

Will IoT technology bring us the quantified employee?

The Internet of Things in human resources



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Deloitte's Internet of Things practice enables organizations to identify where the IoT can potentially create value in their industry and develop strategies to capture that value, utilizing the IoT for operational benefit.

To learn more about Deloitte's IoT practice, visit <http://www2.deloitte.com/us/en/pages/technology-media-and-telecommunications/topics/the-internet-of-things.html>.

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Introduction

WORLD-CLASS athletes track how far they run, how much weight they lift, how many calories they ingest, how much sleep they get, and even how much oxygen they consume. By measuring and monitoring these variables, athletes can optimize their performance, shave seconds off their time, and gain a competitive advantage on the field. And technology that collects information and offers quick feedback helps these athletes conserve energy, keep track of daily workouts, and determine their peak performance times.

While few of us face such pressure on a court or track or field, Deloitte research¹ suggests that we are all operating as “corporate athletes”—dealing with too many decisions, too many emails, and too many meetings in not enough hours (two-thirds of all businesses characterize their employees as “overwhelmed”²). We, as businesspeople, need tools to track our own productivity just as badly as athletes.

The desire to quantify, measure, and monitor ourselves has spawned an entire industry, with companies developing wearable computing devices, fitness trackers, and mobile communication tools at a fevered pace. Consumers bought more than 45 million wearable devices and fitness trackers in 2015, and analysts

expect demand to grow by more than 45 percent annually through 2019, becoming one of the fastest-growing technology markets.³

What are these wearable devices doing for us? They are giving us information on our exercise, sleep, movements, diet, and pulse, creating the *quantified self*,⁴ powered by an architecture of technology referred to as the Internet of Things (IoT).

But when the quantified self arrives at the office, does he or she become the *quantified employee*? Many employers would hope so: With oceans of data from workers’ wearables, HR departments could aim to create more pleasant and efficient work environments by looking at productivity, patterns of communication, travel and location trends, and how teams work together. But there are real obstacles to enlisting a workforce into this effort, beginning with the fact that employees aren’t necessarily comfortable giving their bosses unrestricted visibility into their movements and more.

As we as consumers spend more and more money tracking ourselves, it’s a safe assumption that most of us wouldn’t mind using fitness trackers and smartwatches to give our 9–5 lives a boost as well. The big question is whether we’re ready to give our *employers*

access to this information, unleashing details about where we are, what we do, and with whom we do it. The growth of disciplines such as organizational network analysis and people analytics⁵ clearly shows that employers are interested, and every day they look at new and innovative ways to help us quantify what we do at work.

As the market for the quantified employee grows, fed by a focus on productivity, fitness,

wellness, and improving the work environment, two key questions come to the fore:

- In what interesting ways can employers use employee-driven IoT technology to solve problems and improve work processes?
- How can employers overcome resistance and persuade workers to willingly become quantified employees?

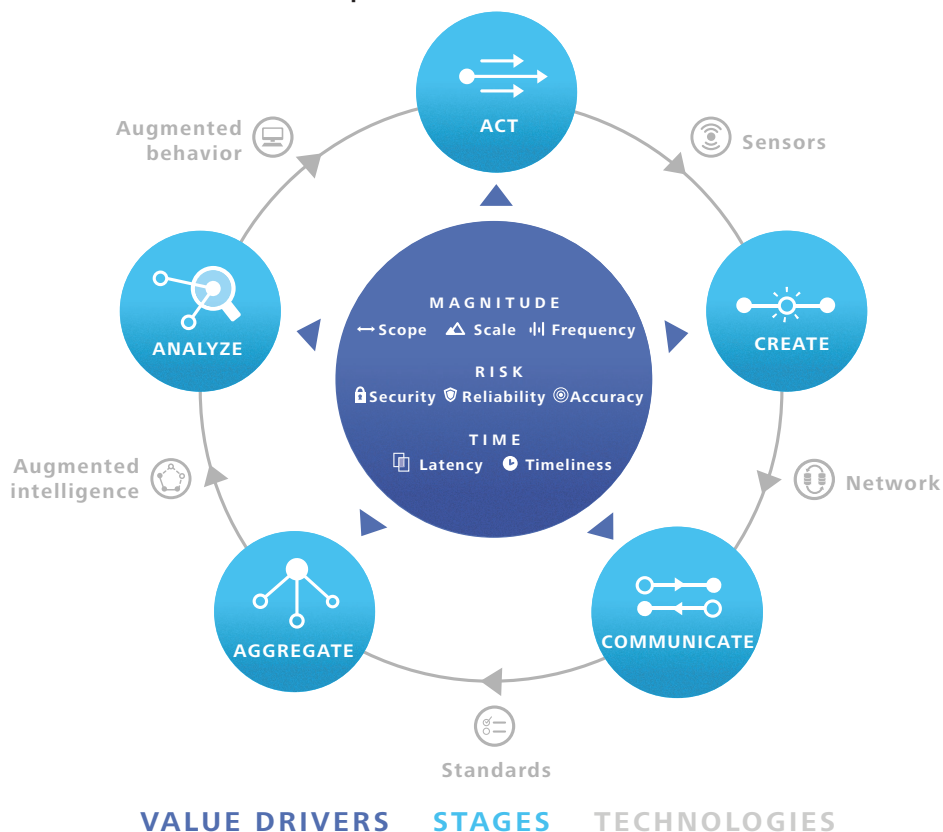


The IoT's flexibility

FOR most, the term *Internet of Things* calls up visions of consumer products such as connected thermostats or smart washing machines, or of companies installing data-capturing sensors to monitor unmanned facilities. Underlying any of these seemingly simple gadgets is an incredible network of sensors,

communication technologies, and analytic power. The IoT is a technology architecture connecting the technologies together to perform actions, a way of stitching together many different types of technologies in a specific way in order to do something new.⁶ Regardless of the specific technologies in any particular IoT

Figure 1. The Information Value Loop



Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

application, the architecture—the way those technologies are connected—is described by the Information Value Loop depicted in figure 1.

The fact that no particular device or piece of technology defines the IoT makes it remarkably flexible. IoT technology has applications for consumer wearables and in the home—and in every industry and sector, both visible and behind the scenes. That wide range of uses is driving serious growth projections: Research suggests that manufacturers shipped 1 billion IoT devices in 2015, and analysts predict that the market will grow over 3,000 percent in four years.⁷ Already, organizations are placing IoT-based devices far and wide: cameras that watch traffic, stress gauges that monitor bridges, thermostats that monitor and regulate temperature—almost everywhere but in the office.

Reflecting executives' increasing recognition of IoT technology's demonstrated value, analysts estimate that almost 60 percent of the market will end up in corporate or business applications.⁸ For example, IoT sensors placed throughout a factory can determine when machines require maintenance or alert plant managers if temperature or humidity levels are too high for sensitive processes such as painting or mixing ingredients. One chemicals company struggled with unplanned downtime due to multiple failures of process equipment, occurring 90+ times per year, hurting production, driving up overtime labor costs, and frustrating workers. Once the company installed IoT sensors—along with predictive data analytical models—it reduced equipment downtime by 80 percent.

In business as well as consumer applications, increasing efficiency is only one angle for IoT technology, and it seems a natural next step to look to instrument and augment human workers themselves. After all, plenty of employees already wear smartwatches and carry smartphones—and, when in the office, don lanyards with ID badges that open doors and allow access. (See sidebar “Measuring humans at work.”)

MEASURING HUMANS AT WORK

With more than 250,000 professionals serving clients all over the world, Deloitte has many opportunities to experiment and use these tools. Consider how sociometric badges helped Deloitte Canada redesign its work environment.

Increasingly, business and HR leaders see the work environment as a major driver of productivity and engagement and are moving to align research findings with actual workspaces. For instance, research shows that many people work best in small teams, so companies are knocking down walls, adding coffee bars, and creating open offices all over the world.⁹ (Of course, this isn't universal: Some studies show that these moves actually reduce productivity for introverts.¹⁰)

Deloitte Canada recruited a set of volunteers to wear sociometric badges—measuring location, voice, and movement—to assess which aspects of work were positive and negative. The devices could hear voice tones and deduce when people were under stress; the data-based system correlated factors such as “who is in the meeting,” “how much time are we spending together,” and even “who is pushing back in his chair” with employee stress levels and other measures of productivity.

The results of the project gave Deloitte Canada the following insights:

- Cross-disciplinary teams are higher-performing and more engaging than when service lines work alone (on many accounts, Deloitte often has consulting, audit, and tax professionals working independently).
- Offices with more windows and more light promote more “happy people” than spaces that are more closed-in and private.
- Large conference rooms are more conducive to positive meetings than small conference rooms.
- People tend to prefer to work in smaller groups, and working physically closer to others increases enjoyment and productivity. (MIT management professor Thomas Allen established this in the late 1970s, codified in the so-called Allen curve.)

Deloitte Canada used these findings, and others, to redesign all of its major offices and teams.

The rise of people analytics

AS the quantified self enters the workplace, leaders must contend with a deluge of data, determining which information is most relevant and useful—and what data-driven responses are in workers' best interests as well as management's. Increasingly, organizations are practicing *people analytics*.¹¹

Of course, analyzing worker performance is hardly new—companies have looked to measure employees for more than 200 years, long before the advent of HR departments and industrial psychologists. In the late 19th century, mechanical engineer Frederick Winslow Taylor¹² set out to measure the movement and behavior of ironworkers in steel mills,¹³ aiming to figure out what would increase organizational productivity. As an industrial engineer, Taylor thought about people primarily as machines and therefore measured factors such as the amount of weight they could carry and what path they should follow to optimize throughput at the plant. He concluded, for example, that for maximum efficiency, grown men should carry exactly 65 pounds of pig iron: More weight causes fatigue and accidents, while less wastes time. Taylor's work typified business thinking in the industrial age, when few managers took a holistic view of their employees.

Taylorism fell out of favor by the 1970s—about the time when computers began taking over

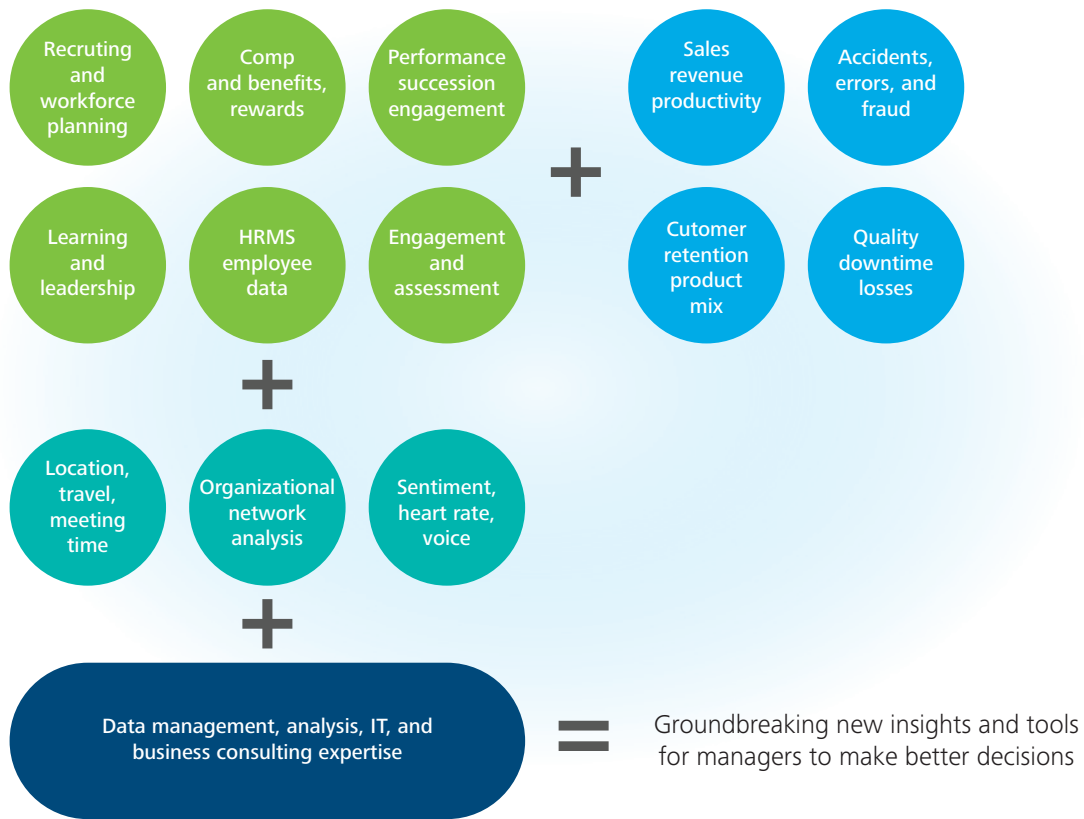
the workplace, aiding payroll and HR management systems in particular. HR departments started warehousing data, and many large companies began looking at the relationship between pay and turnover, patterns of progression for high-performing leaders, and other measures of organizational success. Computing power and sophistication have, of course, exploded since the early days, and HR is finally taking advantage: Adoption and maturity of people analytics have nearly doubled this year alone.¹⁴

HR strategists originally conceived people analytics as a way to correlate information such as employee engagement, performance ratings, and other work-related activities, and IoT technology is fundamentally changing its practice (see figure 2). By gathering data about workplace activities that were previously invisible to both managers and employees alike, companies are able to use an ever-widening range of information to help make the business run better.

The quantified employee gets connected

Companies are finding any number of ways to incorporate IoT applications and people analytics into business today. (See figure 3.) Consider the following examples:

Figure 2. The context of people analytics has changed

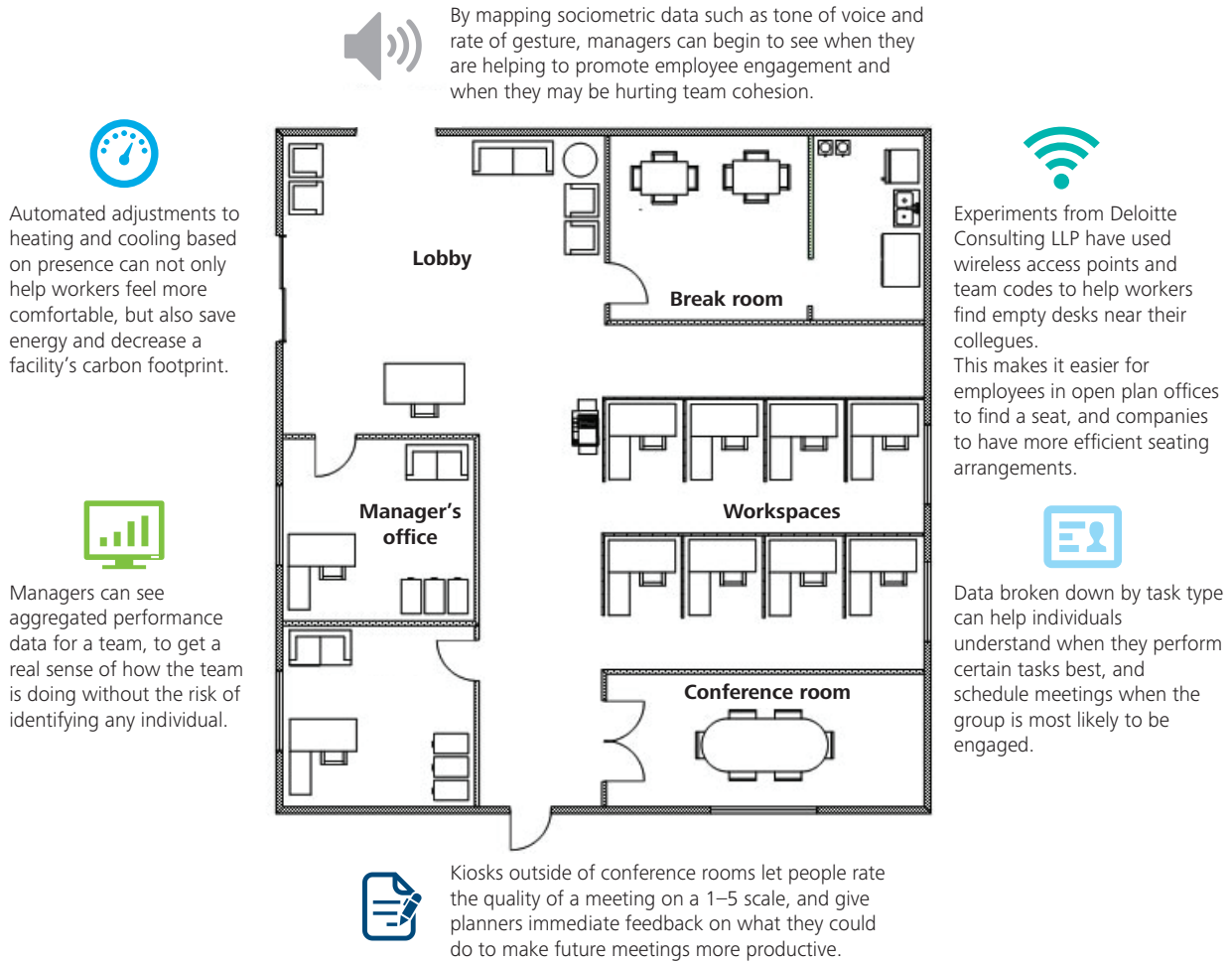


Source: Bersin by Deloitte.

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- Many package delivery companies now install sensors on trucks to monitor parameters such as speed, direction, braking, the health of certain drivetrain components, and even driver seatbelt use.¹⁵ Working with planning software, analysts can use this data to automatically plan hyperefficient routes that eliminate left turns, reduce wasteful idling, and even arrange for maintenance only when it is needed. In one year alone, an IoT-based system helped UPS cut idling time by 15.4 million minutes and delivery routes by more than 1.7 million miles, saving nearly 200,000 gallons of fuel.¹⁶
- Several health care providers and many retailers now offer employees fitness trackers and wellness apps that give employees the opportunity to share their calorie-counting, flights of steps walked, and other fitness activities with team members, creating competitions for healthy living and exercise. These tools are often found to have a positive impact on individual performance and well-being.
- HR is well aware how contagious social ills such as compliance risk, fraud, and toxic employee behavior can be—that when someone is behaving poorly, those working closely with or sitting near him may well follow suit. Therefore, by monitoring and analyzing personal behavior such as location, tone of voice, email traffic, and other parameters—much of which IoT applications can aid—companies can understand where “conduct risk” may lie within the organization and take steps to mitigate it.

Figure 3. Possible IoT applications in the workplace



Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

For financial services firms, where small cultural changes in what is acceptable can lead to regulatory crackdowns or questionable trades, such tools can help not only improve workplace morale but stave off threats to the company's very existence.¹⁷

- MIT computer scientist Sandy Pentland developed badges with sensors that capture more than 100 data points on how people interact, from how often they have face-to-face interactions to more subtle cues such as tone of voice and how much they gesture, listen, or interrupt.¹⁸ His team found, for example, that bringing call-center workers

together for lunch at the same time (typically they are staggered so people can stay on the phones) significantly improved productivity: Communication between employees rose 18 percent, stress (as measured by tone of voice) dropped 19 percent, and most importantly, the call completion metric improved by 23 percent.¹⁹ Industry is increasingly looking to apply these principles to everyday work. Hitachi, for example, has been “instrumenting” its employees with smart badges for years and now offers a range of employee “happiness monitoring” tools to other companies.²⁰

Will IoT technology deliver value to employees?

If IoT applications have the power to fundamentally alter how organizations measure and improve themselves, they also bring challenges that companies may not yet be equipped to handle.

Experience shows that workers worry that their employers may use personal monitoring against them. Research shows that almost 75 percent of employees believe their employer is capturing data about them without their knowledge,²¹ so people are wary and a little worried. Consider the UPS delivery system discussed earlier: Yes, tracking has increased efficiency, saved time and money, and reduced environmental impacts, but for many drivers, the constant reminders from managers to brake less often and avoid idling or reversing the truck felt like Big Brother surveillance, ultimately reducing employee engagement.²² While the drivers' contract prohibits managers from disciplining drivers based on telematics data alone, monitoring inevitably generates frustration and stress.²³

This situation is hardly unique to delivery drivers. In every industry, if employees feel that a new technology or management system provides no real benefit to them, they may avoid using it or even actively undercut its adoption. The challenge, then, is to design workplace IoT applications to offer employees obvious, tangible value—even though developers' ultimate aim may be to improve performance efficiency.

Instrumenting workers is fundamentally different from attaching sensors to machines.

Consider sensor-data driven auto insurance rates. Insurers offer dongles that plug into a car's onboard data port and report back data on speed and braking velocity; this data helps set rates based on individuals' real driving performance rather than relying on generic actuarial tables. The benefits of a more accurate valuation of risk are clear to the insurer, less so to the insured. While some particularly cautious drivers might expect a reduction in rates, others will likely suffer a corresponding increase, and since no driver can be certain of paying less, most consumers will see no clear benefit from adopting telematics-based insurance. In fact, because people generally overvalue potential losses, there may even be a slight disincentive, which may help explain why 47 percent of the US driving population is skeptical of this type of insurance under any circumstances²⁴—and why insurers looking to accumulate more data may have to entice customers with discounts, at least at first. (For much more on auto insurance and IoT technology, see our article *Opting in: Using connectivity to drive differentiation*.²⁵)

The only segments proactively taking advantage of telematics-based insurance are those that do see some benefit from it: In the United Kingdom, teen drivers, with insurance rates nearly three times the average, have

plenty of incentive to adopt the technology—so long as they do in fact drive responsibly.²⁶ (For more detail on how perceptions of value impact technology adoption, see our article *Power struggle*²⁷ or listen to the podcast.²⁸) To effectively use IoT technology—not only in the workplace but everywhere that requires user buy-in and compliance—it is important to make clear the benefits of that technology to users, whether customers or employees.

And framing an IoT-aided efficiency gain as an employee benefit doesn't have to be difficult: If instrumenting UPS delivery drivers generates data that reduces their driving time by even one minute per day, that translates into a \$14.5 million annual savings.²⁹ If a company were to pass on even a portion of such savings to employees as a bonus or salary increase, it would likely help align drivers' motivations

with organizational priorities, making monitoring a little less ominous.

And value to the employee hardly needs to be limited to financial rewards. There's obvious, visible value in making a job easier, faster, or safer. Take firefighters, for example: By instrumenting each firefighter, not only can on-scene commanders more effectively deploy people at a fire—an IoT-driven system can automatically, instantly alert individuals to conditions those people might not sense or to dangers such as an impending building collapse. As firefighters approach a crash involving an IoT-connected car, the vehicle's sensors could communicate with the firefighters, helping make real-time decisions about rescue procedures. Very few of us work just for money, and IoT applications can offer very real opportunities for improving work both in the office and in the field.

Designing a quantified work environment

IN or out of the workplace, data fuels the IoT, and the value of the technology and applications depends on that data being useful, valid, and plentiful. Too little information—or the wrong information—can generate misleading and unhelpful analysis; too much data poses the drinking-from-a-firehose problem, leaving managers staring at columns of figures with little sense of how to prioritize or act.

With employee buy-in, IoT sensors can offer data analysts an embarrassment of riches: information as simple as how many daily steps a worker takes (and where and when) to complex sociometric measurements of her emotions and tone of voice in different workplace situations. Before equipping an entire workforce with smartwatches and connected ID badges, you should carefully consider your goals: What problem are you trying to solve? Begin with the business problems you want to solve first, and then decide what data you need.

Now: How to get the data you need? Again, many employees are reticent—justifiably so—about becoming quantified, giving their bosses unchecked IoT-aided access to their movements, meetings, and conversations. As U.C. Berkeley management professor Morten Hansen puts it, “The quantified self is perverse.”³⁰ Promises of confidentiality notwithstanding, once potentially compromising data is in the system, can any employer guarantee that the information will never, ever

be invoked during an annual review? Hansen recommends that employers aim for “less data, less but better feedback, focus and selective behavior change. Quality, not quantity.”

Consider one employee monitoring study, at a large American insurance firm, in which some employees were monitored while performing their daily job duties while others were not. When it came time for workers to review their own individual performance, 80 percent of those in the monitored group identified production *quantity* as the most significant factor in their self-evaluation, while 85 percent of the unmonitored employees singled out *quality* of customer service and teamwork.³¹ Focusing on metrics actually lowered service quality.

If the company had simply announced, “We are going to start a project to understand how we can help you improve productivity and service, by analyzing what types of support and activities create the most value,” employees might have responded differently. Indeed, they may have been willing to collaborate by suggesting particularly relevant IoT-driven metrics, based on their daily work experience.

Remember also that accumulating high-quality data often requires capturing information over an extended period of time. During certain times of the year, month, or season, employees’ responsibilities may radically shift—not to mention their behavior near the

Figure 4. Designing a quantified workplace



Source: Deloitte analysis.

Graphic: Deloitte University Press | DUPress.com

end of a stressful quarter. Daily workplace activity and performance during the summer may scarcely resemble those in the fall, meaning that you may need to collect data over as long a period as possible.

As professionals in the people analytics or employee engagement area know all too well, statistical validity and reliability are paramount—and an ongoing challenge. Suppose you collect data about employee travel and work behavior and come to a conclusion about what drives sales productivity or another business metric. If the data set is not statistically reliable and tested, you may discover only that “high-performing salespeople like to travel a lot”—which may or may not be valuable information. As always, correlation is not causation.

Another reason to carefully plan data collection: avoiding the common problem

of multiple systems within an organization winding up with inconsistent, incorrect, and duplicated information. If you do decide, for example, to monitor employee location data or email metadata, it’s important to work with IT to ensure that you have a single, integrated source with solid privacy and security tools, along with strategies for data storage and distribution. Many HR organizations have not yet developed policies and procedures for data governance, which will likely be increasingly important as the current trickle of data becomes a flood. You should have a clear process for securing data, managing access, and holding people accountable for security and quality standards. Figure 4 illustrates leading practices for designing a quantified workplace.

Embracing the change

AS we move toward the quantified workplace, mistakes are inevitable: Remember that in the world of data analytics, we often must experiment to figure out the true meaning of particular data. It's key, as Google executive Laszlo Bock cautions, is to not trust your gut on what works and why—rather, we need to use data to predict and shape the future.³² As behavioral science research has shown, instinct may lead to good decisions but is prone to error. As seen in Sandy Pentland's experiments, counterintuitive measures such as increasing workplace break time can improve overall performance. Work to understand the needs of both your employees and the business, and use those as variables to create natural experiments within the collected data in which both outcomes can be met. Pilot programs, multiple tests, and replicated groups around the organization are all ways you can learn about the impact of your data—without spending a year or more on a massive, organization-wide project.

As data collection becomes more pervasive in a connected world, so does the potential for invasive overreach. You should, then, balance the analytical insights possible from individuated data with the need to protect privacy by aggregating data. For example, consider the annual employee engagement survey, which typically shows only team-level

data when there are six or more responses, and 360-degree feedback that is often given anonymously.

IoT technology compounds this problem, since the sheer bulk of data that sensors collect makes meaningful anonymization difficult. After all, it takes as little as four pieces of metadata to sufficiently identify an individual from digital exhaust.³³ So designers should build in security measures that—especially if a system offers employees access to some of their individual data to help manage their calendar or organize tasks—put in place meaningful technological and governance steps to anonymize data shown to managers. After all, with legal context on these issues still evolving, no company wants to face accusations of discrimination, whether knowing or unconscious.³⁴

Indeed, establishing trust between worker and employer is the linchpin of successful applications of the quantified employee. Constant and consistent communication is key: Clearly explain your goals, allow people to opt in or out of new programs, and make available channels for anonymous or open feedback about the program. Often, the biggest challenge is people's fear of the unknown, and you can ameliorate this by communicating clearly and honestly about what you are aiming to do and why—with regular reminders of how

workplace wearables can benefit employees as well as management.

And with IoT applications more common and wearable devices more popular, most people will become increasingly comfortable with the idea of being quantified, for wellness, efficiency, and more. Considering that at work, more than two-thirds of us feel “overwhelmed” by the pace and constant flow of information we have to process,³⁵ it will likely feel ever more natural to use related technology and applications in the office, aiming to make work easier and reduce stress.

The convergence of the IoT and the quantified self gives organizations an opportunity

to use data to help make work more productive and meaningful for both employer and worker. If organizational leaders carefully balance business needs with employees’ goals, privacy concerns, and lifestyles, they can solve workplace problems and make the company more competitive.

Sure, few of us have a real chance to become world-class athletes, even with a technological boost. But by giving people the data they need to accomplish real-world goals, we can all become champions in our offices and workplaces.

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