions. While this may seem like a natural progression, we believe that the implications of these interactions for consumer experience – especially when they occur with the everyday objects and devices typically found inside people’s homes – will be nothing short of revolutionary. Predictions are difficult, but just as the Internet revolution that began nearly a generation ago brought staggering change to nearly every aspect of human life, we believe the consumer IoT represents another wave of change that is likely to be astonishing and even a little bit frightening. As events unfold, the insights we have been able to derive thus far from our research may help managers as they struggle to understand the strategic marketing implications of the consumer IoT. The first step is to think carefully about not only the immediate challenges involved in fostering early adoption but on developing the mass market and encouraging habitual use to encourage retention. We hope these ideas help.

1.

FURTHER READING

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Better
LIVES!



Amazing Machines and the Quest for Meaning in Consumption

Stefano Puntoni



KEYWORDS

Automation, Dematerialization, Identity, Consumer Behavior



THE AUTHOR

Stefano Puntoni

Professor of Marketing,
Rotterdam School of Management,
Erasmus University, The Netherlands
spuntoni@rsm.nl



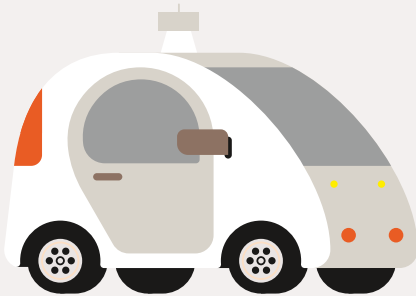
A combination of powerful innovations – above all in the areas of robotics, artificial intelligence, and networking technology – are changing our lives. What I am describing in Box 1 is not some futuristic scenario from a sci-fi book, although it surely sounds like it. Instead, it is the world we live in. Today's products are yesterday's science fiction, and sometimes it even feels like today's products are today's science fiction. A few years ago, it started to become clear that increases in computing power and breakthroughs in machine learning were going to yield big dividends and transform many product markets. Although the benefits of these technologies are obvious and unquestionable, it is especially interesting for social scientists to examine whether the same developments also have a dark side for consumers. With the arrival of amazing machines, will we eventually lose something important? The key insight of our research is that the benefits brought to us by recent product innovations also come with potential burdens for people who are motivated to consume by identity motives – that is, by the desire to be the kind of person that they want to be.

Free from the tyranny of chores ... but what if the chores are "me"? /// Take the first vignette of Box 1 about autonomous products. Autonomous products free us from the tyranny of chores. Now products can take care of everyday activities like driving or cooking. This can relieve a burden and make our life easier. At the same time, what if those everyday activities are important for a person's sense of self, for his or her identity? What if, for example, driving or cooking are not only activities pursued for utilitarian reasons but also activities that are in some way self-defining?

{ Box 1 }

WOULDN'T LIFE BE PERFECT IN A WORLD OF AMAZING MACHINES?

"AUTOMATIC!"



Imagine... a time when machines can work things out by themselves, a time when products can talk to each other and solve problems before people even become aware of them. Imagine leaving the office and not having to worry about driving because your car can drive itself on the motorway while it also figures out the best way to avoid traffic congestion.

"INVISIBLE!"



Imagine... a time when products disappear into a mysterious cloud. Imagine accessing all the information in the world by just talking aloud in our home. You no longer need books, CDs and a lot of other stuff because everything is accessible instantly from a small device in your pocket. Initially, you worried whenever a cloud hung over your head – would anything fall? But then you realized that it was safe and everything works like magic.

Automated products can be unattractive when identity motives are an important driver of consumption. When consumption requires skill and effort, automation prevents consumers from attributing consumption outcomes to their own skill and effort, ultimately depriving identity-driven consumers of an important source of self-esteem and personal satisfaction. To illustrate, consider a bread-baking machine that can bake bread with minimal involvement from consumers. These machines can direct the user on ingredients, control temperature and set timing, and thus replace skills essential to one's identity as a baker. When automation replaces skill or effort, it removes opportunities for consumers to feel that it was they who produced the bread. In other words, automation takes away from people who consume for identity reasons the

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Automated products can be unattractive when identity motives are an important driver of consumption.

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possibility to attribute the outcome of consumption (e.g., the bread) to their own skill and effort. Consumers who strongly identify with a task are more inclined to resist automation than others, according to our studies outlined in Box 2.

Free from the tyranny of clutter ... but what if the clutter is “me”? /// Take the second case in Box 1 of invisible products. In many industries, digitalization leads to “dematerialization.” The CD uses digital technology but still requires physical support. Instead, buying music on iTunes or streaming it from Spotify comes with no material artifact. Dematerialization frees us from the tyranny of clutter. For example, we can now consume culture like music, films and books in an empty home. This development makes life more comfortable and consumption more convenient. At the same time, what if those objects that are disappearing are important for

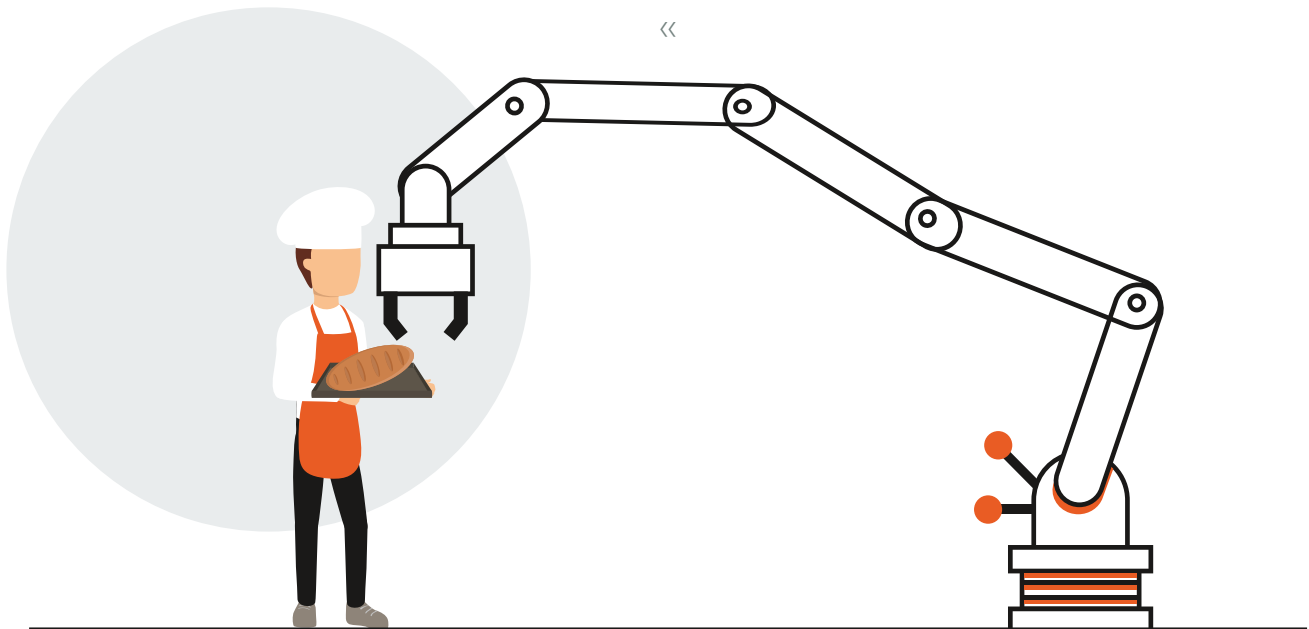
establishing and maintaining one’s view of oneself? What if, for example, one’s books and music define a person’s taste and likes?

Our research (Box 2) has also confirmed that identity-related consumption motives affect consumer preference for materiality. The consumption of certain products can be diagnostic of one’s identity and act as a signal for both oneself and others. For example, owning the entire catalogue of the Beatles might indicate that the music of the Beatles plays an important role in one’s life. Material products are superior to digital equivalents in terms of identity-signaling, according to our results. The sensory engagement that comes with material products gives consumers more power to signify their commitment; material products that you can see and hold are in a way “more real,” and so must be the identity associated with those products.

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Physical products
won’t completely disappear any time soon,
especially when they are relevant for a
person’s identity.

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{ Box 2 }

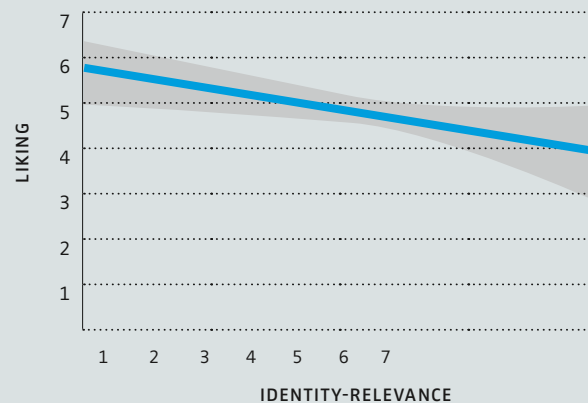
INVESTIGATING AUTOMATION, DEMATERIALIZATION AND IDENTITY

In two projects on technology and identity-based consumer behavior, we investigated the relationship between shopping motives and technology. My collaborators in these projects were Maria Cristina Cito, from Bocconi University, and two colleagues from Erasmus University, Eugina Leung and Gabriele Paolacci. In a series of studies, we demonstrated that consumers who strongly identify with a particular social category tend to resist automation in identity-relevant products. We argued that these strong identifiers should resist the automation of identity-relevant tasks and tested this in areas as diverse as driving, fishing, cycling and baking.

For example, consumers' willingness to accept the offer of a free battery pack when they buy a bicycle decreases with the extent that cycling is central to their identity. Similarly, people who agree with statements like "driving is an important part of who I am" are less likely to own a car with automatic transmission, even after controlling for driving expertise and other decision criteria. Automatic hook settings for fishing and multipurpose cooking machines (see figure1) produced similar results.

FIGURE 1:

The more important cooking was to a person, the less he or she liked a cooking machine that offered full automatization of the whole cooking process.



Results from a research experiment with 400 Dutch students
(details: working paper by Leung, Paolacci, Puntoni, 2018)

In addition, we conducted a number of studies examining preferences for movies, books and music either in physical or dematerialized form. For example, we focused on consumers' identities as gamers and offered them physical books or e-books about videogaming versus cooking. Regardless of whether we measured identification with gaming using self-reports or with the number of playing hours as a behavioral proxy, we found that the identity-relevance of a target book determined the likelihood of participants choosing the book versus e-book version. Strong identifiers preferred the material version of the book relevant to their identity (the book about videogames) but preferred the immaterial version of the product unrelated to their identity (the book about cooking). The same difference did not emerge for weak identifiers. Corroborating our theory, in other studies we also found that, while e-books score higher on functionality and reading pleasure, physical books scored higher than e-books in terms of the ability to signal and represent the identity of a person.

How to balance a world of amazing machines with consumers' quest for meaning

/// Machines in the Internet of Things can perform an ever-increasing range of tasks on our behalf. The recent explosion in the power of computing and artificial intelligence will lead to the appearance of increasingly skillful products capable of autonomous decision-making and action. At the same time, the increasing range of tasks that can be carried out via digital services means that dematerialization is likely to transform consumer behavior in many domains. Amazing machines provide great efficiency gains, but our work suggests that they may not always be desirable. IoT adoption will be more likely when the associated tasks are less relevant for identity signaling. IoT adoption will be less likely when the associated tasks are relevant for identity signaling. People who consume for identity reasons, however, are not necessarily modern-day Luddites. Those who oppose IoT application in one context might willingly accept IoT applications in others with less personal relevance.

Managers should not overlook that people's quest for meaning in consumption remains an important driver of buying decisions even in our age of amazing machines. Physical products won't completely disappear any time soon, especially when they are relevant for a person's identity. Vinyl has made a remarkable comeback in the music industry, and it now seems that e-books will coexist alongside traditional books. Companies that do not go with the tide will still be competitors for business opportunities. And those who jump on the bandwagon of the IoT should not overlook that our life is not just about efficiency and being freed from seemingly inconvenient tasks, but also – and maybe now even more than ever – about leading a meaningful life.

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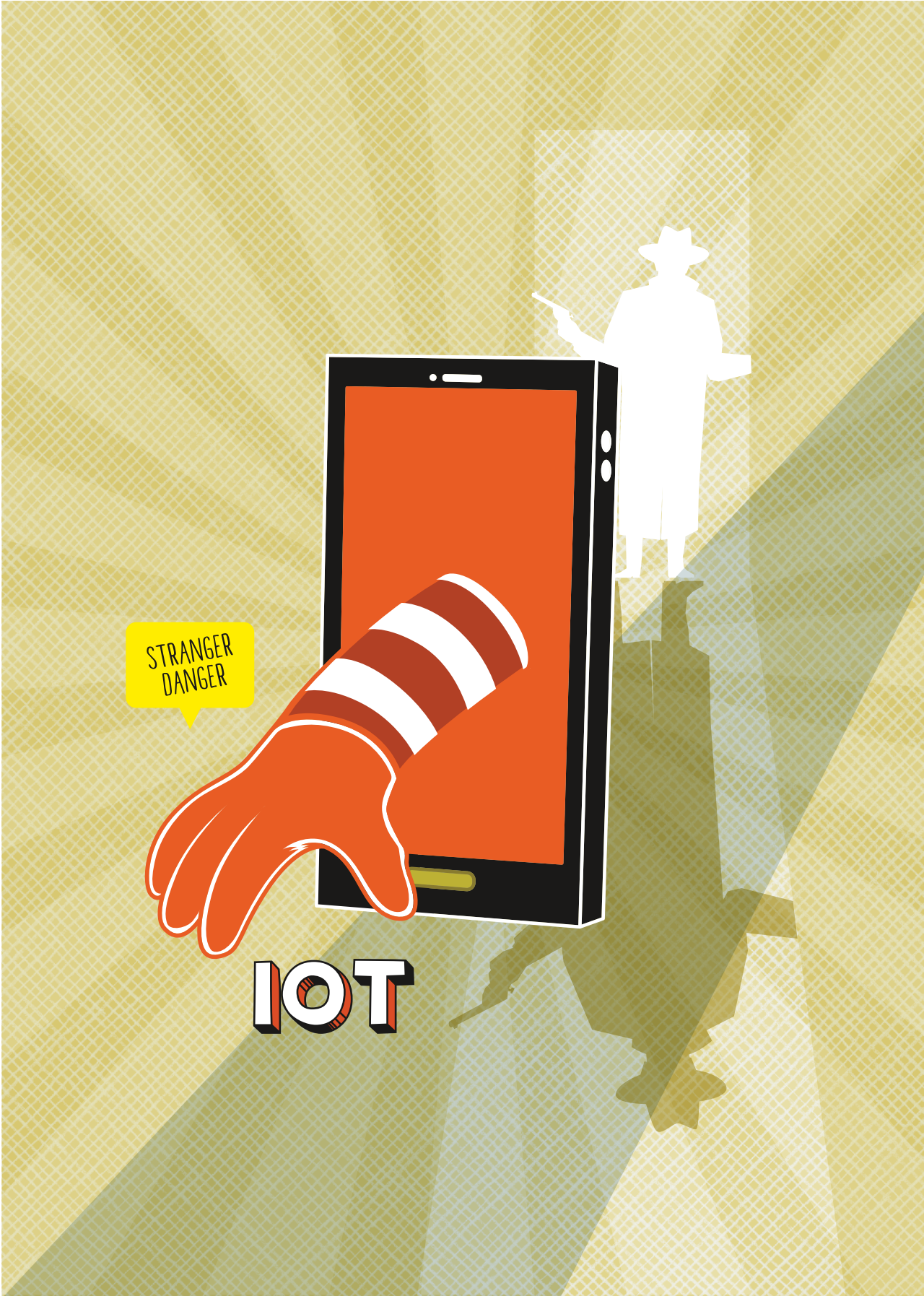
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STRANGER
DANGER

IOT

IoT Stories: The Good, the Bad and the Freaky

Markus Giesler and Eileen Fischer

KEYWORDS

*Customer Experience, IoT,
Storytelling, Doppelgänger*

THE AUTHORS

Markus Giesler

Associate Professor of Marketing,
Schulich School of Business,
Director of the Big Design Lab,
York University, Toronto, Canada
mgiesler@schulich.yorku.ca

Eileen Fischer

Professor of Marketing and
the Max and Anne Tanenbaum Chair
of Entrepreneurship and Family Enterprise,
Schulich School of Business,
York University, Toronto, Canada
efischer@schulich.yorku.ca

Alexa the witch /// In March 2018, headlines drew attention to user reactions when their Amazon Alexa-enabled devices started emitting what sounded like strange, unprompted, “witch-like” laughter. Many users had responses like the one reflected in the tweet in Figure 1.

Apparently, reactions like these are common even among those who have considerable experience with Alexa-enabled devices. Though new IoT products may be deeply engaging, even the consumers who love them and use them may also be persistently wary of them.

IoT marketers can learn valuable lessons from these weird consumer associations and the mixed feelings they entail. In general, sociological consumer research into users’ relationships with technologies suggests that there are deep cultural roots to such paradoxical reactions. Marketers need to anticipate and respond to the conflicting feelings that many consumers have even toward technologies they own and use. But how can IoT marketers avoid or handle these paradoxical responses and foster consumer trust? Turns out the answer lies in storytelling.

The power of stories /// Consumers’ perceptions of technology are less matters of product attributes and concrete statistical evidence and more of captivating stories and myths. From this sociological perspective, managers of IoT can instill consumer trust when they tell highly emotional stories about the technologically empowered self, home, family or society. The key benefit of this approach is that storytelling-based IoT marketing allows consumers to forge strong and enduring emotional bonds with IoT and, in many cases, to develop loyalty beyond belief.



Two sides to every coin /// However, stories aren't always positive, such as the reactions to Alexa's laughter. Doppelgänger brand images – negative stories and meanings about a technology that are circulated in popular culture – can be dangerous and harmful to a brand or a new technology. By drawing on deeply rooted mythic archetypes about technology such as the popular Frankenstein tale or the myth of enslavement through technology, or, lately, Alexa the witch, doppelgängers can undermine emotional consumer-technology bonds and provoke technology distrust and rejection. The dark doppelgänger images for a given technology can be generated by the mainstream media, by internet trolls or by concerned consumers. Sometimes marketers contribute, unintentionally, to the rise of their own technology's doppelgänger (see the Amazon Key Story in Box 1).

»
Marketers need to anticipate and respond to the conflicting feelings that many consumers have even toward technologies they own and use.
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{Box 1}

STRANGER DANGER OR WELCOME STRANGER?

Trust me ... I'm Amazon!

Stranger danger! For most of us, hearing those two words together is enough to conjure up an image of a parent or teacher warning us not to trust people we don't know. Based on this logic, Amazon introduced Amazon Key last year in 37 metropolitan areas in the US. In a nutshell, Amazon promoted this initiative on the basis that a well-functioning IoT camera and smart lock will give consumers extra convenience while also ensuring safety. But according to a recent survey by technology news website Recode, even among Amazon Prime subscribers, over half of respondents would "definitely not" buy Amazon Key. It seems people simply aren't open to the idea of allowing a stranger to enter their own home when they're not around.

Trust me ... I'm Airbnb!

But wait... hasn't someone else already proven that this isn't true? Trusting strangers enough to let them into your home is the pillar upon which the immensely successful hospitality platform Airbnb was founded. Not so long ago, it would have been unfathomable that almost one million people would either be staying in someone else's home or be welcoming someone into their home each and every night. Now, this is quite common and considered normal.

Trustworthy by design

Amazon chose a product-based approach, while Airbnb is dependent on selling trust. By promoting cloud cameras and smart locks as surveillance and security tools, Amazon Key largely retells ingrained "stranger danger" stories. Airbnb, in turn, approaches IoT as a sociological instrument – a means for rewriting the story of the home as a social space. Or as Airbnb co-founder Joe Gebbia put it, "maybe the people that my childhood taught me to label as strangers were actually friends waiting to be discovered." Airbnb approaches the home security dilemma from the stance that people are generally trustworthy, and everything on its website is geared towards this positive, market-enabling stance. Sure, if something does go wrong, homeowners and renters know they have back-office guarantees protecting them, but these are in the background for a reason – Airbnb wants people to know that you are a trustworthy human being, and so too are most of the people in the world. Designing an experience in which customers view delivery people not as strangers but as decent human beings is something Amazon might want to learn from Airbnb. Even more important than technology, trust will be the key to opening doors for Amazon.



How to navigate the paradoxical images of IoT technologies /// IoT marketers can use the storytelling approach to their advantage. Based on our research on the role of stories in the perception of technologies, we have several recommendations for IoT marketing.

- > **Diagnose conflicting stories and images** /// Powerful doppelgängers are likely to spring up for almost any new technology. Consider the intense, but conflicting, cultural images that have emerged for smart technologies like Amazon Key, for instance. One image sees the Amazon Key as the ultimate enabler for consumers who want to welcome Airbnb guests, dog walkers or delivery people into their homes. The other positions it as a dangerous threat to consumers' safety and security, a virtual invitation to "stranger danger." Regardless of its source, marketers need to understand the nature of the doppelgänger images that may be circulating for their technologies. The doppelgängers can be regarded as diagnostic tools to better understand how consumers think about and experience their IoT solutions. Apple, for instance, has developed an elaborate doppelgänger radar that monitors social media in real time for negative stories about their products.
- > **Do not underestimate the pervasiveness of paradoxes** /// Some conflicting images of a technology are unique to particular consumer segments, while others are widely shared even among those who are considering a purchase or who already own the technology. It's critical that marketers do not assume that negative images will remain localized to people outside their target market. Even those who are considering a purchase or who already own an IoT technology can be affected by both its enabling and its threatening images.
- > **Address doppelgänger images across all UX touchpoints** /// Clearly, marketing messaging is critical, as the case of the Amazon Key referred to in the Box illustrates. However, rhetoric alone won't keep the doppelgänger at bay. IoT marketers need to consider the full range of consumers' experiences with their technology in order to keep the threatening images of their technologies from overwhelming the enabling ones. Users feeling disturbed by the creepy laughter coming from Amazon Alexa illustrate that consumers' interactions with the product itself also have the potential to confirm their fears about the threats it poses. Only once marketers know the triggers that elicit doppelgänger images can they hope to ameliorate them.
- > **Carefully select the stories that guide technology marketing** /// Technology marketers need to be aware that they are telling stories even if they think they aren't. Amazon triggered "stranger danger" perceptions simply by concentrating on security-related product features. Marketers need to be aware of the deeper meanings and of popular myths and stories of their messages. Based on such insights, they can manage the stories and meanings to build consumer trust, or they can apply the more elaborate doppelgänger management technique of inverting a doppelgänger's negative meanings. Consider how Airbnb has successfully combatted stranger-danger perceptions by presenting itself as a promoter of neighborhood community.

While doppelgänger images can be bad or freaky and significantly undermine emotional consumer-technology bonds, they can also point marketers to negative perceptions consumers might have and the underlying cultural values that they see at stake. When marketers read doppelgänger stories like sociologists do, they can learn a great deal about consumers' enduring quests for important cultural values such as a warm and caring home, a loving family, or a welcoming neighborhood. From this diagnostic standpoint, doppelgänger narratives are valuable raw ingredients from which marketers can cull new, more captivating IoT stories that nurture consumer adoption, trust and happiness. As long as they are diagnosed, understood and addressed or inverted in the entire technology experience, even bad and freaky stories can be good stories.

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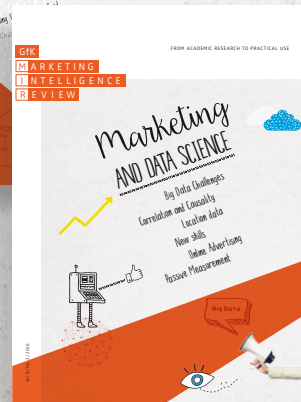
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Internet of Things: How to Avoid Short-Term Errors and Ensure Lasting Adoption

Larry Downes

KEYWORDS

*IoT Strategy,
Big Bang Disruption,
Shark Fin Adoption Model*

THE AUTHOR

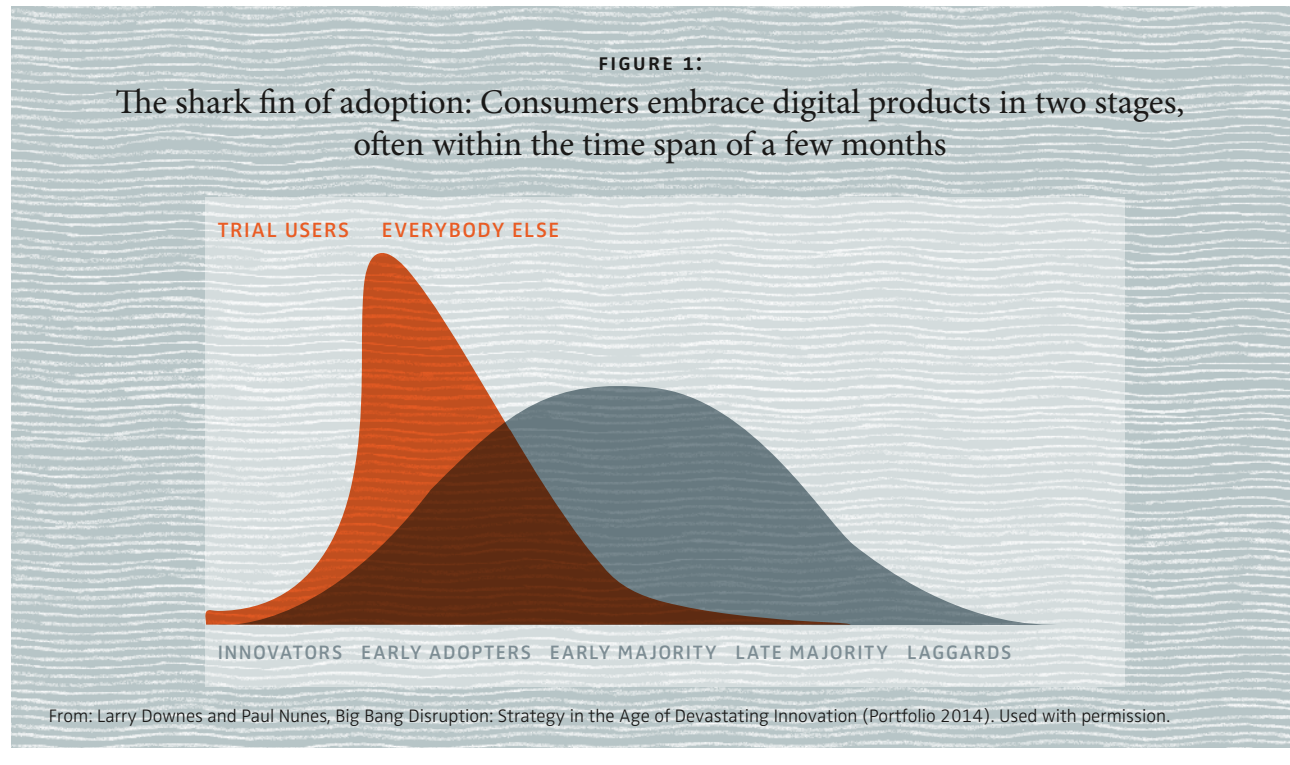
Larry Downes
Project Director,
Georgetown Center for
Business and Public Policy,
Washington, D.C., USA
larry@larrydownes.com

The Internet of Things is at risk of becoming a victim of its own popularity ///

Today, the IoT market is generating \$200 billion in revenue, a number expected to triple in the next 10 years. But a rush to market by developers of consumer IoT products and services has been accompanied by shortcuts in design, particularly in information security, usability and branding. Several embarrassing and highly public data breaches have left buyers increasingly wary of embracing smart technology, slowing market adoption for products both good and otherwise.

These early market failures must be corrected, and quickly, if the IoT is to reach its full potential. Soon, up to a trillion items in everyday will become “smart” devices, allowing them to send and receive data over the global Internet. Machine-to-machine applications will help seniors age in their own homes and make possible truly autonomous vehicles. For manufacturing, agriculture and energy, among other verticals, IoT technology promises vast improvements in supply chain efficiency and sustainability.

Consumer surveys over the last few years, however, reveal slower-than-expected adoption of IoT solutions. Stories of hacked baby monitors and connected toys, video cameras taken over by botnets and fitness trackers revealing the locations of secured military installations, coupled with a lack of clear user value propositions, have generated skepticism that IoT applications are really ready for mass markets or, indeed, if they ever will be.



“Big bang disruption” demands new marketing strategies /// These marketing problems are a side-effect of what I have termed “big bang disruption,” where disruptive innovations, following a short period of failed market experiments, achieve wide-scale adoption quickly – sometimes in a matter of weeks. Today’s disruptors have replaced the classic bell-shaped model of adoption famously described by Everett Rogers with a distorted curve that resembles, appropriately enough, a shark fin. While adoption followed five fairly predictable stages (see figure 1) in the old economy, the adoption of digital products has shrunk to two stages and is happening much faster. Sometimes the rise and fall happen within weeks only – as happened with Pokémon Go in summer 2016.

As in other recent examples of big bang disruption, the IoT’s shark fin is being driven by a combination of factors, including rapidly falling prices (and sizes) for sensors, wireless receivers and transmitters, semiconductors and other component parts.

Coupled with an increasingly ubiquitous platform of high-speed broadband access and cloud-based services, new prod-

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While adoption followed five fairly predictable stages in the old economy, the adoption of digital products has shrunk to two stages and is happening much faster.
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ucts can be launched quickly and cheaply. And with social media empowering consumer-to-consumer marketing in real-time, buyers sort the winners from the losers immediately, driving short-lived but dramatic winner-take-all success for the lucky few.

The pressure of delivering products in hyper-competitive markets, however, often leads developers to ignore basic data management precautions, along with a failure to devote adequate resources to other marketing imperatives.

Marketing imperatives for the Internet of Things

/// That's precisely what's happening for the IoT – damaging a valuable new market for everyone. So to assure these short-term errors don't cause long-term damage, developers must adopt five related strategies that have been central to successful deployment of earlier big bang disruptors.

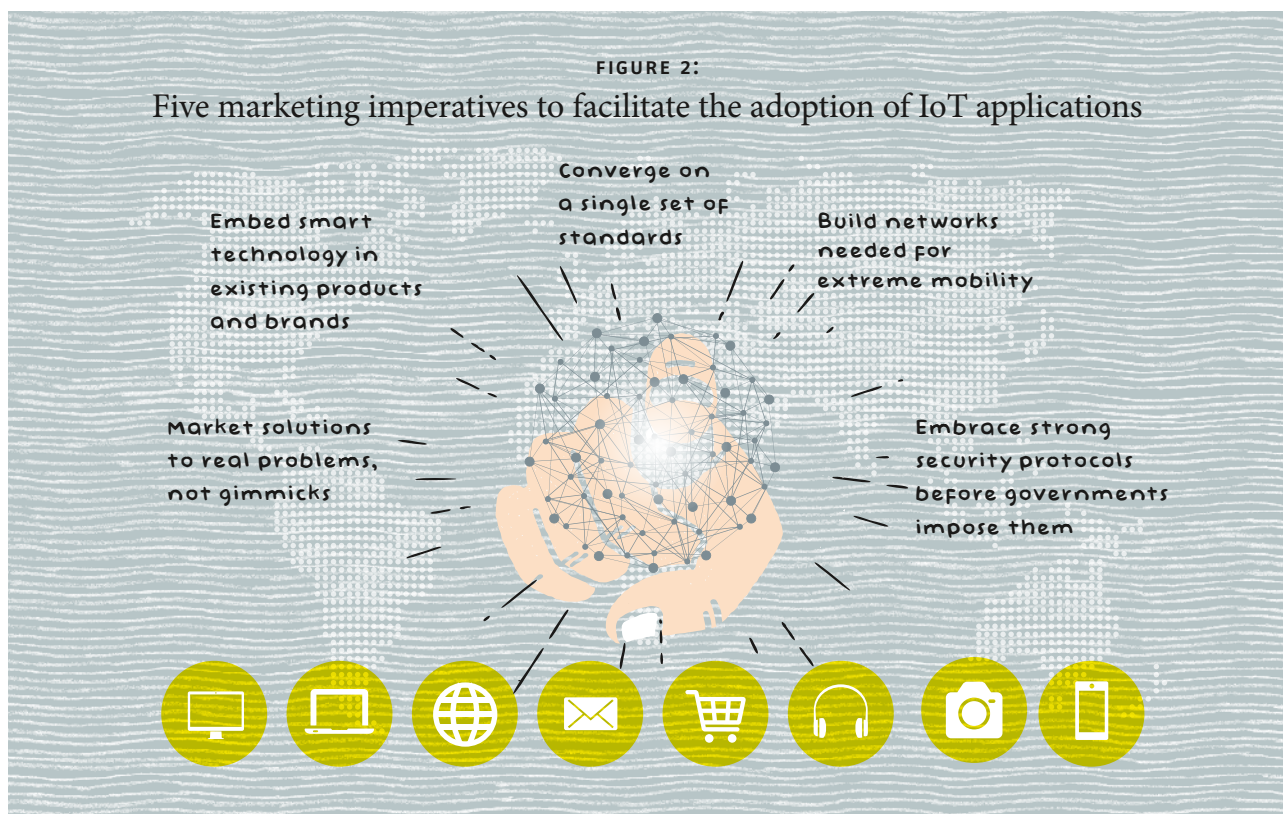
Converge on a single set of standards /// As is typical with emerging technologies, every Internet of Things developer hopes to establish itself as the industry standard for interactions with other networks and other products. Competing industry groups have also sprouted up, each offering to eliminate incompatibilities by offering an open, neutral set of communications and data exchange rules anyone can follow. IoT standards wars are taking place for everything from devices finding each other and coordinating activities, establishing low-power wide-area networks, and sharing data in standard formats. Major hardware and software vendors, including Qualcomm, Intel, Google and Amazon are offering combinations of proprietary and open solutions, along with consortiums including the Zigbee Alliance and Z-Wave.

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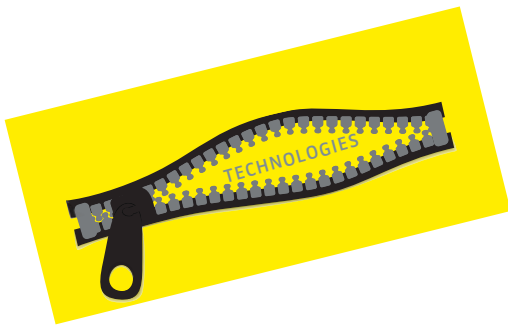
Some Internet of Things vendors are now building products that follow everyone's standards, while others are leaving the problem to third-party developers. The standards war will undoubtedly be resolved, but in the interim consumers are understandably hesitant to make big investments in new systems.



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To work for all consumers, technologies that transform markets must be integrated into existing solutions from trusted brands and become invisible.

<<



Build networks needed for extreme mobility /// Internet of Things devices may never have to communicate large volumes of data, but the sheer number of connected items and the need for constant interaction for many of them can't be supported even with today's fastest mobile networks.

That's one reason mobile providers and their partners are investing billions in next-generation 5G networks, which will increase network speed and capacity by orders of magnitude. The 5G architecture optimizes performance for both the close quarters of your home and the potential free range of autonomous vehicles on the road and in the air.

5G standards groups are still working on the details, but network operators and their hardware partners are already testing equipment that can deliver speeds that are dramatically faster and more reliably than existing mobile technology. In the United States, both Verizon and AT&T are already conducting 5G tests. The new networks, however, require more and different ranges of radio frequencies, which only regulators can allocate. It may not be until 2020 that robust and ubiquitous 5G service is in place.

Embed smart technology in existing products and brands

/// For IoT products that integrate deeply into the consumer's daily life and which collect sensitive data, applications must be integrated into existing solutions from trusted brands. Since 2015, for example, fitness technology leader Under Armour has invested heavily in the nascent Internet of Things. Its Connected Fitness platform allows customers to import tracking data from a wide range of devices and third-party products, including those of Under Armour's competitors, into a single dashboard and a series of apps.

Or consider IoT technology aimed at improving sleep. Early efforts required users to remember to wear separate devices that were uncomfortable to sleep with or install extra equipment under an existing "dumb" mattress.

Compare that to products now being marketed by Sleep Number as part of its "Smart Bed" line. Sleep Number, a familiar brand already associated with technology-based innovation, was the first major industry player to build sensors right into the mattress.

To work for all consumers, technologies that transform markets must become similarly invisible. Ironically, the more disruptive the technology is, the sooner it needs to disappear.

Embrace strong security protocols before governments impose them ///

IoT products will collect potentially sensitive personal information about its users, heightening growing security concerns for digital products and services generally. To avoid consumer resistance and the potential intervention of regulators who may unintentionally slow or skew the trajectory of IoT adoption, manufacturers must quickly coalesce around industry best practices for data collection, analysis and storage.

So far, many smart devices have proven to be pretty stupid; more than a few early products released with inadequate protection, as noted, have experienced embarrassing security breaches. The Federal Trade Commission and other regulators have already brought enforcement actions under consumer protection laws against several vendors who failed to live up to security promises. More broadly, lawmakers are circling the emerging industry, threatening preemptive regulation, specific rules and invasive oversight.

An industry-led alternative should be quickly developed. It could come from a combination of general standards bodies,

including the International Organization for Standards, and more targeted efforts, such as IoT best practices recently proposed by the Broadband Internet Technology Advisory Group. Policymakers should likewise be careful about regulating too soon or too heavily. Overreaction to what may be simply growing pains for the Internet of Things may unintentionally delay both the development and adoption of technology that will actually improve the safety and security of activities, such as transportation, that today rely on highly-fallible human operators.

Market solutions to real problems, not gimmicks – If IoT developers want to ride the wave of a big bang shark fin, their products must do more than simply replace existing and still-working items in the consumer's life. They must do so in a way that adds new functions and new applications that existing technology can't possibly duplicate.

Up until now, according to Donna L. Hoffman and Thomas P. Novak, companies pitching IoT gear have focused on specific applications, fragmenting the overall market. A smart refrigerator, a connected toothbrush or an intelligent thermostat may each be worth the cost and hassle of adoption for some consumers. But individually they don't deliver on the promise of a connected life. Standing alone, they're just gadgets. "The key to smart home marketing is to view the smart home as a complex dynamic system," write Hoffman and Novak. To jump-start mass adoption, marketers must instead "focus on communicating the value proposition inherent in experience; current approaches may actually be underselling the smart home."

Developers, in other words, must provide solutions to actual consumer problems – which means, for one thing, performing the kind of market research necessary to know what those problems are.

In home security, for example, most early offerings were simply "smart" door locks that could be opened and closed remotely using smartphones and tablets as the controller. Compare these limited-interest products to offerings from Piper, Comcast and others, which integrate digital cameras, motion sensors and wireless notifications to offer a more complete home security solution.

Get ready for the bang /// There is plenty of incentive for entrepreneurs to adapt these strategies. The IoT market, properly configured, could grow to \$2 trillion by 2022. As these issues are resolved, the Internet of Things will experience the kind of dramatic takeoff that followed the introduction a few years ago of smartphones that users actually enjoyed owning.

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The Complex Network of Things: When Technology is Making the Deal

William Rand



KEYWORDS

*Internet of Things, IoT,
Complex Systems, Networks,
Emergence, Feedbacks*



THE AUTHOR

William Rand

Assistant Professor of Marketing,
Poole College of Management,
NC State University, USA
wrand@ncsu.edu



Consumers and device-based interactions /// A lot of things will soon be happening automatically and without active consumer involvement, just like in Beatrice's life (see Box 1). What Beatrice notices is just the tip of the iceberg. Underneath the surface, dozens of applications are communicating and interacting with each other. As a result, the world of the future is much more about integrating your products within this overall network and enabling them to interact with other devices than it is about marketing to consumers. In the world of the Internet of Things (IoT), the endpoints and persons in charge are still the consumers, but they are at the center of a complex network of device-based interactions (Figure 1). Therefore, in order for a brand to succeed in this complex environment, it needs to work within this network and make sure that its messages are the ones that filter all the way through and ultimately reach the consumer.

Reaching the consumer through a complex IoT network

/// We can view the IoT as a network whose components are IoT devices and messages (see Box 2). Only a few devices like Amazon's Alexa, Apple's watch or Google's Pixel have the ability to actually communicate directly with consumers, while the other devices in this network can only communicate with other devices. Therefore, the goal for a brand entering into this complex network is to provide the right messages to the right devices so that meaningful messages ultimately reach the consumer.

What actually makes it to the consumer's attention is not necessarily obvious from the beginning. In Beatrice's case, her car cannot remind her about a free coffee without the

{Box 1}

BEATRICE IN THE NEAR FUTURE

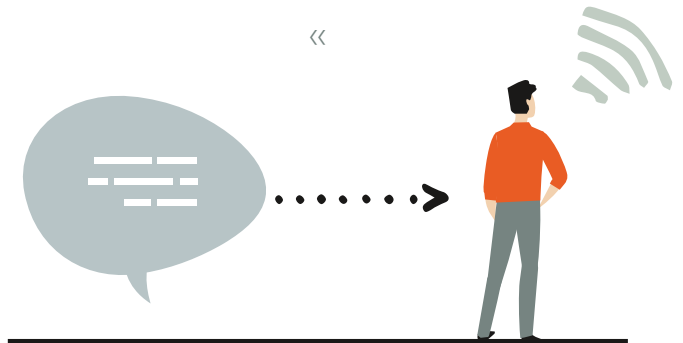
Beatrice Lee is a twentysomething, young professional fashion designer. She wakes up one morning and the first thing she does is ask Amazon's Alexa about the weather for the day. Alexa tells her that it will be sunny with a chance of rain and also lets her know that her favorite blouse is ready at the dry cleaner, according to an email received during the night.

Alexa then goes right into playing a morning news broadcast followed by Beatrice's favorite podcast, which Alexa had learned about from monitoring the usage of her Google Pixel during the day. As Beatrice is getting dressed and ready for the day, she walks by her Samsung refrigerator. It signals an order of groceries all ready to send out after her approval – based on her past ordering patterns. She approves the order and heads toward the door for her morning workout.

As she passes through the door, her Nest doorbell displays a notification on her Apple watch, reminding her to grab an umbrella before heading out. On the way to the gym, her Android Auto-enabled Ford CMAX pings to remind her of a voucher for a free beverage at Starbucks that she could pick up on the way and that she should not forget her blouse at the dry cleaner.

Starbucks app on her phone, and without the GPS located in her car knowing where she is and where she is going, the Starbucks app would not know that she was going to pass by a Starbucks. A brand alone cannot provide the messaging necessary for the consumer. Brands need to work together with other apps and devices to create an emergent experience that a consumer such as Beatrice enjoys.

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The goal for a brand in this complex network is to provide the right messages to the right devices so that meaningful messages ultimately reach the consumer.



Moreover, any experience emerging from an IoT network will create feedback that affects the decisions of individual brands. Grocery brands might become aware that people are regularly using their Samsung refrigerator to order food. As a result, more grocery stores may produce online endpoints for IoT, allowing these devices to order from them automatically. Also, more packaged food producers may start creating RFID-enabled products so that the refrigerator can monitor these food items. Such decisions, in turn, may inspire other additions to the IoT such as a smartphone app that monitors consumers' caloric intake based on these RFID tags.

Key insights to manage a complex IoT system successfully /// So, what does the theory of complex systems tell us to expect from IoT? There are a number of lessons that seem readily applicable.

> **You cannot control a complex system, but you can guide it.** /// Trying to control a system that has so many moving parts is a futile effort. Research into complex systems has shown again and again that it is hard to force them into a particular state. Taxi companies found this out when they tried to control the system of urban transportation by controlling who could provide taxi services within a town.

FIGURE 1:
IoT devices communicate with consumers, among each other and with brands



Uber and Lyft showed them that this control was useless. However, if the taxi companies had been forward-looking and had realized the advantages of app-based ridesharing, they could have offered an Uber-like app earlier and potentially avoided this disruptive competition.

> **Security issues of single elements can emerge in unexpected ways.** /// Since IoT-enabled devices inherently

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If security is underestimated,
the whole system and the consumers
are put at risk.

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must be able to communicate with other applications in the system, their designers need to make sure that they can only send and receive valid messages and consider the ramifications of those messages on the rest of the system. If security is underestimated, the whole system and the consumers are put at risk.

As an example, Chrysler, like many car manufacturers, enabled their Jeep Cherokees to communicate with the Internet. They designed their Uconnect system for entertainment, navigation, and a few car controls and the car itself as an integral part of the IoT. However, their systems were hacked, and it turned out that the entire car could be controlled remotely. The Uconnect system could not control the car's engine and wheels directly, but hackers were able to send signals to kill the engine, disable the brakes and track the car using GPS. They did this by first controlling the Uconnect system and, since the Uconnect entertainment system is linked with another network that controls the car's engine and wheels, they could send "spoofed" messages that could stop the car.

{Box 2}

THE INTERNET OF THINGS – A COMPLEX SYSTEM

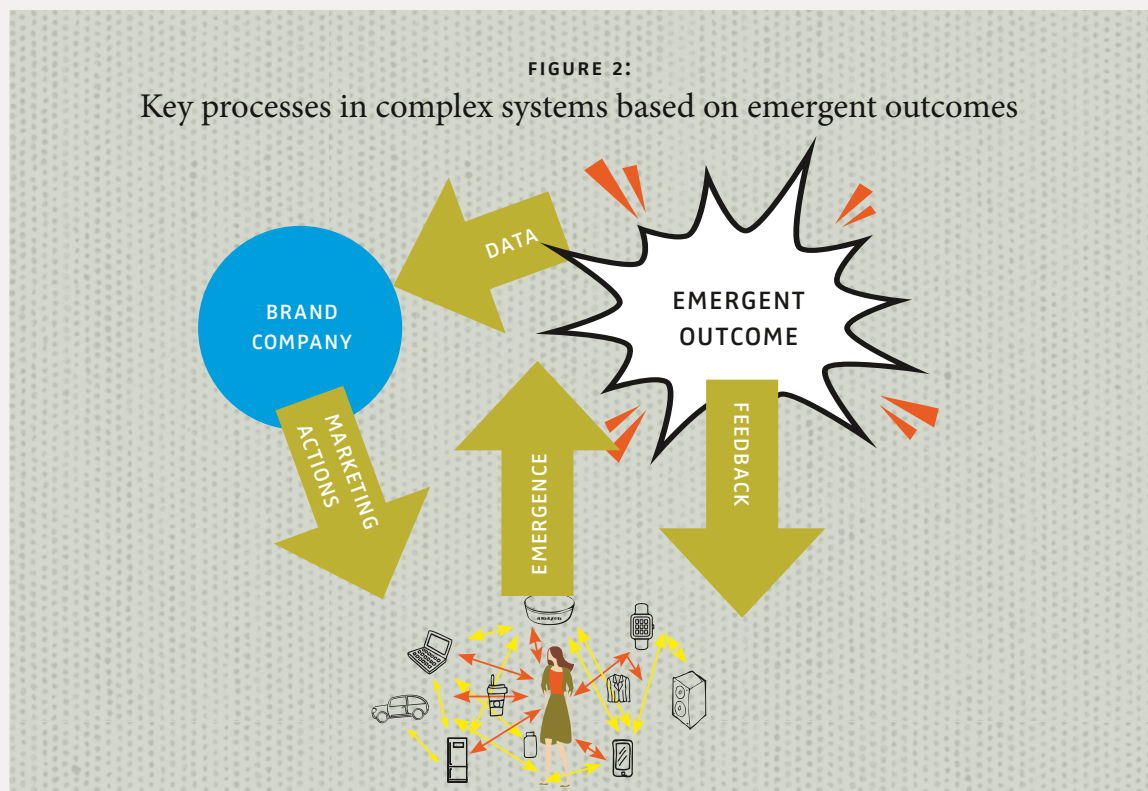
How can managers make sense of what's going on in the Internet of Things? How do they decide what to invest in? How do they choose which new products to develop and how to enable IoT on older products?

A framework that can help facilitate answering these questions is the theory of complex systems. This theory has been used to understand systems as diverse as ant colonies, residential location decisions, the immune system and the creation of firms. In fact, in an area very related to IoT, in 2003, Procter and Gamble used a complex systems perspective to create an agent-based model. That model helped to optimize their supply chain, resulting in an estimated \$300 million reduction in costs of operation.

Complex systems are composed of a massive number of interacting parts. The outcome of the activity of the parts together is not easily understood, but emerges from the interplay of different decisions of individual elements, and is affected by those same outcomes. Many complex systems are characterized by two main processes that are also at work in IoT:

Emergence: The network creates patterns of behavior that emerge through its interactions. The outcomes are different from anything any individual element could have produced by itself and are more than the mere sum of all of the parts.

Feedback: The emergent pattern of behavior generates effects and feedback on individual components. Such feedback can be used to learn about system dynamics and to guide a system towards a desired state (see Figure 2).



- > **Gatekeepers play pivotal roles in complex systems.** /// A single component of a complex system has very little power on its own, and the components around it serve as gatekeepers to other elements. This is especially important within the realm of IoT because the goal is often to get a message or piece of information to a real human consumer. In order to get there, the product must communicate with a host of other devices.

For instance, Amazon's Alexa is becoming increasingly popular, and one of the most widely used features is voice-searching and ordering of products. So far, Amazon vastly limits the number of different brands that can be bought through Alexa. As a result, smaller brands can hardly be considered within the IoT if they do not provide their own solutions. Amazon now encourages brands to create branded apps for Alexa, which they call "skills." For instance, Unilever created a skill called Cleanipedia that teaches consumers how to solve cleaning problems and suggests Unilever products. By working with this powerful gatekeeper, Unilever has developed a way to still reach consumers that rely on Alexa.

- > **Complexity should be embraced and amplified rather than feared.** /// One of the greatest qualities of IoT is that it is creating massive amounts of data. We learn what consumers are doing, how they are doing it and how the other components of the IoT are working with our own products and apps. It is important to examine this data and to understand the usage of IoT-enabled products and their interaction with other nodes in this complex network. For instance, one of the first IoT devices, which even predates the use of the term IoT, was a camera "trained" on a coffee pot at the University of Cambridge. It enabled people who worked in the building to know when coffee was available. No one had ever intended for these cameras to be used for monitoring daily activities. Nevertheless, this development inspired the first webcams that are now in use throughout the world to allow people to monitor what is going on in other locations. The data about how consumers are using devices helps companies to get a better idea of what people actually expect from IoT-enabled devices and to develop better solutions for them to accomplish these goals.

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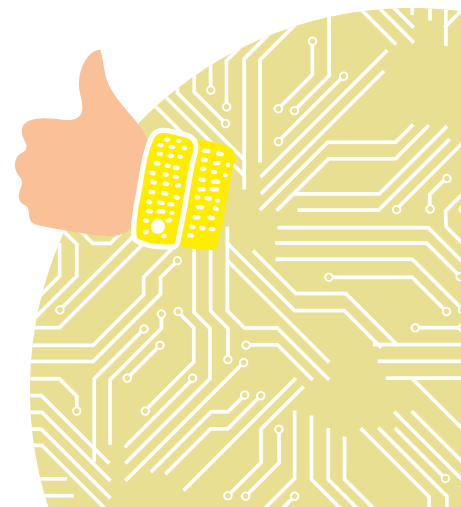
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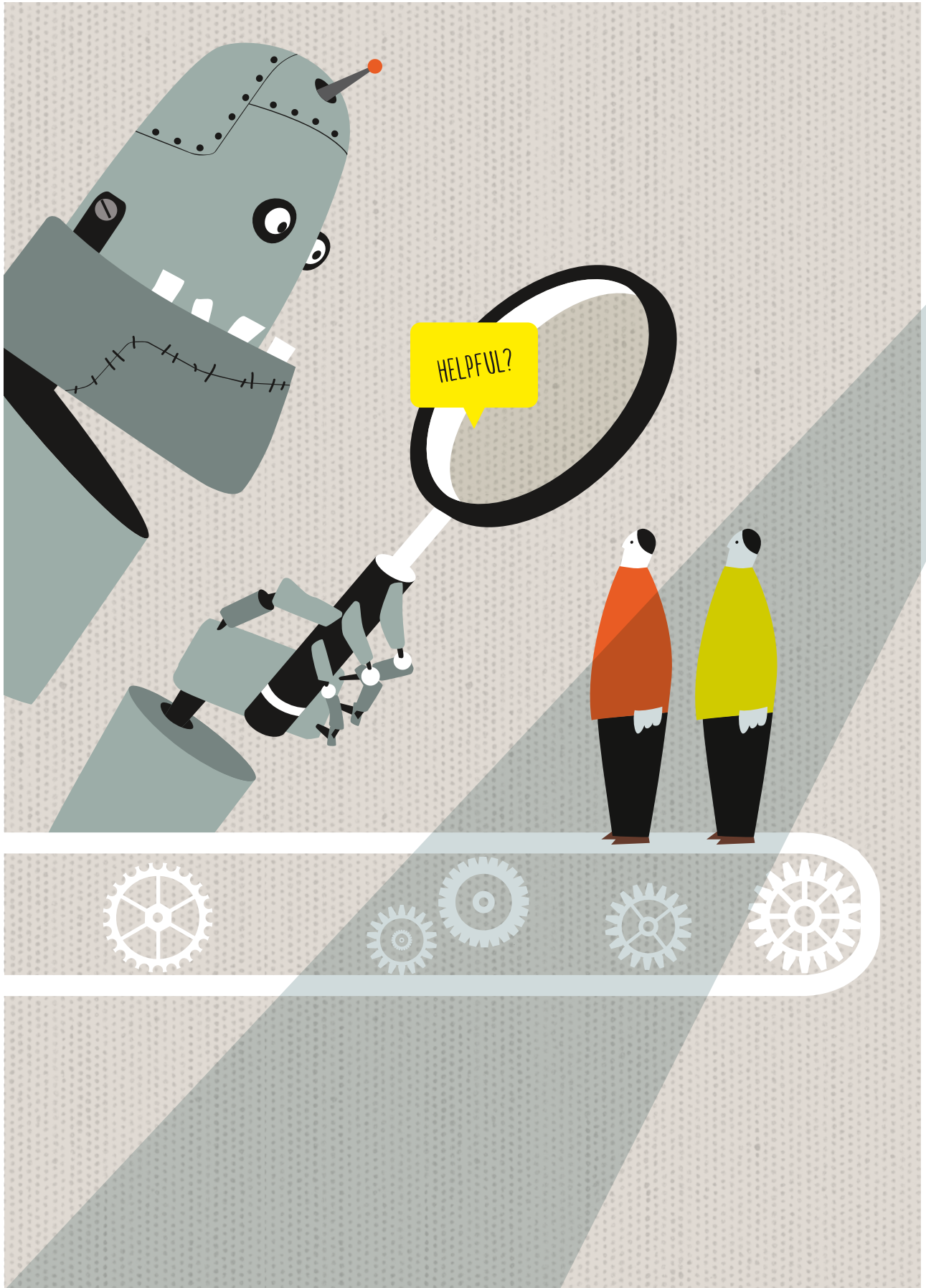
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Internet of Things – Will Humans be Replaced or Augmented?

Paul A. Pavlou

KEYWORDS

*Internet of Things,
Artificial Intelligence,
Augmented Intelligence,
Human-Computer Symbiosis,
Autonomous Systems*

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THE AUTHOR

Paul A. Pavlou

Milton F. Stauffer Professor and
Co-Director, Data Science Institute,
Fox School of Business, Temple University,
Philadelphia, PA, USA
paul.pavlou@temple.edu

Machine alone or human+machine? /// Recent developments in sensors and networking technologies have led to a significant growth in Internet of Things (IoT) devices, such as wearables. They are based on Artificial Intelligence (AI) technologies, such as machine learning, deep learning, computer vision, natural language processing and big data analytics. These advances have led to the development of autonomous systems, such as smart homes, smart cities, smart energy grids and driverless interconnected cars.

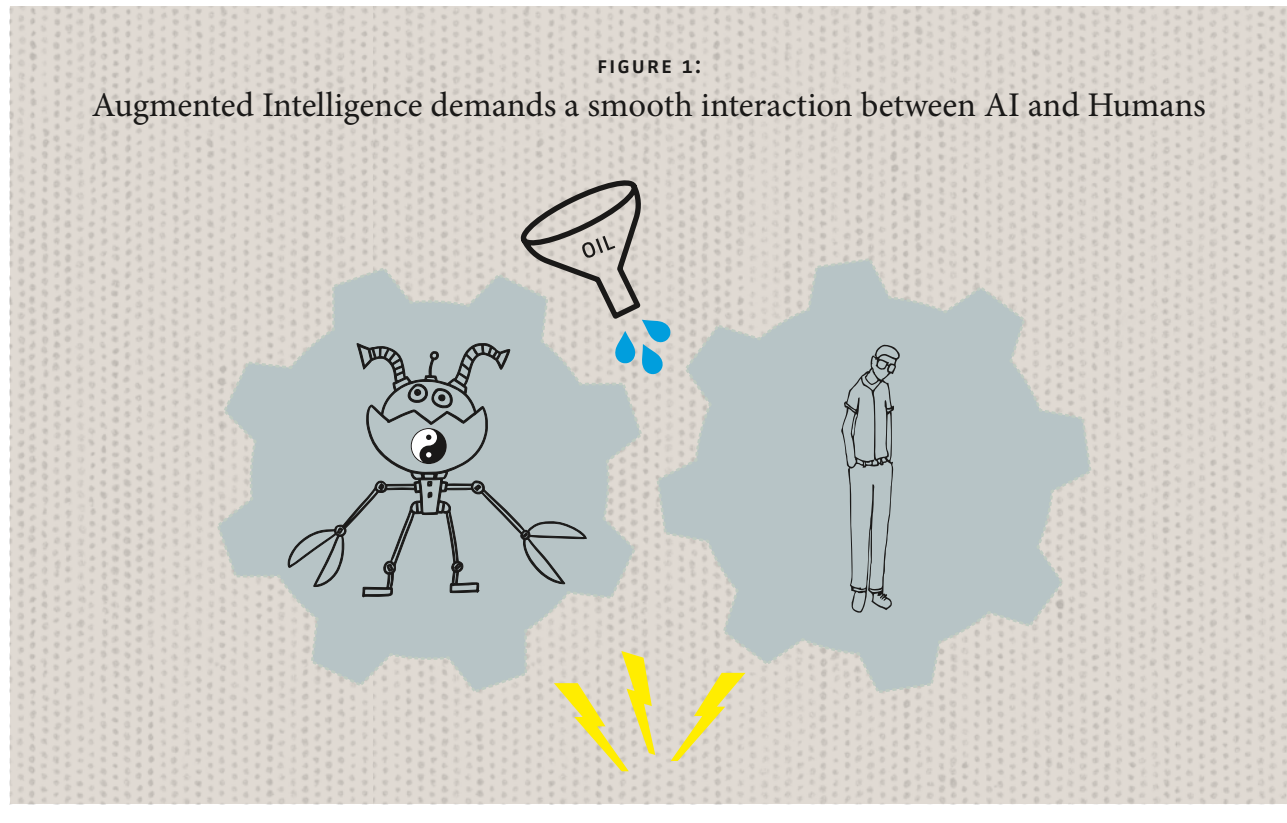
Will such intelligent IoT systems make all human workforce redundant? Will human beings become meaningless in the future of work? Will AI systems fully replace human beings, or will the IoT rather enhance human intelligence and empower us to solve the most pressing issues of our times in a more satisfying way than we would ever have dreamed of?

I argue that effective human-computer symbiosis, often referred to as Augmented Intelligence, has the potential to address some of these emerging challenges successfully, possibly more so than pure AI, at least in the foreseeable future.

Artificial Intelligence versus Augmented Intelligence

/// Augmented Intelligence is defined as computers enhancing human intelligence, while AI commonly refers to computers fully replacing human beings. Much of the hype around the potential of IoT is triggered by purely self-performing, autonomous AI systems powered by big data analytics with data collected from IoT devices. Indeed, the potential of IoT will not materialize without the ability to collect, aggregate and analyze the enormous amount of data created by IoT devices, either by AI alone or supported by human intelligence.

Machine learning, natural language processing, data analytics and other AI applications can perform exceedingly well with large-scale data and without human judgement. In contrast, areas such as design of creative marketing ads, personal sell-

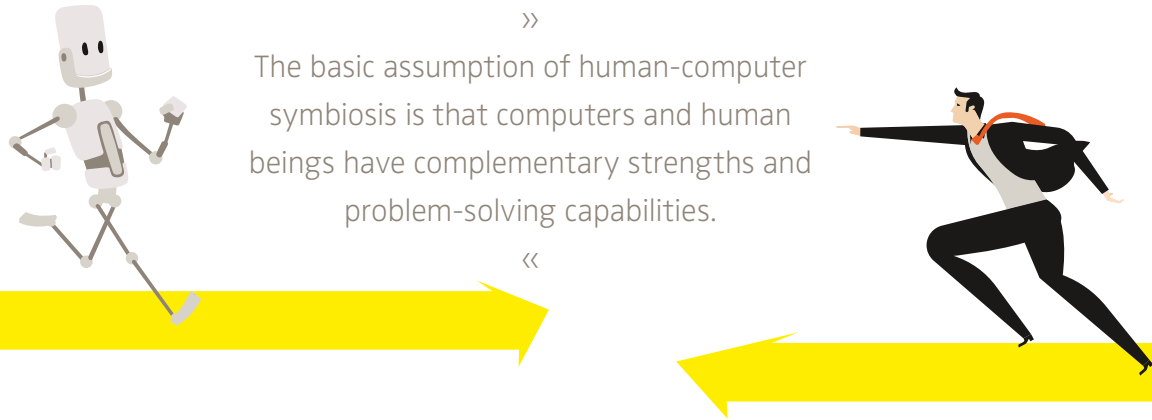


ing, hiring and mentoring employees, strategic decision-making and treating diseases are prime examples where human judgment, managerial intuition and human-computer symbiosis can still enhance work performance. Human intelligence is still needed to make decisions related to human-oriented data associated with employees, customers and partners that include their preferences, past behaviors, habits, emotions and personalized information. Human beings generally outperform machines when dealing with ambiguity, vagueness and incomplete information, and when requiring emotional intelligence and judgment, elements that are still considered the most critical limitation of AI.

Augmented Intelligence integrates the unique abilities of human beings that cannot be replicated by AI, and legitimate concerns about AI have been raised by Bill Gates, Stephen Hawking and Elon Musk, among many other visionaries. Large-scale IoT problems often cannot be solved by either computers or human beings alone. Therefore, there are sig-

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Human beings generally outperform
machines when dealing with ambiguity,
vagueness and incomplete information.

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nificant opportunities in IoT applications that are coupled with the notion of Augmented Intelligence. Machine learning approaches and human intelligence should be integrated to keep ultimate human control.

The potential of human-computer symbiosis in IoT

/// Human-computer symbiosis denotes the collaborative interaction between human beings and computers. In the context of IoT, a symbiotic human-computer relationship will emerge when IoT collects the data and AI tools perform the routine data calculations based on criteria determined by humans and prepares the insights to perform evaluations and make decisions. The basic assumption of human-computer symbiosis is that computers and human beings have complementary strengths and problem-solving capabilities. Intelligence is augmented when we optimize the computational power of computers and IoT with the cognition, intuition and "common sense" of human beings.

Augmented Intelligence is not a new concept, and it is akin to Human Computer Research on Human Computer Interaction (HCI), but IoT is a new domain for research in HCI. Interestingly, HCI researchers have always warned about the simplistic nature of AI, which views human beings as perfectly rational machines. Rather, HCI seeks to improve the symbiosis between interpretive and emotional human beings as entities and computers to enhance human performance. Many Augmented Intelligence approaches rely on crowdsourced strategies and gamification in the spirit of the HCI tradition. They are able to provide design solutions to Augmented

Intelligence that can be applied to IoT devices to enhance the design of human-IoT interaction.

Toward a more human IoT /// IoT that enables multiple connected devices to share information and make decisions without human control causes legitimate management concerns: Can AI be trusted to fully circumvent human oversight? Organizations face multiple risks from AI in IoT, such as privacy intrusion, mechanistic decision-making and loss of managerial control. Therefore, managers need to consider carefully for which task, in which way and to what extent IoT applications will be applied. The following guidelines will help managers to reach optimal solutions for leveraging Augmented Intelligence and AI in the context of IoT.

- > **Consider tradeoffs between full automation and human control** /// Managers can embrace both fully-automated AI solutions and Augmented Intelligence traditions. They must make their choices based on the expected performance, cost and risk of autonomous IoT solutions that would operate without human oversight. For example, automated manufacturing, predictive maintenance and security IoT solutions may be cautiously fully automated. However, human-oriented applications, such as smart retail, could still maintain human oversight. Beacon technology and eye tracking devices can optimize the placement of merchandise, and salespeople equipped with mobile devices can leverage the personalized information from the IoT devices to personally sell products, thereby enriching IoT solutions.

{ Box 1 }

COMMERCIAL APPLICATIONS OF AUGMENTED INTELLIGENCE IN IOT

All high-tech giants are developing applications to foster Augmented Intelligence. Commercially-available IoT platforms, such as Amazon AWS, IBM Watson and Microsoft Azure are developing fast, and many of these applications resemble an Augmented Intelligence mindset versus being purely AI. Also, Google's approach to search engine design is akin to the tradition of Augmented Intelligence. These platforms are constantly expanding their scope and reach by adding new technologies and services.

One of the most prominent and advanced platforms is IBM Watson. Named after IBM's first CEO Watson, it was created back in 2007 as part of an effort by IBM Research to develop a question-answering tool to compete on a quiz show. Since winning the show in 2011, it has been extended considerably and was commercialized in 2014. Now Watson offers "cognitive computing" and is designed as a human interface tool for reasoning, decision, language, speech and vision. While existing computers must be programmed, Watson understands the world in the way that humans do: through learning, interpreting and improving based on experience.

From healthcare and education to finance, transportation and energy, Watson is trained by leading experts in their respective fields. It understands seven languages and the special nature and terms of different industries and taps into deep domain knowledge to help humans make more informed decisions faster. According to Vincent Thomas, Client Engagement Leader, IBM Watson, "Cognitive systems are very good at doing the heavy lifting – pulling data together, analyzing the information and then presenting the relevant answers to users so that they can make more confident and effective business decisions that impact performance and revenue."

FIGURE 2:

IBM Watson: Cognitive computing promises a new partnership between human beings and computers



ENHANCE

the cognitive process of professionals to strengthen decision making in the moment



SCALE

expertise by elevating the consistency and objectivity of decision making across an organization



ACCELERATE

development of expertise in others by capturing the expertise of top performers

Figure based on: <https://www.slideshare.net/AndersQuitzaulbm/cognitive-computing-for-insurance>
by Anders Quitzau © 2015 International Business Machines Corporation

- > **Design the interface of IoT carefully** /// Applications of Augmented Intelligence are beginning to emerge in many IoT domains, such as cybersecurity, counter-terrorism, healthcare and space exploration. The interaction between human beings and such IoT applications does not evolve by itself in the most productive way. IoT designers can increase their focus on human-machine interactions and interface points, following an HCI logic, to make the resulting IoT systems more efficient and effective to ease appropriate human control.

- > **Create synergies between AI and Augmented Intelligence** /// Managers must engage in a conversation on potential synergies between Augmented Intelligence and AI in the context of IoT. They should strive to effectively combine human cognitive power with computer computational power to design applications of human-computer symbiosis in various industries, such as healthcare, FinTech, cybersecurity, smart cities and smart grid, among others.

Replaced or augmented: The long-term perspectives of IoT

/// In some distant future, machines alone might dominate decision-making in most applications. There will nevertheless be a fairly long interim during which the main intellectual advances will be made by human beings and computers working together in intimate association. IoT is such an area that can integrate human and computer intelligence to solve emerging problems. Moreover, our society needs to adapt to the broader social, economic, behavioral and ethical implications of AI and Augmented Intelligence. Both affect the future of work, organizational productivity, the blurring of industry boundaries, and other legal, policy, and governance tasks. For the time being, appropriate IoT designs should maintain a reasonable level of human control and oversight and give mankind a chance to get acquainted with delegating control to machines.

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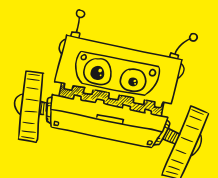
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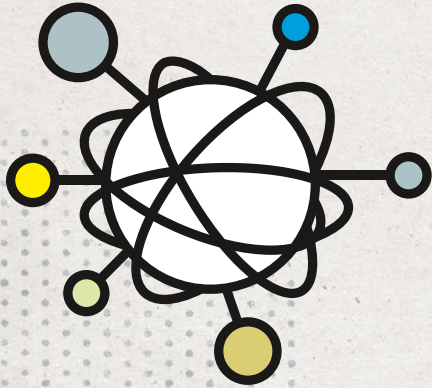
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ABOUT IFTTT

IFTTT gets all your apps and devices talking to each other. Not everything on the Internet plays nice, so IFTTT sees its mission in building a more connected world. The platform was initially released in 2011. Currently, there are over 600 apps and devices including Google, Microsoft, Amazon, Twitter, BMW, Fitbit, Dropbox and Samsung available on IFTTT. The company believes that the creative control of all services in use should be intuitive and accessible to everyone.

www.ifttt.com

ABOUT LINDEN TIBBETS

Linden is the CEO and co-founder of IFTTT, a service that inspires people with the confidence to control their connected world. Linden graduated from Santa Clara University, where he studied Computer Engineering. Before starting IFTTT, Linden developed his keen interest in all things design at IDEO. He is an ardent fan of radical ideas of all shapes and sizes.

<https://twitter.com/ltibbets>

<https://www.linkedin.com/in/lindentibbets>

THE INTERVIEWERS

Professor Donna Hoffman and Professor Tom Novak conducted the interview in June 2018.

Connecting Everything With Everything: The Sky is the Limit

*Interview with Linden Tibbets, co-founder and CEO of IFTTT,
San Francisco, CA, USA*

You want your shopping list to appear on your car's dashboard? Or to have your coffee brewed as soon as you get up? No problem, if you know IFTTT. IFTTT (pronounced like "gift" without the "g") is a neutral platform that offers easy and free ways to get all your apps and devices talking to each other. Millions of users worldwide have enabled more than 75 million Applets for over 600 services that already cooperate with the platform. Linden Tibbets, co-founder and CEO of IFTTT explains how this platform works and how end users and companies can get more value from being able to connect just about everything with everything.

DONNA: IFTTT is a fairly young company. In the tech scene, people might know that you are a start-up that connects apps and devices, but many marketing people might not know you, yet. How would you explain IFTTT to a newbie? Why do we need IFTTT?

LINDEN: In a nutshell, IFTTT is a trusted, neutral platform that allows digital services of all kinds to work together on your behalf. It allows different services to access each other in ways that improve the individual end-user experience.

DONNA: Which type of services are we talking about? Just digital to digital or digital to physical or all of it?

LINDEN: We have realized that in the future, everything in the world is going to be a digital service. Every brand, every organization, every noun. You literally couldn't name anything that isn't going to be either directly connected to the internet or closely tracked by it in the future. You have things like Domino's

Pizza, a Toyota Prius, Gmail and a connected Ring doorbell and each of these services has data about you and knows who you are and what you want, but each is its own isolated island. Domino's can deliver pizza, Gmail can send an email to anybody in your address book. But as we increasingly surround ourselves with such services, the value of each is closely linked to how well it can work together with other services.

DONNA: Is IFTTT a service or a platform?

LINDEN: Both! We are a platform for services. We look at ourselves as a place in which everything you might adopt in the future, your cellphone, your cable TV, Netflix, Internet, Domino's Pizza, your Ring doorbell, your car, Honeywell, your health insurance, credit card or just anything is going to be a service. Over time, the real value of each service will be delivered through its interaction with other services, and we are a platform for these interactions and connections to happen. We bring end users and services to the same table, and they both have a say.

DONNA: So, for consumers, linking different services creates additional value? What's the benefit of IFTTT for those providing the individual services?

LINDEN: For businesses, the value proposition is slightly different. Even for the biggest players in the world – Amazon, Apple, Google – it's increasingly difficult to build a robust developer ecosystem around their own API platforms. Doing those types of integrations takes so much developer time and IFTTT provides a standard and a neutral platform to make connections between different services. When businesses work with us, they can quickly go from owning an API to turning that API into a robust and active integration and developer ecosystem that drives engagement and creates opportunities for their users to use that service in new and exciting ways. Over time, we will drive revenue for a business either directly from its users or because they can connect their APIs with other businesses that are willing to pay for some of these connections.

DONNA: That sounds incredibly ambitious. Are you the only company doing that?

LINDEN: Funny enough, I believe that we are one of the only businesses in the world that truly sees these opportunities. Integration as a whole is a massive problem, and the sheer volume of specialized services that need to be adopted justifies a lot of business. In the past, services have not been architected to work with others and as everything is becoming a service online we have a massive problem. Even within a large enterprise, there is a microcosm of hundreds or thousands of discrete services that need to work together for the company to function. So, there are other start-ups who are tackling adjacent opportunities, especially within the enterprise space, in marketing automation and in enabling non-technical persons to make these connections.

TOM: In what way does your approach differ from other companies that connect services?

LINDEN: Within this space we are tackling an exciting opportunity: We are working with businesses and their customers rather than businesses and their employees. It's a real winner-take-all- opportunity, similar to credit cards or other types of two sided markets. We see the incredible opportunity to be a dominant player and that's why we think our business opportunity is so massive.

TOM: What does it mean to be a neutral platform and why is this important?

LINDEN: It's incredibly important. We do something that truly has the best interest of both end users and businesses in mind. This is difficult to do when you offer your own services. Imagine: if we had our own cloud storage, connected doorbells or AI assistants, we would immediately scare off Google Drive, Amazon Alexa and Ring doorbell. They would fear that we pushed our own services over others. And with all the service diversification within the big consumer technology company umbrellas, there is a massive problem. It is hard to imagine a scenario in which you order something from Amazon with a Google Assistant. Alexa isn't really made for deep integration with Gmail or Google Calendar.

TOM: Isn't it sufficient that services work together within one specific large ecosystem?

LINDEN: Not being able to connect across the umbrella of technology companies is not in the best interest of the end users and, frankly, not in the long-term interest of each of these companies either. Short term, it might make sense to solve the compatibility problem within one specific ecosystem in which, of course, the services work well together. But as more and more products will become services, we will come to a tipping point where this will be harder and harder to do. Just look around your home; you might soon have a lot of smart furniture and home appliances and will have to work with different brands that maybe came out years after you have adopted one service or another. Some brands may not even have knowledge of the other's existence. For sure, this will be difficult, and I think the winner will be the one who can solve the necessary integration in the most neutral way possible.

DONNA: How is IFTTT fitting into the Internet of Things?

LINDEN: The IoT is an awesome trend and we often get identified as an IoT company. This is fine, but we never talk about ourselves as an IoT company. Only about 40% of the services we have currently integrated in our platform are IoT devices. Mostly they are on the consumer side, from vehicles to doorbells, your voice assistants to thermostats. We are excited about the Internet of Things, but this is only a subset of the larger trend that everything will be a service. A lot of the connections that are happening within IFTTT are between IoT services and non-IoT services like your calendar, your email, the weather forecast, Domino's Pizza deliveries and so on.

DONNA: Is the hype around IoT justified?

LINDEN: The IoT is coming – the world has picked up on this. When it became clear two or three years ago that this was going to happen, that eventually everything with electricity would be connected to the internet, there was a real hype. We expected to have a sort of “iPhone adoption movement” immediately, that everything would be replaced quickly. But you don’t replace things like a dishwasher every two years. So adoption will never be quite on par with the expectations of the hype. Nevertheless, we see that this wave is coming and that it is growing in big numbers and we want to be part of it.

DONNA: The IoT buzz and hype is a bit replaced by AI, currently. You see more AI than IoT in the media now. What role do AI and ML [machine learning] play in your company?

LINDEN: I think about AI and machine learning a little bit differently than the general public. Typically, if you think about AI, you immediately jump to the interface and think of a human-like assistant. I think of it more as the technique that will help make sense of the massive amount of information and data from all our devices and services. Hopefully making sense means creating value for the end user. AI might be a voice assistant interface, but also a system or just a better way to recommend a movie or a restaurant.

DONNA: Can you tell us a little bit more about who is using IFTTT. What are they excited about?

LINDEN: The early days of IFTTT were about building something for power-users, somebody who understands how these services work and who has the patience and know-how to work them together. As the platform has grown and more and more people have begun to surround themselves with more services – from the internet to email to Facebook, now Instagram and connected lightbulbs and doorbells, the IFTTT user base began to shift and is now more representative of the general population. Gender-wise, back in 2012 we started with 80% or even more male users; now we are getting much closer to 50/50. We have tried to make our services simpler and more approachable, but we have also added a lot of services that more and more people use just as people have gotten more technically sophisticated.

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Over time, we will drive revenue for a business either directly from its users or because they can connect their APIs with other businesses that are willing to pay for some of these connections.

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DONNA: Does usage vary by country or gender?

LINDEN: We have been international from day one and anybody can find IFTTT from anywhere. Only 50% of our audience today is here in the US. Other large countries are the UK, Germany, France, but also China and Japan use IFTTT. The interface is in English only, but this will change with time. Obviously, there is a real need everywhere for people to get their things to work together. The variation in use is less by country or gender but depends on the services someone has and what their problems are. For instance, is someone just moving in a new home? What type of connected devices will they decide to adapt? Will they have a smart speaker? In general, if you are an active user of a service and that service can be found on IFTTT in an app, it is very likely you find value in IFTTT.

TOM: How do you connect to potential users? If someone wants to control their lightbulbs, for instance, how do they get the idea that they could use IFTTT?

LINDEN: There is a difference between the early adopter and someone who just wants their stuff to work when they already use several services. Early adopters are solving the problem for themselves. They know their problem. They want their services to work together, they know IFTTT and they are turning to the platform to solve this by themselves. Those power-users are an important aspect of the IFTTT ecosystem because they publish the solutions to their problems for the rest of the community. The other users do not know exactly what problem they have, but they have a pool of Applets and get recommendations and then make the decision to use that Applet or not. And the future for everyone else in the world, the real big opportunity for all services is to begin thinking about how those options can be presented to the end users.

DONNA: How will this work? Will I get a message that suggests a service and where would I see that?

LINDEN: Could be anywhere, on a car dashboard or an email a service sends to you or it could also happen within IFTTT. We are building the ability for services to integrate. So, it doesn't really matter how the contact is made. If you are getting a new BMW it might know that you have a connected webcam or home-security system and immediately present a valuable reason why you should allow the services to integrate. By doing so, you might immediately know when someone breaks in, or when there is motion at a strange time. So, they could present the value in different stories and then you are given a choice to say, "That's good, I'll do it" or "No, I am not convinced yet."

TOM: So, AI will help people decide what they should connect?

LINDEN: AI will be important to help people understand what they can connect and IFTTT has the ability to build an assistant that does a better job of recommending what people should connect. IFTTT could also help other companies that are using AI to make similar recommendations on their own platforms. Airlines, as an example, have a very rich media library for flights nowadays and there is no reason why we couldn't help airlines to power an algorithm, just like Netflix has, to make recommendations based on what people have watched on all the other services they use. This is a problem that we are not solving today, but could solve in the future.

DONNA: So there is really no limit to what IFTTT can connect?

LINDEN: That's correct. Today we have over 600 very diverse services. All of those have found some way to make useful integrations. There is such a massive long tail of ways in which services can work together and it would be impossible for any one service to even get a handful, let alone all of them themselves.

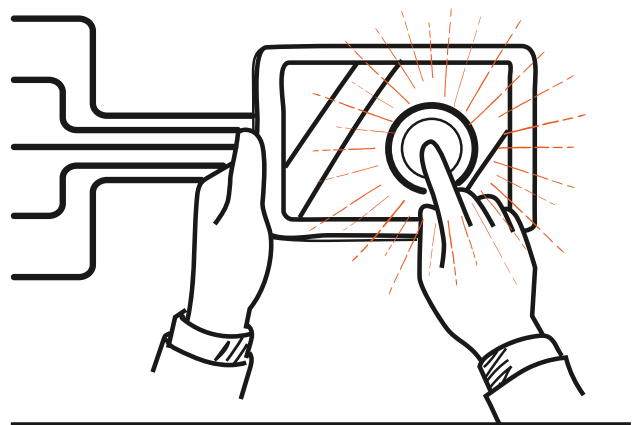
DONNA: We have talked about ways to approach end users. How does it work with the companies on your platform? Who approaches whom? How do you integrate them?

LINDEN: Firms approach us. We have a very powerful platform, and they need a web API they can integrate with IFTTT. The integration process is fairly lightweight and a matter of days and weeks, not a huge lift relative to building a native app. The only other hard requirement besides the web API is that you allow users to authenticate as themselves on our platform using OAuth 2.0, which is an industry standard. We work with companies to identify where to start, on what the right data is, how to format the data and how to get that data to the platform.

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TOM: Is the company doing the integration work, is IFTTT doing it or is it a joint effort?

LINDEN: The company has to do some light work, but it is about the same amount of work as if you would integrate with only one other service directly using your API. With IFTTT you get access to over 600 other services for the same effort plus an active, growing ecosystem. You could build the world's best API into the best platform or portal for external consumption. It might be perfect, but still a ghost town in terms of adoption and ecosystem. IFTTT already has an active ecosystem and this is one of the exciting reasons why companies love to work with IFTTT.

TOM: What are the revenue opportunities for IFTTT in the system?

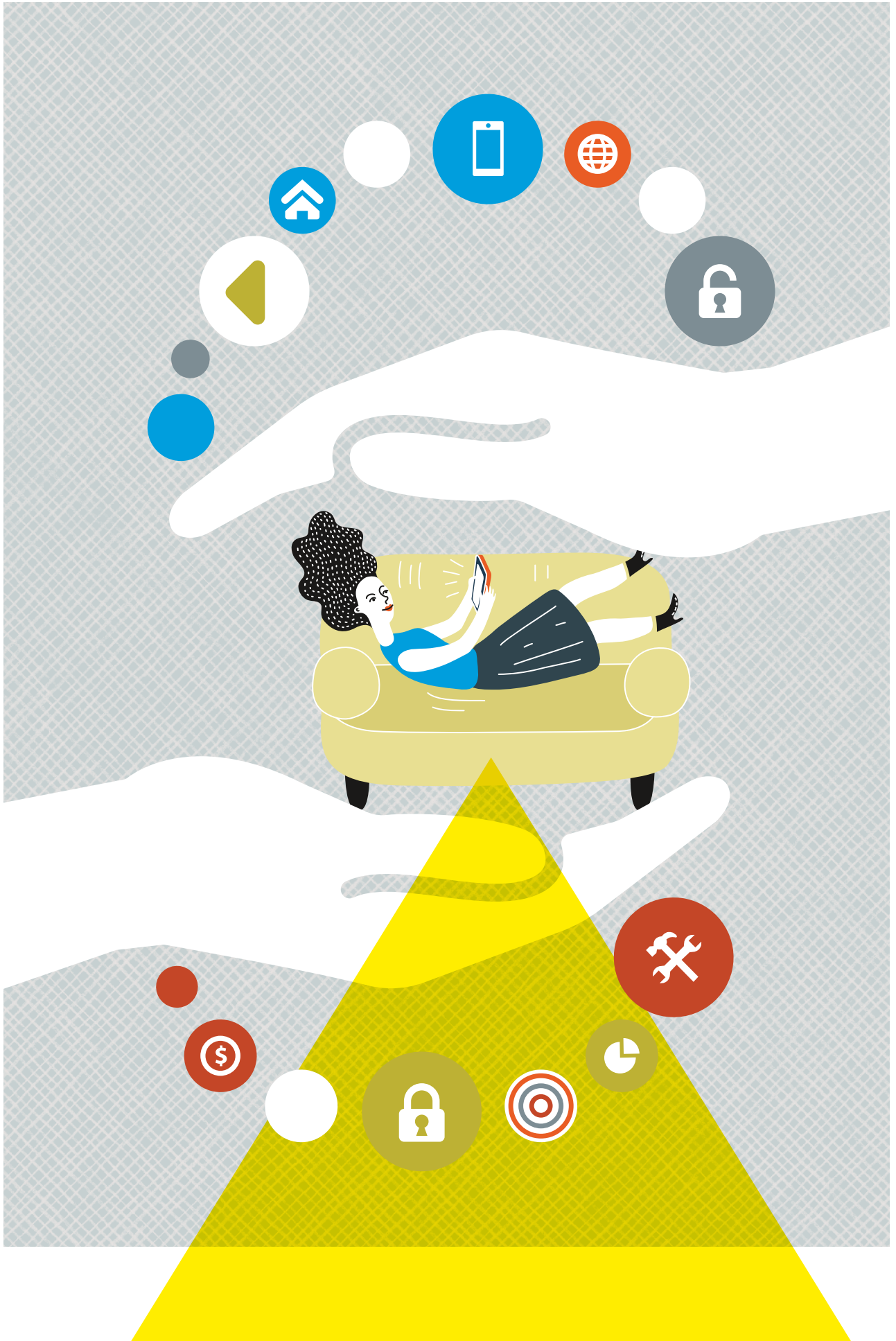
LINDEN: Our customers are the services themselves and we help them solve the developer ecosystem problem for a fraction of the cost compared to spending millions on their own systems that often fail. Over time, we will also drive new revenue streams, especially in the IoT field where companies need to transition from selling hardware to selling services to survive. We help them build a services business model.

DONNA: Let's wrap up with the challenges you are facing. Are they unique to you?

LINDEN: Our challenge will be unique compared to those companies that offer their services to single companies only, yet similar to any type of platform business. We have to create value on both sides of the platform – for the businesses and the users. Consistently, we will have to protect the quality of our ecosystem and balance growth with driving real value for customers. But this makes it worth it in the end. Frankly, I wouldn't like to work in anything but a platform business, and I am convinced that we will have incredible opportunities. And really – the sky is the limit!

DONNA AND TOM: Thanks so much for your time. It was great talking to you about your emerging platform and all the amazing services you offer. We wish you all the best for your project and will be happy to support you with any academic research on consumer motives and ways to leverage data to create real value.

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Connecting the World and Reinventing Customer Centricity

Rudolf Aunkofer

KEYWORDS

Customer Centricity, IoT, Technical Consumer Goods, Smart Technology, Customer Journey, Touchpoints

THE AUTHOR

Rudolf Aunkofer

Business Partner Information Technology, GfK
rudolf.aunkofer@gfk.com

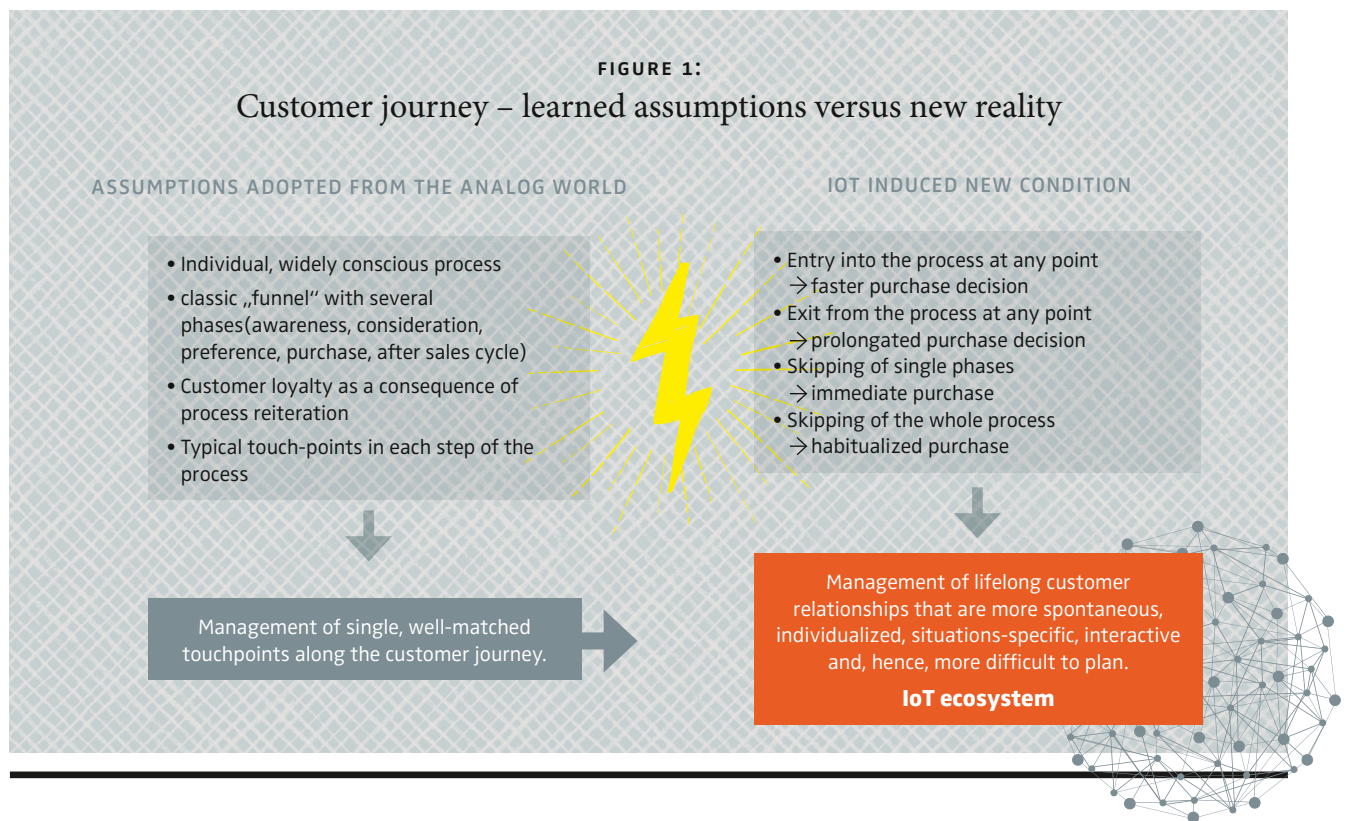
Director and Professor Institute of Information
 & Supply Chain Management,
 University of Applied Management,
 Ismaning, Germany
rudolf.aunkofer@fham.de

Smart technology – a revolution in buying behavior

/// Smart refrigerator or not? At first glance, the difference really isn't that great. In the future, technical consumer goods will mostly remain long-term investments with product life cycles of several years. Yet, the way in which we select, buy and use technology, will be revolutionized in the next five to ten years. That's the conclusion of an expert survey the GfK Verein carried out in cooperation with the ISCM Institute at the University for Applied Management. The Internet of Things (IoT) and increasing digitalization enable providers to better understand customers for one thing, and, for another, to personalize technical products and services. Even today, new technologies such as artificial intelligence, virtual reality, robotics or voice and gesture control offer a glimpse of what could become reality very soon. The relationships manufacturers and retailers have with customers will radically and permanently change and become more interactive. Therefore, it is necessary to rethink ways of creating emotional and positive shopping and product experiences in an IoT context.

The customer journey reinvented – a relationship revolution

/// Even modern versions of the digital-analog customer journey continue to be rooted more in the thinking of the twentieth century than in the digital opportunities of the twenty-first: a purchasing decision as a consciously managed process following a funnel logic and characterized by individual touchpoints in its individual phases (see Figure 1). This view implicitly assumes that consumers lack and need information which is not readily available. Additionally, the market situation is judged to lack transparency, and time budgets and information processing capacities are assumed to be limited.



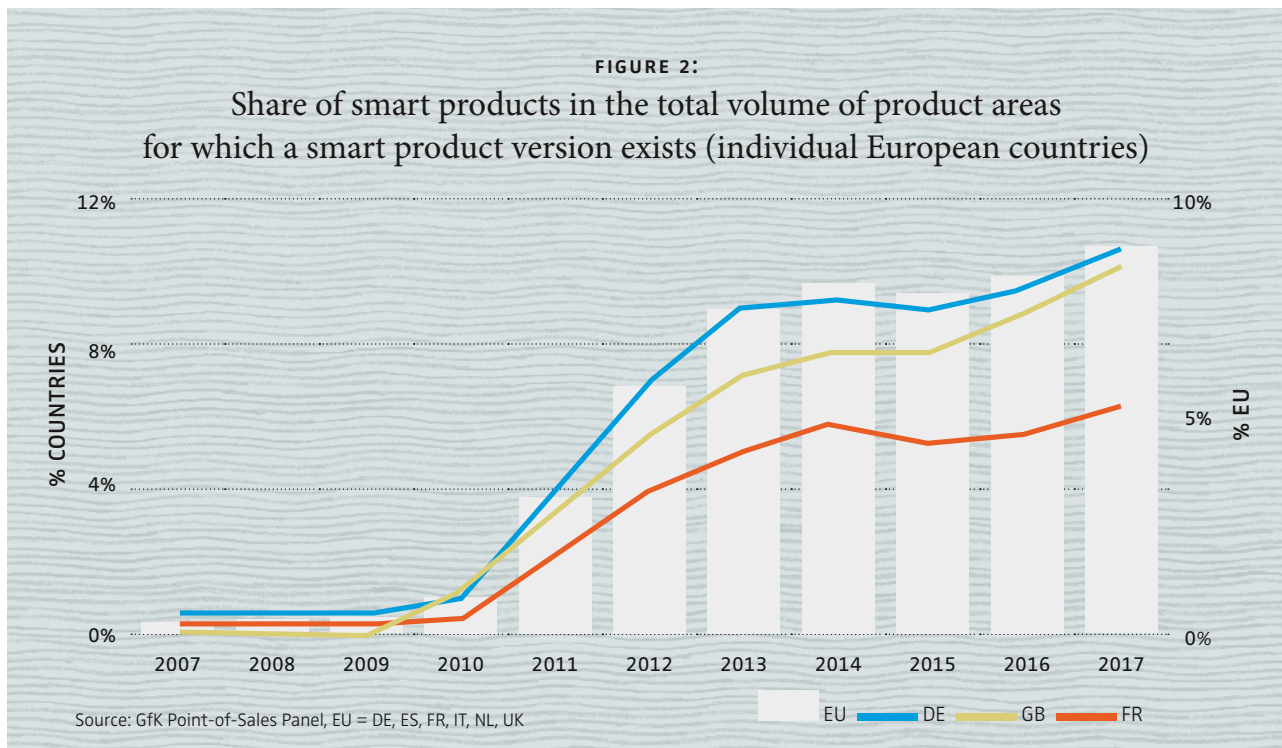
Connected products and the ubiquitous availability of networks and cloud-services create new conditions. Everybody can now be reached anytime, generating diverse data that can easily and quickly be accessed. This leads to a market transparency that has never existed before and also massively affects the customer journey. Better information, education and knowledge cause more transparency and make the whole journey more flexible, more individual and significantly shorter. It happens in multiple, partially automatized and is less predictable for manufacturers and retailers. The classical customer journey with its touchpoints is transformed into a lifelong, interactive customer relationship within an IoT-based product-service-ecosystem (Figure 1).

Ecosystems instead of physical product features ///

Additionally, for technical consumer goods such as television sets, smartphones, computers or even appliances, physical product features are becoming less important than digital, software-driven qualities. Considering the high market satu-

ration, long usage cycles and over-fulfillment of requirements, many product features are often rated as less critical than in the past. – Who actually uses all of the programs of a smart washing machine? Who uses all of the recording functions of smart TVs or all cleaning modes of a smart toothbrush? – The industry speaks of a commoditization of markets – products are experienced as functionally interchangeable.

For many users, customer satisfaction results from simplicity, service and convenience over the entire life-cycle. Important aspects are user-friendliness, integration into a comprehensive service ecosystem and a smart and connected service-interface with remote access. Flexible apps that can be updated easily make it possible to adapt digital products to customer needs quickly and in almost any way. Log-in effects are generated, which result in platform-based replacements and follow-up purchases of products from the same manufacturer or other network partners.



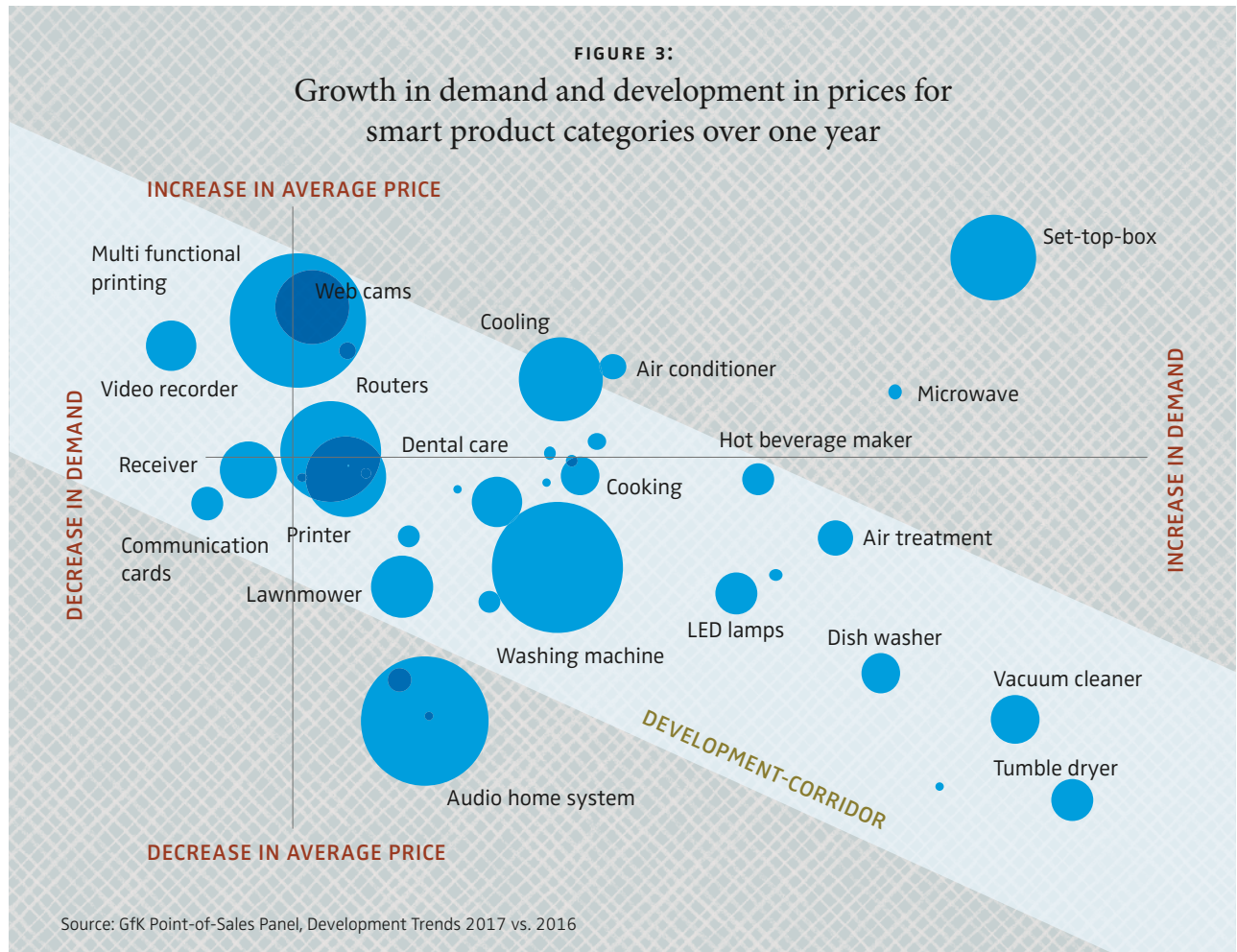
IoT – Much room to grow /// At this point, most households are already connected. In Germany, around 91% of households have internet access, around 89% have a computer and around 76% own a smartphone, and other Western European markets are similar. The infrastructure for exchanging digital data with manufacturers and services partners is thus available.

By contrast, the demand for connected products is comparably low and differs from country to country (see Figure 2). It is obvious that consumers do not necessarily prefer smart product solutions. After quick growth initially, the share of smart products has been increasing at a much slower rate since 2014 as more and more products with smart versions have been launched and are starting from scratch. The benefits of “smart” are still too vague for many consumers and a willingness to try out smart solutions is often limited to innovators and early adopters. Many manufacturers are still focusing on non-smart products at more affordable prices.

The adoption rate of the average consumer is thus slow and often dominated by pricing. The advantages of platform- and ecosystem-effects have not yet been fully thought through by many manufacturers or adequately communicated to retailers and customers.

Therefore, consumer adoption of smart products is the true challenge for the Internet of Things. The high market saturation for technical consumer goods results in new purchases occurring primarily to replace defective or outdated products. In Germany, for instance, 97% of households owned a washing machine in 2017; for TV sets, it was 96%; for dishwashers 72% and for electrical toothbrushes 59%. The numbers are similar in scale all over Western Europe.

For the smart versions of these products, however, adoption varies significantly. According to a GfK consumer panel, after seven years of smart TVs, the rate is at around 68%; after five years of smart washing machines and toothbrushes, it is only



at around 2-3% and after three years of smart dishwashers, it is still under 1%. This shows that the rate of adoption of IoT-products strongly depends on the assessment of their concrete benefits and varies significantly for different types of devices. The product's image and visibility as well as the product policies of the manufacturers are also relevant. The high adoption rate of smart TVs is likely a consequence of many manufacturers' policies to integrate smart features as a standard into higher priced models. A portfolio analysis of large European countries (Germany, France, the United Kingdom, Italy, Spain, the Netherlands) clearly shows that of the 40 smart product categories registering a positive increase in demand in 2017, 58% made price concessions with decreasing average prices. This is a clear indication that just being "smart" is not enough to justify a permanent price premium.

Customer centricity 4.0: Redesigning user value /// For many product categories, the IoT is thus not going to take off until providers and retailers succeed in getting at what their customers really want. For one thing, they need to better understand individual usage behavior, and for another, there is a need to better personalize products and services, creating emotional and situation-specific customer experiences. Expanding the ability of digital products to communicate with each other, to record and analyze usage behavior and to implement concrete product improvements will be decisive.

Individual customer centricity is already apparent today in digital marketing and the design of digital product components, e.g. in the multitude of available apps or in services that can be booked individually. Convenience, like being able

to return products or obtaining refunds for e-books that a customer does not like, or simplicity, like being able to cancel a contract at any time, will become new standards. Consumers are taking these “digital conveniences” and their continual improvement as a given for future product use. This is the only way to position products in a high price category and to ensure noticeable and tangible benefits for customers. Longer usage cycles for technical products require a focus on practical and concrete advantages from IoT-integration. If customers see a real value – for example, in better service and more tailored and flexible performance – smart products will replace classical products in the next five to ten years. Industry and retail should consider the following recommendations to convince consumers of the benefits of the Internet of Things:

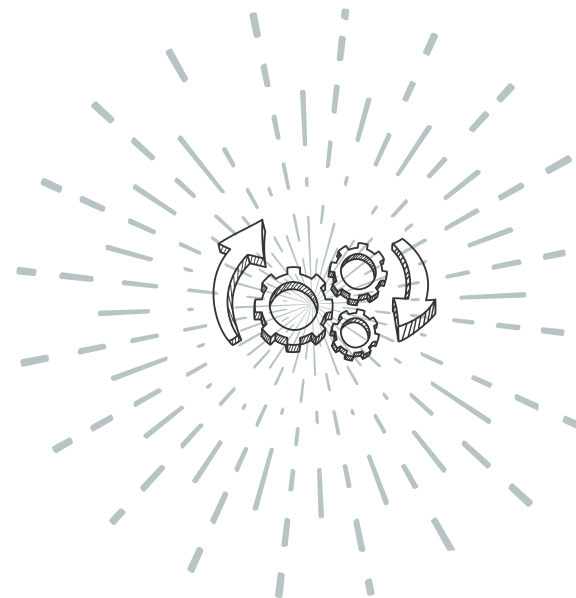
- > **Offer situation- and user-specific product information** /// Customers are literally “always on”. The classical consumer journey occurs individually and in many different ways, making it complex and only partially predictable. It is necessary to use all relevant marketing, sales and communications channels to personalize interactions with customers. Consumers naturally expect to be addressed individually and no longer as an anonymous member of a group. Individual product recommendations during online shopping are a first step in this direction.
- > **Personalized and automated customer service** /// The IoT will become the central instrument for collecting customer and usage data. Providers should customize their marketing and services based on this data. Customers should be personally and directly addressed, and they should be able to select tailor-made customer service. This includes digital bookmarks across devices or dash buttons that activate the entire supply chain with a single click. Smart washing machines, for instance, should be able to automatically reorder the necessary laundry detergent based on individual usage.
- > **Build trust in brands** /// Consumers will nevertheless only use automated services if they trust the respective provider. A brand enabling consistently positive customer experiences leads to investment security, which reduces the perceived risk of a purchase. Brand credibility and positive experiences are decisive success factors when usage cycles are long. Especially in the market of technical consumer goods, these factors create brand loyalty. Modular and flexible services like provided by most telecommuni-

cations or pay-TV brands, lead to loyal consumers within specific product and service ecosystem. The (seemingly) individual need fulfillment creates trust in brands.

- > **Ensure convenience and simplicity** /// Simplicity and convenience in using products and services as well as easy-to-understand contracts will become prerequisites. Consumers desire direct, quick, simple, intuitive and holistic experiences in each specific situation. Lights that automatically turn on or off when someone is present, or that dim according to the time of day or day of the week, are initial steps in the right direction. Energy management such as running dishwashers and other appliances according to the output of solar panels is another application. Voice recognition and control can be combined with artificial intelligence to enable a more intuitive interaction with technical goods, requiring less technical expertise.

The IoT offers an unforeseeable range of new options. The challenge lies less in obtaining data about customers and their behavior than in selecting and extracting the most informative user data in a smart way. Only by analyzing the relevant data will it be possible to gain information about actual customer needs in a connected world. This will be a precondition for successfully developing products with long-term relevance and for creating new customer centricity.

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Editors



Donna L. Hoffman

Louis Rosenfeld Distinguished Scholar
and Professor of Marketing,
The George Washington University School
of Business, Washington, D.C., USA
dlhoffman@gwu.edu

ABOUT DONNA L. HOFFMAN

Donna L. Hoffman is the Louis Rosenfeld Distinguished Professor of Marketing and Co-Director of the Center for the Connected Consumer at The George Washington University School of Business in Washington, D.C. Professor Hoffman's current research is focused on consumer and smart object experience in the Internet of Things. She is an award-winning and internationally recognized academic expert and sought-after industry speaker and has worked with major corporations on the topic of digital marketing strategy, including Procter & Gamble, Intel, Microsoft, FedEx.com, Land's End/Sears, Walmart.com and many others. She has served as an Academic Trustee of the Marketing Science Institute and as a member of the Procter & Gamble Digital Advisory Board.



Thomas P. Novak

Denit Trust Distinguished Scholar
and Professor of Marketing,
The George Washington University School
of Business, Washington, D.C., USA
novak@gwu.edu
<http://postsocial.gwu.edu>

ABOUT THOMAS P. NOVAK

Thomas P. Novak is the Denit Trust Distinguished Scholar and Professor of Marketing at The George Washington University School of Business in Washington, D.C. Professor Novak's research since 1993 has focused exclusively on consumer behavior in online environments and digital marketing. His current research interests deal with using assemblage theory, anthropomorphism and topological data analysis (TDA) to understand consumer experience in the Internet of Things. An internationally recognized academic researcher in Web-based commerce, Novak has published extensively on the subject in top academic journals in a range of scholarly disciplines. His work has global impact with 26,000 citations in Google Scholar.

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MANAGING EDITOR

Christine Kittinger-Rosanelli

Marketing Intelligence Review
christine.kittinger@gfk-verein.org

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PUBLISHER

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 90419 Nuremberg
 Germany
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 Fax +49 911 376 77872
 Email: hello@gfk-verein.org
www.gfk-verein.org

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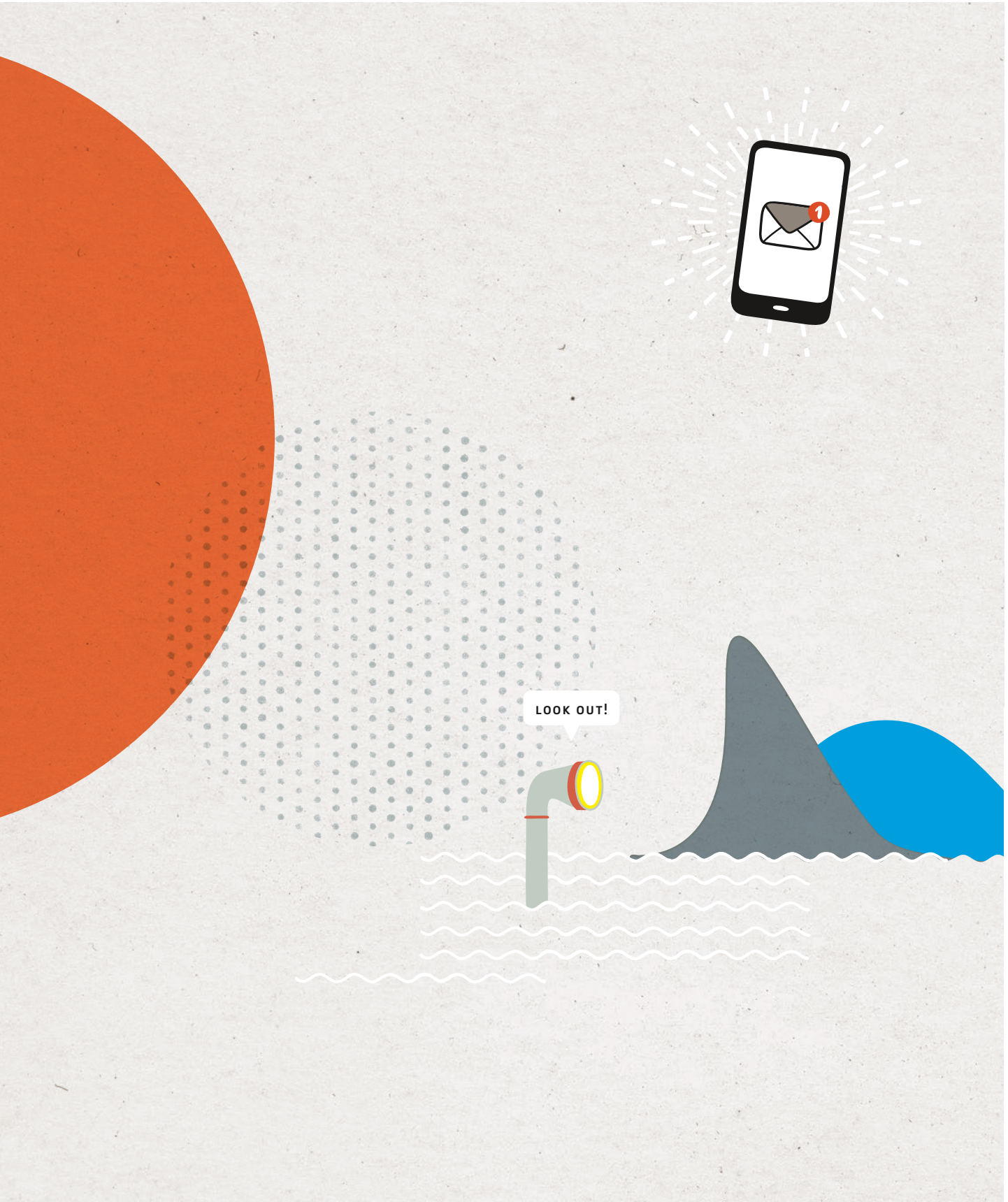
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