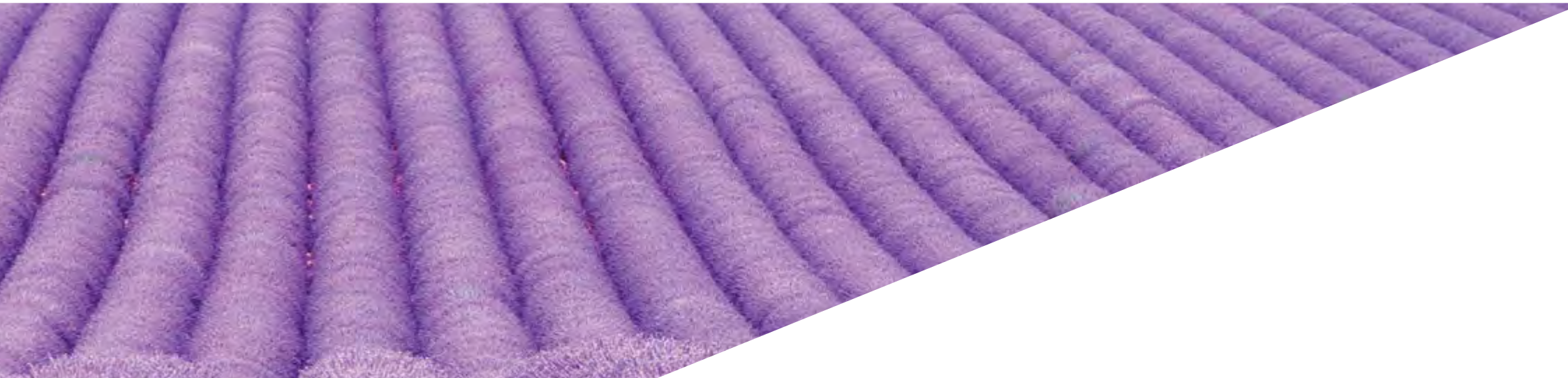


TREND 2

# The Outcome Economy: Hardware producing hard results

Intelligent hardware is bridging the last mile between the digital enterprise and the physical world. As leading enterprises come face-to-face with the Internet of Things, they are uncovering opportunities to embed hardware and sensors in their digital toolboxes. They are using these highly connected hardware components to give customers what they really want: not more products or services, but more meaningful outcomes. These "digital disrupters" know that getting ahead is no longer about selling things—it's about selling results. Welcome to the "outcome economy."





How much would you pay to laugh out loud? If you were a patron of a pay-per-laugh Teatreneu theater company production in Barcelona, the answer would be €0.30 for each instance.<sup>1</sup> Teatreneu uses facial recognition technology to register each laugh and charges customers accordingly—up to €24 per show, a 25 percent increase over previous ticket prices.

And, if you live in the smart city of Los Angeles, there's a good chance you have benefited from one of 7,000 smart parking spaces. The hockey puck-sized sensors, which Streetline installs in the roadbeds of the cities and campuses where it operates, communicate real-time parking conditions to smartphone apps, telling drivers where parking is available. These connected parking spaces have delivered tangible outcomes to drivers and to the city, increasing parking revenue by 2 percent, while simultaneously decreasing the average cost of parking by 11 percent and increasing space utilization by 11 percent.<sup>2</sup>

## WHY NOW?

**Hardware is approachable:** More businesses and individuals are able to leverage a vast ecosystem of tools to design, produce, and distribute hardware than ever before. It's no longer necessary to be a tech firm to build hardware.

**M2M economics:** Cost reductions are driving machine-to-machine (M2M) investments: 45 percent of global consumer electronics executives cited declining costs as driving their M2M investments in 2014, up from 27 percent in 2013.<sup>3</sup>

**Sensor efficiency:** Sensors are cheaper, smaller, and more energy efficient than ever before, allowing more sensors to be installed in more places and maintained for longer periods of time at the edge of networks without the need to service or replace them for two to five years.

**M2M standards:** Machine-to-machine communication standards are closer to reaching maturity, allowing for more localized and real-time decisions at the edge of networks. In 2014, 22 percent of organizations had M2M solutions in place, and 42 percent of the rest expect to implement M2M solutions by 2016; by 2017, 75 percent of organizations will have M2M as part of their strategic roadmaps.<sup>4</sup>

**Ubiquitous bandwidth:** High-bandwidth, wired, and wireless communications are now ubiquitous in most markets. Traffic from wireless and mobile devices will be 54 percent of all traffic, exceeding traffic from wired devices by 2016. By 2018, global fixed broadband speeds will reach an average of 42 Mbps, up from 16 Mbps in 2013.<sup>5</sup>

These are just two glimpses of the emerging outcome economy in which digital businesses increasingly sell solutions and results rather than just products and services. The outcome economy is defined by the ability of companies to create value by delivering solutions to customers that in turn lead to quantifiable results. This is made possible by hardware becoming increasingly intelligent, otherwise known as the Internet of Things (IoT).

From smart industrial equipment to the bevy of sensors in the modern smartphone, companies now have the tools to gain end-to-end insights into the outcomes that their customers are trying to achieve. What's more, this same technology allows companies to discover the metrics, or measures of value, by which their customers define success. In effect, these metrics enable businesses to identify, measure, and aim for their customers' desired outcomes.<sup>6</sup>

By placing intelligent hardware at the edge—where the digital and physical worlds intersect—84 percent of our Vision survey respondents agree they can gain a deeper level of understanding of both how products are being used and the detailed outcomes customers are trying to achieve.

## Harbingers of the outcome economy

The underlying principle of an outcome economy is not new: marketers have long talked about selling solutions rather than products. Decades ago, Harvard University marketing professor Theodore "Ted" Levitt was famously said to have told his students that people didn't want quarter-inch drill bits; they wanted quarter-inch holes. However, the outcome economy has been notoriously difficult to grow, because there have been few effective ways of deeply and continually discerning what customers want.

Digital technology is now resolving that difficulty—so much so that the outcome economy is no longer just an aspiration; it is very much here and now. In fact, it's a strategic transformation for big companies in every industry as well as a disruptive opportunity for startups. The early adopters are tying feedback from embedded hardware and sensors to their digital systems, giving them the end-to-end insights necessary to understand and influence outcomes. A few examples prove the point.

Not long ago, Monsanto acquired Climate Corporation, a maker of farm intelligence software that integrates with precision agriculture sensors and systems to deliver intelligence about current and future weather, soil, and crop conditions. With the acquisition, Monsanto is able to offer growers actionable insights on how to reduce risks, improve yields, and increase profits. The agrochemical giant can now not only recommend the most profitable crops to plant, but also what types of seed to buy, when to plant, how to tend the crops, when to harvest, what yields to expect, and even what revenue farmers can expect at the end of the growing season.<sup>7</sup>

The end-to-end knowledge that Monsanto can now gather powers its ability to improve outcomes for growers. Today, farmers are able to buy field-specific weather-related crop insurance that guarantees financial outcomes and hedges against the risk presented by increasingly variable and extreme weather events. It's not a stretch to envision a future in which precision irrigation systems, integrated with these decision support systems, then take autonomous action based on sensor data of soil moisture and precise weather forecasts.

In the auto industry, Tesla Motors found a way to use hardware on the edge to deliver safety outcomes to consumers beyond what was previously possible. In late 2013, the luxury electric car maker saw several instances of the battery packs in its Model S cars equipped with the Smart Air Suspension option catching fire after being punctured by road debris at highway speeds. Instead of following the traditional auto industry protocol of issuing a costly recall and waiting for customers to bring their vehicles in for

service, Tesla made use of the intelligent hardware in every car to distribute a firmware update to the affected cars, which increased their minimum ground clearance and prevented them from automatically lowering at freeway speeds.<sup>8</sup> When Tesla devised a longer-term solution, it returned the original functionality to the affected vehicles and gave owners the option of bringing their cars in for a free retrofit of its sturdier undercarriage armor. The diagnosis of the problem and improved safety outcomes for Tesla customers were possible only because the manufacturer had end-to-end feedback from and the ability to update the computer systems in those drivers' cars.

This emphasis on outcomes is also seen in the pharmaceuticals sector, where Proteus Digital Health is focused on improving patient outcomes as a new way to create value in that industry. The digital health company integrates a tiny, inert sensor in the pills it produces; the sensor acts in concert with a wearable device and mobile app to provide full "adherence transparency" for patients, healthcare

providers, and payers. Not only can the Proteus hardware-based system determine when patients take their medications, but it also can send alerts and reminders to the individual if they forget to take a pill. With this approach, Proteus can help patients increase the effectiveness of their treatment, demonstrate cost savings over traditional methods of care, and drive better overall outcomes for patients, payers, and providers—the proverbial "win-win-win" situation.<sup>9</sup>

There is no shortage of trailblazing examples across a variety of other industries. The one big point that bears underlining: edge intelligence—and the hardware that powers it—is not a digital phenomenon that benefits only high-tech companies.

## Hardware at the edge

The levels of insight and control that are the hallmarks of the outcome economy are only made possible through the integration of hardware with existing capabilities. Cloud-based software analytics and visualization technologies, along with hardware sensors and increased computing capabilities at the edge, are all necessary components in the outcome economy. As intelligence moves steadily and rapidly toward the network's edge, it effectively builds a bridge of data-rich feedback loops that span the "last mile" between customers and businesses. Companies that incorporate this next generation of edge intelligence are seeing their performance per unit cost soar.

Just one quick example: Nest, the intelligent home products company, pushed new software to its Nest Protect devices and consequently halved the incidence of false fire alarms—delivering greater safety and trust outcomes to its customers. The company's smoke and carbon monoxide alarms

featured embedded, low-cost, but dormant humidity sensors. Armed with aggregated anonymous data from hundreds of thousands of its deployed devices, Nest was able to refine and improve its detection algorithms. But, to do so, it needed humidity data. So the next software update sent to products in the field activated the dormant humidity sensor and improved the performance of the installed devices.<sup>10</sup>

Having this bevy of sensors in a device such as a smoke alarm would have seemed fiscally irresponsible just a few years ago, but as unit shipments have soared, the cost of sensors has plummeted. Between 2006 and 2013, shipments of micro-electromechanical sensors (MEMS)—analog microchips for measuring things in the real world—for consumer devices have grown at 32 percent year-over-year to eight billion units.<sup>11</sup> In four years, the Samsung Galaxy smartphone went from having three sensors in the first-generation model in 2010 to 10 in the fifth-generation model in 2014.<sup>12</sup>

Sensors are also getting more sensitive and significantly less expensive. In mid-2014, Broadcom released the WICED Sense Development Kit. The kit includes a full software development stack, a mobile app to view real-time sensor data, and a device the size of a key fob with five MEMS: gyroscope, accelerometer, pressure, humidity, and temperature—all of which retails for \$20.<sup>13</sup> Other embedded and expandable solutions such as Raspberry Pi, Intel Galileo, and Marvell Kinoma also help makers embed sensors in just about anything so they can rapidly prototype and create new hardware-centric products in far less time and at much lower cost than ever before.

## Cresting the hurdle of hardware

Leading businesses, large and small, are using hardware and its ability to bring them closer to their customers as a differentiator and as a way to enter new markets.

But what exactly is meant by “hardware”? In this context, the definition is not confined to traditional IT categories—servers, networking gear, PCs, and so on. The concept is far broader than that. It includes the IoT and devices that range from smart washing machines, wearables, and security cameras to autonomous cars and intelligent buildings.

Today's hardware offers capabilities that parallel the advancements that were made in software more than a decade ago and amplified in the as-a-service world. It is not a stretch to say that as intelligent hardware becomes cheaper to create and easier to integrate, it is effectively becoming the new software. In our survey, nearly two thirds (64 percent) of respondents indicated their company was either using or experimenting with emerging channels such as smart objects (parking meters, smart appliances, robots, etc.), connected TVs (68 percent), and connected cars (59 percent) to engage customers.

Hardware is indeed becoming much easier to make: it can be designed, produced, and distributed by small teams with significantly fewer resources than what was required just 10 years ago. Sociometric Solutions, a social-sensing analytics firm that helps service-based organizations improve productivity and drive sales growth, has experienced this firsthand. In 2005, when the company was a Massachusetts Institute of Technology Media Lab startup, its founders had to write their own operating system for the name-badge device whose embedded sensors can track a person's location, interaction, body movement, and speech dynamics.<sup>14</sup> Eight years later, when the company redesigned its badge as an independent startup, it was able to use an embedded Linux kernel and add modular capabilities to the software stack, enabling development to happen four times faster at less than half the cost.<sup>15</sup> LIFX, an Australian connected lighting startup, went from concept to hardware, firmware, and software to shipping in 12 months.<sup>16</sup>

Today, there are more and more resources to help enterprises master the hardware dimension of the outcome economy.

Many manufacturers and manufacturing services companies are setting up specialized units with this in mind. Hardware accelerators, just one segment of this movement, are launching at an astonishing pace: at the start of 2013, there were three top-tier hardware accelerators globally; just a year and a half later, there were 15.<sup>17</sup>

For example, PCH is a provider of end-to-end product development and supply chain solutions. In 2013, the company launched Highway1, a hardware accelerator designed to help hardware startups navigate the complexities of launching a new product. Hardware accelerators such as Highway1 and competitor Flextronics' Lab IX are making it possible for startups, many of which are crowdfunded, to deliver products to their customers on time and within budget.

The "crowdfunding factor" is important to the development of intelligent hardware. Between 2011 and 2013, there were 443 hardware campaigns on Kickstarter and Indiegogo that raised more than \$100,000 apiece. Nearly 10 percent of those have gone on to raise venture capital, averaging an initial

investment of \$8.7 million each.<sup>18</sup> In fact, many new companies are using their seed rounds of funding to launch highly professional crowdfunding campaigns in order to gain valuable insights about product/market fit and test pricing strategies. A handful of notable examples are: Scanadu, Misfit Wearables, Oculus VR (Oculus was later acquired by Facebook for \$2 billion), Canary (home security), and LIFX (smart light bulbs).

Large, long-established enterprises are already active participants in the push to make hardware more accessible, usable, and results focused. GE is an investor in Quirky, an acclaimed marketplace and crowdsource design community, building both smart (connected) and traditional products. For its connected products, Quirky has launched its own connected device platform, Wink—a type of standards and certification body with its own hardware hub that enables smartphones and other devices to connect with and program Wink-compatible products as well as smart products from more than a dozen other brands.<sup>19</sup> This not only provides a way for devices from dozens of previously

isolated or siloed brands to interoperate, but also makes it easier to build capacity for intelligence at the edge.

With every new intelligent device and every new industry group supporting hardware development, the promise of the outcome economy comes that much closer.

## Signposts of transformation at the edge

One of the most significant markers of the shift toward hardware on the edge is the coalescing of standards for inter-device communication. Companies that are keen to engage in the outcome economy now should tune into the standards discussion and decide where they want to participate in defining the future of their industry and others. Sitting on the sidelines at this stage will mean allowing others to define the way businesses will compete in the future.

It's no exaggeration to say that a standards war has erupted. Prior to 2014, the only large-scale standards body in the IoT space was the AllSeen Alliance, promoting and expanding the use of AllJoyn, a software framework and core set of system services that allow edge devices to communicate. In 2014, a half-dozen more industry groups, certification bodies, and standards organizations joined the fray. Several focus on the connected home, while others concentrate on industrial applications at various levels of the stack.

It's still too early to tell which consortia will have the most influence over the long term. But, the fact that so many groups are coalescing in the first place underscores the importance of the role that intelligent hardware will play in our collective future. Enterprises must not wait for a clear winner to emerge, as the standards landscape will likely be fragmented for many years. The key will be for each company to join the consortium that best fits its digital strategies and to learn by collaborating with fellow participants.

## What businesses must do next

Of course, with every step forward by a Tesla, Monsanto, or hardware startup, customers are conditioned to expect more. Yesterday's automobile firmware upgrade will become tomorrow's baseline expectation.

The shift toward the IoT powers the outcome economy and prioritizes data-rich feedback loops that help companies get to know the outcomes that their customers want and improve performance on the metrics that matter. Today, most companies still make tools that their customers have to configure to create the outcomes they desire. These tools are usually functional, but they often require much more work to satisfy the real needs of customers—such as customizable off-the-shelf software that still requires a team of developers to configure and maintain. Now, for the first time, companies can gain quantifiable, end-to-end insights into the outcomes their customers are trying to achieve and use those insights to develop significantly more effective products.

To take advantage of these new capabilities, businesses need to start by re-evaluating their customers' intended outcomes. They must establish feedback loops wherever their customers create value. Then, they need to incorporate the resulting insights into their business processes and product management systems.

To begin, businesses would do well to map feedback loops throughout product and service lifecycles, paying special attention to how many steps away from customer outcomes the farthest collection points are located. The goal is to move feedback loops as close to customer outcomes as possible in order to figure out what the desired outcomes are and how to influence them. Acting on these insights will help to refine the critical data that needs to be collected and the types of hardware that need to be in place to take action—either through mobility or app solutions (informing a person at the right time) or machine solutions that automate corrective actions.

When adding new hardware, companies can develop the competency to build it themselves, as Nike did with FuelBand, or they can partner with or acquire companies as Google did with Motorola, Nest, and Dropcam.

In many cases, new hardware solutions, or the integration of sensors in existing hardware, will help to push the edge of the network closer to the customer. In more challenging cases, new partnerships or acquisitions might be required to enable new capabilities at the edge—and to unlock the greatest of opportunities, wholly new business models may well be necessary.

The possibilities are far-reaching and can play out across industries. Consider the utilities sector, for instance. Companies such as SolarCity are going beyond the meter to own, install, and operate infrastructure on their customers' premises. They have end-to-end insights and control over the outcomes their customers want.

In doing so, SolarCity gains long-term, stable cash flows and removes the customer payback risks of renewable energy by guaranteeing economic outcomes up front.<sup>20</sup> In fact, SolarCity has been so successful that utilities are starting to see its business model as a threat to their survival.

The IoT transition presents an opportunity for utilities and their regulators to pursue a future where the edges of utility networks stretch beyond the meter and into the homes and businesses of their customers. This transition could simultaneously offer utilities more control over the grid, while also delivering improved outcomes for customers and the environment. Consider Facebook's Open Compute Project, an open initiative to crowdsource the design of energy-efficient servers for data centers, which was able to realize \$1.2 billion in energy savings for Facebook.<sup>21</sup> If utilities could manage infrastructure on their customers' premises, it might make sense for them to form, say, Open Furnace and Open Air Conditioning projects, delivering the outcomes

that customers want, as well as the end-to-end control that utilities need to conserve energy, manage the grid, and build robust demand response infrastructure.

This hypothetical opportunity offers a glimpse of how disruptive companies can be when they nudge the edges of their networks just a step or two closer to their customers. When companies gain end-to-end feedback loops that extend all the way to the intersection of the digital and physical worlds, true disruption can occur. This is the value unlocked by the outcome economy.

## The hardware imperative

The outcome economy upends long-held notions of how superior products and services are defined. Delivering customer outcomes is a strategy for sustaining competitive advantage today; it will be a turnaround strategy in the next few years, and a survival strategy beyond that.

Hardware at the edge is absolutely critical to this capability and a competency that business leaders must strive to attain, no matter the industry. From now on, hardware will no longer be an afterthought—it will be part of the DNA of every business.

This new capability in hardware will not only add another layer of insights, but will also help businesses better understand the context in which their customers are operating. This combined benefit will empower managers to make decisions that directly impact customer outcomes. Of course, one company cannot do it all—the new leaders will be those that can consistently collaborate with others to deliver excellence across a spectrum of capabilities that include hardware. Seventy-seven percent of our Vision survey respondents are already strengthening their digital businesses by taking part in open innovation initiatives, using APIs to exchange data, and leveraging technology platforms to deliver better outcomes to partners and customers. The companies that make those kinds of connections—literally and figuratively—will outrun their rivals today and thrive for a long time to come.



77%

Are taking part in open innovation initiatives, using APIs to exchange data and use technology platforms to deliver better outcomes.

Accenture Technology Vision 2015  
Survey

## YOUR 100-DAY PLAN

In the next three months, focus on taking an inventory of where your business stands, so you can be more strategic over the longer term.

- Catalog the outcomes your customers are trying to achieve and map those outcomes to current product and service offerings.
- Take an inventory of hardware at the edge of your network; chart the proximity of this hardware to the customer outcomes cataloged earlier. Use the intersection of these two mappings to highlight opportunities to use hardware at the edge for new feedback loops. Determine if any of these solutions are repeatable across products and services.
- Evaluate existing product and service feedback loops by drawing process diagrams for your top 10 offerings, taking careful note of how many steps away from customer outcomes your furthest data points are located.
- Identify which Internet of Things (IoT) consortia might be ideal to accelerate the hardware

ambitions of your business and your ecosystem of partners; reach out to some existing members to discuss the benefits of participating.

- Build a competitive threat matrix that is focused on nimble startups. Look at the way they use intelligent technology at the edge to compete for your customers. Use what you learn to either inform your acquisition strategy or propose new initiatives that will provide best-in-class insight on how to help your customers achieve their goals.
- Identify opportunities to add sensors or other hardware to existing products that will enhance business insight on what customers are trying to achieve. Evaluate options to transform product companies into product-service hybrid companies, with important data-based information services.
- Launch a company-wide innovation challenge to solicit ideas from your workforce that will highlight opportunities to migrate from products to services and services to outcomes. Identify at least three new business models to pilot.

## YOUR 1-YEAR PLAN

By this time next year, be prepared to embark on a hardware project, add sensors to existing solutions, and have pilot projects that can demonstrate insights gained from a closer relationship to customer outcomes.

- Model the impact of transitioning to outcome-based revenue streams. Evaluate a roadmap and pilot the transition of at least one offering or suite of offerings to outcome based.
- Evaluate your ability to deliver hardware solutions at the edge and acquire or partner with organizations to fill capability gaps.
- Appoint an outcome-driven innovation champion to work with product managers to uncover ways products can be refined to meet unmet customer needs.
- Pilot an outcome-based offering with a close customer and create feedback loops within its business processes that provide near-real-time insights on the outcomes your product is delivering to their business.
- Look outside of your company for data sources that will enhance your understanding of what your customers are trying to achieve.
- Create a multiyear roadmap for integrating more hardware and feedback loops with existing products and services.
- Develop an ecosystem strategy that will allow you to work with a portfolio of potential partners. Evaluate if there are opportunities for disruptions in your industry by moving up the value chain with hardware-based outcomes.