The future of work

Trusted partner for your **Digital Journey**

Atos

Preface

Once upon a time, work used to be clear cut. The organisation you worked for in 1980 could exist for another 70 years. Now, organisations exist no longer than 10. Technology creates new opportunities and strong reforms.

Blockbuster, Kodak, Neckermann and Barnes & Noble didn't make it. Companies like Hewlett-Packard but also Cisco and Microsoft are struggling with disruption, while startups and new business models such as Uber and Spotify conquer 'old' markets. It's difficult to move away from something that was once 'the norm'. Today, organisations find themselves in a constantly changing environment. If they don't adapt they don't survive.

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Preface

Universities, scientists and innovative companies continuously bombard us with technologies with exponential growth. And we need to respond to that. Organisations and people have to adapt faster, be more flexible and move away from old patterns.

To build an organisation fit for the future, you need new skills and perhaps a new culture. You also need 'fresh thinkers and doers'. Enter the Millennials, also known as the "omega generation": they are young, flexible and can't imagine a world without smartphones. They are the ones who will lead the existing organisation into the future.

'Reverse mentoring' becomes crucial: multiple generations leading the organisation to a new existence. Within an organisational culture where change is the basis for a 'hyper-connected' future.

'The Future of Work' takes you on an inspiring journey to all the factors that determine that future. Examples, case studies and interesting statistics give direction. Share this book with your colleagues and management and take the time to discuss it. Let the book be a source of inspiration for all, ensuring a movement in which people and meaningful work take centre stage.

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Introduction

The businesses of the 21st century face incredible challenges and opportunities.

Unlike the pen and paper, snail mail environment of the Mad Men era, our digital, global, 24/7 business culture demands adaptation, flexibility, and foresight, pushing best practices far beyond the status quo. The human resources, management, and organisational structure of the past are simply not equipped to compete in this bold new era of global freelancing, small-team solutions, and bottom-up leadership.

It's not just that emerging technology allows the businesses of the future unrivalled opportunities to automate repetitive tasks, or that managers need to consider how to attract and retain mobile, global talent. Given the rapid pace of hard skill obsolescence, the need to keep employees healthy and happy, and the necessity to innovate and adapt instantly, the static hierarchies and cumbersome, outdated policies of the past simply have no place in the 21st century.

The future of work is innovative, flexible, and lean. Its employees challenge hierarchies, self-organise, and readily share ideas with their small teams. Its managers re-think everything from office furniture to wellness, enabling and empowering rather than ordering and controlling. Its smart offices sense employee mood and automatically take measures to reduce stress. And its hiring practices are shaped by the new realities of skill obsolescence and a global market of talent that can easily look elsewhere for work.

Top 10 trends we forecast

The most forward thinking organisations have already adopted many of these changes. We offer a careful look at their innovations so that you can share in their success.

What we discover is exciting. Here are just some of the trends we forecast for the next twenty to thirty years:

1. As millennials replace baby boomers in the workplace, traditional top-down organisation will give way to flat or horizontal structures of authority-less leadership. We expect that no less than 50% of the global workforce will be drawn from the millennial generation by 2050;
2. Small, flexible, ad hoc teams will self-assemble to tackle problems, modelling their activity on hackathons.
3. The managers of the future will operate without clear authority, enabling teams of equals to function smoothly by cooperating more and controlling less;
4. The majority of employees will work remotely, and many will have temporary or freelance contracts. This will increase the need for companies to adopt attractive policies as well as increase the competition for available jobs. Already, 25% of Americans report earning a significant portion of their income through freelancing;
5. Because of increasing skill obsolescence—measured at an incredible 4% per year—soft skills will be increasingly emphasised over hard, technical skills when hiring;
6. The HR of the future will attract and retain employees who are self-starters and life-long learners, flexible team-players who demonstrate creativity and drive. Rather than a specific skill set, these future workers will be expected to have mastered a variety of social and leadership skills, and they'll be expected to be avid self-learners;
7. Wellness programs will take on added significance, using wearables and complex systems of sensors to encourage relaxation and discourage stress. Forward looking organisations like the Houston Medical Centre have already instituted such programs;
8. Artificial intelligence (AI) will become a ubiquitous tool of business, doing much of the heavy lifting in routine tasks, freeing employees to focus on value-added work;
9. Automation and thinking machines will replace any work that is routine and repetitious. This applies, of course, to everything from factories to fast-food, but it also threatens millions of middle-class, white-collar workers as well. Bank of America forecasts that in the US alone, 47% of employees will cede their place to automation and AI;
10. We expect that advanced software like Blockchain will allow the growth of a new breed of decentralised autonomous organisations (DAOs), timeless businesses without managers, forever changing the way we do business. We've seen Uber crush traditional taxi companies in L.A. and New York, but that's just the beginning of this trend. Imagine an Uber for nearly any service, owned by nobody.

Drivers of change in the next decade:

44% Changing work environments and flexible working arrangements

26% Advances in computing power and big data

34% Mobile internet and cloud technology

23% Rise of the middle class in emerging markets

Source: World Economic Forum.

The workers of the future

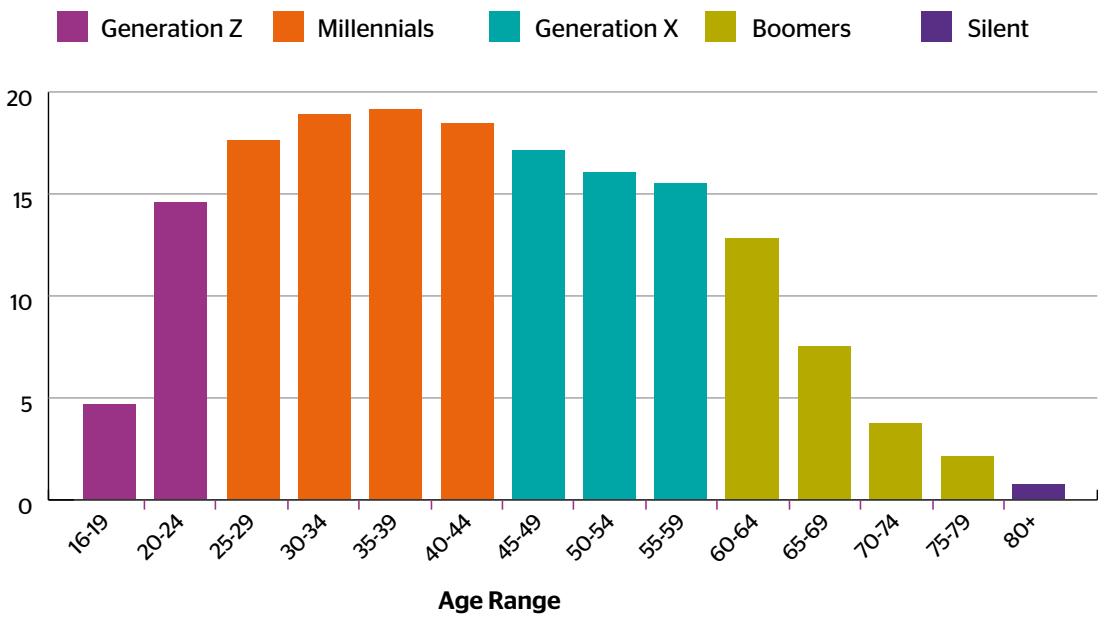
Millennials: the workers of the future

Perhaps nothing defines the future of work more those who will do it.

Estimated to be no less than half of the global workforce by 2020, the growing presence of those born between 1982 and 2002 is reshaping management techniques, communication, benefits packages, and the technology of the office. The future of work will be shaped by this new generation of employees, and as we'll see, they bring a great deal to the table.

The workforce in 2025

Projected size of US labour force (in millions) by age, for the year 2025



Source: Department of Labor | WSJ.com

The workers of the future

In the now globalised market for labour, successful 21st century companies will learn how to attract and retain these high-skill employees in an ever increasing battle for talent.

One challenge is that many businesses remain rooted in the past, paralysed by the discontent bred by culture clashes between generations and cohorts. These aren't differences driven by age as much as worldview; millennials represent a stark discontinuity from the attitudes of their parents. Managers will need to change their techniques to engage these new workers as they supplant baby boomers as the primary generation of employees.

For senior management, who are themselves likely to be members of the post-war baby boom, this may seem nonsensical. "Why change what works?" they ask.

The answer is as simple to understand as it is challenging to implement.

As the Ivey Business Journal reports, boomers offer their employers their vast organisational memory, optimism, and willingness to work long hours.

This stands to reason: they've been in the trenches for half a century and they now possess an intimate knowledge of the companies for which they work. Moreover, especially during their early careers, markets soared, business expanded, and wages increased; their optimism is understandable, especially in the US. And for most of them, their long hours translated into promotion, career success, and the comfortable life these can bring in their wake.

It's no surprise, then, that they see these characteristics as paramount in new hires as well.

But if they look for themselves in the new workforce, they'll be disappointed. Millennials were shaped in a very different context. New players at work, they're more aware of the limitation of strict, hierarchical organisation and outdated management models. Moreover, they came of age in an era of economic stagnation and recession; they can't count of the financial security the baby boomers take for granted. And for them, wages are not keeping apace of inflation—long hours are just that: hours not spent with friends and family.

This bears repeating: the future of work isn't a return to the values that brought the baby boom success; times have changed, and millennials are ideally suited to help business take advantage of that.

Consider that millennials are consistently better educated, more technologically fluent, and more capable of multitasking than previous generations. They are far more able to slide effortlessly between messaging, analysis, meetings, and research. They're the first cohort of workers to arrive with a more developed tech skillset than their managers; for them, broadband, social media, and mobile tech is old hat. They don't need to be trained to use the latest technology—they can train you! While they have high expectations for advancement, they also crave meaningful feedback and timely correction. And while they value work-life balance, they seek challenges and bring greater flexibility, confidence, and teamwork to the office.

That is, rather than seeing millennial attitudes as a problem, the managers of the future will reframe the inevitable as an advantage. Millennials are different: more skilled, more adaptive, more cooperative, and more tech-savvy. But they're also less hierarchical and independent, a sometimes strange combination. They have consistently shown a surprising ability to question authority at the very same time that they want to be managed—and for the increasingly nimble, small-team 21st century business, this is a tremendous advantage.

The workers of the future

That is, the differences millennials bring to the office are strengths—in the right hands.

How will the management practices of the future evolve?

Data

38% of millennials who are currently working said they were actively looking for a different role

18% of millennials expect to stay with their current employer for the long term

43% of millennials said they were open to offers

28% said that the work/life balance was worse than they had expected

41% say they prefer to communicate electronically at work than face to face or even over the telephone

52% said rapid promotion was the main attraction in an employer, coming ahead of competitive salaries in second place (44%)

Quick summary:

- By mid-century, millennials will make up about half the workforce.
- These new employees offer a stark contrast to baby-boomers:
- They're more aware of the limitations of hierarchical organisation;
- They're more tech-savvy and educated;
- They demand a more flexible workplace;
- They crave im mediate, substantive feedback; and
- They are less motivated by pay than promotion.
- Business will need to change to better attract and retain the talent of the future.

The future of management

The future of work necessitates a new breed of manager, leaders who ask questions, who challenge the status quo, and who are willing to leave the 'best practices' of the 20th century behind.

In part, this is driven by the change in who's working: 21st century workers will need a 21st century workplace. But this is also a product of a changing business environment, a global market in which the old ways simply can't compete.

Small is the new big

In the past, the sheer number of employees that a company had on its payroll could tell you a lot about its market share and capabilities.

This is increasingly outdated. The employees of the future are intellectually agile, skilled, and flexible: more like a team of commandos in the Special Forces than rank and file soldiers. You don't need many of these talented, motivated people to get the job done, nor do they need to be micromanaged to produce. Give them a problem and empower them to solve it!

As Atos observes in Journey 2020, the evolution of business organisation could leave these small teams as "the majority of existing staff."

The businesses of the future realise this and take advantage of these 'work multipliers,' much as the militaries of the West increasingly rely on these highly trained, flexible, smart, small teams for the most challenging missions.

Over the next ten to twenty years, managers will increasingly rely on small, flexible teams in business, adding talent as needed from a global pool of job seekers. Like a Formula 1 race car designer, they'll organise these small teams to maximise power and minimise weight, stripping their organisations to the bare metal in an effort to lean them down. Simplicity is key, and as Atos cautions, "successful and responsive businesses will need to leverage this community and crowd" to complement their elite corps of employees.

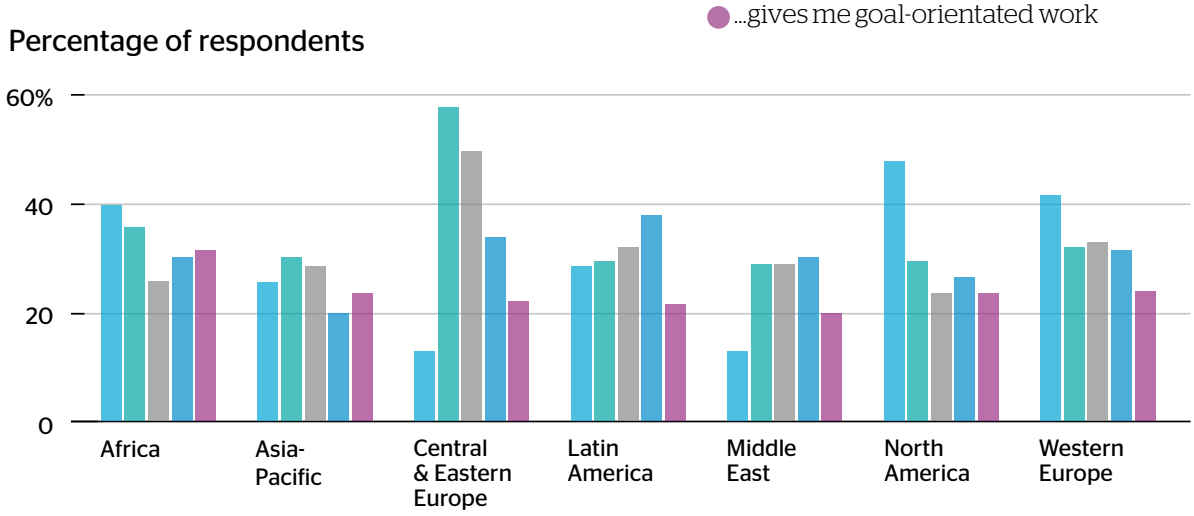
These managers of the future will also rely on technology to do the routine but heavy lifting of daily tasks: crunching numbers, collecting data, and organising HR. They'll save their talent for the work that counts, finding ways for their small, flexible teams to do more with less. If we flash forward twenty years, we'll see a much greater emphasis on remote work, meaningful real-time feedback, workplace flexibility, and constant skill building.

The future of management

The kind of manager millennials want

If you were able to choose your manager, which of the following would be most important to you? Someone who...

- ...empowers their employees
- ...is a technical or functional expert in the field they're managing
- ...sets transparant performance criteria and evaluates it objectively
- ...is a role model for me
- ...gives me goal-orientated work



Source: "Millennials: understanding a misunderstood generation" - hbr.org

The New York Times reports that workers are happiest when four needs are met:

Physical

through opportunities to regularly renew and recharge at work

Emotional

by feeling valued and appreciated for their contributions

Mental

when they have the opportunity to focus in an absorbed way on their most important tasks and define when and where they get their work done

Spiritual

by doing more of what they do best and enjoy most, and by feeling connected to a higher purpose at work

Let's look at some changes that can help secure these basic needs.

The future of management

Remote work

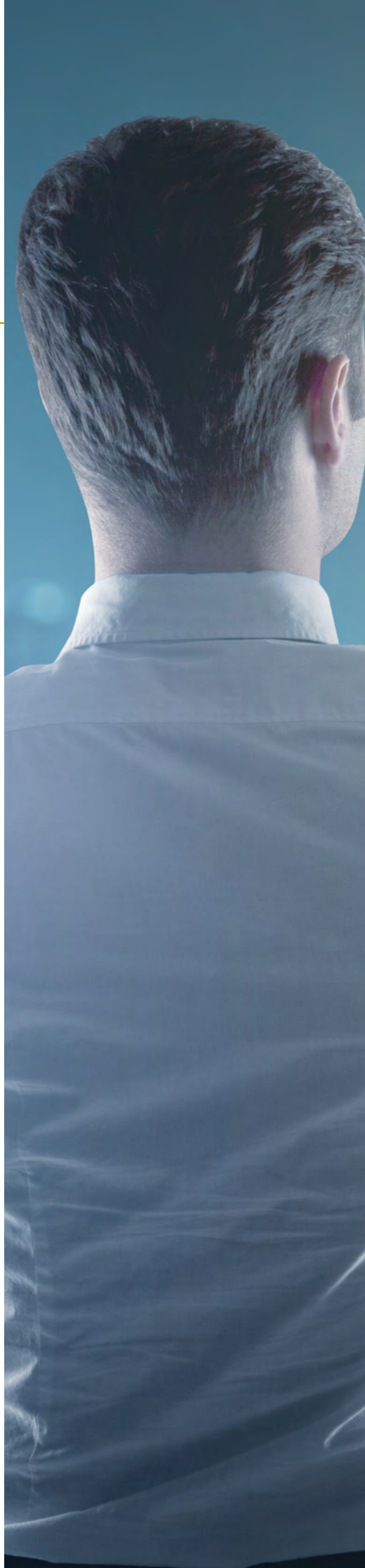
The managers of the future realise that it's more cost effective and efficient to allow employees to work remotely—to work where they like—and to have flexible hours—to work when they like. This new flexibility, more a change in attitude than technology at this point, has tremendous advantages for workers and companies:

- **Workers are happier.** They can dress as they like, take breaks as they please, and avoid irritating commutes. They can more easily care for their families and juggle busy schedules. When they need to be home for a repair technician, they can be. When they need to pick up a sick child from school, no problem. Overall, mental health improves and stress decreases.
- **Vastly diminished overheads.** When the office is virtual, there's no more rented office space, no more utility bills, no more cleaning teams, and no security or infrastructure costs. Workers supply their own equipment and their own space. The savings for companies evolving to virtual offices can be enormous.
- **Productivity increases.** People can work when they work best, take breaks when they need them, and avoid burnout more easily. When performance is based on output rather than time spent working, or quality of work rather than quantity of hours in the office, employees work smarter. According to Remote.co, remote workers reported a tremendous boost in productivity: "30% said that telecommuting allowed them to accomplish more in less time, while 24% of those surveyed said they were able to accomplish more in about the same amount of time." Those numbers are hard to ignore.
- **Recruiting and retaining talent is easier.** Workers increasingly choose flexible working arrangements over higher pay. That can help businesses attract top talent. And since there are no geographical limitations, it's much easier to match talent to need. In the increasingly global battle for high skilled workers, this advantage is everything.

This new business strategy has been adopted by Apple, for instance. This tech giant now employs legions of at-home customer service workers, allowing the company to embrace a global pool of job seekers. As a result, they've increased efficiency, productivity, and worker satisfaction.

"A recent Gallup report indicated that 37% of the workforce in the US is now telecommuting (up from 9% only 20 years ago!), and this number is projected to increase to 43% in the next year."

—Michael Solomon, co-founder of 10x Management



The future of management

The future of management

More frequent and substantive feedback

One change to management in the next five to ten years will be a move to more frequent feedback. In place of annual or semi-annual review, millennials work better when they receive more immediate, substantive feedback. They want to know now—in real time—when they need to improve, and rather than an overly general holistic review, millennials crave specific, directed criticism. Where do they need a change? How can they affect these improvements? What are you looking for that they're not providing—and how can you help them work better?

As Matt Hulett, chief product officer of TINYpulse, an employment engagement company explains, "Traditional annual performance reviews are inadequate." He told Business News Daily what was wrong: "They're biased towards recent work, goals aren't communicated clearly, there's misalignment in objectives between organisations and employees, and quite simply, the whole process just takes too long. With more and more ... workers wanting change, the time for a performance review system upgrade is now."

And according to the prestigious Harvard Business Review, more than a third of US businesses have abandoned traditional performance review for informal, immediate feedback. The list of companies who've embraced this new management technique is impressive: Adobe, Juniper Systems, Dell, Microsoft, IBM, Deloitte, PwC, Gap, Lear, Oppenheimer Funds), and GE.

> "Traditional annual performance reviews are inadequate."
>
> **—Matt Hulett CPO for TINYpulse**

Less concern with hierarchy

Research has demonstrated time and again that millennials are team-players. Formed in an era in of group work and team sports, millennials are better communicators and co-operators than previous generations. This means that they will readily accept and offer assistance, and also that they see strict hierarchies as outdated. **The top-down, information silos of the 20th century fail when brought up against the problems of the 21st century, and millennials are more focused on results than titles.** In fact, research demonstrates that they expect skills to win out over time in service, and are likely to form ad hoc teams of experts to solve emerging problems. **Millennials think that information hoarding, lack of transparency, and authoritarian decision making just don't make sense—and it's hard to argue with them!**

Organisations like Atos who have the greatest experience at the cutting edge of the developments recommend that businesses flatten their organisation to empower new leadership and build trust and flexibility, but they warn that the old organisational structures and information silos need to go! For employees wedded to the old ways of doing business, this will mean an uncomfortable process of adaptation. Nevertheless, the rewards are huge!

According to a study conducted by Puppet Labs, such "high-trust organisations encourage good information flow, cross-functional collaboration, shared responsibilities, [and] learning from failures and new ideas; they are also the most likely to perform at a high level."

The future of management

Advantages of hierarchical organisations	Disadvantages of hierarchical organisations
• Authority and responsibility are clearly defined	• Communication across various sections can be poor, especially horizontal communication
• There are specialists managers and the hierarchical environment encourages the effective use of these managers	• The organisation can be bureaucratic and respond slowly to changing customer needs and the market in which the organisation operates
• Employees are very loyal to their department within the organisation	• Departments can make decisions which benefit them rather than the business as a whole

Source: https://evonnsok.wordpress.com/category/organizational-structure/

That is, far from signalling failure, non-hierarchical organisation has been adopted by Automattic, developers of the wildly successful blogging platform WordPress. Taking this idea a step further, software maverick, Valve, has done away with bosses altogether, and since doing so the company has risen to superstardom.

Millennials are willing to embrace 'flat management' and they see no problem breaking the old rules: sharing their technological fluency with their managers—reverse mentoring the people who may expect to be in charge—or expecting to be constantly in the loop. To work well, they argue, we need to know. For millennials, this is a natural development of their collegial and team-oriented culture.

For baby boomers, however, this may signal a lack of respect or smack of insubordination. The businesses of the future, however, will find ways to navigate this culture clash by lessening the emphasis on 20th century organisational models.

Consider, for instance, that many of the tech industry's giants use hackathons as a form of employee-initiated organisational disruptions. The idea behind a hackathon is to bring people from different departments together to share ideas and act quickly upon them.

They are self-organised—managers don't order these all-night coding sessions. Instead, people with an idea come together across organisational boundaries and beyond normal working hours to brainstorm and create.

As Pedram Keyani, an engineer at Facebook, explains, "people started organizing hackathons as a way to collaborate with colleagues from different parts of the team to get their ideas working fast." He continues:

> "It's still up to anyone in the company to decide when we're going to have our next hackathon... Before every hackathon, we create an internal wiki where people can start brainstorming, plug their hackathon ideas, and find teams to help them execute. Hackathon projects are usually driven by cross-functional teams, with everyone from engineers to lawyers to UX researchers... A lot of people also use hackathons as a time to hone a new skill or work on projects where they can be exposed to unfamiliar technologies. Everyone, regardless of team or skill level, is free to check out what projects are happening and jump in."

The idea behind hackathons can work across the business world: break down barriers, disrupt hierarchy, and allow ideas to be expressed and explored.

Within this new, flat, adaptive structure, Atos explains,

> "Employees need the opportunity to decide for themselves, within the boundaries of their capability, where they can deliver the most added value. They can achieve this by swarming together in transient, purpose driven working groups that form internal and external networks, sometimes with the involvement of the open crowd, to address challenges and opportunities collectively, whilst concurrently keeping the current business running. Adopting this micro-entrepreneurial mind-set is the responsibility of all."

And that's the beauty of the hackathon and the flat hierarchy: every employee is a micro-entrepreneur.

The future of management

Greater flexibility

Millennials are results driven. Relics of the 20th century like dress codes, strict working hours, and expectations of long days in the office look to them like artefacts of a bygone era—which they are. The managers of the future will need to reconsider how business is done: separating what is necessary and what is just 'the way we've always done it.'

Keep in mind that these legions of new workers went to college in the digital age: they researched and wrote their papers in cafes and kept tabs on their friends through social media of all kinds. **The world is their workplace—and given the capacity of mobile devices to provide 24/7 connectivity, they see no reason to be tied to their desks.** Outputs, not inputs, matter; quality, not quantity, matters. The managers of the future will need to be comfortable with a hands-off approach, giving their employees a task and letting them decide when and where to work on it, as well as providing the creative space for out-of-the-box thinking.

By contrast, the business of the past too often measured work by counting feet under desks. A well-oiled business machine was a tidy workspace manned by clean shaven men and made-up women in business attire. Clock in, clock out, forty hours a week—and tiny bite by tiny bite, things crawled along. This was fine when the pace of business was dictated by a pen and paper world, but the digital era isn't limited by the time in Chicago or Bangalore, and it doesn't care how many hours you've worked or what you're wearing. Results are all that counts.

The managers of the future will adopt this as their mantra, measuring employees not by the length of their hair but by their productivity.

And rather than looking to the rank and file for advice, the businesses of the past were too concerned that senior management was firmly in charge. Nowhere was this more evident than in the basic architecture of the workplace, divided into cubicles and offices, more prison than engine of creativity. The companies of the future will re-evaluate these stultifying assumptions, and their managers will rethink the way space is used.

When senior management is separated by walls—more often floors—from the rank and file, it's easy for them to be out of touch. And by moving any two employees a mere 200 feet away, the odds that they have daily contact drops to nearly zero. Managers in the 21st century will encourage collaboration, brainstorming, and teamwork by tearing down walls and removing partitions—but this means relegating the 'corner office' as a reward to the dustbin.

Pitney Bowes, for instance, redesigned its office space to encourage better relationships and freer collaboration by creating a common area and café in the centre of the work space.

The result: happier, more productive employees.

To compete for skilled millennials, and to compete in a global, digital market, managers will need to rethink these unspoken rules and tired methods.

Consider the shoe retail titan, Zappos. Roger Hodge recently visited their headquarters; here's what he found:

> "An unofficial dress-code of T-shirts and sneakers predominates in its expansive open-plan offices; large tattoos, high-fives, and hugs abound; severed neckties, liberated from stuffed-shirt visitors, adorn a wall behind the lobby reception desk. Conventional job titles hardly exist, and top executives are referred to as 'monkeys'; assistants, on the other hand, are 'ninjas'." Stuffed animals, toys, and murals decorate most surfaces. Upbeat music blares from speakers in the headquarters' courtyard. Zapponians, as the employees call one another, like to talk about 'work-life integration' rather than work-life balance."

Not everything Zappos has tried worked, and there have been bumps aplenty along their path, but their experiment reminds us that the companies most able to attract and retain new talent have been those least bound by past modes of doing business.

The future of work is already here; business must adapt or die.

The future of management

Constant learning and advancement

Millennials love a challenge. For them, constant learning was a feature of the tech they grew up with, and they see no reason to stop learning just because they land a job. Moreover, they are less likely than their parents to see themselves as single-skill workers, offering not only larger, more diverse skill-sets but also greater flexibility as well.

As Nick Taylor explained to Forbes: "We've found that employees relish... a chance to think outside their traditional roles, learn new skills and work collaboratively with others."

Forward-thinking businesses will offer these new employees the opportunity to develop their skills and learn new ones, to explore unconventional roles and new positions as needed. As smart managers are coming to realise, investing in these young employees is good business.

But in contrast to baby boomers, millennials expect rapid promotion. For the previous generation, years working in the trenches was a guarantee of a solid salary and employment stability, but business has changed as the economy has soured. Many millennials find that the dream of a comfy, middle-management job outdated; they want stimulating, meaningful work that comports with their values, and they want to be rewarded for success rather than time.

This may strike traditional managers as unacceptable, but they should reconsider. When an employee possesses a broad set of skills, adapts flexibly to changes, and is innovative and productive, it's reasonable to expect reward. The managers of the future will need to set clear goals and communicate clear expectations for promotion—and be willing to deliver for those employees who meet them, irrespective of how long they've been at work.

In short, millennials are redefining the future of work and the management of the future. And this is a good thing, something to be embraced rather than opposed.

Consider Jacob Morgan's description of the relationship between workers and their work in the 20th century:

> "Employees used to be thought of as expendable and they didn't have a voice. They all came to work at around the same time, wearing similar clothing, doing similar tasks, and reporting to similar people. They worked in similar cubes, took lunch breaks at similar times, and worked in perpetual homogeneity, which is the quickest way to kill innovation. They did what they were told and didn't have the opportunity to engage with each other or build communities. Employees weren't encouraged or empowered to ask questions and no technologies were in place to allow employees to connect and engage with others. These employees were essentially supposed to work like robots."

From the perspective of a successful baby boomer now in senior management, this may seem unnecessarily harsh. But for a millennial just starting her career, this is spot on. Consider it from her perspective: these policies were designed around a work culture that lacked mobile technology and the capacity to work from anywhere, a work culture that took its understanding of decorum from the first half of the 20th century, a work culture that emphasised loyalty, hierarchy, and obedience above innovation, questioning, and efficiency.

In the increasingly global economy, the old way of doing business simply isn't good enough. The most forward thinking companies will re-design themselves, alter their policies, and transform their business models. Making work more productive through leadership designed to empower rather than control, they'll better compete for the talent they need to succeed. By contrast, over the next twenty years, those companies that refuse to evolve will find it harder and harder to attract the best new employees and keep their star talent.

Quick summary:

- The changing business environment and the growing presence of millennials offers challenges for management;
- To compete in a global, 24/7 business culture with young, highly skilled employees, the managers of the future will need to:
  - Recognise the sense in which small is the new big;
  - Adopt remote work practices;
  - Revise feedback mechanisms to ensure real-time, substantive recommendations;
  - Re-think outdated policies like dress-codes and grooming standards;
  - Alter the organisation of space to encourage contact and collaboration; and
  - Create opportunities for constant skill-building and education;
- In short, the managers of the future will need to question more and enforce rigid hierarchies less.

The future of education

The future of education

A major change driving the future of work is education.

Western education was designed around the needs of an agrarian and early industrial economy. In everything from summer breaks to the movement of students during the day, our schools were designed to meet the needs of a society that no longer exists, producing factory workers from farmers and equipping them with the skills and knowledge of yesteryear.

It's easy to miss the sense in which schools are designed as training factories: students take public transport to a complex of buildings, where they find their assigned work station before a bell announces work. They sit in an organised 'work floor,' facing their line manager, who doles out assignments that are often boring and repetitive. This manager evaluates each employee for promotion and retention, judging the quality and speed of their work. At the signal of a bell, each worker moves in an orderly fashion to the canteen or to a new work station. At the end of the day, these practicing workers return home on public transport.

This may have been ideal in an era in which transforming farmers into factory workers was the aim, but it's hard to see how this serves our children now.

This is no longer the kind of training our economy requires. Moving in an orderly fashion from machine to machine isn't the wave of the future. Nor are discreet and limited skill-sets: basic arithmetic, writing, and reading, complemented by very basic knowledge of chemistry, physics, and biology, won't serve students well in a high-tech, knowledge-based economy.

And because these institutions are steeped in tradition, education has been slow to change, remaining centralised, hierarchical, and out of touch.

That's no longer the case.

Much as the concept of the office is evolving to embrace tech that makes location insignificant, so too is the concept of education. In the 20th century, if a student wanted the benefit of a lecture from a professor at Harvard or Oxford, she had to attend university there. Similarly, information was available in research libraries housed at major universities. And no less significant, the flow of information tended to be hierarchical: experts at the top dispensed information to those at the bottom.

But recent changes in attitude, organisation, and technology have made this style of education obsolete.

Consider massive online open courses (MOOCs). Designed around unlimited participation, leading educators can record a lecture, upload it to the web, and pair it with problem sets or questions for critical review. Ideally, anyone can log in, attend a virtual lecture, and complete a course at home. 2012 was the year of the MOOC; long-term, however, a variety of problems have plagued the idea—low completion rate, a lack of real interaction, and excessive demands on both teachers and students. Perhaps the biggest problem other than abysmal completion rates is assessment; when 3,000 students enrol, who's going to grade? These problems notwithstanding, the concept that information could be broadly shared with an unlimited audience was revolutionary.

The future of education

The basic idea behind the MOOC is not only sound, it's prescient. In a world connected by digital resources and virtual communication, information need not be localised, sequestered, or silo-ed. 21st century education is diffuse, dispersed, and peer to peer. A great example is YouTube: if you want to know how to remove a broken light bulb, a host of handymen are there to help. Need to get a stain out of your favourite shirt? Experts are waiting to offer you advice. And if you need help developing your 3D graphics skills, coding in Python, or learning to use new software, people are ready to teach you what they know.

Because of the ubiquity and power of Google, memorising facts and information simply isn't as valuable as it once was. Instead, knowing how to analyse and think, knowing how to find and assess information, is the basic literacy of the 21st century.

In fact, education is increasingly informal and peer oriented rather than traditional and hierarchical. This doesn't mean, of course, that engineers won't require degrees from accredited universities, for example,—far from it—but rather that many of the rapidly evolving skill-sets workers need aren't taught in school but rather online or in short-session tutorials like week-long courses offered by peers.

And new tech is driving the pace of change. **Virtual and augmented reality (VR and AR, respectively) are poised to have a transformative effect on education.**

One promise of VR/AR systems for education is that they further erode the centralisation of education, dispersing access to museums, galleries, and travel. By donning a VR headset, students in rural Kansas could be taken on a virtual tour of the Louvre or the American Museum of Natural History. In a geography class, these systems might allow a teacher to pan from a space view of Earth, slowly bringing Beijing into focus for her students, before leading them on a virtual tour of the city centre.

Another advantage VR and AR offer is the visualisation of data. By projecting graphics and data over real-life scenarios, augmented reality might allow a biology class to explore a forest as though it were an exhibit, complete with informative overlays for each species of plant or animal they encounter.

And this tech is nearly classroom ready.

Magic Leap, preferring the term mixed reality (MR) to 'augmented,' has developed ordinary looking lenses, much like those you might find in reading glasses. But that's where the similarity ends. Their tech tricks the brain into thinking that the projected images are real. A step beyond AR, the results shocked Wired magazine when they explored the prototype.

Think way beyond games: by projecting data and graphics in mid-air and tracking hand and eye movement, your mobiles and pcs may soon be replaced by heads-up displays only you can see.

Education can benefit from immersion, as L'Oreal has discovered. By using off-the-shelf cameras to capture hairdressers at work, L'Oreal has created VR training centres it hopes to deploy world-wide. Apprentice hairdressers can study the techniques of experts from all angles, even stepping into the virtual shoes of a pro for a first-hand look.

Microsoft is also in the MR market, offering its HoloLens, and in collaboration with the education giant Pearson, has a training program for nurses that replaces actors and large-scale simulations with virtual emergencies. Already in place at the Texas Tech University Health Sciences Centre in Lubbock and at San Diego State University, HoloLens demonstrates the utility of this approach.

The future of education

Using augmented and mixed reality for education and business will be second nature in the next decade.

A final player we'd like to mention in the AR market is ATOS. The IT giant has developed a system they call 'Augmented Interactive Reality' or AIR. By juxtaposing the digital over the real with 2D and 3D holograms, Atos wants to create an experience for its clients in which they can get immediate access to information that matters at a glance. Using a semi-transparent display on a mobile device to project this information, ATOS's system requires that the environment be previously digitised and it needs some pretty sophisticated software to recognise its location and spatial orientation, but the concept is revolutionary and its potential is clear.

Using augmented and mixed reality for education and business will be second nature in the next decade. But there are even more startling tech advances reshaping the way we think about education. Recent research has led to the development of direct brain stimulation to enhance learning. One such project is driven by Daniel Chao and Brett Wingeier, co-founders of Halo Neuroscience, who began by asking if direct stimulation of the neural pathways that regulate muscle activity could enhance the efficiency of a workout. They invented a wearable, basically a small headset that looks a lot like a pair of headphones, that can send signals directly to the brain. What they found was that by summoning more muscle fibres to work, not only could they increase apparent strength, but the exercise was actually more effective at building muscle - perhaps as much as 50% more effective.

Startlingly, this technique can also help the brain build and improve new neural pathways, decreasing the time it takes to learn complicated motor skills.

Halo claims that the US military has shown an interest in this aspect of its tech, using 'neuropriming' to hasten the speed of pilot and sniper training. While this clearly has uses for occupational therapy, for instance, it's easy to see just how many complex tasks could be made easier to learn with this tech.

A similar program has been developed by HRL Laboratories. In an experiment, they measured the brain activity of six pilots in flight simulators. Using non-invasive wearable 'helmets,' they transmitted these electrical signals directly to the brains of student pilots, improving their piloting skills. Just how much improvement was made isn't clear, but don't expect Matrix-like downloads of skills anytime soon.

Nevertheless, the results of Halo and HRL Laboratory's work points to a near-future in which complex skills are easier and faster to learn, though it's far from clear whether these techniques work for non-motor skills.

Quick summary:

- 20th century education is poorly suited for 21st century work;
- The workers of the future need skills rather than information;
- MOOCs, VR, and AR provide a glimpse at the future of education;
- The most cutting-edge technologies signal disruption in the way motor skills are learned.

The future of skills

In the 19th and 20th centuries, workers were hired for a discreet skillset.

But increasingly, that's no longer the case, even in the highest-skilled jobs. As managers are learning, 21st century business demands a broader, deeper set of skills than ever before. Advances in social media, big data, the Internet of Things, and technological change generally means that the pace of skill obsolescence is now unrivalled by anything experienced in the 20th century.

In practice, even people who have desirable skills today may find that they're left behind tomorrow. **According to Dutch researchers, for high skill workers, the pace of obsolescence is nearly 4% per year, meaning that in just 10 years, college educated employees find almost half their initial skill sets are no longer useful.** And as the World Economic Forum reports, "In many industries and countries, the most in-demand occupations or specialties did not exist ten or even five years ago, and the pace of change is set to accellerate."

For the employees of the future, this means focusing on learning how to learn and mastering skills that are permanently in demand. As we mentioned earlier, the rote memorisation of facts and figures was critical before the digital age, but it's worse than useless now. What's needed is flexibility and adaptation, the ability to learn new things, to learn new tech and new ways of doing business, quickly. **What's needed are 'working learners,' employees who have the desire and ability to adapt quickly, employees who've mastered the 'soft skills' such as persuasion, argument, and emotional intelligence.** Can you sell an idea? Can you creatively assess a problem and provide an inventive solution? Can you move beyond data to the human aspects of an equation? Can you determine what matters—and what can be ignored? And can you adapt to tech changes that will make your current skills obsolete in a year or two?

For employers, future success means focusing on **hiring 'smarts' and so-called 'soft' skills rather than narrowly defined 'hard' skills.** When you hire an engineer or programmer, keep in mind that their expertise is ageing rapidly. Can they relearn their jobs quickly? Adapt to the changing tech and business environment? Do they have the flexibility the changing business environment demands?

Top 10 skills in 2020

1. Complex problem solving
2. Critical thinking
3. Creativity
4. People management
5. Coordinating with others
6. Emotional intelligence ☆
7. Judgment and decision making
8. Service orientation
9. Negotiation
10. Cognitive flexibility

The future of skills

The future of skills

Learning skills

Let's examine the skills of the future in greater depth.

Critical and creative thinking

In contrast to the routine office workers of the 20th century, the employees of the future will find that critical thinking is in high demand. **As tech advances, routine, repeatable functions will increasingly be performed by machines, even in the white collar world.** The businesses of the future, inundated by Big Data and rocked by unpredictable changes, will demand sharp, critical, hard-minded analysis and quick, incisive decisions. **The workers of the future are learners and thinkers, people who possess the capacity to assess, judge, analyse, and plan.** As the ACT Foundation observes, "Employees of the future must be proficient analysts who can make logical conclusions. They have to be able to digest and use information by achieving literacy in mathematics, written communication, scientific methods, information technology, and critical thinking."

Routine computation is no more useful than strict obedience to rules. In the fast-paced, ever changing environment of 21st century business, old methods are quickly outdated. Creative solutions to complex problems are needed, solutions often involving trans-disciplinary thinking, to tackle issues as complex as global warming or epidemiological crises like the spread of Ebola. Novel solutions, out-of-the-box answers, challenging questions, and defying conventions: these are the skills the future requires. How will managers think critically and creatively about strategies to motivate millennial workers? How can solutions for one problem be modified to apply to others? What insights from other fields might illuminate answers to our problem?

Spotify provides a great example. Launched in an era of rampant piracy driven in no small price by exorbitant music prices, founders Daniel Ek and Martin Lorentzon realised that by managing digital rights and setting appropriate prices, they could corner the market on legal music streaming. Their realisation was driven by a creative, critical assessment of possibility and promise.

Zappos is again instructive. Rather than sticking to the old, its employees are encouraged to ask, "Is this safe enough to try?" The result is creative, novel thinking and problem solving. This is necessary: as times change, business must change with them—and the pace of change today means that even the best practices five years ago may be outdated now.

Collaborating and communicating

Team-work has never been more valuable than it is now. Given the complexity of problems and solutions in the 21st century, lone-wolves and isolated geniuses are of little use. And the increasingly global reach of business brings the need for cross-cultural fluency to the fore.

21st century management relies on flexible, smart people brought together into temporary, small teams. These ad hoc collaborations require the workers of the future to possess the ability to work smoothly with one another, delegate and accept tasks fluidly, and accept and provide meaningful, substantive feedback. As team-members, they will need to possess the skill to start and end conversations gracefully, ask for and offer help, and defuse tense situations. Communication needs to be concise and clear. And every employee needs to cultivate the capacity to actively listen. Because of globalised outsourcing, this frequently must take place across languages and cultures and through electronic or virtual, rather than face to face, communication. **This demands a deep awareness of context, difference, and a willingness to adapt to the needs of others.**

Literacy skills

Information, media, and technological literacy

These forms of literacy are so deeply interconnected that they are inseparable. Information literary refers to the skills needed to assess what needs to be known and where to find it. Media literacy skills help an employee to access media to gather or distribute information. And technological literacy allows a worker to employ the latest tech to this end.

While managers can expect that most millennials will possess technological literacy, knowing, for instance, how to use social media or start a blog on WordPress, information and media literacy is a challenge for everyone. The digital age has encouraged an explosion of media and information choices, and these are often 'unfiltered' or 'un-confirmed.' **The workers of the future must be able to assess where they can find a reliable source of information, judging a source's authenticity, validity, and reliability.** Given that even the news media blurs the line between information and entertainment, this is a growing challenge.

For instance, the workers of the future must be able to assess whether a blog is factual and objective, know how to fact check, and distinguish 'click-bait' from substance. That is, they need to critically assess the content and the source of that content, deciding whether the information can be trusted. As simple as this sounds, it's quite complex because of the growth of 'new media' and the ubiquity of blogs, alternative news sites, and false or biased reporting.

The future of skills

Life skills

Flexibility

Skill obsolescence is more than a function of rapid change. The future of work will see more companies rethink the need for management at all levels: if employees are savvy and motivated, they will ask, to what extent can we do without costly management? For instance, when Zappos abandoned a traditional workplace hierarchy, many of its managers were left scrambling for meaning. Besides managing, what else could they do for the company? **Every employee of the future will need to ask, "What else can I do with my skills?"**

The future demands flexibility. Workers need to take changes in stride, using their critical and creative thinking skills to solve emerging problems and to challenge convention. They must be able to respond to crises by reassessing which tasks are critical. And they will be required to adapt at every turn by the speed of change and skill obsolescence.

Initiative

It isn't enough, anymore, to do what's expected. While employers battle one another in a global competition for talent, employees are subject to the same forces, finding themselves in increasing danger from hungry competitors.

The workers of the future need to develop the skills of initiative, for instance, the acumen to ask the right questions, the drive to do more, and the capacity to predict and learn emerging skills.

Social skills

As the old hierarchies slowly fall away in the workplace, new challenges emerge. **Without rigid placeholders reinforced by titles, employees are left to their own devices to sort out relationships and status.** The result is that social interaction is often far more complicated in the business of the future, demanding far more advanced social skills and social intelligence from its employees.

This is especially true through social media and chat apps of various kinds. Quick, informal, and context-less, it's easy to be misunderstood. Moreover, the workers of the future need to have the social savvy to turn these tools to their advantage, leveraging the power of social media to enhance their company and their career. And as the most progressive managers know, trust matters.

To build trust between co-workers, across teams, and with clients, the employees of the future will require exacting social skills that allow direct, but polite disagreement and conflict resolution.

10 Essential social skills:

1. Maintaining eye contact
2. Using proper body language
3. Being assertive vs aggressive
4. Knowing your channels
5. Being flexible
6. Accepting criticism
7. Remaining positive
8. Being teachable
9. Showing respect
10. Being human

Discipline

As old hierarchies fall away, it's important to recognise that each employee is increasingly responsible for self-management. In practice, this means cultivating the self-discipline to work hard, think ahead, and manage time carefully to ensure productivity. Gone are the days when clocking in and out mattered most—with greater emphasis placed on productivity, the worker of the future needs to be focused, determined, and disciplined in order to succeed.

It's important to remember that discipline is linked to a variety of social skills. We tend to restrict discipline to impulse control and gratification delay, but that's a mistake. There are a variety of business situations in which discipline is useful, from self-control, to establishing healthy boundaries, to empathy.

Conscious skill (emerges from powers)	**Life / communication skills**	**Value**
Composure	Anger management, gratification delay	Integrity
Encouragement	Pro-social skills (kindness, caring, helpfulness)	Interdependence, optimism, gratitude
Assertiveness	Bully prevention, healthy boundaries	Respect for self and others
Choices	Impulse control, goal achievement	Persistence
Empathy	Emotional regulation, perspective taking	Honouring diversity, honesty
Positive intent	Cooperation, problem-solving	Compassion, generosity
Consequences	Learn from your mistakes	Responsibility

The future of skills

Leading without authority

Perhaps the biggest challenge for the employees of the future relates to leadership. In the future's ad hoc teams, leadership will be both informal or shifting. Though 20th century managers could always rely on title and direct authority to overcome obstacles, tomorrow's team leaders will find that counterproductive at best. "Leaders who don't have formal authority come under suspicion when they act more like a team captain than a curious scientist," explains Steven DeMaio for the Harvard Business Review. The trick will be to bring a team together, delegate tasks, keep team members accountable, and do all this with no formal authority.

To succeed, these leaders of the future will need to draw on an impressive array of social skills to build and maintain strong relationships. They'll need to be able to make decisions, build trust, listen actively, and solve problems on the fly—often by suggesting rather than commanding. The ideal leader in an anti-hierarchical environment will need to learn to empower rather than control.

Source: Bruce Woodcock, bw@kent.ac.uk University of Kent Careers Service

Quick summary:

- The pace of hard skills obsolescence is nearly 4% per year, meaning that only ten years after employment, a high skilled worker can expect that 40% of her skill set is outdated;
- And as repetitive white-collar tasks are automated, soft skills will be increasingly emphasised in the workplace;
- Learning skills such as critical and creative thinking, life skills such as flexibility and initiative, and social skills such as self-discipline and leadership are not subject to obsolescence and will be in increasingly high demand;
- Because the future of work is built around small-team dynamics and bottom-up leadership to encourage innovation, strong social skills, the ability to self-learn, and discipline and drive are essential.

The office of the future

The office of the future: the quantifiable self and the sensing organisation

Any routine, repetitive job is likely to be replaced by a machine in the very near future.

As we transition from an information economy into what some call a wisdom economy, the soft skills of the future will be in even greater demand. While it's true that thinking machines like IBM's Watson can manage big data better than any human, it takes emotional intelligence, flexibility, and creativity to lead a company into the future.

"Employees were literally timed with stop watches to see if they could shave seconds off of their tasks. This was the mentality of organisations in the early to mid 1900s, and it is the same mentality that plagues our organisations today."

—Jacon Morgan, Forbes

Every employee of the future will be expected to be self-directed, to be a team-player, and to develop his or her skills over an entire career. And as we've discussed, the increasingly global reach of business places tremendous responsibility on the shoulders of future workers. It's not enough that they get along with close friends and colleagues; they must navigate cross-cultural relationships, communicate across languages without mud-dying meaning or giving offense, and form and reform teams as problems dictate. The work of the future will depend as much on mental, emotional, and social intelligence as it will on any hard skill.

But pressures like these threaten to crush employees, and the businesses that succeed over the next twenty to thirty years will recognise this and adapt. As Deloitte reports, a combination of 'information overload' and are driving today's employees to the edge, with almost two-thirds of executive revealing that the 'overwhelmed employee' was a major problem.

The office of the future

It is unlikely that the demands on the workforce will decrease, and if success requires healthy, happy, motivated workers, what strategies will the companies of the future adopt to cultivate the flourishing people at the heart of business?

First, companies will focus more on mental health and well-being by using the latest wearable and mobile tech.

"70% of US employers now offer some kind of employee wellness program, up from 58% in 2008"

—James A. Martin, CIO

"The [global employee wellness] industry grew 6.4% from 2013-2015, to $43.3 billion...two-thirds of that spend is concentrated in North America ($16.2 billion) and Europe ($16.1 billion)."

—Laura Hill, welltodo.com

A company—and its culture—are only as healthy as its people. For this reason, Wisdom Works reports that serious commitments to wellness are already being made by Google, Virgin Pulse, Johnson & Johnson, Steelcase, Zappos, and Humana. These aren't the wellness programs of the past, mind you.

"...41% of European employers say they lack the budget and resources to deliver an effective programme."

—Mark Eltringham, Insight.com

As Nichol Bradford, of the Transformative Technology Lab, told CIO, the most cutting-edge companies are "looking into ways to incorporate wearable gear that measures brainwaves, as well as meditation programs that help employees better communicate and become leaders."

This makes perfect sense. Given improvements in the Internet of Things (IoT) and sensors, and given the ubiquity of mobile devices and wearables, vast amounts of information about mood, productivity, stress, and happiness are available. As Josh Bersin, Joe Mariani, and Kelly Monahan write for Deloitte, these devices and sensors "are giving us information on our exercise, sleep, movements, diet, and pulse, creating the quantified self."

A great example of this is WellBe. A smart wearable, WellBe measures heart rate and syncs this data over time, location, and interaction to map stressors. When it notices that a wearer is experiencing elevated anxiety, it offers a variety of calming actions, ranging from breathing exercises to custom playlists.

"The cost to Europe of work-related depression was estimated to be €617 billion annually..."

—Executive Agency for Health and Consumers

Click for video

Another example of this new generation of mood altering wearables is Thync, a wearable neuro-stimulator paired with your phone. All you need to do is place the Thync strips on your forehead and use the app on your mobile to provide relaxation or stimulation of various kinds, as needed. Rather than focusing on actions you can take to reduce stress, for instance, Thync does the work for you by direct stimulation. Other similar systems include Lumosity, Happify, Thalmic Labs, Headspace, Alkili, Ginger.io, Interaxon/Muse, and Beyond Verbal.

Clearly, this tech is in its infancy, but it offers a promising path forward to increased well-being.

The office of the future

Second, the most forward thinking companies will use smart wearables to measure stress and happiness to change how they organise daily business. Deloitte offers practical insight into how this might be done.

Deloitte Canada asked volunteers to wear 'socio-metric badges' that measured tone of voice, movement, and location. "The devices could hear voice tones and deduce when people were under stress," Deloitte reports, and "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." This revolutionary program discovered—among other things—that cross-disciplinary teams were more effective, that large conference rooms and natural lighting decreased stress and increased productivity, and that its employees preferred working in smaller, physically closer groups.

And then Deloitte acted, making changes to the way it organised space, teams, and meetings.

This reinforces the importance of flexibility. The best data in the world is useless if senior management refuses to act on it and change the way things are done.

The company of the future will need to become a 'sensing organisation,' using the latest tech not primarily to measure productivity, but rather as a means of gauging and improving social dynamics. For instance, as much as 80% of work time is spent in conversation, and without these productive interactions, progress can grind to a halt. By using wearables and office sensors, researchers at MIT propose measuring the amount of communication between team members and ostensibly allied departments. When the office

notes little communication, that's an indications that something's wrong. Changes need to be made to encourage more interaction and get the team working again.

This can work hand-in-hand with systems measuring stress. Are certain team members a continuous source of frustration? Is one department a model of stress-free work? The sensing organisations of the future will know, and in turn, use this information to transform the work environment.

Third, business is increasingly using basic wearables like Fitbit or Being to gamify fitness and encourage healthy activity. No less than thirty of Fortune's top 500 companies use Fitbit Wellness to promote healthy lifestyles. As Lindsay Rothfeld explains for Mashable, "Generally, companies will use the trackers as a motivator as part of a rewards program or company-wide competition. Then, they can use a Fitbit dashboard with aggregated data to track steps, calories burned, active minutes, distance, hours of sleep etc." This reflects a basic truth: unless managers find ways to keep employees excited and engaged in wellness, old patterns will creep back in.

One method being explored now is the gamification of wellness. Essentially, this means turning healthy living into a good-natured competition with real rewards for meeting goals. The idea isn't just to make smart choices more fun, but to change workplace culture for the better.

A practical example is Houston Methodist medical centre. They gave employees the option to use Fitbit and a biometric screening to access their overall health. Each employee was assessed for risks and encouraged to follow a custom-tailored plan for improvement. If the targets were reached, insurance premium reductions of $520 were the reward. 80% of Houston Methodist's employees decided to participate, and now more than 4,000 employees sync their health data monthly.

Quick summary:

- Demands on employees are ever-increasing;
- To ensure that workers can perform at their best, the companies of the future will invest greater energy in measuring and maintaining their health;
- Smart wearable, sensors, and data analysis will dominate wellness in the next ten to twenty years;
- These advancing technologies will measure mental as well as physical health, assessing stress and unhappiness to better manage employee mood;
- But to take advantage of this data, managers will need to think challenge the status quo and be willing to act boldly.

The future office

Imagine watching an employee arrive at work in London in 2036.

She touches a small sensor to gain access to the building; it scans her fingerprint and collects a sample of DNA from her skin. The doors hiss open instantly. Inside, she passes lush greenery fed by expansive skylights. Trickling water provides soft white-noise in the background. The office senses her presence as she moves from the door; because it knows she likes the room a tad warmer, it slowly brings the temperature up two degrees. As her co-workers arrive for work, some take a seat, others stand. Each is wearing the latest augmented reality tech, projecting private images, email and chat to one side of a presentation on the latest sales figures.

The future office

Our employee needs to know the emerging trends in consumer preference— when, where, and what is purchased by 19-25 year olds in Madrid. The raw crunching and analysis of data is simply too much for a human, so she summons her holographic AI buddy, AIDa, who is projected by her AR wearable. Noticing that she seems stressed, AIDa uses a more soothing tone than usual, and begins gathering data from mobiles and wearables. In about half an hour, AIDa has compiled and analysed the data from approximately 5 million people over three years, comparing the patterns it found to previous analyses. Our employee is pleased by the results and sends a quick virtual message to a co-worker in Chicago.

Just then, a quiet tone alerts the team to an incoming call from their manager in Singapore; with a swipe of a finger in mid-air, the presentation is paused and minimised and a virtual appointment with their boss begins. She, too, wears the latest AR tech, allowing the team to see full-body projections of one another in real time, simplifying communication by conveying body language as well as tone and facial expression. But these projections don't reflect the casual clothing and rumpled hair of the actual team: they're overlaid avatars in Armani suits, always ready to meet with clients.

During the meeting, a co-worker's chair notes that his back is tightening—he's been sitting too long—and it slowly inches upward, encouraging him to stand. Files are shared with nothing more than eye movement, and the meeting runs smoothly to its conclusion.

The call over, the AR wearable returns our employee to the presentation, reminding her that she's well ahead of her goal of running 2 miles a day. If she keeps going like this, she'll be entitled to an extra week of vacation, and she's looking forward to extra time at the beach.

But there's another pressing problem, and the team needs to find a solution. The smart office, sensing that they're still hard at work at lunchtime, recalls the preferred orders of each team member and has their food delivered. When it arrives, AIDa appears and recommends that they take a break, suggesting that perhaps they eat in the adjacent garden...

Don't make the mistake of thinking this is far-fetched.

As we've already seen, the architecture of the office of the future will represent a decided break from the past. Rather than isolated cubicles and peripheral offices, space will be open to encourage collaboration and contact. Expect a shift, as well, to smarter office furniture, standing desks, and more natural light. For instance, as Oliver Heath tells Raconteur.net, "employees who work in environments with elements such as natural light and live plants report a 15% higher level of wellbeing, are 6% more productive and 15% more creative overall." Indoor green spaces, abundant sunlight, and peaceful rest areas boost productivity and lower overall costs, and the offices of the future will increasingly boast these additions.

And because of embedded sensors and smart tech, the office of the future will integrate heightened concern for its employee's health. As Houston Methodist's adoption of wearables illustrates, quantifying workers' health is smart business; the offices of the future, we think, will extend and amplify this trend. Employees work hard; we think the offices of the future will be designed to help them succeed. From smart furniture to wearables that report stress levels to AI holograms encouraging healthy habits, the next few decades will see employee health become an even more pressing concern for business.

But this is only the beginning: the emergence of ubiquitous augmented reality, the expansion of virtual meetings, smart offices, and AI will make the workplace almost unrecognisable.

Virtual, holographic-style meetings are smart business: they cut travel costs, allow clearer communication than phone, email, or Skype, and allow global, real-time collaboration.

Quick summary:

The office of the future will incorporate:

- DNA analysis for security;
- Smart office furniture;
- AR tech to increase productivity;
- Full-body virtual meetings to improve communication;
- Advanced AI to ease the burdens on employees;
- A green, naturally-lit workplace to improve mental health; and
- Smart wellness programs to keep employees in tip-top shape.

The rise of automation and AI

The rise of automation and AI: meaningful work

"We stand on the brink of a technological revolution that will fundamentally alter the way we live, work, and relate to one another. In its scale, scope, and complexity, the transformation will be unlike anything humankind has experienced before."

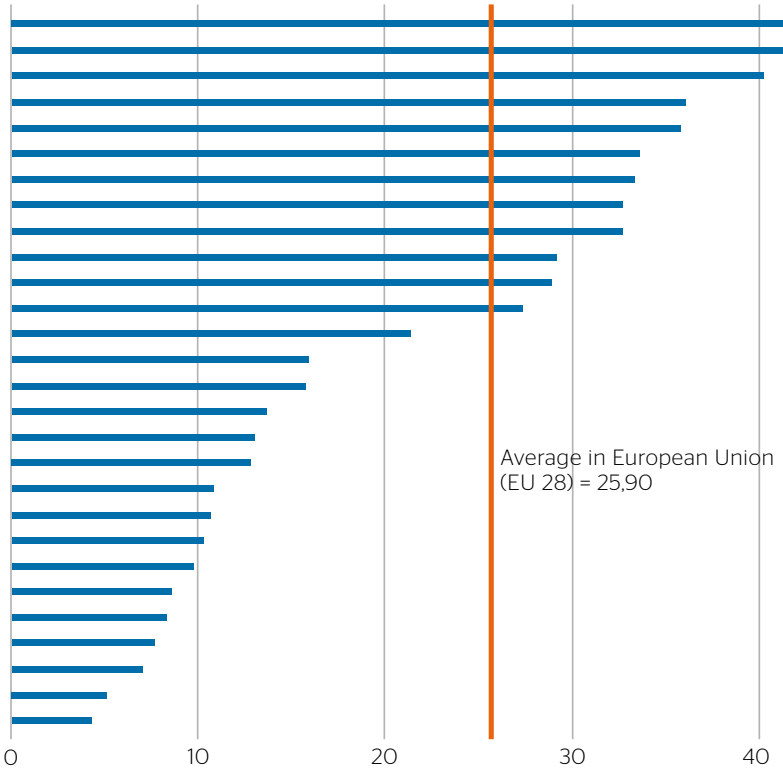
—Klaus Schwab, World Economic Forum

Earlier, we suggested that routine work of all kinds would soon be the purview of machines.

Indeed, we can already see advances in robotics and AI shrinking the need for labour. For business, this is excellent news as machines work longer, faster, and better than human beings in many roles.

Labour cost in the private sector (per hour worked in EUR)

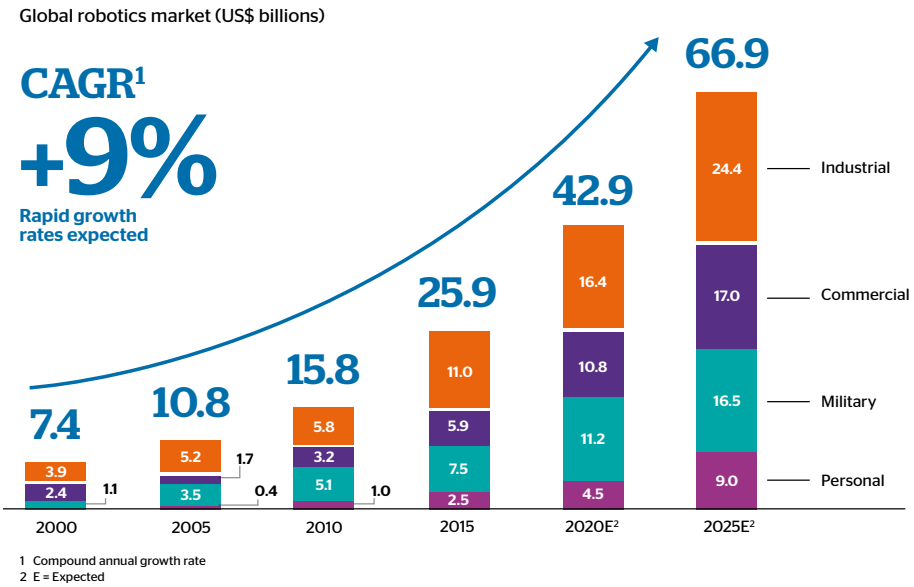
Denmark (EU-max)	42,70
Belgium	41,10
Sweden	40,10
Luxembourg	36,00
France	35,70
Finland	33,50
Netherlands	33,20
Germany	32,70
Austria	32,50
Unidted Kingdom	29,00
Ireland	28,70
Italy	27,20
Spain	21,10
Slovenia	15,70
Cyprus	15,50
Greece	13,60
Portugal	12,90
Malta	12,60
Estonia	10,70
Slovakia	10,40
Czech Republic	10,10
Croatia	9,50
Poland	8,40
Hungary	8,10
Latvia	7,50
Lithuania	6,90
Romania	5,00
Bulgaria (EU-min)	4,10



Source: Statistisches Bundesamt, Wiebaden 2016

The rise of automation and AI

Worldwide spending on robotics is expected to reach $67 billion by 2025



Source: International Federation of Robotics, Japan Robot Association; Japan Ministry of Economy, Trade & Industry; euRobotics; company lillings; BCG analysis.

Moreover, as the cost of robotics decreases, the profitability of replacing human beings continues to impress, even in the white-collar jobs that were previously impervious to automation.

On two fronts, then, we see machines advancing: in industry and in the office. Let's consider each in turn.

In industry

The clumsy automation systems of the past are giving way to new, elegant designs. Previously, robot automation was too bulky, too strong, and too fast to have humans work nearby for risk of injury or death. As a result, automation was kept carefully separate from human co-workers, often by sequestering it into its own spaces. But this physical separation is both inefficient and costly as it limits human-robot interaction and demands expensive safety precautions.

But that was the old way.

A recent development in robotic tech is the 'cobot,' a robotic co-worker. Cobots are designed to work with people, for instance, to help them lift heavy objects in manufacturing or pass them difficult to handle parts. A robotic arm—with limited mobility and power—can be put to work between two human co-workers, supplying that pair with the components they need, as they need them. By using a complex and sensitive array of smart sensors, the cobot is alerted to the exact location of its flesh and blood co-workers, slowing its movement or stopping altogether if it might do them harm. Advances in robot tech have made these machines comparatively inexpensive. A common cobot, for instance, is only $24,000. When this is compared to the wage of the workers it replaces, the savings quickly add up. And because cobots can be designed to be hyper-flexible and super strong, they multiply efficiency when used in tandem with people. This increases productivity and safety while lowering costs.

"...it's cheaper to buy a $35,000 robotic arm than it is to hire an employee who's inefficient making $15 an hour bagging French fries."

—Ed Rensi, former President of McDonalds

Click for video

Click for video

The rise of automation and AI

It isn't just factories that are seeing these advantages. Consider fast food giants like McDonald's. New minimum wage legislation in the US may drive the cost of basic labour to $15 an hour. At this price, automation is an easy sell. As Paul Horner, a spokesman for McDonald's told the News Examiner, "With the high demand for a minimum wage of $15/hr and the protests getting worse every day, this is something we had to implement. Plus with the tremendous margin of human error, poor hygiene, lack of education, laziness, as well as the recent advancements in artificial intelligence it just make sense to automate our restaurants now rather than later." Even as the current President, Steve Easterbrook, has softened this stance, he admits that anything non-value added that can be automated will be. His vision is to have people improving the dining experience—in the 'front'—and automation making the food and taking orders—in the 'back.'

In the past, this wasn't an economically viable option. That's changed. As Futurism.com reports:

> "Some robots already cost less to operate than the salaries of the humans they replace, and they are getting cheaper and better. Boston Consulting Group predicts that, by 2025, the operating cost of a robot that does welding will be less than $2 per hour, for example. That's more affordable than the $25 per hour that a human welder earns today in the US, and even cheaper than the pay of skilled workers in the lowest-income countries."

The cost effectiveness and efficiency of automation are sufficient for ATOS, a leader in digital services, to recommend to its clients that they consider maximising automation in every aspect of business, with the exceptions being areas that would negatively impact "customer experience, trust, or compliance." The most forward looking companies, Atos thinks, will look for new ways to use advanced automation to decrease costs, increase productivity, and keep customers happy.

Amazon warehouse bots:

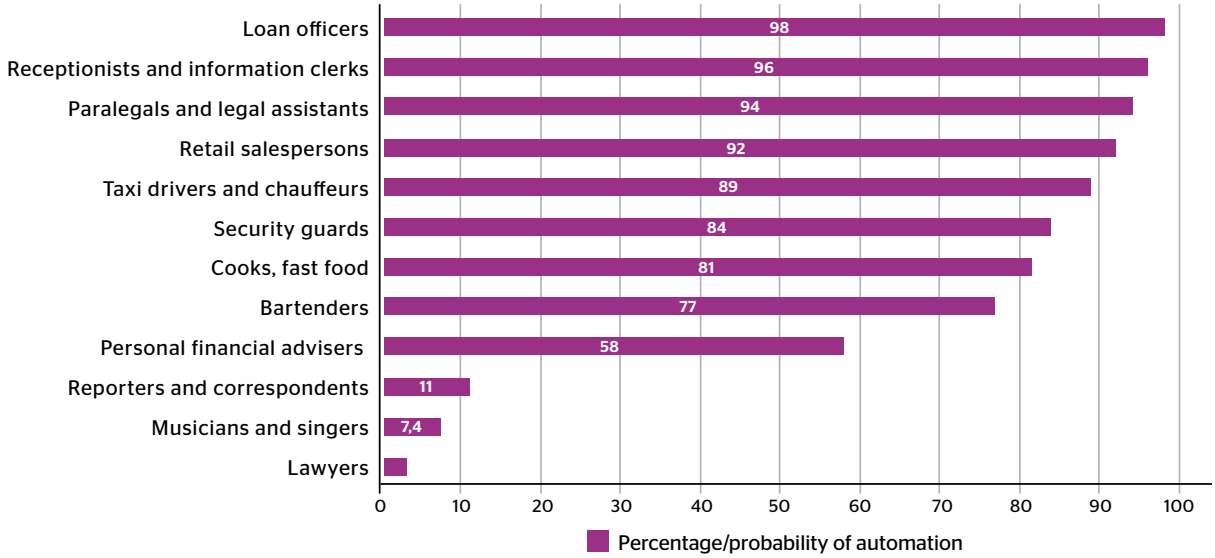
Click for video

The rise of automation and AI

In the office

"The AI on the horizon looks more like Amazon Web Services—cheap, reliable, industrial-grade digital smartness running behind everything..."

—Kevin Kelly, Wired



Source: Oxford University data via Bloomberg News

Automation is typically associated with repetitive, manual work: auto factories, foundries, heavy industry, etc.

But that's starting to change as the latest AI systems take advantage of natural language processing, deep learning, and blistering processing speeds. Hobbled by their inability to understand normal speech, AI systems have languished in the background for the last decade, largely relegated to crunching big data.

Recent advances, however, have brought AI back to the fore. As Jonathan Openshaw writes for Mr Porter, "it's not just blue-collar jobs that are set to be disrupted. Many roles within law, medicine and finance involve highly repetitive tasks that may be better done by algorithms. Legal secretaries, for example, are 98.5% at risk of losing their job to a robot, and already eBay settles some 60 million disputes through online automation."

The key to this AI renaissance isn't just processing speed—it's actual smarts.

IBM's Watson, for instance, understands ordinary questions and answers, linking speech to context much as might a human being. This points the way forward for machines in a variety of white-collar and service industry fields. McKinsey notes that the more predictable the physical movements of a given job, the more likely it is to be filled by a smart machine, a machine like Watson that can understand natural language. "In retailing," they report, "such natural-language advances would increase the technical potential for automation from 53% of all labour time to 60%. In finance and insurance, the leap would be even greater, to 66%, from 43%." Pretty much any predictable, repeatable job will be given to a machine in the near future--and that's a lot of jobs lost.

But the future isn't all about worker replacement. The better we understand what machines might be able to do for us, the more time and energy we can salvage from our human workforce—time and energy that can be put to more creative, more meaningful use. Imagine a future in which even management reconsiders what can be done with machines, freeing time for team building, creativity, and the what McKinsey calls "the core competencies that no robot or algorithm can replace."

As Atos observes, the growing impact of AI will shift the emphasis from high-skill routine tasks (like engineering or accounting) to employees who possess and master more non-routine skills. i.e. typical human skills, like creativity, interactive problem solving or cross functional impact collaboration."

Even the analysts at McKinsey aren't sure what AI's limits might be in the next few decades. As they note, McCann Japan, an advertising firm, just hired its first AI creative director. And Watson has already made its directorial debut:

Click for video

Yes, that's right. IBM's thinking machine created a successful, appealing movie trailer.

The rise of automation and AI

Even creative, socially intelligent jobs might not be safe. Many of the basic tasks of management are repetitive, data driven, or otherwise within the competencies of the latest AI. For more senior management, the rise of a machine-driven workplace will mean collaborating more with AI as co-workers, though presumably greater energy will be spent on the few remaining people at work.

But as Sidney Finkelstein warns:

> "The sad truth is that middle management is on its way to becoming virtually extinct. While there will always be some people supervising the work of other people, changes in technology, business culture and demographics are all conspiring to upend what has long been standard practice in companies. We should no longer expect traditional job ladders for managers to move up the ranks, or even retaining the notion that middle managers are the glue that connects workers and ensures goal alignment up and down the hierarchy."

That is, for employees of all kinds, there should be serious concerns. Bank of America, hardly a company given to flights of fantasy, estimates that within 30 years, advances in machine learning and artificial intelligence will cost 230 million knowledge workers their jobs. In the US alone, they suggest that 47% of employees will cede their place to automation and AI.

And researchers at Oxford University think that as much as 40-50% of middle-class jobs will simply disappear in the United States. Similar numbers are forecast for the United Kingdom. **In the next five to ten years, the World Economic Forum predicts that emerging tech, globally, will cause job loss for approximately 5 million workers.**

And these aren't the familiar displacements due to automation in factories: masses of educated, highly-skilled workers will find that they are no longer needed in the workplace. As And as Atos reports in its *Journey 2020: Digital Shockwaves in Business*, we need to re-imagine where the impact of AI will fall in employment. As they note, "virtual service desks, driverless vehicles and medical and legal research" are fertile ground for AI to begin its harvest or push human workers further into the gig economy.

We think Atos is right. By combining the latest in AI and AR, we expect many service jobs that demand interaction with clients--everything from cashiers to salespeople to managers in hotels--to be replaced by AR holograms every bit as capable as the real people they replaced--but always polite and efficient. As the tech advances, expect AR to drop from the picture in lieu of projected holograms.

Quick summary:

- Automation of repetitive tasks will free up valuable time to spend on more creative and meaningful work;
- Advancements in robotics allow automation in industry that both works with and replaces many workers;
- The cost of automation is falling below the minimum cost of human labour; we anticipate a growing shift toward machines replacing workers in fast-food, supermarkets, and warehouses;
- Advanced AI threatens traditional white-collar workers as well; recent efforts to have machines understand natural language point the way forward to replacing human beings in retail, customer service, and in any information job that is data driven;
- Thinking machines have also begun to take on creative tasks, and it's unclear just how good at these traditionally 'safe' jobs they'll be.

Blockchain, crowdsourcing, and the gig economy: the democratisation of work

Most of us are accustomed to thinking about work in terms of more-or-less permanent relationships.

Indeed, a hallmark of the middle class is more or less permanent employment, and until recently, an employee could expect to spend his or her entire career with a single firm. This is increasingly not the case—and not just because people change jobs more frequently. The last decade has witnessed an explosion of people who work for themselves, at home—broadly construed—as freelancers. This new trend has been called the gig, or freedom, economy, and more than 25% of American workers are already part of this change in how we work. Similarly, Europe has seen incredible growth in the freelancing economy, with numbers approaching 9 million workers, a growth of 45%.

There are 1.4 million British freelancers working across all sectors:

14% Is the growth of the number of freelancers in Britain

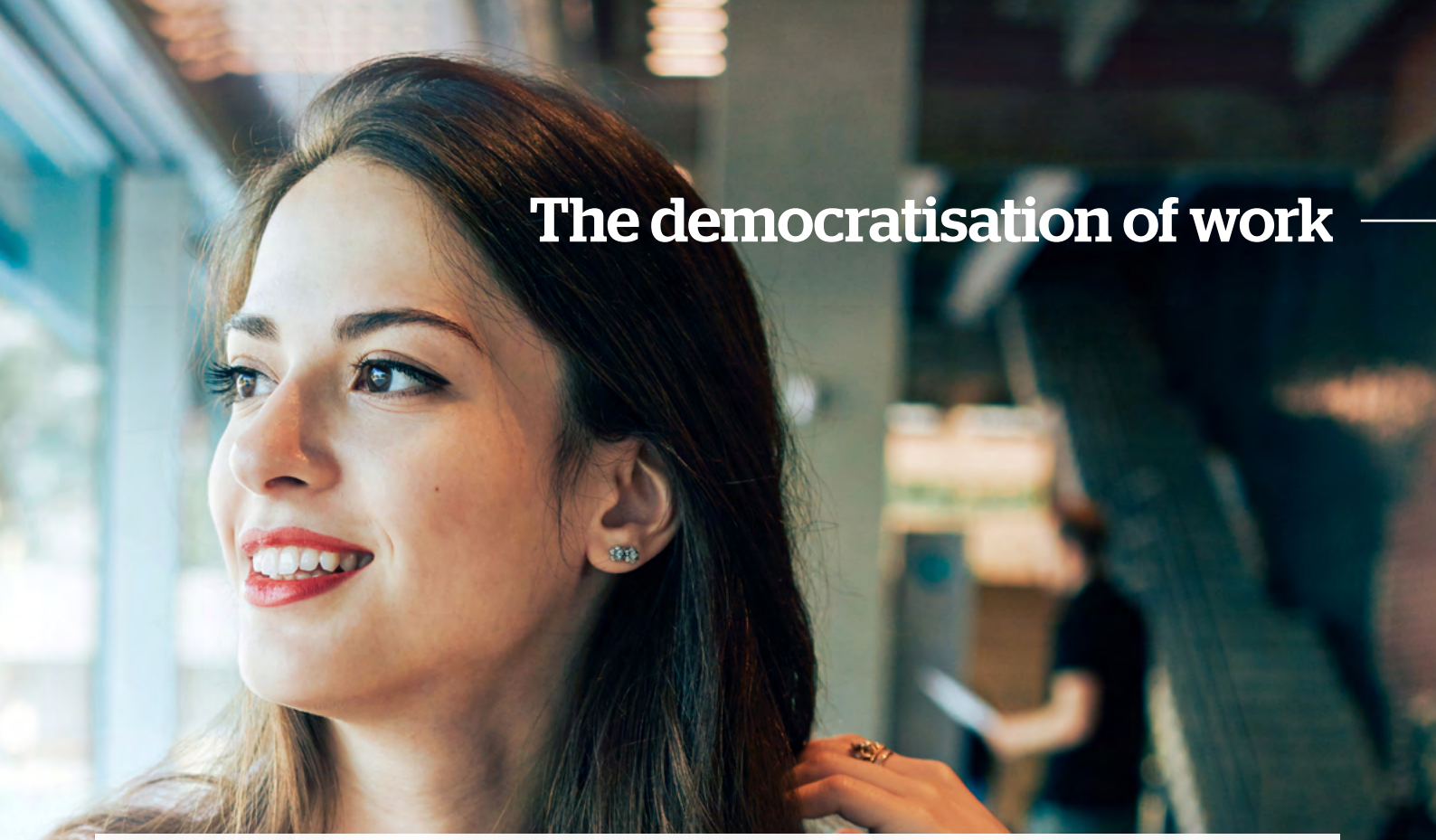
£21 Billion is the flexibility offered by Britain's freelancers worth to the UK economy

78% of the UK public think that freelancing and flexible working help promote a good work/life balance

72% think freelancing has a positive effect on family life

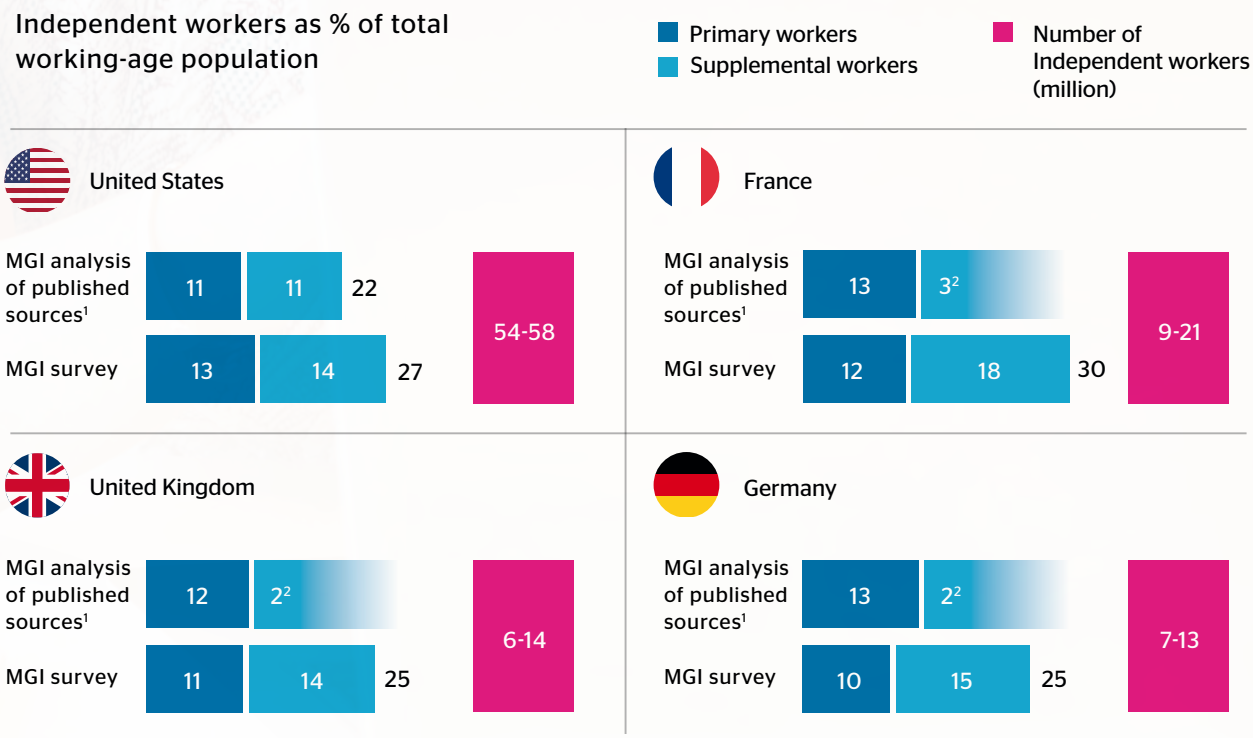
Source: https://benrmatthews.com/freelance-statistics/)

The democratisation of work



The numbers are already staggering: a third of Americans reported earning significant income as freelancers. Growth in this 'sector' is tremendous. Paul Chaney reports for *Small Business Trends* that 2015 saw an increase in 700,000 gig workers in America. That's a number impossible to ignore.

MGI's survey indicates that the independent workforce is larger than previous estimates



Source: http://www.iworkglobal.com/mckinsey-study-gig-economy-workforce-is-bigger-than-official-data-shows-in-u-s-europe/

The democratisation of work

Freedom economy

80% of non-freelancers say they are willing to work outside of their primary jobs to make more money

65% said freelancing as a career path is more respected today than three years ago

36% of moonlighters who have a primary job - 5.1 million people - have thought about going completely independent

The gig or freedom economy, as it is sometimes called, allows people to freelance globally—and this is good news for big business. Previously, expensive, long-term, local wtalent was required for any task. Now, however, managers can rely on a global pool of skilled labour to form ad hoc teams of experts, 'crowdsourcing' their need for talent.

The most forward thinking companies realise that the future of business can't be secured by relying exclusively on local talent. To compete over the next two decades, the businesses of the future will rely more and more on remote work and freelancing to fill their needs.

That is, the gig economy can't be separated from the new outsourcing, creating a new, hybridised crowdsourcing. Much like crowdfunding relies on the public to donate startup money, crowdsourcing relies on the public to fill vacancies as freelancers. This is disrupting human resource management.

In the 20th century, outsourcing was little more than relocating manufacturing. As wages and environmental protection laws made US or German based production expensive, for example, manufacturing would be moved to China or India to decrease costs and avoid problematic regulation.

But now it's not just factory workers who can be crowdsourced: information workers and experts of all kinds can be had, globally, for short or long term work. In fact, the new crowdsourcing is the globalisation of the gig economy. **Two forces drive this global shift away from the local.** First, every advantage of the freelance employees applies when they move 'offshore.' Overheads decline and productivity increases—but with lower wages and little need for middle management, the cost savings are even greater. As the skill gap between Western and non-Western workers shrinks, companies can get equal quality for lower cost.

Second, if a business only needs programmers for certain projects or accountants at the close of the financial year, why hire permanently? Think of crowdsourcing as a cost-effective way to manage itinerant needs without the costs of permanent HR. This can happen locally or globally, but again, as the skill gap disappears and wages remain low in emerging markets like Asia, it makes sense to rethink human resources.

This emerging gig economy offers possibilities and challenges. It can better match talent to work and make life easier, but it also increases competition among the unemployed, leading some to worry about abuses. When employers can hire and fire nearly instantly, and when they can shop for the lowest price of labour globally, there is significant concern that this will lead to a race to the bottom for workers. Unprotected by labour law, hired for the short-term, the gig economy isn't all roses.

Gig-driven crowdsourcing is still largely a hierarchical arrangement grounded in the management and organisation of the last century.

But that's changing too.

One early sign of this power of the gig trend was made clear through the sharing economy. For example, the popular house vacation site Airbnb allows home and apartment owners to rent their properties through the web. This element of the gig economy is already crushing the hospitality industry, which estimates that "that hotels lose approximately $450 million in direct revenues per year to Airbnb. Between September 2014 and August 2015, 480,000 hotel room nights were reserved while over 2.8 million room nights were booked on Airbnb." Do the math—that's a 5:1 ratio in favour of the private owner!

Similarly, Uber and Lyft are disrupting the formerly profitable taxi industry. In both L.A. and New York, traditional taxi fares are down 30% due to the popularity of the ride-sharing services.

In both cases, it's not that money isn't being made, it's that the profit increasingly finds its way into the pockets of the little guy, sidestepping the need for intermediaries and middlemen to take their cut. Money still flows upward, of course, but it passes through fewer hands.

And even greater revolutions are in the works. Sophisticated software like Blockchain isn't just making Bitcoin and other crypto-currencies possible: Blockchain also allows transparent, peer to peer networking that replaces the old way of doing business.

Think of Blockchain as a revolutionary business model. As Atos explains, "the attraction of Blockchain is largely due to the core principles upon which it was built," concepts like verifiability, openness, and diffusions.

Blockchain doesn't depend on trust because any user has access to its indelible, immutable transactions,. In other words, there's no way to hide any shenanigans. And since it's diffuse, housing itself across countless 'peer nodes,' it doesn't depend on a central authority or regulator to conduct its peer to peer business. Finally, unlike banking software, for instance, Blockchain is open source. These principles are effectively written into the DNA of Blockchain, and that makes it attractive to many socially or politically conscious startups.

The democratisation of work

Consider La'Zooz. Concerned that Uber was just another 20th century ploy to make the little guys work for the guy at the top, Matan Field and Shay Zluf started a Blockchain driven project in Israel to decentralise the gains and remove the organisation from Uber.

Here's how the Blockchain economy works:

- Andrea performs some kind of work valued within a specific community;
- the community employs a system that registers this work, dividing it into payable units;
- and then the system rewards the 'worker' with currency valued within that community.

For La'Zooz, Andrea's work is driving within a ride-sharing system organised by mobile phones. When she agrees to share her empty seats and takes on a passenger, that passenger's mobile tracks 'proof of movement,' reporting to the La'Zooz system. The system measures the distance and rewards Andrea with tokens she can use to purchase rides of her own.

The beauty of this approach is manifold. Workers benefit directly from their work, bypassing middlemen and avoiding passing their profit up the chain, enriching someone else. No one's in charge of this system, and the software is housed on the many mobiles of the people who download the app. Overheads are basically non-existent. And La'Zooz solves a real problem for commuters and the environment all at once.

Perhaps most importantly, this model can be applied broadly. Steemit, for instance, pays writers in Steem, a Bitcoin-like crypto-currently valued at more than $4, for up-voted content.

This is the wave of the future: organisations that use peer to peer networking to define, assess, and reward work.

But that's only the tip of the iceberg.

Vitalik Buterin, one of the developers behind Bitcoin, launched Ethereum, a crypto-currency Blockchain application that uses smart contracts to reinforce transparency and enable manager-less management. The idea is to do away with middlemen everywhere, replicating the success of Bitcoin and La'Zooz on a massive scale. According to Gian Volpicelli, Ethereum allows developers "to build programs that interact with the world based on public rules enshrined in so-called smart contracts. Think of a software application that runs a fleet of self-driving cabs and automatically calculates the price of each ride according to some criteria. These criteria are predetermined in the software's contract and known to all customers."

Significantly, once these rules are in place, they can't be changed by anyone, freeing users from the concerns of fraud or preferential treatment. And because Blockchain provides open records of each transaction, Volpicelli insists that "users will not have to just hope the company does not swindle them: they know everything it is programmed to do."

Like La'Zooz, Ethereum isn't housed on a single computer, but rather like Bitcoin's ledger, the code can be found on every mobile device to which the app is downloaded. Not only, can it not be taken down, it's effectively immortal, giving rise to a new breed of decentralised autonomous organisations (DAOs), timeless businesses without managers.

Imagine a future in which everything from taxis to cafes become DAOs and you can begin to get a sense of the potential disruption. Want a coffee? Make two of someone else and buy yourself a steaming mug in turn. The only limit to systems like La'Zooz and Ethereum is your imagination.

Quick summary:

- The gig or freelance economy is rapidly displacing traditional employment;
- This offers opportunities and challenges for the businesses of the future:
- They will have access to a larger, deeper pool of talent;
- But they'll be competing with other firms for these high-skilled workers and will need to rethink policies that attract and retain these superstars;
- The sharing economy is disrupting traditional business models in hospitality and the taxi industry; expect that this trend will continue and that it will spread broadly to many service fields;
- Blockchain software enables DAOs that are reshaping the nature of business, leading to leader-less companies.

Bottom-up innovation

Startup societies, future labs, and bottom-up innovation

We're already seeing the disruptive effects of new forms of organisation emerging from advances in tech and creative re-imaginings of business dynamics. For instance, we've seen how Facebook uses hackathons to spur internal innovation by encouraging bottom-up leadership.

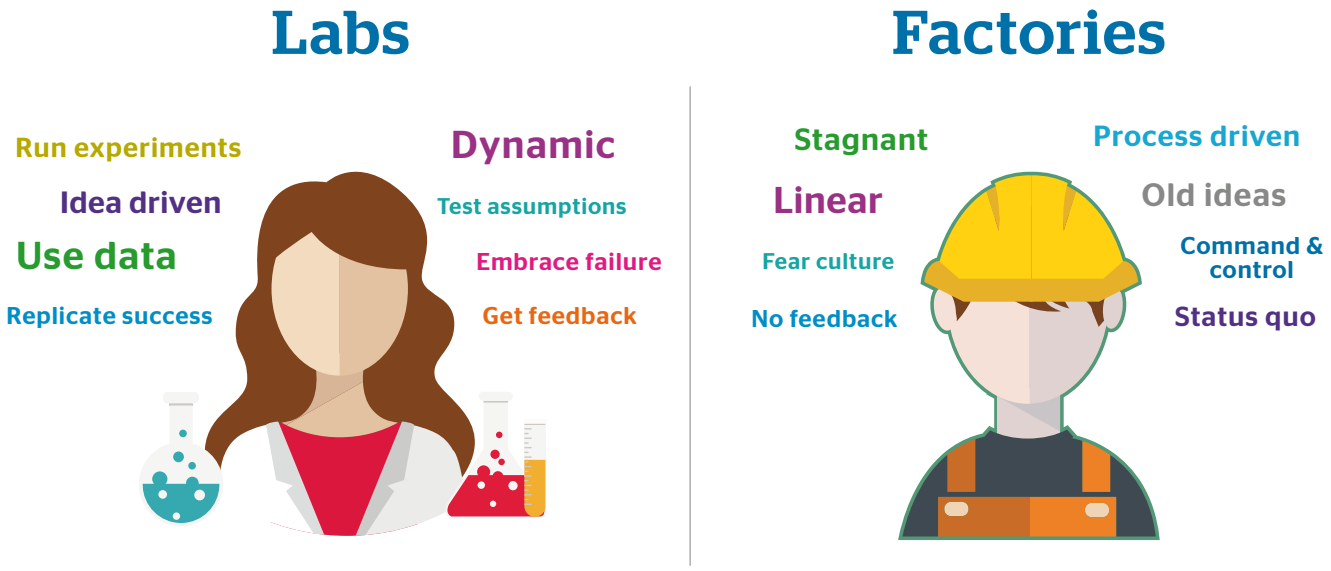
We suggested that the hackathon idea—allowing self-organising, driven talent to experiment and create—has applications far beyond tech.

Traditionally, business—all business—was imagined as a factory: workers produce something, be it machine parts or financial reports. And this model has distinct limitations. Factories are hierarchical, static, and linear. They emphasise efficiency, repeatability, and monotonous division of labour. But this is often true for so-called information workers, as 20th century management came to rely on something like an assembly line for everything from engineering to accounting.

"Every time we start a new project, we always ask ourselves the same question: What can we do better and different?"

—Ricardo Guadalupe, CEO of Hublot

Bottom-up innovation



But as we've discovered, this way of doing business simply can't compete in the 21st century. Instead, the companies of the future will organise themselves more as 'labs' than 'factories,' embracing innovation, experimenting, accepting failure, and allowing employees to bring new ideas to the table, even when they appear disruptive or crazy.

As Jacob Morgan explains for *Forbes*:

> "Organizations like Adobe give employees $1,000 to build prototypes of ideas or concepts. Whirlpool allows any employees within the organisation to go through a structured ideation process to either improve a product or create a new one. At LinkedIn and AT&T, employees can literally pitch executives their ideas to get funding much the same way a start-up founder would pitch a VC."

The businesses of the future will nurture entrepreneurship from within their ranks. But this means changing business culture and embracing new, sometimes radical ideas. Consider again how Zappos or Facebook break with tradition, and how their successes reflect these bold decisions.

And these creative solutions aren't limited to existing business and tech giants. For new companies, even the best ideas can fail for lack of experience, capital, or expertise. Startups struggle—it's a simple fact. But there are exciting new forms of assistance to help them take their first few steps.

The idea is pretty basic: offer knowledge, expertise, and resources to startups to increase their success rate and drive them over the early obstacles to profitability. For instance, Future Labs, a project of the engineering department at New York University, offers venture capital, mentorship, and expertise as an incubator for tech startups. By providing the real-world experience and know how needed to get new idea moving, **Future Labs allows entrepreneurs a helping hand.**

The results

10 acquisitions

$87.5 million in revenue

1,256 new jobs

67 thriving new businesses

You should see a pattern here: by hiring smart, motivated people and turning them loose, by relinquishing command and control, the businesses of the future will spur innovation from within.

Bottom-up innovation

Quick summary:

- **The companies of the future will encourage internal entrepreneurship to spur innovation.**
- **But this means rethinking the basic assumptions of business and embracing experimentation and failure.**

The employee of the future: neuro-hybrids and trans-humans

Our final analysis brings us back to where we began. Nothing defines the future of work more than the people who will do it, and the latest advances in neurotechnology will radically transform the workers themselves.

Rethink everything you know about talent, education, and what you can expect from your most able employee. The next few decades will simply redefine what it means to be human, what it means to 'know something' or 'learn something.'

Welcome to the age of the trans-human worker.

And it begins with tech that's already here. Philips, the Dutch technology giant, has developed home medical systems that use brain-computer interfaces (BCIs) to help patients suffering from neurodegenerative diseases control their home appliances. By directly measuring brain activity, in this case the tiny electrical signals generated by thoughts like 'open my email', these systems translate ideas into commands, much like a voice controlled system would, allowing someone with limited dexterity and speech to control devices that would otherwise require touch or sound to activate.

Potentially, nearly anything connected by the IoT--your TV, mobile, car, or bank account--can be manipulated by thought! Ten years from now, you might summon your car and pay your bills merely by wishing it so.

Sounds impossible? This is the tech that's already in development!

"All sorts of things that are actually happening today, from neural transmitters to artificial hearts, are bringing about fundamental changes in the way we view and challenge the limitations of our biology. We are on the cusp of an evolution revolution."

—Simon Raik-Allen, MYOB Chief Technology Officer and Futurist

"If we can mimic the natural function of the brain, and we can truly work with neural code, then I posit the question – what can't we do? Could we learn a thousand times faster? Could we choose which memories to keep and which to get rid of? Could we have a connection with our computers?"

—Bryan Johnson, University of Southern California

The employee of the future

The employee of the future

What's coming is straight-up science fiction.

Philips's system relies on a non-invasive wearable to capture and transmit these commands; the most startling new tech involves microchip implants to deliver results that are simply incredible.

The most exciting research involves BCIs capable of enhancing the human brain. Such 'neuro-hybridisation' is a step in the direction of the cyborgs of science fiction. These new 'trans-humans,' futurists like Raik-Allen at MYOB think, will have brain implants that enhance cognition, memory, and motor function.

Impossible? Not anymore.

Theodore Berger, a biomedical engineer at the University of Southern California, is making the first breakthroughs that may bring this future to fruition.

To better understand his work, remember that what you experience as a memory is a firing of particular neurons, a pulse of electricity that translates 'storage' into 'experience' through bio-chemistry. Berger's goal is to understand the humbling complexity of this system and learn, step by step, how to activate the capacity for new memories with microchip implants.

His early experiments were promising. In rats and chimpanzees, Berger's team was able to provide simple memories, in this case the choice of a switch that would provide a reward, when the animals were chemically stripped of what they had learned. Essentially, Berger's chip simulated the storage system of the brain, sending the tiny electrical pulses that constitute memory from external--and then later, internal--storage devices.

The first human studies have already begun.

To map the neural storm of memory, the team had to implant sensors in its test animals, but that's clearly not something they can do to people. Instead, they had to get creative.

Epileptics often have microchips inserted in their brains. These implants help control seizures by sending electrical signals to the 'misfiring' parts of their brains, controlling their seizures. Berger saw an opportunity here—he could record as well as influence with these microchips, giving him the understanding of human memory that he needs to move forward. The result: an algorithm that predicts the process of memory in 80% of cases!

He's cautious, however. The part of the brain responsible for memory, the hippocampus, is perhaps the most complicated and least understood, and it's not clear if each 'kind' of memory is differently processed and stored.

But Berger's also hopeful.

Funded in part by the Defense Advanced Research Projects Agency (DARPA), his research was driven by the need to help veterans who've suffered traumatic brain injury, robbing them of their memories. It may also prove critical to patients struggling with Alzheimer's or senile dementia, a prospect we all face. The first few trials in people have been closely guarded secrets, but Berger's team says they're heartened by what they've found.

And as is common in neuroscience, Berger's work on memory promises to move past restoring function for the ill. Soon, scientists think we will be able to augment and enhance, rather than merely restore, memory.

Bryan Johnson, a scientist who works with Berger, wants to take the next logical step. If we can restore memory for people suffering its loss, can't we improve memory for people with healthy brains?

The employee of the future

Johnson thinks so, and has invested $100 million of his own money in the new project.

Decoding the neurology of memory is the key to some pretty fantastic possibilities. As Johnson says, "If we can mimic the natural function of the brain, and we can truly work with neural code, then I posit the question – what can't we do? Could we learn a thousand times faster? Could we choose which memories to keep and which to get rid of?"

Indeed, could we download information, skills, and talents, bringing the training sessions of The Matrix to real life?

We think so.

It might work something like this:
Imagine a group of students with microchip implants recording their memory formation while learning calculus or Mandarin or fluid dynamics. As they learn, Johnson could study the patterns of the neurons firing—deciphering the whens and wheres and how oftens of this complex thunderstorm in the brain. By finding the overarching patterns of memory formation for these particular thoughts, the researchers of the next decade or two might be able to devise an algorithm for calculus, for instance, an algorithm that replicates the memory of advanced math stored biologically by the hippocampus.

After converting this biological storage to its silicon equivalent, they could download this pattern of neural activity to an implanted microchip, providing the 'memory' of calculus to someone who has never studied math! Anything anyone has ever learned could be captured, recorded, and downloaded to anyone else, nearly instantly.

The possibilities are mind-boggling, and Johnson is a true believer in the future of microchip brain implants. "I think that human intelligence will be one of the largest industries, if not the largest industry, to ever emerge."

As hard as that is to imagine, Johnson's prediction makes sense. Imagine having a Google Play or iStore for skills. Need to know Dutch? Download the app and be fluent in a matter of seconds. Need to brush up on thermodynamics for a research project? Download the talents of the best professor at MIT.

This heralds an age in which we begin transforming ourselves, redefining what it means to be human or perhaps even leaving the simply 'human' behind.

To say that this will be transformative understates its impact.

But there are dangers as well. On one hand, ethicists are concerned that the era of the post-human will merely exacerbate current inequalities, leading to a future in which the merely mortal can't compete. But Elon Musk has turned this fear on its head: his concern is not that people won't be able to compete with their enhanced brethren, but rather that we'll all end up 'house cats' of advanced AI. Embracing neural implants as a solution to this, Musk thinks that seamless, integrated AI--a 'neural lace' of advanced processing in the brain--can save humanity from obsolescence.

We're far from sure who's right. But it's clear that the possibilities for cognitive enhancement are almost limitless, and they will redefine life in the next three to four decades.

"There is good reason to believe that the sharing of memory can happen"

—Theodore Berger, University of Southern California.

Quick summary:

- Recent developments in neurotechnology promise an end to traumatic and disease related memory loss.
- Future developments point the way forward for cognitive enhancement and an age of trans-human hybrids.

Conclusion


SALES BY CATEGORY
West
South
North
East
Other
NETWORK SEARCH
LOADING 100%

Conclusion

The future of work is as exciting as it is challenging.

Businesses will ask more from their employees than ever before, and in turn, they'll provide more to their employees than ever before: more flexibility, more concern for health and wellness, and more freedom to create.

The best practices of the past are simply outdated. They were designed and refined in an era of stasis: static hierarchies, static technologies, and static skills. And though the pace of technological change will never make age-old value like trust and hard work a thing of the past, businesses evolving to meet the challenges of the 21st century will need to rethink and recast their organisations.

1 they'll need to respond to the influx of millennials by adopting new modes of feedback, embracing remote and flexible work, and challenging the rigid hierarchies that too often stifle innovation.

2 they must reconsider management as a tool for enabling and empowering work by clearing obstacles, cultivating creativity, and building effective, happy teams of flexible self-starters.

3 they'll find that that hiring smart, sociable people who can learn on their own but who demand greater freedom in their work lives and more attention to work/life balance pays off. Skills obsolescence means that hiring on the basis of technical know-how is a recipe for long-term failure and high staff turnover. As a result, the companies of the future will pay as much attention to social and life skills as they do to hard skills now, and they'll cultivate opportunities to invest in the human capital they already have.

4 these businesses will re-evaluate basic office dynamics and wellness by adopting the latest tech to measure and quantify stress, health, and happiness. Rather than sit on this data where it challenges old thinking, they'll act, boldly adapting to what works.

5 they'll adopt a bottom-up approach to innovation, encouraging entrepreneurship from within by taking concrete measures to encourage risk-taking and creativity. They'll accept that failure is the price of experimentation, rewarding initiative and creativity.

6 rather than seeing automation as a worker replacement, the most forward thinking organisations will reconsider the ways in which robotics or AI can interact with employees at all levels, freeing human beings to do more meaningful work.

And finally,

they'll recognise the ways in which software like Blockchain, the sharing economy, and the growing use of freelancers must reshape business models, recruitment, and retention.

That is, the companies of the future will embrace the future of work rather than resist it. They realise that the human resources, management, and organisational structure of the past is simply not equipped to compete in this bold new era of global freelancing, small-team solutions, and bottom-up leadership.

In any change in environment, it's those who adapt fastest that survive longest.

Are you ready to meet the challenges?

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