



EXCEED
YOUR
VISION

UNCOVER THE TRUTH BEHIND
EUROPE'S TECHNOLOGY TREPIDATION

EPSON
EXCEED YOUR VISION

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FOREWORD:

A LETTER BY MR. MINORU USUI, GLOBAL PRESIDENT OF EPSON

The world is in transformation. The global economy is being reshaped by innovations on the supply side and by changing behaviours on the demand side; people are challenging the way societies develop; and in every industry, choices about the future need to be made. Driving much of this is technology.

With the advent of the steam train, the first industrial revolution automated much of the world's muscle work, and allowed for increased creativity and brain work. We are now entering a new revolution. Thanks to the efficiencies afforded by technology, our work and life will take on new meaning and purpose; and regardless of our current livelihoods we must all be mindful of this change and prepared to embrace it.

Epson as a company is well placed to support this new era in work and life, and we have identified four areas of innovation where we believe we can make a difference: inkjet, visual communications, wearables and robotics. Our background in sensing will undoubtedly position us for growth in the future as technology across industries like healthcare, manufacturing and retail, become increasingly interconnected.

Our aim at Epson is not just to innovate, but to create solutions that improve people's work and lives. This is why we have looked to explore the topic of 'the workplace of tomorrow', not just through the eyes of the experts, but through today's workforce because these are the people that will be most affected by the changes to come. We wanted not to predict the future, but to test

the readiness of companies and their most valuable assets; the people who work for them.

The research shows that we as a workforce are willing, but not prepared. What I see, through the research as well as through my experiences and conversations as global president of Epson, is that leading economies such as Europe have big decisions to make now in order to make the most of the future. The direction in which Europe decides to take its relationship with technology will have implications for individual employability, corporate performance and global competitiveness.

The rapid pace of change through technological development will only increase from now into the future and our way of life will evolve faster than we expect in the next ten years. Being ready for the workplace of 2025 and beyond is our challenge now and we must ensure that technology is properly implemented to support us moving forward.

This will be the responsibility of everyone – governments, organisations and individuals. Embracing the opportunities that come with technological developments will require a shift in mind-set. It calls for action, including reinventing education, boosting innovation, and incentivising change that will lead us to a longer-term vision. For companies, technology can no longer be viewed as an item of equipment or a spreadsheet; it must represent a much bigger conversation about organisational values, competitiveness, and contribution to society. How we take ownership of the transformation will define who we are in the generations to come.

I hope that this report exceeds your vision and that you will join me in this exciting conversation over the coming years.

Yours sincerely,



Mr. Minoru Usui

CEO & President of Seiko Epson Ltd.





INTRODUCTION



Technology is continually changing the way we live and work. However, we have reached a tipping point. Over the coming years, our industries and workplaces will undergo dramatic transformation, reshaping how companies are organised and how people work. From manufacturing and retail to education and healthcare, critical choices need to be made now in order to open up future opportunities. The way we educate and train people, the way we regulate industry, and the way we ensure that companies remain competitive and also serve society are all big topics of discussion.

With this in mind, Epson embarked on this research with the aim of understanding not just the expected major trends in workplace technologies and how they will transform industries and work, but also the willingness of people to embrace these technologies and changes. The research tested the views of 17 industry experts and over 7,000 current business leaders and employees in Europe's workforce across a range of industries including retail, education, healthcare, and manufacturing to gauge sentiments toward the future of the workplace.

From these discussions certain scenarios came to life, and considerable gaps in organisational readiness and individual awareness of the benefits of technology became apparent. In addition, questions were raised about responsibility and how best to prepare for the future. Although technology may be driving massive change, behind this is the human drive to create a better society. Technology is the means to achieve this improvement, not the end in itself.

In fact, trends predicted by leading industry experts and the views of Epson, point to a world where life takes on a new purpose. Life in the future will be about the quality of time beyond work, where workplace technologies move increasingly toward bringing more value to society. But – as with any sizeable change - getting there will be the challenge.

Innovators, companies, policy makers and educational institutions will need to listen and respond as the conversation becomes louder, because the only way to harness the opportunities within the current wave of change will be to grasp the underlying motivations and trepidations of people in the context of this change.

As with any report on the topic, this is a snapshot and cannot claim to identify all the changes to come. However, it highlights some valuable insights into future technological transformation and some of the resulting opportunities and challenges – for companies, governments, and individuals.

TECHNOLOGY AWARENESS

Across the board, when asked, only 59% of those who responded to the research survey were knowledgeable of wearable technologies, dropping to 37% when asked about technologies like organic and bio printing or cobotics, which could be due to the fact that these aren't currently as common in today's workplace. Similarly, when asked about certain technology trends, respondents were equally unaware. Only 51% acknowledge the blended learning trend, and just 35% acknowledge omni-channel retail.

When asked which ones they found appealing (respondents were given a brief explanation of the technologies) the results were more promising. In fact, all the technologies and trends were greeted with more positive results. Referring to the earlier examples, 65% found wearable devices and technology appealing and 58% and 57% found organic and bio printing, and cobotics appealing respectively. Of all the technologies presented, respondents were most intrigued by 3D printing, which is expected to have a profound effect across all industries, but primarily in manufacturing and retail. The same reaction was seen across the trends. Trends associated with education and learning were met positively by respondents, with blended learning (68%), collaborative education (65%) and meta learning (66%) stated as the top three.

While optimism towards technology exists, it may be in vain if organisations themselves do not seek to maximise the opportunity afforded by it. Only 14% of employees consider their organisations to be 'excellent' at monitoring for new technology advancements.

Reaction to technologies and trends expected to shape the workplace of tomorrow

| EMERGING TECHNOLOGIES | KNOWLED-GEABLE OF | FIND APPEALING |
|------------------------------|-------------------|----------------|
| Wearable devices / tech | 59% | 65% |
| Artificial intelligence (AI) | 54% | 63% |
| 3D printing | 53% | 66% |
| Virtual reality | 51% | 63% |
| Robots | 49% | 62% |
| Collaborative tech | 48% | 65% |
| Big data | 46% | 62% |
| Augmented reality | 45% | 58% |
| Organic/bio printing | 37% | 58% |
| Cobots/cobotics | 37% | 57% |

| EMERGING TRENDS | KNOWLED-GEABLE OF | FIND APPEALING |
|-----------------------------|-------------------|----------------|
| Blended learning | 51% | 68% |
| Collaborative education | 50% | 65% |
| Meta learning | 46% | 66% |
| Flipped classroom | 41% | 59% |
| Mass customisation | 38% | 58% |
| Smart/intelligent factories | 38% | 59% |
| Gig economy | 36% | 51% |
| Omni-channel | 35% | 57% |

TECHNOLOGY AND ITS IMPACT

Overall, the majority of respondents expect that technology will be revolutionary in their industries in ten years' time with 8% stating it will be completely revolutionary and just 2% expecting it will have no effect at all. When asked about aspects of organisational change including structure, roles and responsibility, respondents had some distinct views on how technology could shape the future workplaces across these industries.

When shown specific technologies, respondents stated that wearable technologies could have the most positive impact and organic / bio printing the least. This could be explained by the fact that wearable technologies are viewed to be more applicable to more mainstream uses whereas organic or bio printing is, for the most part, very specific to the healthcare sector. There was a similar sentiment across trends related to the education sector, followed closely by smart factories.

Technologies and trends expected to shape the workplace of tomorrow

| TECHNOLOGY | TRENDS |
|--------------------------|-------------------------|
| Wearable technologies | Collaborative education |
| 3D printing | Blended learning |
| Big data | Meta learning |
| Collaborative technology | Smart factories |
| Artificial intelligence | Flipped classroom |
| Virtual reality | Mass customisation |
| Augmented reality | Omni-channel |
| Robotics & cobotics | Gig economy |
| Organic/bio printing | |



While differences within industries and markets exist, clear across all of them is a willingness among the workforce to embrace technology. However, our organisations are not yet prepared despite the benefits it could bring to business.

THE IMPACT ON BUSINESS

Over half (57%) of the European workforce believe industries and organisational models will be disrupted by technology in the coming ten years. Perhaps not as stark a number as one would expect, but this could be explained by the lack of technology awareness.

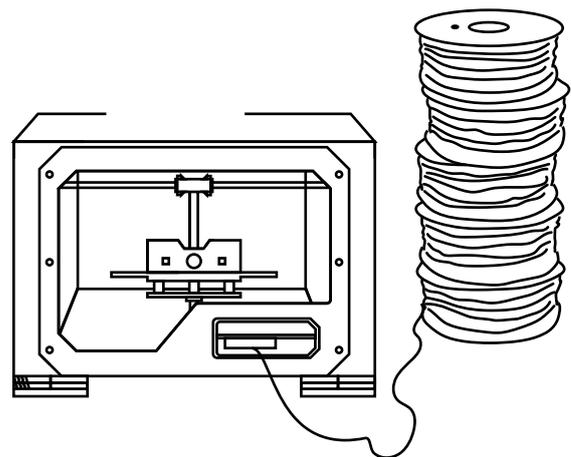
Despite this, 79% of respondents did acknowledge that technology would improve an organisation's efficiency – supporting a move to a future where we are more time-rich and less constrained by traditional working days. Furthermore, 77% say it would increase profits for their organisation despite 59% saying it would increase the operating costs.

When it comes to overall competitiveness, 76% say technology would open up new possibilities for growth and 74% acknowledge that it would increase competition in the industry, especially as we move in to an era where technology challenges the traditional way of doing things, which 81% of respondents say would happen.

However, respondents also acknowledge that technology would have an impact on regulatory and policy aspects too with 73% agreeing that it would lead to more regulation and laws on liability and practices. This is perhaps more prevalent in industries like healthcare where liability issues could be more consequential, but finding a balance between the benefits and how best to manage this across governments and organisations will be essential to future success.

77%

of Europeans believe technology would increase profits for their organisation



IMPACT ON INDIVIDUAL ROLES

When it comes to a topic at the top of a lot of Europeans' minds, 48% say technology would directly disrupt their role within their organisation and 6% agree that their individual roles will no longer exist in ten years.

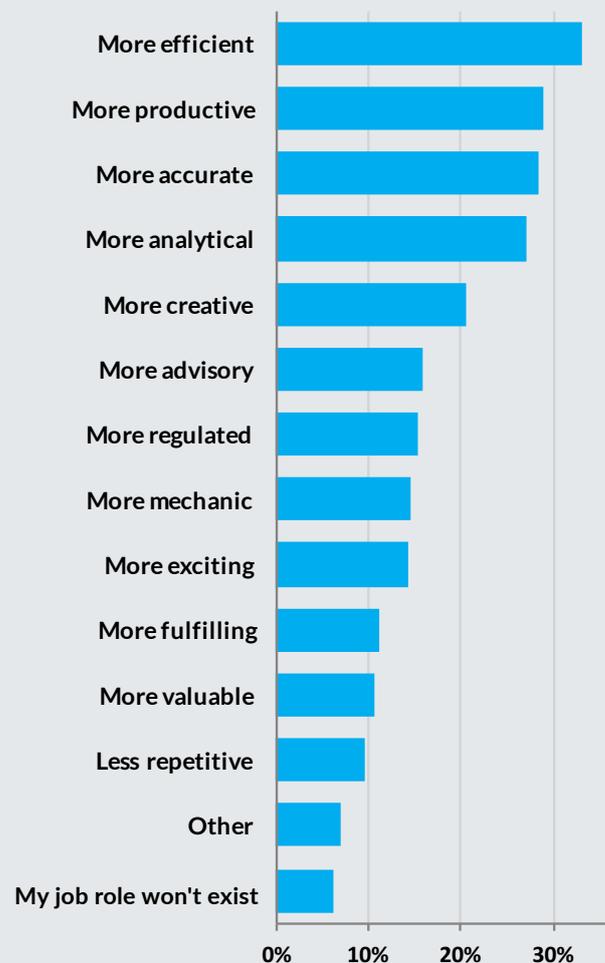
One third of respondents also indicated that their roles would become more efficient overall, closely followed by becoming more productive, more accurate and more analytical. Following this, and in line with popular belief, was the fact that approximately one fifth of respondents stated their role would become more creative. Responses across industries varied, for example, industries such as manufacturing and retail agreed that greater efficiency would be the greatest benefit. This is explored further in the following chapters of this report.

When asked how work practices will change, almost half (44%) of respondents say it would become a more 'monitored and controlled' environment, but this was closely followed by 'more flexible working hours and days' (38%). Only 19% say that it would become 'more exhausting and demanding,' which illustrates a trend toward better work-life balance and technology as an enabler for more purposeful lives outside of work.

6%

of Europeans believe their role will no longer exist in 10 years

Impact of technology on roles



IMPACT ON WORKPLACE PRACTICE

Overall, 63% of respondents say their organisation was good or excellent when it comes to monitoring evolving technologies and practices within the workplace, leaving 23% of businesses today not keeping an eye on how technology is evolving and, as a result, are exposed to missing out on the substantial business benefits it could bring.

Looking closer at practices within the workplace related to technology, 62% say their organisation was good or excellent at communicating the impact of technological change on the industry or organisation, with 57% stating their organisation was good or excellent at communicating the impact of technological change on specific job roles. Furthermore, only 54% of respondents say their organisation was good or excellent at engaging impacted employees to help with the decision process. While these figures look good on paper, they leave almost half of businesses lagging behind.

In fact, when it comes to job roles, 65% say their organisation was good or excellent at training employees to use technology, but when probed further, only 47% say they were good at repurposing potentially redundant employees, and 60% state they were good or excellent at recruiting new employees – which suggests a world where skills are acquired rather than developed.



60%

of Europeans believe their organisations are good at recruiting new employees, but only 47% say they are good or excellent at repurposing potentially redundant employees



IMPACT ON INDUSTRY

Differences across industries stood out across the research too. Overall, respondents identified that the industry most likely to be affected by technology – perhaps led by the historic nature of them – is automotive, closely followed by industrial manufacturing.

In this report, we explore five specific sectors – healthcare, retail, manufacturing, education and the general corporate world - that are all set to harness the opportunities that technology presents. However, the research results clearly highlight the fact that, despite the overwhelming benefits of technology, these industries are going to encounter substantial challenges when it comes to implementing it effectively.

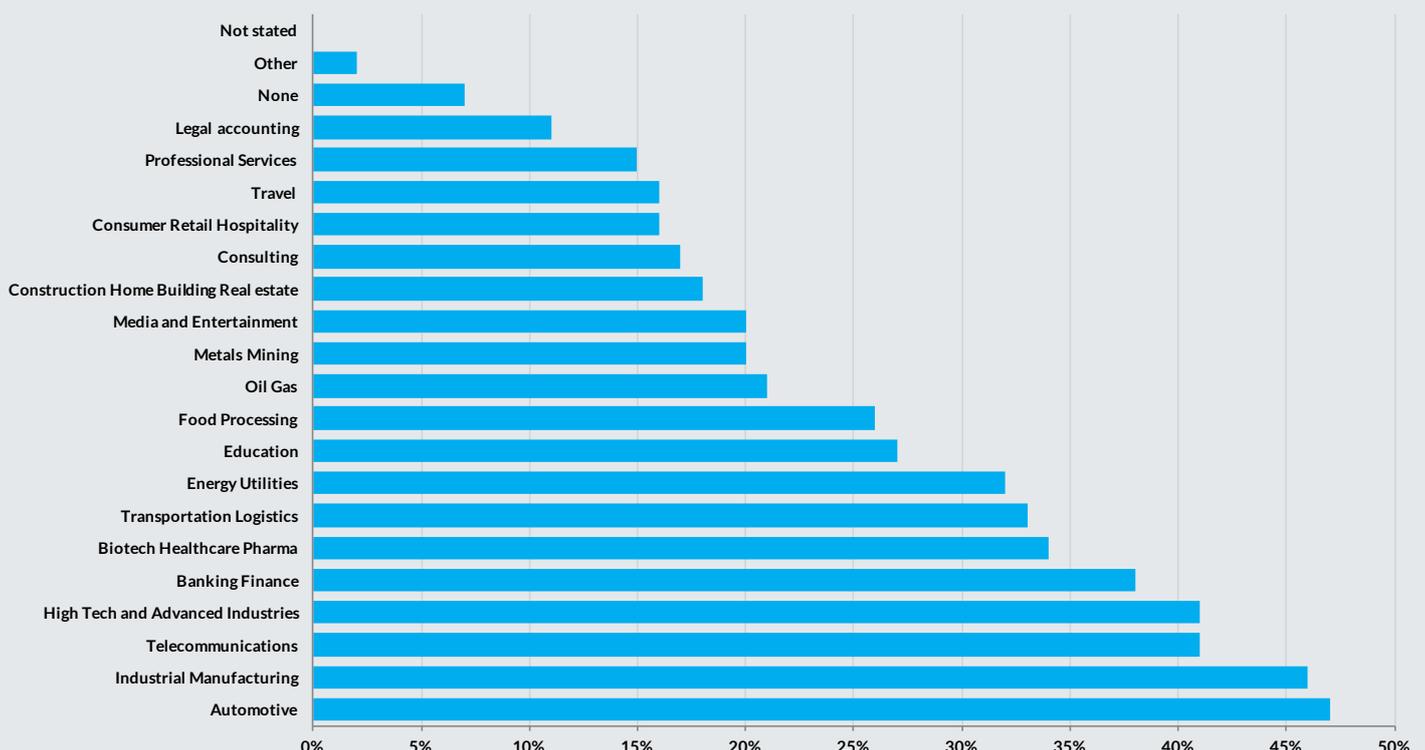
In retail, the research found that consumers are set to have a much stronger role in the way goods are purchased and produced. Technologies such as wearables and big data will facilitate a move toward a world where retailers are no longer the provider of goods themselves, but rather offer consumers the licences to print, at home or elsewhere.

This shift in buying behaviour will have a substantial impact on the way goods are produced globally. In manufacturing, a refreshingly positive outlook exists for the future despite acknowledging that the manufacturing model as we know it is set to be completely transformed toward a more “create what you need” localised one.

The role of data is also apparent across services like healthcare where people could expect to enter a world where illness prevention can take place in the comfort of their own homes, and any interaction with a medical professional is purely consultative – in a manner beyond anything we currently know today. However, holding us back will be the willingness of people to share personal data and concerns around the issues of ethics and liability.

Underpinning our ability to prepare for this new world is the set up and strength of our educational institutions. Teaching professionals and those within the education system are very optimistic about the future outlook and the impact technology could have on education. Yet, they feel that financing, teacher training and the proper implementation of technology could be the three greatest barriers to success.

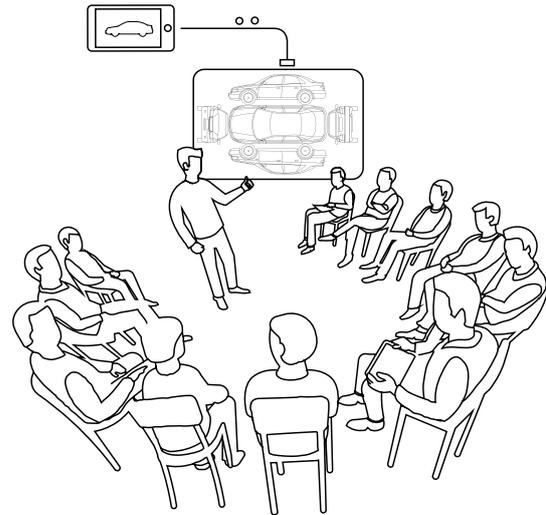
Industries most likely to be impacted by technology



WHAT NEXT?

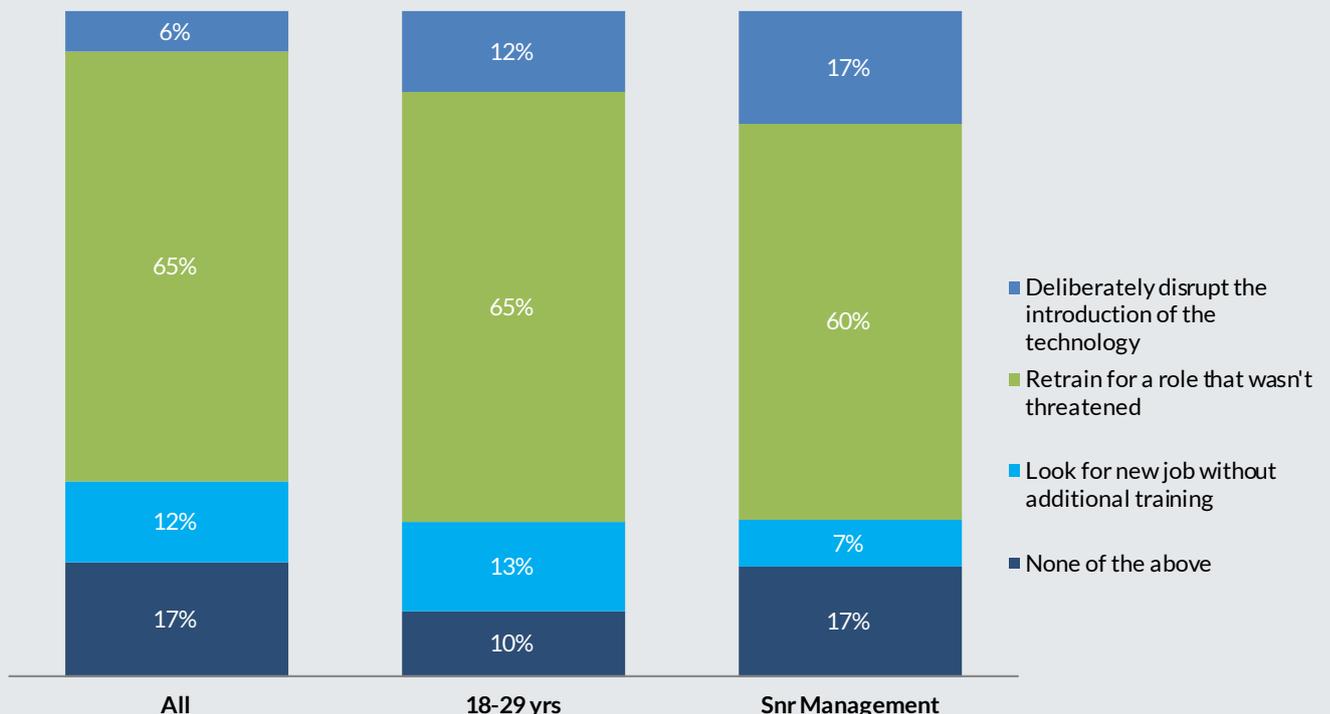
Our “working world” as we know it will be completely transformed. Whether that takes place imminently or gradually over the next ten, fifteen or twenty years, the research points to a world where efficiencies gained through technologies like artificial intelligence or augmented reality could transform the work place as we know it today. In fact, how corporations evolve with the times – even to the point where business models and industries will be altered – could decide who remains successful and who does not.

Overall, respondents acknowledged the wealth of change technology could bring. When shown how technology could shape their workplaces, 71% are optimistic about the future with 65% of respondents expressing a willingness to retrain for new roles. However, organisations should be mindful of how technology is introduced and communicated. Surprisingly, 6% of employees overall state they would deliberately disrupt the introduction of technology if they felt their job was threatened. More concerning is that this figure rises to close to one fifth (17%) within senior management.



65%
of Europeans express a willingness to retrain for new roles

Reaction to negative impact of technology on jobs

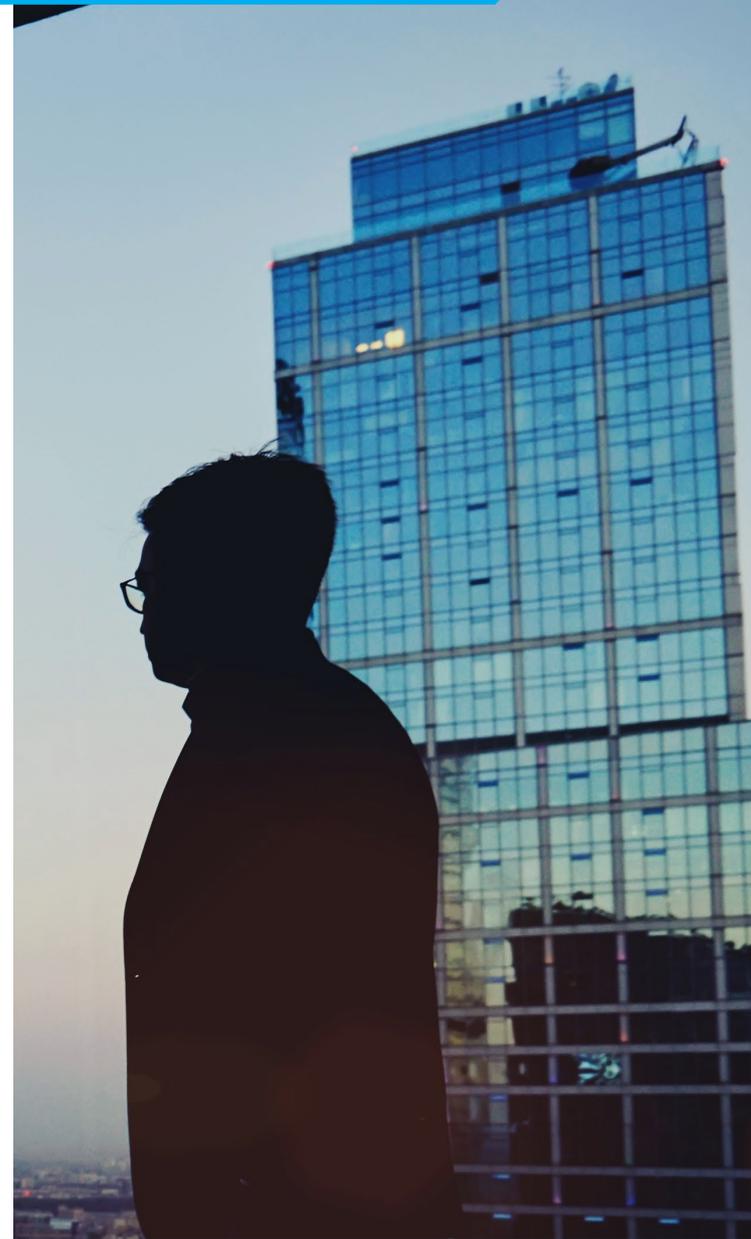


It is also clear from the overall findings that although the majority of employees are ready to engage with technological changes, implementation hurdles still remain. Alongside more general non-sector specific hurdles, these challenges vary in complexity and nature. They are dependant on the specific sector and are discussed in further detail in the subsequent chapters.

This report paints a picture of the future, exploring not just tomorrow's world but the one we are set to see beyond that. At the same time, it tests the acceptance of this expected reality on the current workforce, identifying the considerable gaps and opportunities that could ultimately contribute to future success or failure.

71% of the workforce express positive sentiment toward technology and are ready to engage with technological change. Yet, as with any change, implementation hurdles remain and enthusiasm may not be enough to drive this technological shift. In addition to budget and time constraints, hurdles include:

- A disengaged workforce with a small but not insignificant 6% of the workforce who stated they would 'deliberately disrupt the introduction of technology' if their job was threatened.
- A knowledge gap meaning work still needs to be done when it comes to raising awareness of the benefits of new technologies among the workforce.
- Limited focus on futureproofing, with employers bringing on new employees with required skill sets rather than training and repurposing potentially redundant employees. 65% of respondents say they would retrain for a different role if they felt theirs was threatened. This means organisations should capitalise on their willingness to learn and maximise potential opportunities.



71%

of Europeans are optimistic
about a future with
technology



CHAPTER 1 CORPORATES



“Working habits will change drastically, not just in the way we approach the physical space in which we work, but our way of being in our working life.”

MARIANO CORSO, SCIENTIFIC OFFICER,
PARTNERS FOR INNOVATION



“Augmented reality (AR) and virtual reality (VR) will become completely normal workplace technologies, helping people work faster and do multiple tasks.”

GERD LEONHARD, FUTURIST,
THE FUTURE AGENCY

Over the next ten years, working practices, organisational structure and office environments are all set for a shake-up. The gig economy and ultra-flexible workspaces will become the norm as will new technologies such as augmented reality (AR), robots and artificial intelligence (AI). This will pave the way for a more efficient, more productive and more profitable workplace.

As with any industry transformation throughout history, there is the potential of a negative impact on employee engagement within the corporate sector. There is a risk that employees will feel less engaged with their company and working environments until new patterns become familiar.

Organisations today are in the process of building the technology foundations, which explains why some employees express discontent with certain aspects of technology. Examples include smart phones making us too accessible and concerns over privacy and cyber-attacks.

Nonetheless, technology will evolve, opening up huge possibilities for the future. How corporations and their employees take hold of these opportunities will determine who will remain competitive. In fact, technology in the workplace of tomorrow will lead to businesses saving costs, according to 56% of respondents, resulting in a more profitable workplace.

The research demonstrates that much of the workforce and leaders alike are feeling overwhelmed and to some extent threatened. However, with proper implementation and communication, business leaders, HR and IT can, over the coming years, properly address and implement technology to ensure business success.

Several key technological trends were highlighted by the research:

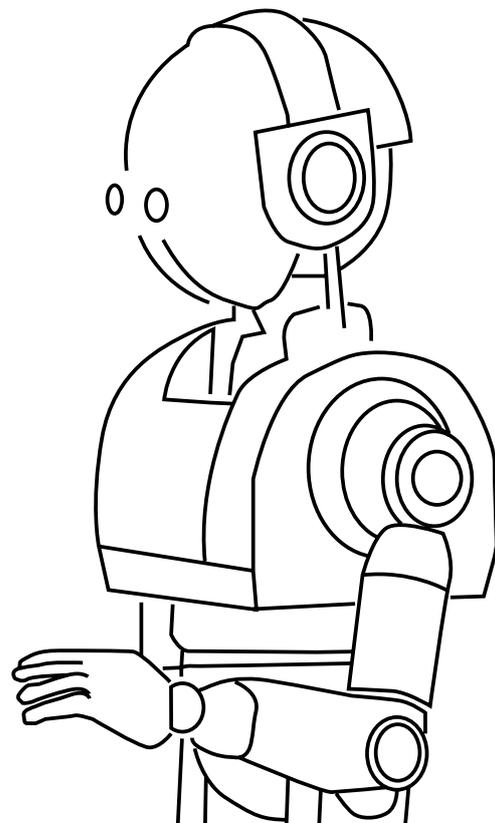
CREATIVE RE-EMERGENCE

According to Futurist Gerd Leonhard, the workplace will become less productivity and results driven – it will become increasingly flexible, remote and personal in order to nurture spontaneous creative work. This transformation is echoed in the research results with 52% of the corporate workforce from numerous sectors agreeing.

In addition, Leonhard predicts that people will evolve in human skills such as spontaneous creativity and imagination, understanding and compassion, and relationship-building. In fact, 71% of respondents agree that artificial intelligence will have the capacity to replace humans in repetitive and codified office jobs and 65% agree that this shift will allow people to concentrate on the creative aspects of their organisation. However, just 43% of respondents agree that the evolution of the work space will have a positive impact on creativity, perhaps due to an inability to imagine what entirely new ‘jobs of tomorrow’ could look like.

71%

of respondents agree that AI will replace humans in repetitive and codified jobs



RISK OF A NEW ERA OF CORPORATE DISENGAGEMENT

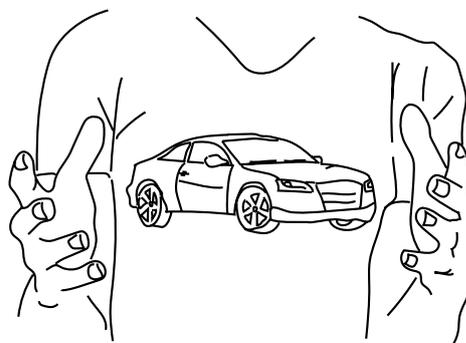
Perhaps as a consequence of so much uncertainty, 68% of the European workforce feel that people will be less engaged with their company in the future due to technology driven changes. Ninety percent of the corporate workforce is anticipating 'disruption,' raising questions about how corporates can best harness new opportunities.

Furthermore, the potential benefits that new technology could bring to people's working lives have not yet fully been grasped, according to the research. Although 72% of respondents express positive sentiment (enthusiasm or intrigue) toward the expected technological shift, 22% of respondents feel that their organisation is poor at communicating the impact of technological change on their industry. Just 16% say their organisation is excellent at communicating the impact of technological change.

While 69% of respondents say their organisation is good at training employees to use new technologies, employers seem to be much better at getting new blood in when additional technological skills are needed (67% of respondents). Just 55% of respondents consider their employer good at repurposing potentially redundant employees.

Despite this, 67% of respondents would be willing to retrain for a role that was not threatened. Consequently, organisations should maximise the opportunity to capitalise on this willingness to learn. Also of critical importance is the concept of "learning while earning". Companies must find a way to help employees evolve into tomorrow's workplace with the need for constantly new and updated skills.

Some stark choices are ahead for individuals, employers and policymakers concerning technological adoption. These choices could have implications for individual employability, corporate performance and international competitiveness. The research illustrated considerable gaps and divergent sentiments toward the potential benefits (and perceived threats) of technology in different industries and economies throughout Europe.



Only 16%
of Europeans say their
organisation is excellent at
communicating the impact
of technological change

67%
of Europeans in corporates
would be willing to retrain
for a role that was not
threatened

OUT WITH THE 'OPEN PLAN'

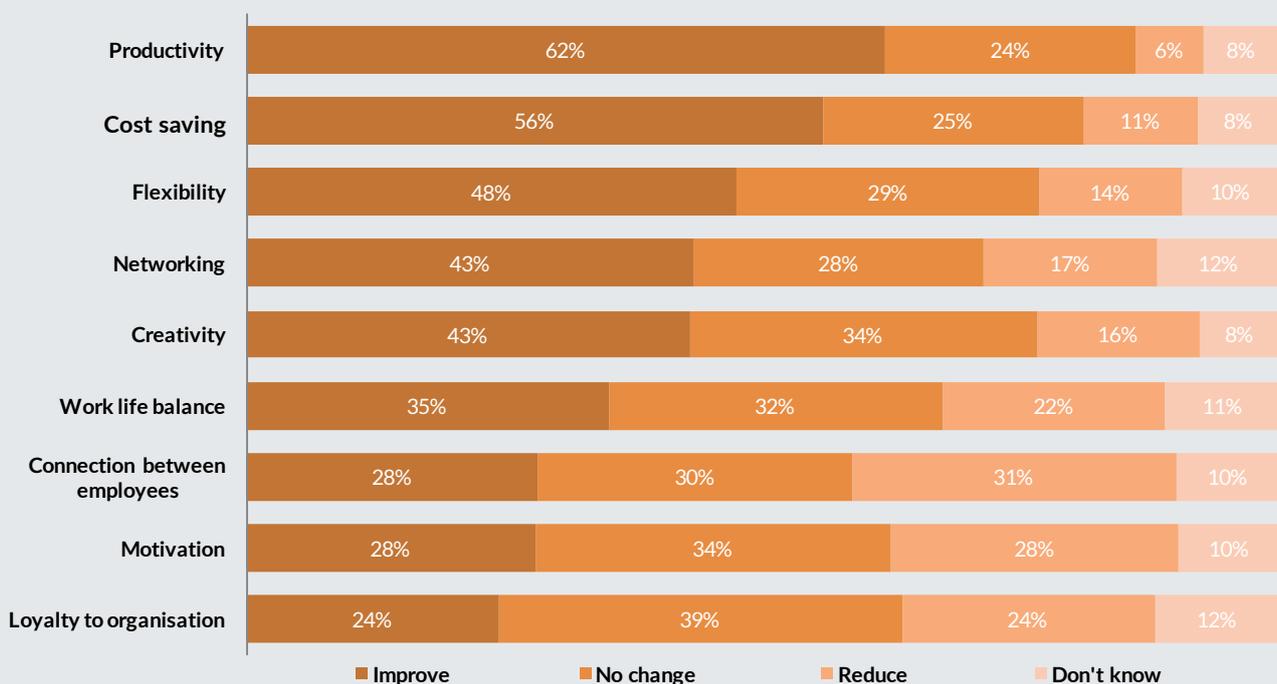
The physical office space as we know it today is set for a facelift in the future. Europe's office of tomorrow will no longer adopt the 'traditional' open office floor space. Instead, offices will comprise smaller spaces and customised working environments for specific groups of employees according to 66% of survey respondents. Supporting this, 65% of respondents believe that as offices become smaller and more remote, collaborative technology will enable the workforce to increasingly work from home. This evolution, according to 62% of respondents will have a positive impact on productivity.

In addition, 65% of respondents believe that tailored technology will be on-hand in this new office space for each individual employee's needs. Consequently, office architects and designers will become important partners for organisations to ensure the office environment transitions into the workplace of tomorrow.

62%

of Europeans in corporates agree a world where employees can work from home and offices become smaller will have a positive impact on productivity

Evolution of physical workspace and organisational impact



GLOBAL WORKPLACE, VIRTUAL MEETING SPACE

Coupled with the physical workplace shift, new technology will support even greater collaboration between local and global employees. While selecting the technologies that are fit for purpose is critical to virtual collaboration, equally as important to the evolution is training and supporting employees as they use this technology.

According to 71% of respondents, future meeting rooms will be entirely virtual with employees based in workspaces around the globe using technologies such as AR and holographic projectors to join real-time workgroups. This could have a substantial impact on employee engagement, especially as 68% of respondents believe people will feel less engaged with their company as the workplace becomes more remote, less team orientated and more impersonal.

68%

of Europeans in corporates believe people will feel less engaged with their company



“Virtual communication is currently inefficient and ineffective – we have the technology now but by 2025 we will have learned how to use it.”

CLINTON WINGROVE, HR FUTURIST

THE GREAT ORGANISATIONAL RESHUFFLE

According to experts, corporate life will enter an era of a smaller, more tech-enhanced workforce that allows individuals to provide higher value to society but will require employees to train for new roles. However, the European work force has a different perspective, with just 35% of respondents believing the size of organisations will shrink and it will be interesting to see how this materialises over the coming decades.

Regardless, today's workforce has already seen the concept of a 'job-for-life' swapped for more short-term career stints, a trend that is set to continue. For individuals, 74% of respondents believe the concept of being attached to a single company will weaken further over time and roles will become even more flexible.

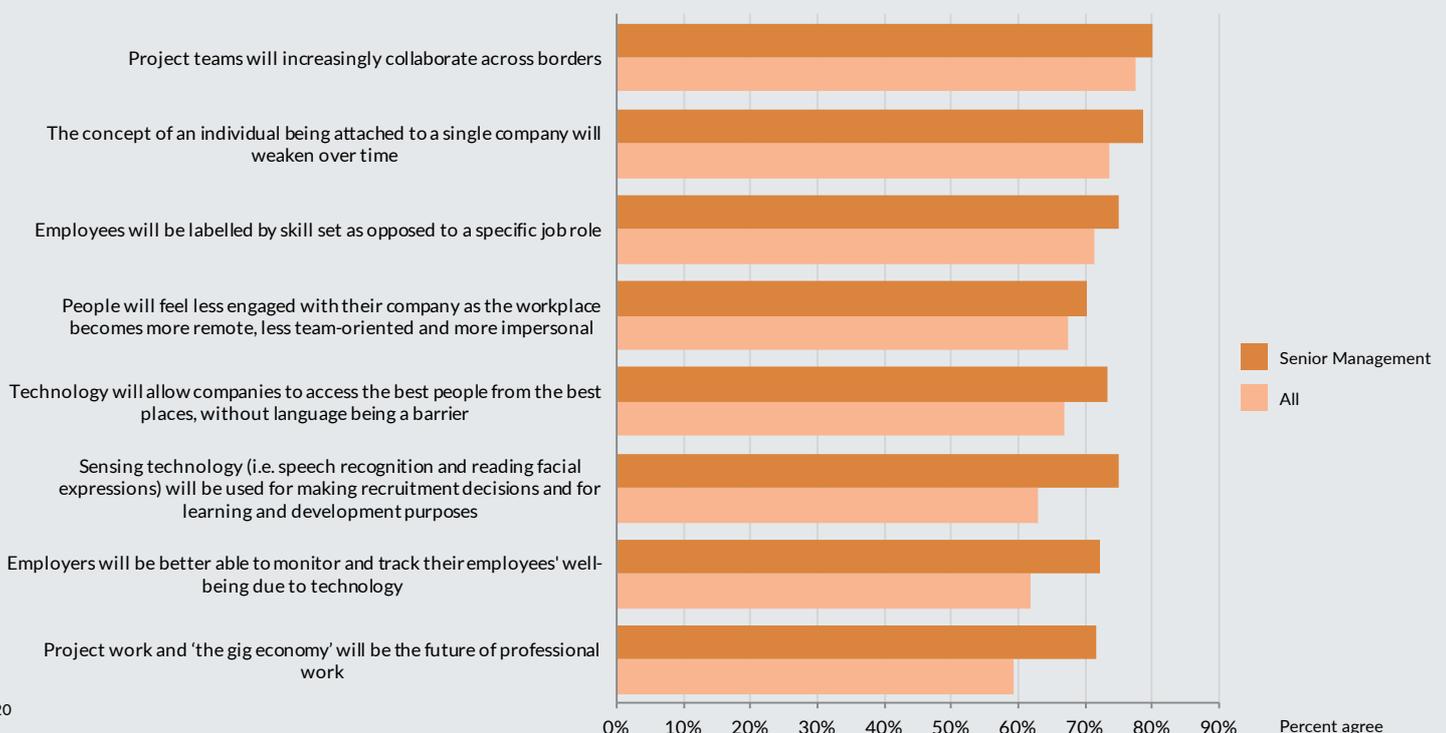
In fact, according to 59% of respondents, project work and the gig economy will be the future of professional work and a further 71% agree that rather than having a specific role in an organisational structure, employees will be labelled by skill set. According to the research, respondents believe that 52% of their respective industries will be working in the professional 'gig' economy in 10 years' time.

“Human resources will be globalised as we are able to prioritise talent and cost over location thanks to collaborative technology.”

BRICE LE BLÉVENNEC,
CEO AT EMAKINA

As a result, organisational and HR structure will have to adapt accordingly in tomorrow's organisation. Technology will have an added benefit to HR from a recruitment perspective. Clinton Wingrove, HR Futurist, predicts that AR will increase the rate of success in recruitment decisions – currently there is less than a 0.6% predictability of success. This is echoed in the research results, with 63% of respondents agreeing that sensing technology (i.e. speech recognition and reading facial expressions) will be used for making recruitment decisions and for learning and development purposes.

Technology and impact on corporate workplace of tomorrow



AUGMENTED COLLABORATION

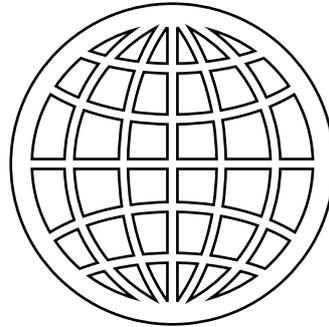
Technology is set to revolutionise current working practices across management, customer communication and colleague collaboration. For example, technology such as AR (complemented by speech recognition, semantic analysis and video technology) has the capability to enhance collaboration and interaction.

According to 69% of respondents, technology will better facilitate interaction and collaboration, and 69% also believe that communication barriers will be removed due to real-time translation technologies facilitating more global collaboration. In addition, 77% of respondents agree that project teams will increasingly be collaborating across borders.

According to Professor Alain Bernard, Professor at Centrale Nantes and researcher at France's Laboratoire des Sciences du Numérique de Nantes (LS2N UMR CNRS 6004), an increased focus on work-life balance will evolve with a growing need for connectivity so employees can aid and assist each other better. However, as revealed in the research, just 35% of respondents think additional technology will improve work life balance. Perhaps this is in part due to the fact that we are in the early stages of entering this era of technological adoption. People do not fully understand the future benefits once the initial implementation process has been rolled out.

Even though technology (for example, wearables, robots and augmented reality) has the capacity to revolutionise working practices, face-to-face connections will remain a crucial component of the workplace of tomorrow. According to 74% of respondents, no virtual application will ever replace face-to-face connections for relationship building but we're yet to see what developments technology could deliver (for example, holographic meetings). Interestingly, just 28% of respondents believe the evolution of the physical work space will improve the connection between employees.

Consequently, organisations will need to ensure that technologies are carefully selected to enable greater collaboration and higher efficiency, while allowing employees to interact in person when it matters most.



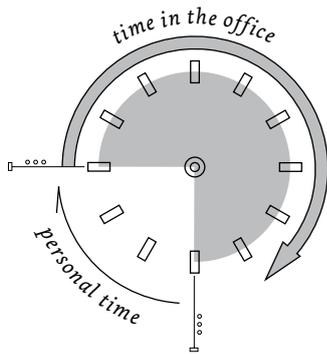
77%

of Europeans in corporates believe teams will increasingly collaborate across borders, thanks to technology

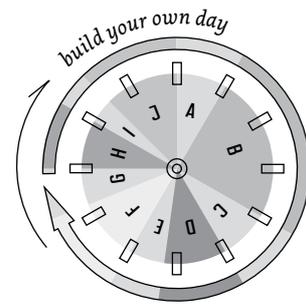
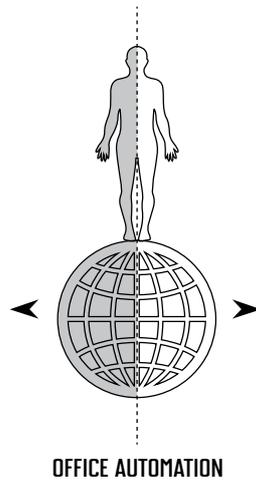
LIFE'S NEW PURPOSE

TECHNOLOGY THAT DRIVES THE QUALITY OF PEOPLE'S LIVES, TO A WHOLE NEW LEVEL

an average day in your life
TODAY
 FOCUS ON WORK, LIFE'S MAIN PURPOSE



an average day in your life
TOMORROW
 FOCUS ON PEOPLE & PLANET, LIFE'S NEW PURPOSE



- a. family time
- b. work for company X
- c. volunteer work
- d. self-actualisation
- e. exercise
- f. work for company Y
- g. lifelong learning
- h. ...

CONCLUSION

According to Wingrove, although people will remain a company's greatest asset, technology will evolve to become just as critical to success; true top talent will be those who can exploit its potential.

With the shift in workplace, technology and business decision makers – including IT and HR leaders – have a big task ahead to ensure that employees remain engaged and have the necessary skills to drive efficiency and productivity forward in the future. Being aware of the possibilities may be the first step toward greater technology adoption.

By embracing the technological and societal trends that are already beginning to shape our future, organisations will be better positioned to embrace the opportunities.

Yet, this inevitable corporate cultural shift cannot be an isolated event. Business decision makers must be aware of external forces which will increasingly affect organisations. It will take more than a decision in the board room to ensure that the full potential of technology can be leveraged throughout the organisation.

Organisations must play a more active role in the wider societal and policy debates when it comes to transformational change over the next ten years. In addition, governments, educational institutions and individuals must realise the massive changes to come and prepare for a societal transformation driven by rapid technological advancements.

A white quadcopter drone is shown in flight, hovering just above a large, brown cardboard box. The drone's propellers are blurred, indicating motion. The background is a blurred urban setting with buildings and windows. A green banner is overlaid on the bottom left of the image, containing the chapter title.

CHAPTER 2 **RETAIL**



“Big data is not really new – the change will come as we develop the ability to analyse and use the data we have access to.”

PROFESSOR RICHARD WEBBER



“The retail experience will be both experiential and social. Brands will need to create a sense of community to keep their clientele; brand loyalty is no longer enough.”

HOWARD SAUNDERS, RETAIL FUTURIST,
TWENTY SECOND & FIFTH

By 2025, retail – both online and in store – will be ultra-personal. Retail futurist, Howard Saunders, says that big data will allow the shopping experience to be tailored and customised for individuals; and 72% of the European retail workforce agree, believing retail staff will facilitate better experiences as a result. While almost half (49%) accept that big data will have a positive impact on the industry, 42% believe customers will not trade data privacy for a more personal and tailored shopping experience (with the number rising to 64% for those aged 50 years old and above and only 50% for Millennials, aged 18-26 years old). This raises important questions about the relationship between retailers and their customers, and it will be a key factor to be addressed if retailers are to realise the full opportunity of technology.

HALF

of Europeans agree that big data will have a positive impact on retail, but 42% believe customers will not trade data for a more personal shopping experience

Overall, 73% of survey respondents see personal devices increasingly being the link between customers and stores. However, alongside this technology, the role of the physical store itself will also expand, with over half of respondents believing that a future without the high street is not plausible. Further strengthening this point, an estimated 56% of purchasing decisions are expected to be made in store by 2025.

However, there are likely to be big changes to the physical store as we know it, as well as additional aspects such as automatic identification to provide an ultra-personalised shopping experience, as expected by 72% of respondents. Forty-six percent also anticipate that stores will no longer hold stock; but will leverage augmented reality to provide a personalised service and recommendations (63%), producing customised products onsite on demand.

Consumers will play an increasing role in the future of the retail sector, not only in consumption of, but also in the production of goods. We are entering an era where goods can be seen, processed and produced (at home or in-store) by an individual, which will likely leave brands as the providers of design licences rather than the goods themselves.

In order to achieve this positive outcome, there are specific hurdles to overcome, including the cost of implementing new technologies (63% of respondents think this will be a challenge) and training for employees (40% agree that a lack here will have a consequence).



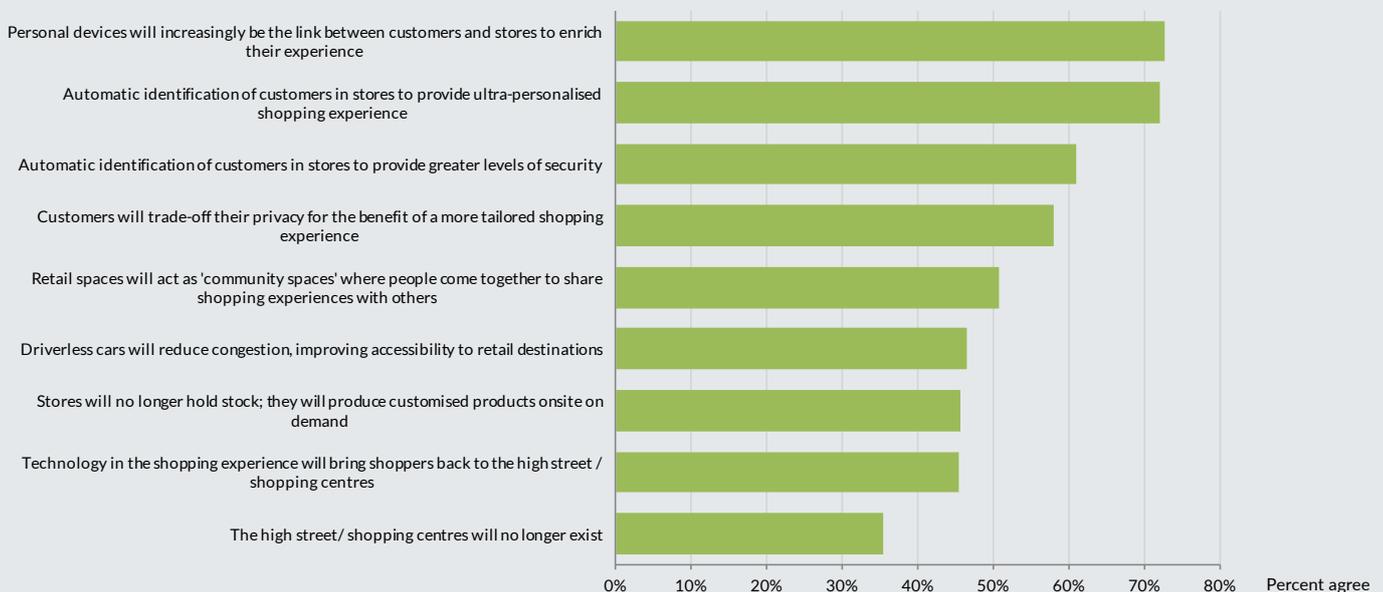
56%

of purchasing decisions are expected to be made in store by 2025

“The focus of retail will shift from the product to the customer.”

GIULIANO NOCI, PROFESSOR OF POLITECNICO DI MILANO

Technology and impact on retail sector of tomorrow



Several key technological trends were highlighted by the research:

RISE OF THE AUGMENTED SHOPPER

Respondents agree that augmented reality (AR) will be the retail game-changer. Sixty-nine percent agree that the simulation of products in any environment (home, work, in-store) will help customers envisage their tailored usage and AR will provide a unique customer sensory experience. At the same time, 57% agree that it will provide a social and fun shopping experience, creating a sense of community around the brand.

According to Jonathan Reynolds, Academic Director of the Oxford Institute of Retail Management, Associate Professor in Retail Marketing and Deputy Dean at Saïd Business School, AR and VR are emerging from the peak of their hype cycle. However, he argues that their integration into retail won't take place until they provide a reliable mechanism for everyday experience. However, as seen from the research findings this shift is closer than we might think.

ZERO QUEUING TIME

As the point-of-sale function evolves, queuing time in stores will be eliminated, according to 45% of respondents. Automatic identification of customers in stores will support an ultra-personalised experience and this personalised service will be ultra-fast with 53% agreeing that transactions will be automatic thanks to debit sensors.

57%

of Europeans in retail believe technology will provide a social and fun shopping experience

“Point of sale becomes a point of presence – a physical touchpoint which should be leveraged according to the particularities of a brand’s customer journey – stretching the five senses.”

GIULIANO NOCI, PROFESSOR OF
POLITECNICO DI MILANO

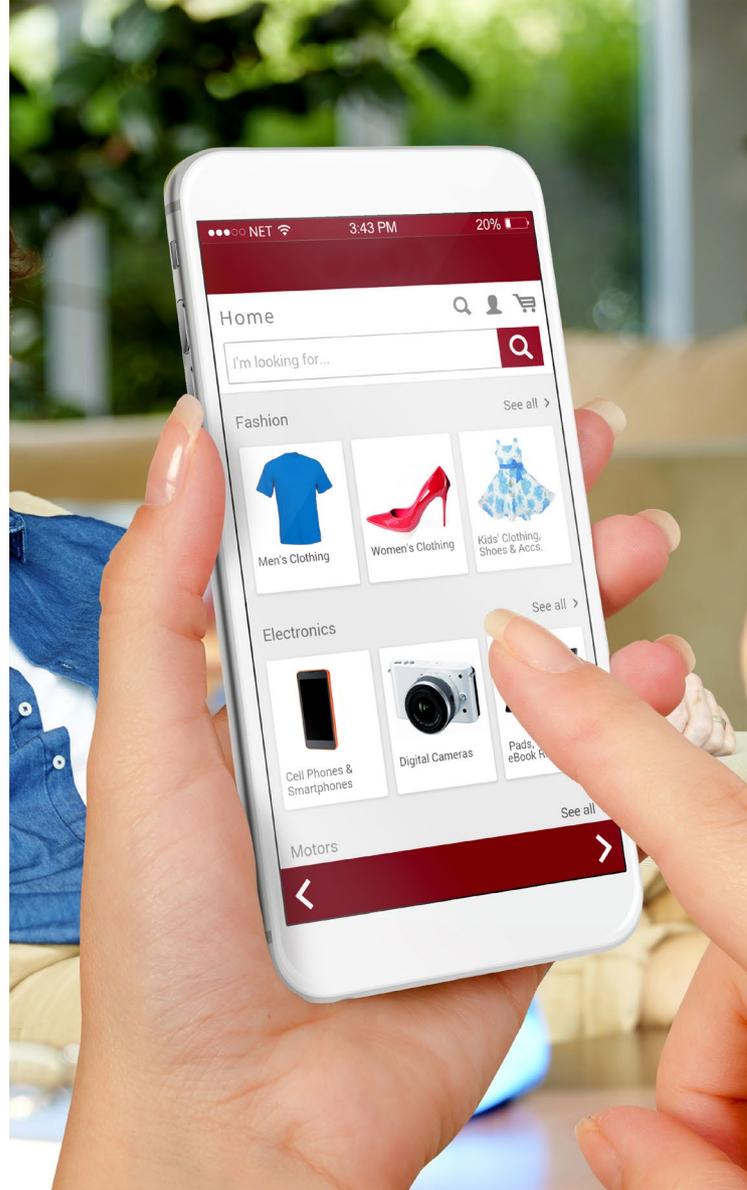
FOOTFALL POWERED BY DRIVERLESS CARS

As shown in the findings, respondents believe that technology integrated into the shopping experience will bring shoppers back to the high street and shopping centres. In addition, almost half of respondents (46%) agree that driverless cars may be a major catalyst in getting them there thanks to a reduction in congestion in major shopping areas. However, in order for this to become a reality, authorities must implement driverless car zones and infrastructure to support this shift.

INSTORE TRUSTED ADVISORS

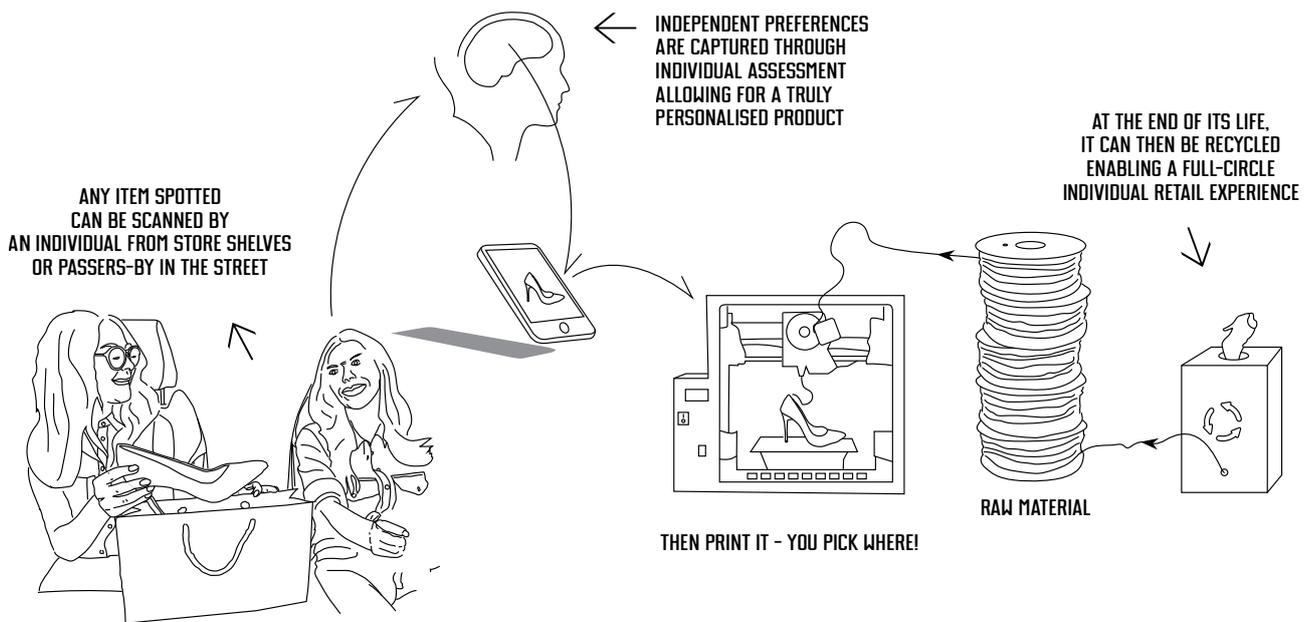
Sixty percent of respondents agree that transactional and cashier responsibilities will no longer exist. Instead, 74% of respondents believe employees will be experts and 'trusted advisors' in retail, able to access up-to-date information instantly to satisfy customers. Consequently, new skills and more training are needed to ensure that in store advisors add value that advanced technologies cannot.

Transformations in the retail sector will bring sizeable benefits to consumers, as they see a new trend running alongside the traditional 'buy what's on offer' model, in the form of a more consumer-centric 'what you see is what you can print (WYSIWYP)' model (see section on manufacturing and 3D printing). This will open up new opportunities for companies to delight and engage their customers in new ways. All of this will be possible, according to experts and respondents alike. This leads Reynolds to believe that the biggest challenge for physical goods will then be home distribution, for example via drone delivery.



WYSIWYP

WHAT YOU SEE IS WHAT YOU [CAN] PRINT



CONCLUSION

As revealed by the research findings, brick and mortar retailers do not need to fear that online stores will take their place, since the experience of visiting a physical store will remain an important part of their leisure time and social lives to consumers. However, creative instore layout and design, equipped with new technologies that facilitate a smoother, more enjoyable and more social experience will be increasingly important. Retail outlets are likely to hold less stock and offer more space for immersive experiences. The idea of people taking their purchases home will become a thing of the past as shops develop into showcases for products. This will result in less congestion in town centres as deliveries and logistics are located out-of-town. Retailers could also consider joining the conversation when it comes to the implementation of supporting services that will bring people to their doors. Driverless cars may seem irrelevant for some, but they are not that far removed from the retail discussion, and they are not that far away in the future. Yet, they will require driverless car zones to be implemented in town centres with local regulations in force.

Stepping back into the instore environment, in exchange for customer loyalty (and personal data), retailers will need to up the ante in terms of more efficient transactions and more exciting instore experiences. As big data, augmented reality and 3D printing become mainstream, consumers will expect retailers to get smarter and faster at personalising their offer and customising their

product.

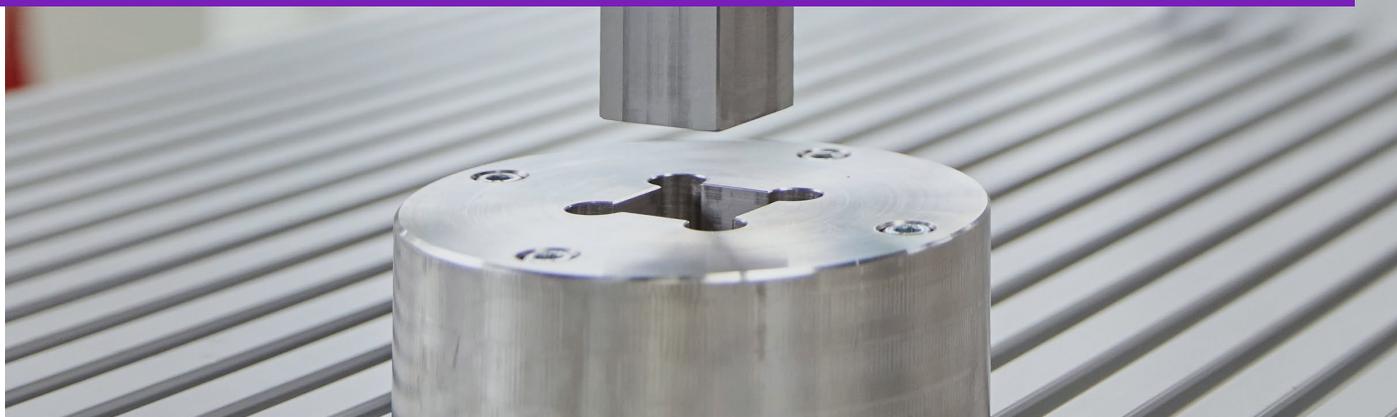
To gain an edge, retailers will need to integrate new technologies. Particularly, they must facilitate seamless transactions to allow retail staff to bring the 'sense of community' that consumers will come to expect and to add value through their roles as trusted advisors. For the retail workforce to fulfil its new role, education and training will be key. Those with heightened interpersonal skills, service industry sensibilities, and ability to effectively work with the technology and devices that can bring data, sensory inputs and outputs, and product offerings together will be needed if retailers aim to enhance the customer experience.

74%

of those working in retail believe those on the shop floor will become experts and 'trusted advisors', able to access up-to-date information instantly to satisfy customers



CHAPTER 3 MANUFACTURING





“It is not the technology itself, but how we use the technology that will be the game changer.”

CLIVE HICKMAN FRENG, CHIEF EXECUTIVE, MANUFACTURING TECHNOLOGY CENTRE

With the advent of the steam train, the first industrial revolution brought us automation of much of the world's muscle work, enabling greater creativity and brain work. Similarly, today the global manufacturing sector is in the midst of morphing into something entirely new, as we enter the next industrial revolution, Industry 4.0, which brings us automation with data exchange. This revolution is defined by connectivity, according to Professor Alain Bernard¹. Influenced by a drive for greater efficiency, automation will become 'intelligent,' linking traditional and more recently automated manufacturing processes to big data and the internet of things (IoT).

On the other hand, a major retail trend towards greater personalisation will bring the same expectations to manufacturing, demanding that products, too, become more customised. 3D printing will enable this to happen, and may just turn manufacturing inside out – taking production from the factory to city centres and even people's homes. This won't replace the factory floor altogether though; and 83% of respondents believe that new technologies in industry will improve organisational efficiency (the highest across all five industries surveyed) as well as make individual roles more efficient, more productive, more accurate, more analytical and more creative.

¹ Professor at Centrale Nantes and researcher at France's Laboratoire des Sciences du Numérique de Nantes (LS2N UMR CNRS 6004)

Several key technological trends were highlighted by the research:

CUSTOMISATION, LOCALISATION AND RESHORING

With the new wave of technological advancements, factories will become smarter, and supply chains will become shorter. Factories will become more frequently localised – equipped to produce quick-to-market, ultra-customised product offerings. This could be a real benefit to consumers, according to 65% of the workforce who believe the quality of goods will improve as new technologies are implemented.

The biggest technology game-changer for manufacturing will be 3D printing, according to Futurist, Christopher Barnatt, who says it will allow for the production of items with multiple parts to be done in one go. Across industries, including aerospace and medicine, 3D printing will also allow material savings to be made, and will facilitate more customised manufacturing and the emergence of new cross-industry business ecosystems.

Experts agree that factories could become giant mobile printers and that people will want factories to relocate to city centres, which should suit the 65% of survey respondents who think that products will be printed on demand, not manufactured in bulk. This will be made possible in part by 3D printing which, according to 60% of survey respondents, will enable manufacturing industries to reshore and localise activities. Coupled with the fact that factories will have the capability to remotely identify demand, production will be faster, cheaper and more able to offer the on-demand production that the market will come to expect.

65%

of respondents in manufacturing believe the quality of goods will improve thanks to new technologies

Furthermore, 40% of those surveyed within manufacturing believe supply chains will become shorter, stronger and more tightly aligned with more communication flow. With a reduced need for large production facilities, warehouses, and complex logistics chains, 57% agree that production facilities will become more localised, offering customised manufacturing that will replace mass global production and provide considerable benefits to business, the environment and society.

"Some manufacturing will become on-demand print; some factories will become 3D printers, and companies will sell licences to print rather than the physical product itself."

CHRISTOPHER BARNATT, FUTURIST,
EXPLAININGTHEFUTURE.COM

CYBER SECURITY IS THE GREATEST THREAT TO THE MANUFACTURING SECTOR

It has been a widely held perception that many people fear that this industrial transformation will mean more technology and fewer jobs. This, however, is not reflected by the research. Almost half (47%) of the manufacturing workforce across Europe say that technology will disrupt their role in the future (this jumps to 65% in France, and drops only to 38% in Italy); but with the manufacturing sector comprising 15% of Europe's overall GDP¹, and contributing over 52 million direct or indirect jobs², the workforce seems to have a refreshingly positive employment outlook amidst an era of uncertainty in Europe as technologies like robotics edge their way in to today's large-scale production facilities. In fact, 62% of respondents say that manufacturing jobs will evolve with technology, not be replaced by it.

67%

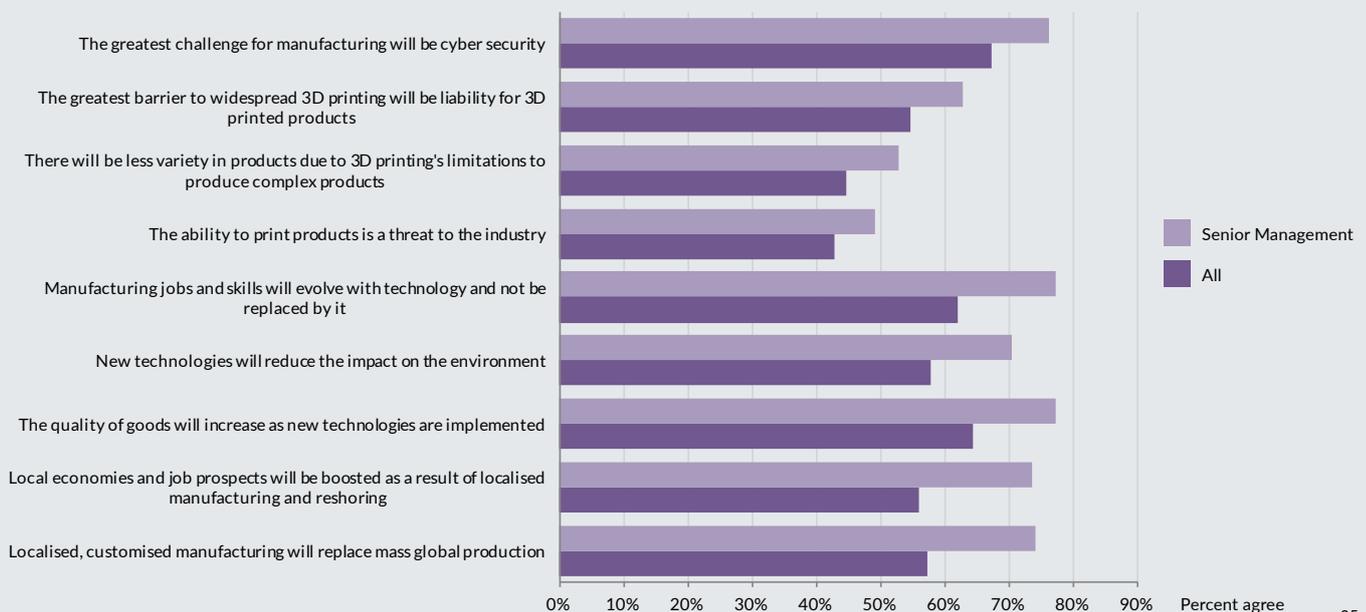
of the European workforce in manufacturing agree that cyber security poses the greatest threat, rising to 76% of those in management roles

Furthermore, experts, along with 74% of senior management across Europe, think that rapid global change in manufacturing will see local economies and job prospects boosted thanks to technology. This should urge a shift in attention away from job security concerns to address cyber threats instead. When asked, 67% of the European workforce in the manufacturing industry agree that cyber security poses the greatest threat, rising to 76% of those in management roles. Threats could include, for example, encryption or plain text messages via the network causing operational downtime; infiltrating firewalls for theft of sensitive data, or external tampering of a robot to manipulate production.

¹ <http://www.forbes.com/sites/sarwantsingh/2016/03/29/future-of-manufacturing-in-europe-seven-transformative-forces-that-will-boost-industrial-growth/#161ae9e924cc>

² <https://www.businesseurope.eu/manufacturing-europe>

Threats and opportunities: an overview of the manufacturing industry of tomorrow



SMART FACTORIES, SMARTER WORKFORCE

Although experts predict that there is still an important role for the workforce in future manufacturing, the workforce will dramatically change over the next 10 years. People will train robots to learn and collaborate, according to Professor Bernard, and cobots (robots designed specifically to collaborate with people) will assist with more difficult tasks. Overall, 70% of the European workforce agree, saying that robots and cobots will take on more complex tasks that would take humans longer to master. Although 69% of the workforce agree that robots and cobots will become a core part of our manufacturing infrastructure, 60% believe that robots will not be able to replace human ability for flexibility, creativity and reaction, suggesting that people will still have an important role to play. The big challenge for organisations, according to more than half (55%) of the survey respondents, will be the struggle to keep up with regulatory requirements when integrating robots into manufacturing and infrastructure.

But robotics and cobotics are not the only game-changing technologies; AR will play an important role in manufacturing of the future, according to industry experts Professor Bernard and Professor Darwin G Caldwell, Research Director, Italian Institute of Technology in Genoa and Chair of the IEEE Robotics and Automation Chapter. It will provide workers – from industrial design to inventory and maintenance – with real-time data, information and instructions and allow for complex manufacturing processes, customisation and error reduction. The biggest impact of AR in manufacturing though, according to nearly half (43%) of the workforce surveyed, will be in product development, followed by knowledge sharing, training and skill enhancement, and process innovation and streamlining. Although many experts predict that this technology will ensure employees work smarter and more efficiently, when it comes to AR in the workplace, it seems that just under half of the workforce will need to see it to believe it; the other 56% find AR ‘appealing’ for their industry.



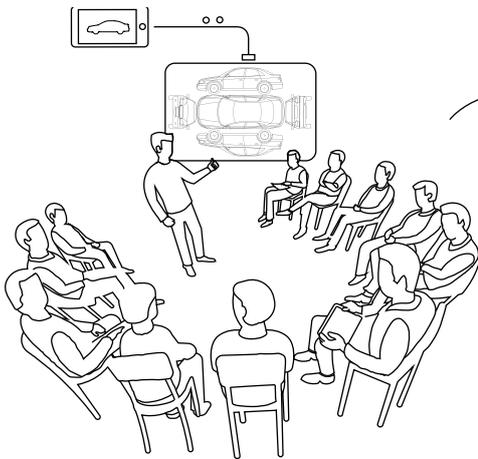
60%

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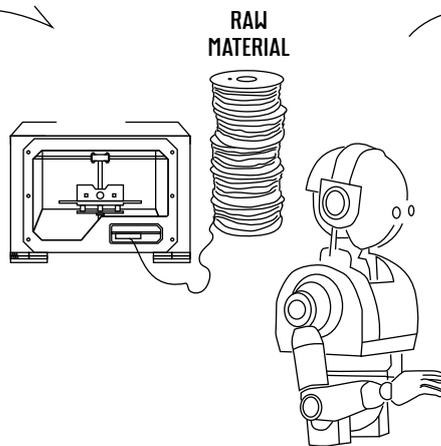
CWYN

CREATE WHAT YOU NEED

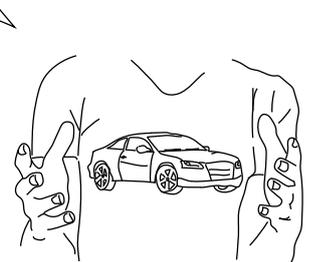
WHEN THE IDEA BECOMES REALITY
THANKS TO AUTOMATED
CREATION AND ASSEMBLY



IDEAS INSPIRED
BY PEOPLE, FOR PEOPLE



RAW
MATERIAL



THE RESULT...
A COMPLETELY UNIQUE SOLUTION
FOR YOUR NEEDS

CONCLUSION

Break-through technologies will drive new trends and ideals in global manufacturing that could result in renewed economic prosperity for companies and societies – but the research identified some important challenges to overcome before gains can be made and technology can reach its full potential.

The manufacturing workforce will require a new set of skills for tomorrow's manufacturing environment, which will include working with cobots, artificial intelligence, augmented reality and the real reality of cyber threats. The industry and the workforce will need to prepare for the next human frontier which will be about identifying and solving problems through greater creativity and innovation.

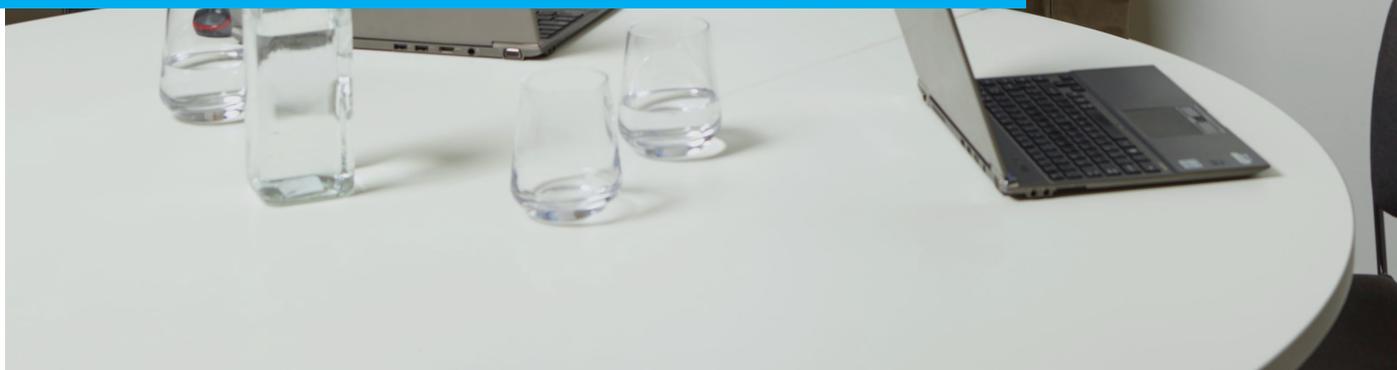
Technology will replace many of the manufacturing jobs of today, but the transformation of the industry will create new jobs of tomorrow. For companies, governments, and individuals the answer is education and training. When asked, 68% of respondents in the manufacturing industry say they would retrain if their current role was threatened by new technologies – showing a willingness to embrace technological change – compared to just 13% that say they would leave for a new job altogether without training. In addition, with regards to minimising potential cyber security threats, as a first step education and information dissemination is critical to both raising awareness and finding viable solutions to avoid the potential damages to industry.

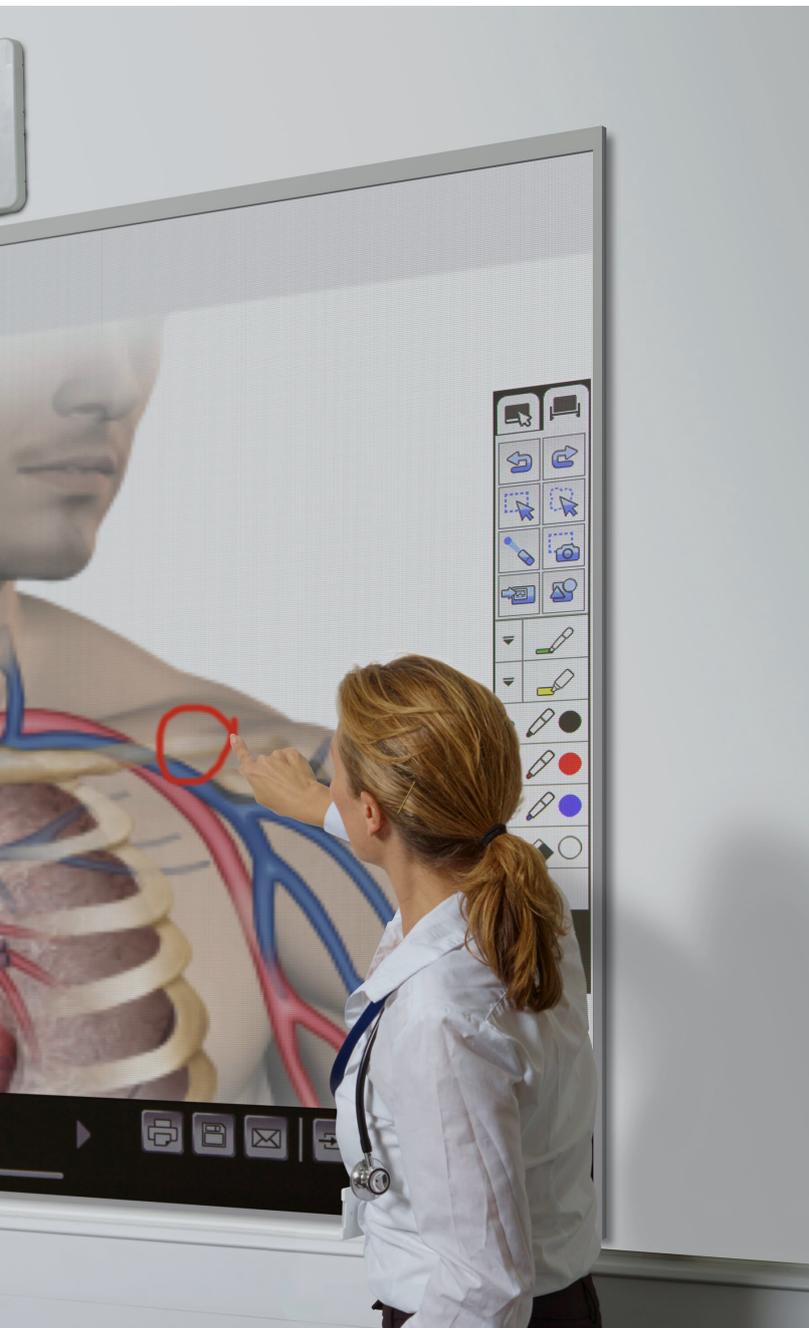
57%

of respondents in manufacturing believe production facilities will become more localised, offering customised manufacturing that will replace mass global production and provide considerable benefits to business, the environment and society



CHAPTER 4 HEALTHCARE





“Technology will allow physicians to spend more time interacting with patients.”

DR. TOBIAS GANTNER, MBA, LL. M.
HEALTHCARE FUTURIST, HEALTHCARE
FUTURISTS GMBH

Europe is experiencing a demographic shift which will further burden an already stretched healthcare sector by 2025. Europe's population is expected to grow from 507 million people in 2013 to 523 million people in 2060¹. Coupled with an increasing life expectancy (from 83.1 in 2013 to 89.1 in 2060 for females), a rise in aging population, with those aged 65 and over increasing from 18% of the population in 2013 to 28% of the population in 2060², and a subsequent growth of so called 'lifestyle diseases', the healthcare industry must find a new vision for the sustainable future of the sector.

According to the research, technology and greater access to data could provide one such method to reduce cost and time impact on this strained sector.

71%

of respondents in healthcare are positive about the benefits technology could bring the healthcare industry

A world where people have greater access to healthcare, for example by monitoring vital stats from home, and are treated with tailor-made medication is not as far away as we think. There has never been a more pressing time for healthcare to fast track its technology integration to enable the industry to shift into an era of illness prevention rather than cure. Encouragingly, this research reveals that 71% of respondents express positive sentiment when shown the benefits technology and greater access to data could bring the medical profession.

¹ European Commission, *The 2015 Ageing Report*, http://ec.europa.eu/economy_finance/graphs/2015-05-12_ageing_report_en.htm

² European Commission, *The 2015 Ageing Report, Underlying*, http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee8_en.pdf

Several key technological trends were highlighted by the research:

NEW TECHNOLOGIES WILL NEED TO COME WITH A MIND-SET SHIFT

Robots, remote patient monitoring and 3D printing will revolutionise medicine, yet a technological transformation signals a substantial mind-set shift for an industry based on human interaction. But, as predicted by Healthcare Futurist Dr. Tobias Gantner, MBA, LL. M. Healthcare Futurist, HealthCare Futurists GmbH, technology will increasingly serve as a valuable support system for physicians, enabling them to redistribute their time to spend more of it interacting with people.

Seventy-two percent of medical professionals agree that 3D, organic and bio-printing would reduce surgery waiting times and a further 70% state this would increase surgery and treatment success. On the same track, printing of personalised prescription medicines has the capacity to dramatically improve treatment outcomes, according to 64% of respondents.

In addition, 3D and organic printing will make organs more available. Overall, 63% of respondents think that 3D printing (from creating organs and bespoke medicine, to reducing logistical issues) will be revolutionary; and, 48% of respondents agree organic and bio printing will be revolutionary in the next 10 years.

“The healthcare team’s skills will be dedicated to human capabilities such as clinical judgement, problem solving or creativity. All other aspects will be provided by artificial intelligence.”

DR. BERTALAN MESKO, THE MEDICAL FUTURIST

“3D printing will be a game changer. From organs to medicines, it will remove geographic boundaries to healthcare access.”

DR. TOBIAS GANTNER, MBA, LL. M. HEALTHCARE FUTURIST, HEALTHCARE FUTURISTS GMBH

Top technological advancements in healthcare expected in the next ten years

According to the European healthcare workforce today



| Technology | Aware of/ Revolutionary |
|---|-------------------------|
| 3D printing (from organ & bespoke medicine creation, to reducing logistical issues) | 63% |
| Surgery with the aid of augmented reality | 50% |
| Organic and bio printing | 48% |
| Remote monitoring of patients via wearable devices | 47% |
| Surgery and diagnoses with the aid of robots with artificial intelligence (AI) | 46% |
| Surgical training via augmented reality | 45% |
| Treatment and care-giving conducted by robots with artificial intelligence (AI) | 34% |
| Mass customisation of medical solutions | 31% |

Augmented reality is set to transform surgery, changing the face of medical treatment and training. The research reveals that 50% of respondents think augmented reality in surgery will be revolutionary; and, 45% of respondents agree that augmented reality will be revolutionary for surgical training, for example, enabling trainees to view the anatomy from different perspectives and reducing time and cost investment.

Robotics and artificial intelligence will also have a crucial role to play in tomorrow's surgeries. Forty-six percent are aware of and agree that surgery and diagnosis with the aid of robots with artificial intelligence will be revolutionary. Thirty-four percent are also aware of and agree treatment and care-giving conducted by robots with artificial intelligence will be revolutionary, leaving room for medical professionals to have a more fulfilling role.

Further enhancing the overall improvement to patient care, technology will have a positive impact on knowledge sharing. In fact, 76% of respondents agree that it would allow for improved knowledge sharing in the field thanks to remote access and virtual collaboration; and 72% think greater access to patient data would improve patient care.

Overall, the medical profession is willing to embrace new technologies in order to facilitate better healthcare for tomorrow; to provide greater efficiency and accuracy, information sharing and tailored treatment which will ultimately lead to better healthcare outcomes.

Yet, despite the perceived benefits of new technologies, in an industry that is extremely time sensitive there is a concern that new technologies will require an entirely new skill set that would need to be learned on top of traditional training (70% of respondents are concerned about the time required to develop new skill sets).

34%

of respondents in healthcare agree treatment and care-giving conducted by robots will be revolutionary, leaving room for medical professionals to have a more fulfilling role

70%

of respondents in healthcare are concerned about the time required to develop new skill sets

HEALTHCARE GOES VIRTUAL & MONITORING BECOMES REMOTE

Beyond medical centres and hospitals, the research revealed the potential benefits technology will have to remote and at-home patient monitoring.

With the aid of new technologies, such as wearables and artificial intelligence, patients will have the possibility to more proactively manage their own health. According to 72% of respondents, remote monitoring of individual patient data through wearable technology will improve patient care. Sixty-nine percent agree that access to health-related big data will significantly improve diagnosis and treatment success for all patients, driven by the move toward remote monitoring.

Additionally, 65% of respondents agree that the data gathered can then be analysed and discussed during virtual consultations, enabling greater access to healthcare services for more people.

Taking into account the current strain on the healthcare system, for example availability of appointments for patients, virtual consultations will help to relieve this pressure.

According to Dr. Gantner, remote monitoring will drive patient accountability. If patients fail to effectively follow a treatment plan, remote monitoring will place the responsibility for failure of treatment on the patient's side - a big shift for the healthcare industry.



69%

of respondents in healthcare agree that access to health-related big data will significantly improve diagnosis and treatment

“Technology will break down the ivory tower of medical knowledge, making patients equal partners with their caregivers.”

DR. BERTALAN MESKO, THE MEDICAL FUTURIST

BIG QUESTIONS: ETHICS, LIABILITY AND DATA PRIVACY

As demonstrated by the research, the European healthcare sector is somewhat divided when it comes to data privacy concerns.

While 47% feel that a loss of data privacy is an acceptable trade-off for patients to make for improved diagnosis and treatment, 67% of respondents believe that data privacy may hold back the implementation of technology. In fact 66% of respondents believe that patients will object to being remotely monitored and 67% believe patients may be reluctant to use new technology.

It is clear that building awareness of the benefits this trade-off could bring will be the key to moving forward. In addition, guidelines and legislation must be in place to ensure the transition happens smoothly.

In addition to concerns about data privacy, the research highlighted concerns the sector has around liability and ethics. Sixty-five percent of survey respondents feel that ethical issues could hold back implementation of technology.

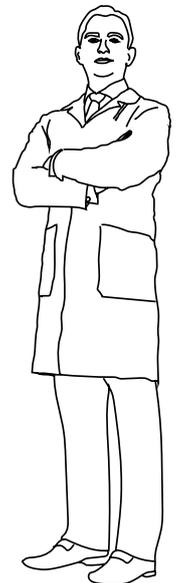
Seventy percent of respondents also say that liability issues, if something were to go wrong, could be a major challenge to the implementation of new technology. This could be why 58% of respondents say medical practitioners will be reluctant to use new technologies.

“The way we create a society that discusses potential ethical challenges and future scenarios including disruptive technologies is a much bigger obstacle than any IT issue.”

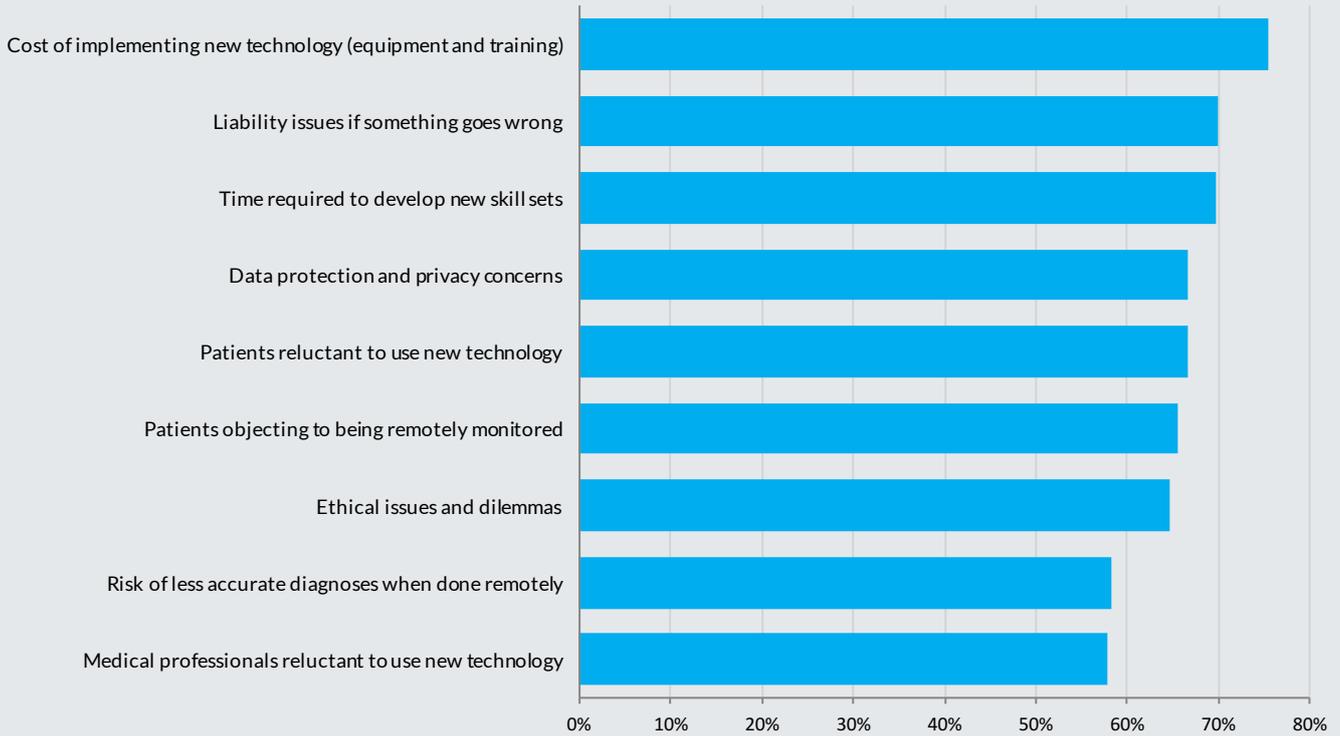
DR. BERTALAN MESKO, THE
MEDICAL FUTURIST

70%

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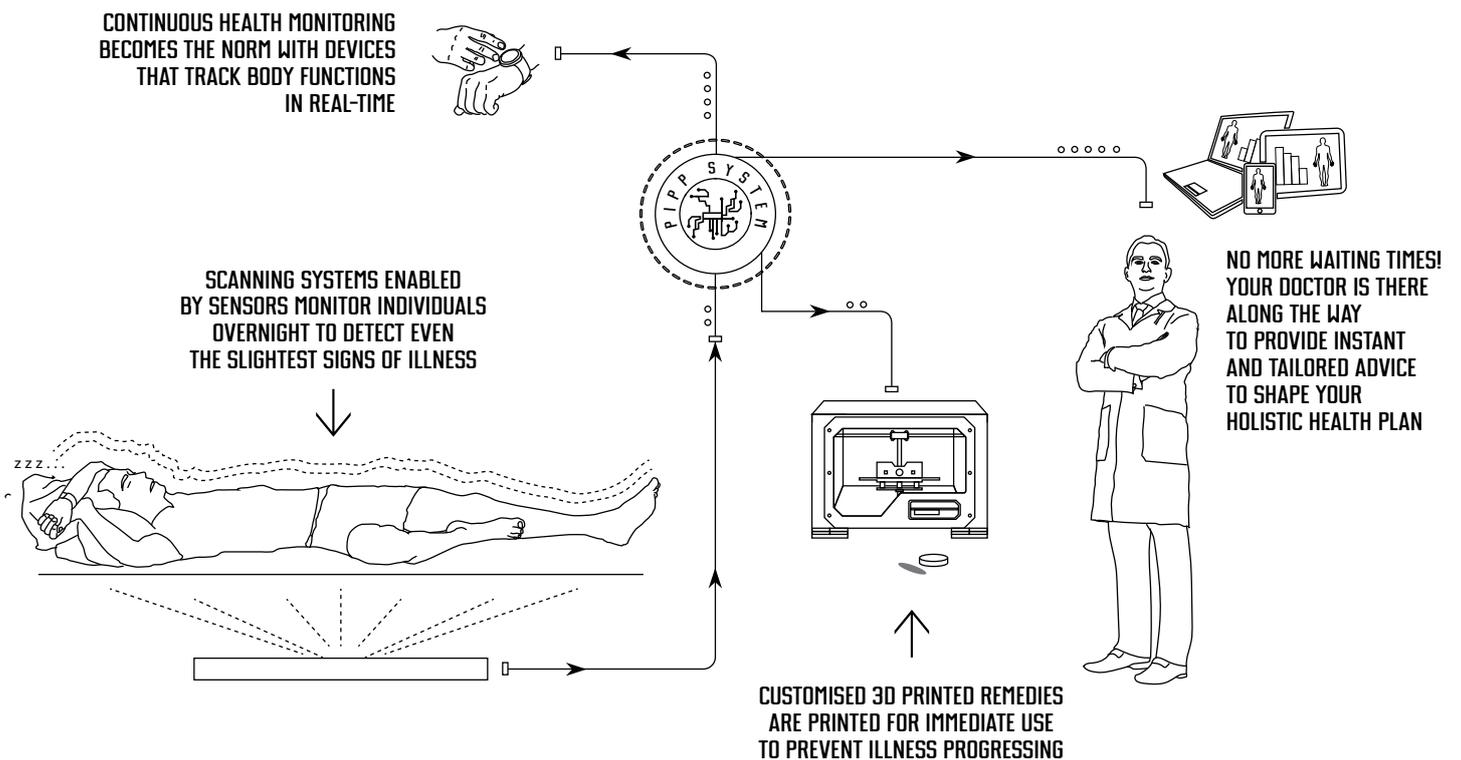


Hurdles to implementing technology in healthcare



PIPP

PERSONALISED ILLNESS PREVENTION PLAN



CONCLUSION

The research demonstrates that the healthcare industry – one which is based on human interaction – is moving toward a substantial period of transformation with the implementation of technology. When looking at the impact on cost, efficiency and society the results are positive and the benefits to the healthcare sector and patient care as a whole could be far greater than the sum of its parts.

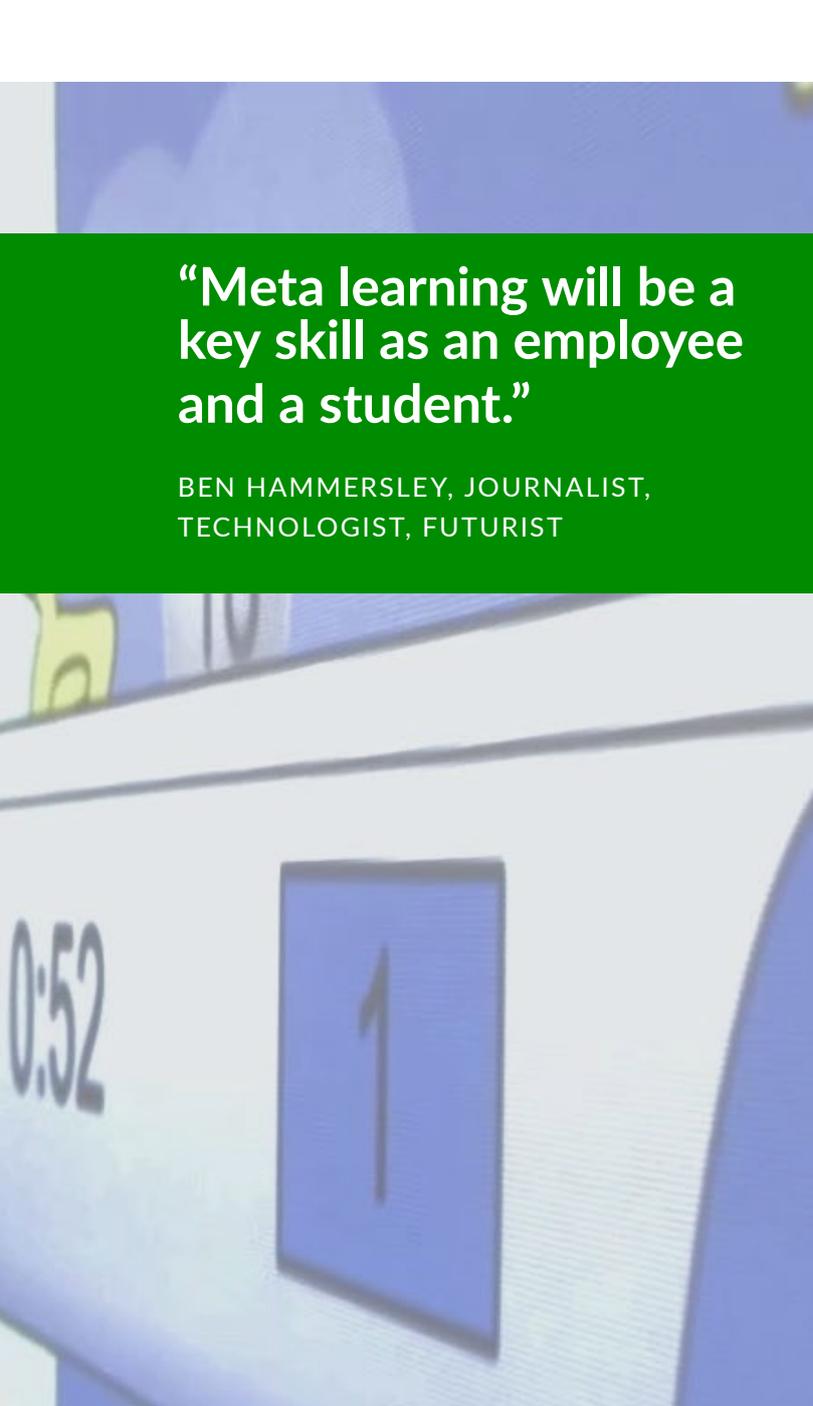
However, it is imperative that the industry ensures cost and time pressures (in terms of learning and implementation costs) do not impede a move toward a more technologically advanced future. Also of importance is building awareness rather than a culture of fear around the topic of data privacy, ethics and liability. Education and skills training are critical to the industry moving forward and technology must be brought into the curriculum of studies for healthcare professionals during their university studies. Also important will be governments and legislators working more closely with the medical profession and patients, to bring about the necessary changes.

71%

**of Europeans agree
advances in technology will
bring benefits to healthcare**

A photograph of two students in blue school uniforms. The student in the foreground is holding a white marker and writing on a whiteboard. The student in the background is also holding a marker and looking towards the whiteboard. The whiteboard has some faint markings on it. The background is slightly blurred, showing a classroom setting with a yellow-bordered chart on the wall.

CHAPTER 5 EDUCATION



“Meta learning will be a key skill as an employee and a student.”

BEN HAMMERSLEY, JOURNALIST,
TECHNOLOGIST, FUTURIST

78%

of respondents in education agree that technology will challenge the traditional way of doing things in education

With rapid technological advancements (across all sectors from medicine, to manufacturing to law and advertising) the workplace is evolving; and consequently today’s students will face a workplace of tomorrow that is augmented by technology. So how do we prepare the next generation of workers for a technological shift that will require new skills and new ways of thinking? The answer is education and training. According to our panel of experts and futurists, the classroom of tomorrow will look and feel entirely different compared to previous years; and so will education technology, which is also expected to transform over the next decade.

However, as revealed by the research, despite a high level of positive sentiment toward technology in education, system failures threaten the ability of teachers to ready their pupils. Successful learning outcomes across the board will depend on stakeholders such as governments, institutions and individuals surpassing some significant barriers.

Respondents surveyed within the sector are both enthusiastic and concerned with regards to how technology could help shape the future of education. Despite 30% of respondents expressing enthusiasm, a not insignificant 20% of respondents express concern toward the impact of technology.

Consequently, it is critical that if education systems are to reap the benefits of new technologies – from interactive projection and augmented reality to robots – and lead the next generation of students into a future where the world is their classroom, then governments and educational institutions must act where it matters. It can be argued that all societal evolutions start with education. Therefore, governments have a vital role to play in ensuring lifelong learning starts at school – and in fact, to go one step further, ensuring new skills are continually learned throughout the span of a lifetime – to realise the full societal values that both technology and people can offer.

Although technology offers substantial opportunities, in order for them to be fully realised it will require significant change. This is backed up by 78% of respondents who agree that technology in education will challenge the current and traditional way of doing things.

HURDLES TO IMPLEMENTATION

As with any substantial change to the status quo, numerous hurdles to implementation of new technology have been revealed.

Despite the high level of positivity toward the implementation of technology – 63% of respondents express positive sentiment overall – the greatest threats to future education quality are as follows: financing (47% of respondents), teacher training (40% of respondents) and outdated technology (34% of respondents).

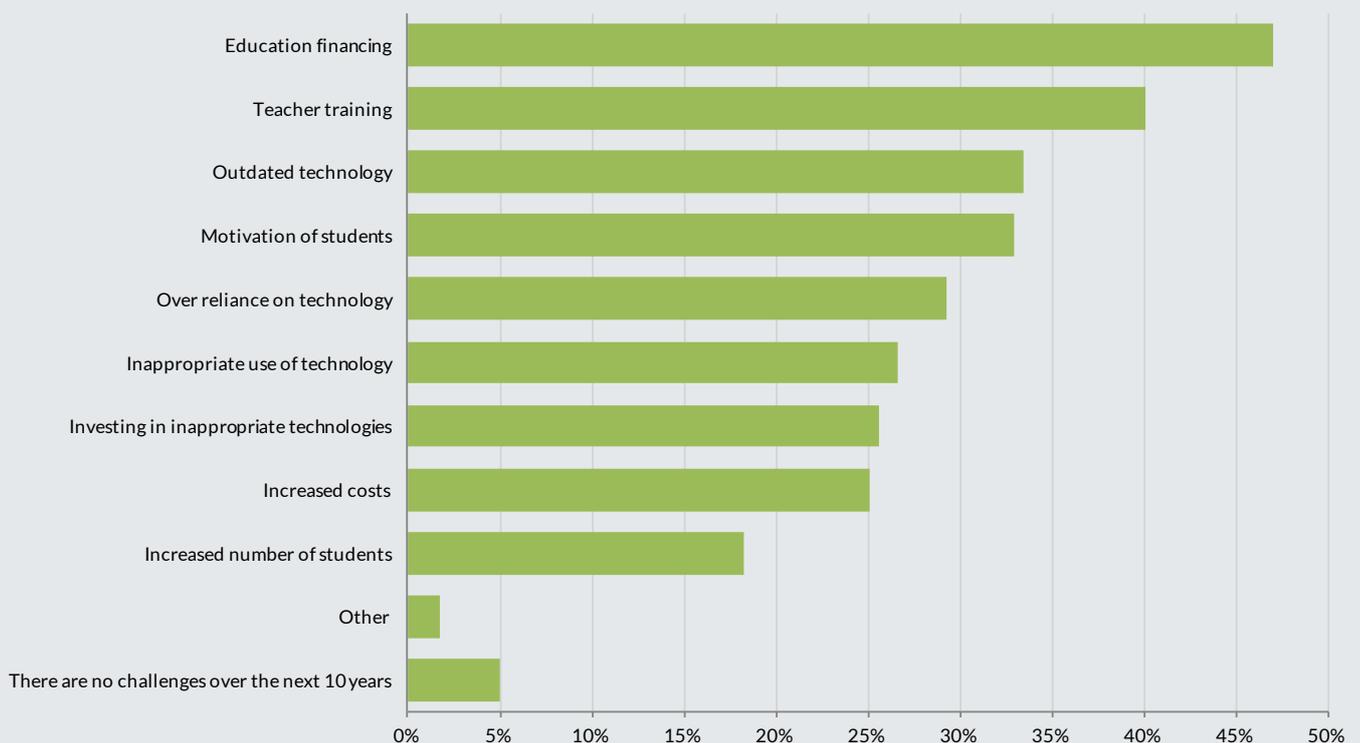
In addition, 50% of respondents believe that teaching quality will diminish as teachers are expected to learn and use more technology.

Furthermore, 61% of respondents believe teachers are not equipped to train students with the necessary skills required to use the technology that will become commonplace over the next 10 years. On a positive note, 61% of respondents say they would be willing to retrain for their future role.

“Technology in education will continue to be more influenced by technology lobbies than educational experts to the detriment of learning.”

RUSSEL STANNARD, EDUCATION TECHNOLOGIST AND FOUNDER OF WWW.TEACHERTRAININGVIDEOS.COM

Hurdles to implementing technology in education



95%

of respondents in education believe the greatest threats to education are as follows: financing (47% of respondents), teacher training (40% of respondents) and outdated technology (34% of respondents)

CHANGING ROLE OF TEACHERS / CHANGING EDUCATION OBJECTIVES

We are moving toward an era in which creative collaboration and meta learning (being aware of and taking control of one's own learning) will reign, as demonstrated in the findings. Technology will free up time for teachers to focus on the essential role of "life coach". Teachers will no longer be responsible solely for imparting knowledge, but will take on a more critical role of guiding students through the learning process according to 70% of respondents. Sixty-four percent of respondents agree that application of information and analytical skills will be the main focus of education in the education system of tomorrow.



“There will be a skill shift in teaching, as teachers become more ‘guides on the side’ and not ‘sages on the stage.’”

RUSSELL STANNARD, EDUCATION TECHNOLOGIST AND FOUNDER OF WWW.TEACHERTRAININGVIDEOS.COM



However, 69% fear that an over reliance on accessing information via technology could lead to general knowledge diminishing. Similarly, 67% of respondents agree that knowledge-retention will no longer be the goal of education as information will be constantly accessible and the sector will move toward more of an “information management” role for teachers as we learn to harness and better use information available at our fingertips.

Coming back to the concept of a shifting role of the teacher in the education system, 71% of respondents agree that “blended learning”- using a mix of online and offline tools – will make education more dynamic and teachers more efficient.

70%

of respondents in education agree that technology will enable teachers to take on a more critical role of guiding students through the learning process



“Teaching the use of technologies is outdated; teaching practical skills and equipping students with the ability to use different platforms interchangeably is the future.”

DAVID WHITE, HEAD OF DIGITAL LEARNING, UNIVERSITY OF THE ARTS LONDON

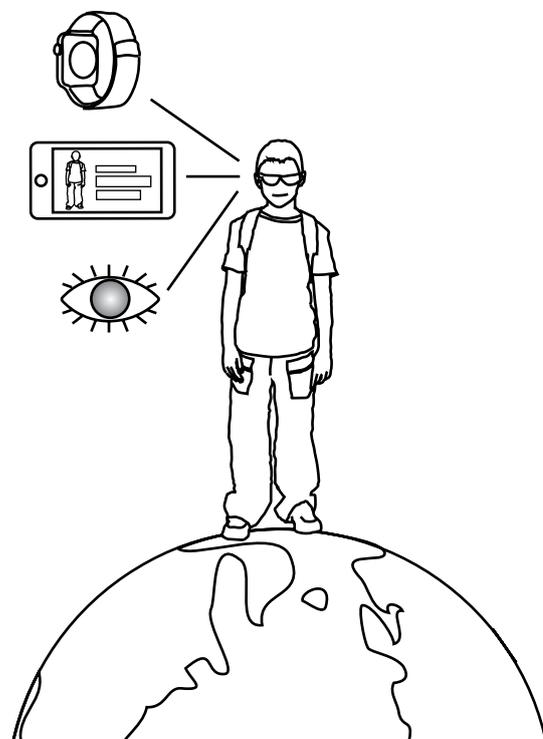


A NEW STYLE OF LEARNING

Technologies, such as augmented reality (AR), and collaborative technologies, such as interactive projection, will drive more dynamic educational content according to 70% of respondents. Similarly, 60% of respondents agree that the collaborative education trend will have a positive impact on the sector and 49% believe the same is true for collaborative technologies.

According to respondents, this shift in learning technologies will drive creative collaboration among students, and 67% believe classrooms will alter to become workshops for collaboration and group work. Collaborative learning technology will also level the playing field for students, enabling each student to learn in their own way as agreed by 62% of respondents.

Moving beyond collaborative technologies, AR will also impact the way learning has been conducted to date – for example, when conducting science experiments. According to 53% of respondents, in the future AR will be widely used for practical experimentation in the classroom, safely and at low cost (and in addition, negating the need for extensive and specialist space for experiments to take place and the need for laborious set-up process in the science laboratory).



“Education will be dynamic, not a mere translation of offline modes of study to online platforms.”

DAVID WHITE, HEAD OF DIGITAL LEARNING, UNIVERSITY OF THE ARTS LONDON

CHANGING ROLES OF STUDENTS

It is not just the role of teachers that will change in the learning environment of the future.

Students will have a more proactive role to play in their learning outcomes. According to 57% of respondents, meta learning (where students are more responsible for their own learning) will become the new norm. And, according to 55% of respondents this will have a positive impact on the education sector as a whole.

As we move toward more virtual learning groups (as predicted by 30% of respondents) it is clear students will have to take a much more hands-on approach to their own learning. The positive news is that only 33% of respondents believe motivation of students will be a threat to education quality over the next 10 years.

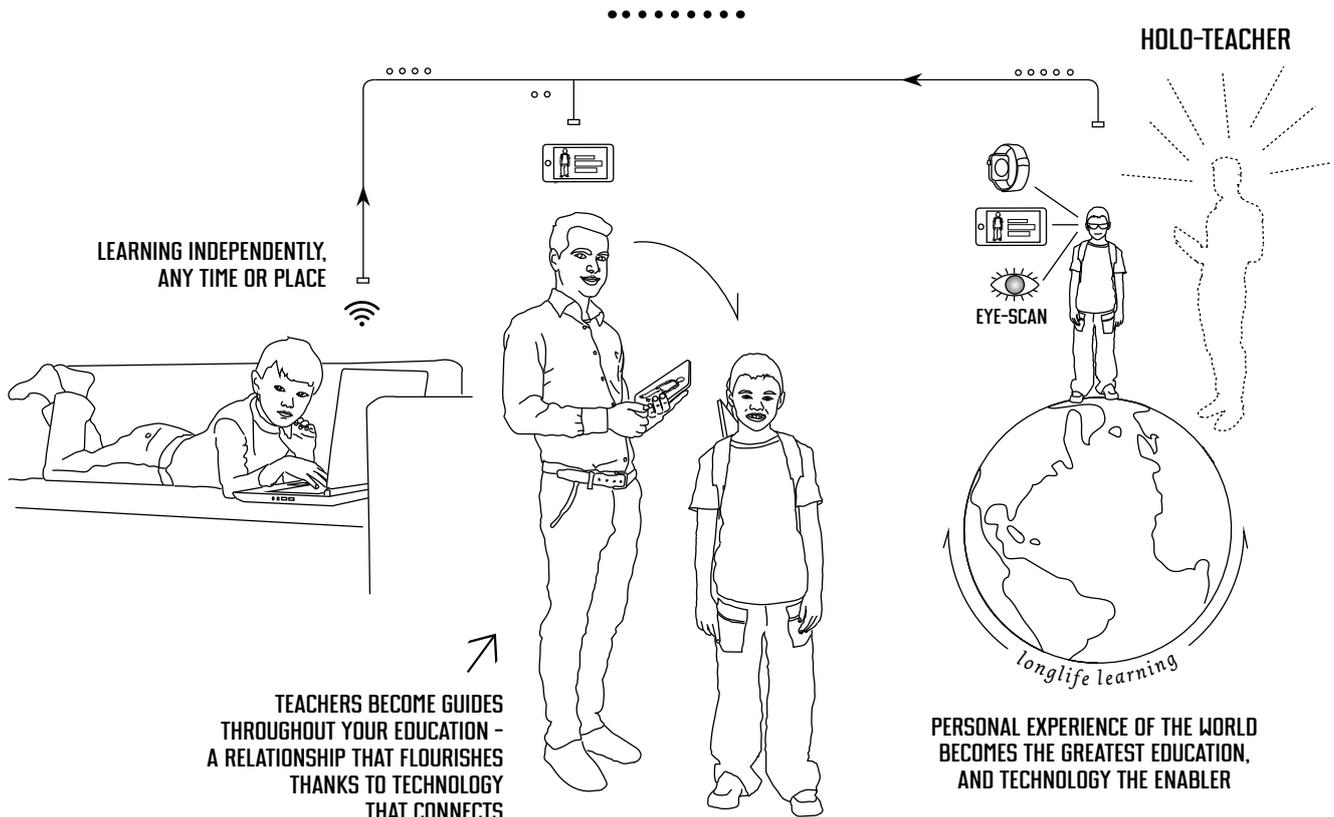
57%

of respondents in education believe meta learning will become the new norm

However, in order for this substantial cultural shift to happen, certain checks and balances must be implemented by educational bodies. It is imperative that emphasis is placed on training students to become 'self-starters' and accountable for their own learning progress, for example, by ensuring soft skill training is an integral part to the learning process.

TOMORROW'S LEARNING FRONTIER

WHERE THE WORLD BECOMES YOUR CLASSROOM



CONCLUSION

As the research reveals, students and teachers are ready to embrace a shift away from traditional teaching and learning methods enabled by technology.

Over the coming ten years, our learning centres have the opportunity to become increasingly interconnected and technology will offer a way to transform how students are taught and learn in order to meet the demands of the future workplace.

But to enable this shift and ensure our future workforce is fully prepared for the workplace they will enter, it is imperative that all education stakeholders and financers are on-board and facilitating this change; ensuring we develop suitable education systems for the future.

33%

of respondents believe that motivation of students will be a threat to education quality over the next 10 years



CONCLUSION & SUMMARY OF KEY FINDINGS



Across five sectors in Europe, Epson's research identified some key trends to watch, as well as challenges to overcome if we are to capitalise on this potential wave of technological disruption. Despite 71% of workforce respondents expressing positive sentiment toward technology and the future of work, enthusiasm alone may not be enough if organisations do not seek to maximise the opportunities.

- Risk of disengagement: A small but not insignificant 6% of the workforce would 'deliberately disrupt the introduction of technology' if their job was threatened. Surprisingly, this figure jumps to 12% for the younger generation (Millennials, 18-29 years old), and climbs higher still for senior management (17%).
- The intrigue-knowledge gap: On average, respondents found emerging technologies like artificial intelligence, augmented reality, wearables, collaborative technologies, and robotics 'appealing' yet felt they are only slightly 'knowledgeable' of them. Therefore, there is still work to be done when it comes to raising awareness of the benefits of said technologies among the workforce.
- Quick-wins or futureproofing: Almost one-third of respondents feel that their organisation is poor at communicating the impact of technological change on job roles. Furthermore, while 65% of respondents say their organisation is good at training employees to use new technologies, employers seem to be much better at getting new blood in when technological skills are needed (60%) as opposed to repurposing potentially redundant employees, which only 47% consider their employer good at. Despite this, 65% of respondents say they would retrain for a different role if they felt theirs was threatened, and organisations should capitalise on this willingness to learn in order to maximise the opportunities provided through technology.



THE CORPORATE WORKPLACE

Key takeaways:

- **Creative re-emergence:** Experts believe that the workplace of tomorrow will become less productivity and results driven, and more flexible, remote and personal – becoming a place that nurtures spontaneous creative work. This is echoed by 52% of the workforce. People will need to develop their ‘soft skills’ – imagination, understanding, compassion and relationship-building. Furthermore, 71% of respondents agree that artificial intelligence will have the capacity to replace humans in repetitive and codified office jobs, and 65% agree that it will allow people to concentrate on creative aspects.
- **Risk of a new era of corporate disengagement:** Sixty-eight percent of the corporate workforce feels people will be less engaged with their company in the future due to technology driven changes. And while 90% are anticipating ‘disruption,’ only 16% feel that their organisation is excellent at communicating the impact of technological change. This raises questions about how corporates can best harness new opportunities.
- **Out with the ‘open plan’:** The office of tomorrow will no longer adopt the ‘traditional’ open office floor space. Instead, offices will comprise smaller spaces and customised working environments for specific groups of employees according to 66% of survey respondents. Coupled with this shift, new technology will support an even greater collaboration culture. This means office architects and designers will become important partners for organisations.
- **Global workplace, virtual meeting space.** Future meeting rooms will be entirely virtual, according to 71% of those surveyed, with people based in workspaces around the globe using technologies such as AR and holographic projectors to join real-time workgroups. Selecting technologies that are fit for purpose will facilitate better virtual collaboration and confidence in new ways of doing things, but training and supporting employees as they use them is just as crucial.
- **The great organisational reshuffle:** Today’s workforce has already seen a mantra of a “job-for-life” swapped for more short-term career stints, and this fluidity is set to continue. In fact, 74% of respondents agree that the concept of an individual being attached to a single company will weaken further over time and roles will become more flexible. Project work and the gig economy will be the future of professional work, according to 59% of respondents; and, 71% agree that rather than having a specific role, employees will be labelled by a skill set meaning organisational and HR models will have to adapt accordingly.
- **Augmented collaboration:** Technologies such as AR (complemented by speech recognition, semantic analysis and video technology) have the potential to be game changers in the corporate environment; across management, customer communication and colleague collaboration. Both collaboration and interaction will be enhanced, with 69% of respondents agreeing that technology will better facilitate interaction and collaboration, and 69% believing that communication barriers will be removed due to real-time translation technologies. Being aware of the possibilities may be the first step to understanding the technologies when they do arrive.



THE RETAIL WORKPLACE

Key takeaways:

- Ultra-personalised shopping will rely on data barter: 72% of Europeans currently in retail agree that shopping will become more personalised with the automatic identification of customers in stores, with retail staff facilitating better experiences, testament to the role of bricks-and-mortar high streets. Yet, while almost half (49%) of respondents accept that big data will have a positive impact on the industry, 42% believe customers will not trade data privacy for a more personal and tailored shopping experience (with the number rising to 64% for those aged 50 years old and above and only 50% for Millennials (18-26 years old)) raising important questions about the relationship between retailers and their customer. This is a key factor that must be addressed if retailers are to realise the full opportunity of technology.
- Rise of the augmented shopper: Respondents agree that augmented reality will be the retail game-changer. Sixty-nine percent agree that the simulation of products in any environment (home, work, in-store) will help customers envisage their tailored usage and AR will provide a unique customer sensory experience. At the same time, 57% agree that it will provide a social and fun shopping experience, creating a sense of community around the brand.
- Zero queuing time: As the point-of-sale function evolves, queuing time in stores will be eliminated, which is agreed by 45% of respondents. Automatic identification of customers in stores will support an ultra-personalised experience and this personalised service will be ultra-fast with 53% agreeing that transactions will be automatic thanks to debit sensors.
- Footfall powered by driverless cars: Technology integrated into the shopping experience will bring shoppers back to the high street and shopping centres, but almost half of respondents (46%) agree that driverless cars could be a major catalyst for this change thanks to a reduction in congestion in major shopping areas.
- Instore trusted advisors: 60% of respondents agree that transactional and cashier responsibilities will no longer exist. Instead, 74% of respondents agree employees will be experts and 'trusted advisors' in their industry, able to access up-to-date information in an instant to satisfy customers. New skills and more training are needed to ensure that instore advisors add the additional value that advanced technologies cannot.



THE MANUFACTURING WORKPLACE

Key takeaways:

- **Customisation, localisation, and reshoring:** Factories could become giant mobile printers and people will want factories to relocate to city centres. 65% of survey respondents think that products will be printed on demand, not manufactured in bulk. This will be made possible in part by 3D printing which, according to 60% of survey respondents, will enable manufacturing industries to reshore and localise activities. Coupled with the fact that factories will have the capability to remotely identify demand, production will be faster, cheaper and more able to offer the on-demand production that the market will come to expect. Furthermore, 57% agree that production facilities will become more localised, providing considerable benefits to business, the environment and society.
- **Cybersecurity is the greatest threat to the sector:** A sizeable 67% of the European workforce in the manufacturing industry agree that cyber security poses the greatest threat, rising to 76% of those in management roles. Therefore, factories and plants must find a way to ensure threats such as encryption or plain text messages via the network which could cause operational downtime, infiltration of firewalls for theft of sensitive data, or external tampering of a robot to manipulate production do not become a reality.
- **Smart factories, smarter workforce:** The fear of workers being replaced by robots is not reflected by the research. Almost half (47%) of the workforce surveyed say that technology will disrupt their role in the future; yet a refreshingly positive employment outlook prevails. Sixty-two percent of respondents say that manufacturing jobs will evolve with technology, not be replaced by it; and furthermore, although 69% of the workforce agree that robots and cobots will be integral to future manufacturing infrastructure, 60% believe they will not be able to replace human flexibility, creativity and reaction. AR will play an important role in evolving the workforce's skills for future jobs, providing workers – from industrial design to inventory and maintenance – with real-time data, information and instructions and allowing for complex manufacturing processes, customisation and error reduction. Yet, when it comes to AR just under half of the workforce will need to see it to believe it; the other 56% find AR 'appealing' for their industry.



THE HEALTHCARE WORKPLACE

Key takeaways:

- New technologies will need to come with a mind-set shift: Although 71% of the healthcare workforce express positive sentiment about the benefits of technology and greater access to health data, and acknowledge the benefits of new technologies including robotics, organic and 3D printing, and augmented reality, in an extremely time sensitive industry 70% agree that the time required to develop new skill sets could hold back the implementation of technology. Experts predict that technologies including robots, remote patient monitoring devices and 3D printing will revolutionise medicine, but a substantial mind-set shift will be needed for an industry that is based on human interaction; especially since the technology will increasingly serve as a valuable support system for physicians, enabling them to redistribute their time to spend more of it on interacting with people.
- Healthcare goes virtual and monitoring becomes remote: Augmented reality and virtual consultations will be game-changing for healthcare – bringing professionals and patients together through efficient virtual consultations and increasing knowledge sharing between professionals across borders. Patients will be able to more proactively manage their own health; with 72% of respondents agreeing that remote monitoring of individual patient data through wearable technology will improve patient care. A further 69% agree that access to health-related big data will significantly improve diagnosis and treatment success for all patients. Gathered data can be analysed and discussed during virtual consultations, enabling greater access to healthcare services for more people, according to 65% of respondents.
- Ethics, liability and data privacy: Hurdles exist for the implementation of technology. A substantial 67% of respondents feel that data privacy may hold back the implementation of technology. However, almost half (47%) feel that loss of data privacy is an acceptable trade-off for patients to make for improved diagnostics and treatment. Ethical issues are paramount to the implementation of new technology, with 65% feeling that these could hold it back. In addition, liability issues are at front of mind with 70% of respondents stating they could be a major challenge to the implementation of technology.



THE EDUCATION WORKPLACE

Key takeaways:

- **Teacher as life coach:** Get learning technology and training right, and teachers will be freed from many tasks to focus on the essential role of guide or 'life coach,' according to 70% of respondents.
- **Learning will become tailored:** Even within a shared classroom 72% of respondents believe learning will become tailored. This is reinforced by the type of technology expected to transform education, with collaborative technology (via products such as interactive projectors) enabling blended and meta learning, as well as wearable devices, augmented reality and 3D printing ranking as the top, most influential technologies.
- **Rise of meta learning:** Where students are more responsible for their own learning, meta learning will become the new norm; say 57% of education professionals with 55% agreeing it will have a positive impact on the sector.
- **More dynamic educational content will be the result of technologies such as augmented reality (AR) and collaborative technologies like interactive projectors (70% of respondents agree). 60% of respondents agree that the collaborative education trend will have a positive impact on the sector; and 49% believe the same is true for collaborative technologies.**
- **Creative collaboration will grow and be expected, as classrooms become more of a workshop for collaboration and group work, according to 67% of respondents.**



APPENDIX

ABOUT THE RESEARCH

The two-phase research project was conducted on behalf of Epson Europe by FTI Consulting. Phase one consisted of qualitative telephone interviews with 17 global futurists and European experts from various sectors from 22nd September-19th October 2016 to gain insights and develop hypotheses on the future of the workplace and the changing roles of the workforce leading up to 2025. The research was conducted by FTI Consulting's Strategy Consulting & Research team from 2nd-13th December 2016, with n=7,016 full time employees across the UK, France, Germany, Italy & Spain, working in the following industries:

- UK: Corporate n=360, Education n=208, Manufacturing n=224, Biotech/Healthcare/Pharma n=224, Consumer/Retail/Hospitality n=313.
- France: Corporate n=392, Education n=215, Manufacturing n=248, Biotech/Healthcare/Pharma n=248, Consumer/Retail/Hospitality n=204.
- Germany: Corporate n=401, Education n=216, Manufacturing n=396, Biotech/Healthcare/Pharma n=253, Consumer/Retail/Hospitality n=161.
- Italy: Corporate n=468, Education n=234, Manufacturing n=358, Biotech/Healthcare/Pharma n=240, Consumer/Retail/Hospitality n=226.
- Spain: Corporate n=430, Education n=217, Manufacturing n=293, Biotech/Healthcare/Pharma n=250, Consumer/Retail/Hospitality n=235.

Please note that the standard convention for rounding has been applied and consequently some totals do not add up to 100%.

Further information on the results and methodology can be obtained by emailing dan.healy@fticonsulting.com

GLOBAL FUTURISTS AND EUROPEAN EXPERTS INTERVIEWED

- Jonathan Reynolds, Academic Director of the Oxford Institute of Retail Management (OXIRM), Associate Professor in Retail Marketing and Deputy Dean at Said Business School
- Howard Saunders, Retail Futurist, Twenty Second & Fifth
- David White, Head of Digital Learning, University of the Arts London
- Russel Stannard, Education Technologist and founder of www.teachertrainingvideos.com
- Darwin G Caldwell Deputy Director of the Italian Institute of Technology (IIT), and Fellow of the Royal Academy of Engineering (FREng)
- Professor Alain Bernard, Professor at Centrale Nantes, Laboratoire LS2N UMR CNRS 6004; Vice-President, AFPR; Vice-Chairman, WG5.1 of IFIP; and member of CIRP Council in France
- Clive Hickman FREng, Chief Executive, Manufacturing Technology Centre
- Christopher Barnatt, Futurist, ExplainingTheFuture.com
- Gerd Leonhard, Futurist, The Future Agency
- Ben Hammersley, Journalist, Technologist, Futurist
- Brice Le Blévenec, CEO at Emakina
- Clinton Wingrove, HR Futurist
- Dr. Bertalan Mesko, The Medical Futurist
- Giuliano Noci, Professor of Politecnico di Milano
- Richard Webber, Professor
- Dr. Tobias Gantner, MBA, LL. M. Healthcare Futurist, HealthCare Futurists GmbH
- Mariano Corso, Scientific Officer, Partners for Innovation

HYPOTHESES

Education

Hypothesis 1: Augmented Reality (AR), screen capture, and collaborative technologies will bring blended learning (mix of online and offline learning) revolution.

Hypothesis 2: Knowledge-retention will no longer be the goal of education because information is constantly accessible at our fingertips.

Hypothesis 3: The key skill needed for students to survive the classroom of tomorrow will be meta learning (being aware of and taking control of one's learning).

Hypothesis 4: Teachers will become 'guides on the side' rather than 'sages on stages', driven by the rise of the flipped classroom model.

Hypothesis 5: Architecture of educational spaces will be revolutionised by collaborative education.

Healthcare

Hypothesis 1: Big data and information sharing across the medical sector will lead to better diagnosis and treatment.

Hypothesis 2: Technology devices will allow doctors greater access to patient information, and therefore more tailored treatment to individuals.

Hypothesis 3: Patients will more proactively manage their own healthcare.

Hypothesis 4: Artificial intelligence and wearables will enable more efficient and accurate healthcare.

Manufacturing

Hypothesis 1: The manufacturing workforce will require a new set of skills as Industry 4.0 sees factories become more "intelligent", merging digital, physical, technical and business processes.

Hypothesis 2: Augmented Reality (AR) will have a key role to play in Industry 4.0, which is driven by increased automation.

Hypothesis 3: Cobots (robots designed to collaborate with people) will assist people with more complex tasks, making manufacturing more efficient.

Hypothesis 4: Print on demand, including 3D printing, will revolutionise the manufacturing industry.

Corporate

Hypothesis 1: Artificial intelligence will revolutionise professional roles, as machines manage much of the routine, repetitive and rules-based work (manual, physical, or cognitive) currently done by people.

Hypothesis 2: The technology game-changer of business communication will be Augmented Reality (complemented by speech recognition, semantic analysis, and video technology), being used across management, customer communication, and collaboration.

Hypothesis 3: The collection of data through technology devices about employees' productivity, health and wellbeing will be critical to business competitiveness.

Hypothesis 4: In the workplace, open floorplans will be obsolete, making way for spaces that are tailored to specific work groups.

Hypothesis 5: Tomorrow's workplace will seamlessly blend print and digital with the printer/scanner remaining a core piece of office technology.

Hypothesis 6: The concept of an individual being attached to a single company will weaken as time goes by, with roles becoming more flexible.

Retail

Hypothesis 1: Sensors and point of sale technology will not only reduce but will eliminate time required for payment in retail.

Hypothesis 2: As the omni-channel shopping experience evolves, the in-store retail space will be repurposed from a place where you buy a product to a space where you 'fully experience' a brand.

Hypothesis 3: The future in-store retail experience must be both experiential and social, creating a sense of community and belonging for shoppers

Hypothesis 4: Augmented reality will be THE technology that will shape the future of retail, providing a shopping journey that hasn't been seen before.

Hypothesis 5: Big data and information at the fingertips of retailers and consumers will facilitate an ultra-personalised shopping experience on a scale never seen before.

BIOGRAPHIES

Jonathan Reynolds, Academic Director of the Oxford Institute of Retail Management (OXIRM), Associate Professor in Retail Marketing and Deputy Dean at Saïd Business School



Jonathan Reynolds is one of the leading academic experts in the study of the retail sector internationally. He is particularly recognised for his scholarship and expertise in the areas of electronic commerce and multi-channel retailing, innovation and entrepreneurship in retailing, retail productivity and skills, and the role of place in marketing and retail management.

His views are sought after by businesses, policy makers and the media. He is heavily committed to knowledge transfer, actively seeking to ensure that his research can be widely disseminated amongst policy-makers and practitioners. He is a founding member of the Oxford Institute of Retail Management, and has been its Academic Director since 1999.

Howard Saunders, Retail Futurist, Twenty Second & Fifth



Howard Saunders has helped shape contemporary retail for thirty years. As a former Creative Director of Fitch, based in London, he was responsible for design, branding and for fostering multi-disciplinary teams of architects, graphic designers, product designers and copywriters. As an independent consultant Howard has worked closely with Marks & Spencer, Waitrose and Westfield, for over a decade, helping them develop new store designs and keeping them informed of the latest retail innovations and shifts in customer expectations. Now based in New York, Twenty Second & Fifth explores the meanings behind brands, what works for consumers and what they are really searching for when shopping. In his role as a retail futurist he helps inspire, inform and motivate retailers to embrace the future and rise to the challenges that lie ahead.

David White, Head of Digital Learning, University of the Arts London



David White has explored various situations where digital, learning and culture meet, in his career, including managing a team of online distance learning developers at the University of Oxford and leading numerous studies on the impact of the Web on learning and higher education. White developed a method of understanding individuals' motivations to engage online entitled "Visitors and Residents" for which he created an online-engagement mapping activity using the Visitors and Residents continuum, which is used globally in a variety of contexts.

As a regular speaker on topics such as digital identity, digital literacies and online credibility, White has been heard on Radio 4, the World Service and ABC Australia. He is at home blogging, tweeting and creating videos to encourage thinking and discourse in online spaces. According to White, digital is much more than a set of tools or a chaotic library, it is a place where we can all learn and live.

Russel Stannard, Education Technologist and founder of www.teachertrainingvideos.com



Russell Stannard previously worked as a Principal Teaching Fellow at the University of Warwick and the University of Westminster, and is renowned for his pioneering work in using technology to enhance feedback and his experiments around the flipped classroom. In his role as an Educational Consultant, he helps organisations to build online and blended learning courses as well as training staff around the world in the use of technology. To date, Stannard has worked in 29 countries for clients such as the British Council, Oxford University, the INTO group and the BBC.

In 2015, he was listed as one of the top 23 most influential Educational Technologists on Twitter and named one of the top 20 Educational Technologists by MIMIO.

Darwin G Caldwell Deputy Director of the Italian Institute of Technology (IIT), and Fellow of the Royal Academy of Engineering (FREng)



Professor G Caldwell is Deputy Director of the Italian Institute of Technology (IIT), Director of the Dept. of Advanced Robotics at IIT and is or has been an honorary

Professor at: the Universities of Manchester, Sheffield, Bangor, Kings College London and Tianjin University, China. He is a past chair of the IEEE Robotics and Automation Chapter (UKRI) and a past co-chair of the IEE (IET) Robotics and Mechatronics PN.

He is on the editorial advisory board of Science Robotics and the Editor board of the "Industrial Robot", and regularly contributes to international activities through conference organisation, seminars and as a guest lecturer.

He has published over 500 papers, 19 patents and has received awards from several international journals and conferences.

Caldwell is a Fellow of the Royal Academy of Engineering.

Professor Alain Bernard, Laboratoire LS2N UMR CNRS 6004; Vice-President, AFPR; Vice-Chairman, WG5.1 of IFIP; and member of CIRP Council



Professor Bernard's recent research activities include founding and heading the "Virtual Engineering for industrial engineering" (IVGI) research team at IRCCyN laboratory,

and now leading the new IS3P team (Systems Engineering – Products-Processes-Performances) of the new LS2N laboratory. He has also been the vice-president of AFPR (French Rapid Prototyping Association) and its representative in GARPA (Global Alliance of Rapid Prototyping Associations) for 25 years. In 2009 Bernard was awarded, by the RP community, the "Academic Carrier Award" at the last VRAP conference in Portugal.

Bernard has published more than 120 papers in international journals and books and has presented more than 240 papers at international conferences, including about 20 invited keynotes.

His main research topics are PLM for Product-Service Systems, knowledge-management and knowledge-intensive decision making processes, product/process/organization modelling, simulation and performance assessment.

Clive Hickman FREng, Chief Executive, Manufacturing Technology Centre



Clive Hickman had over 35 years engineering experience in several roles within the automotive industry prior to joining Manufacturing Technology Centre (MTC) in January

2011, culminating in the position of Head of Engineering for Tata Motors in India. He has also held senior roles at Rover Group, the Motor Industry Research Association and Ricardo Consulting Engineers.

During his career he has worked on a wide range of vehicle programmes including the development of a unique Bentley which, along with Dr Phaefgan of VW, he presented to HM the Queen in 2002.

Hickman was approached by Ratan Tata in 2005 with the idea to set up an engineering function for Tata Motors in the UK and to manage the entire engineering operation for Tata Motors in India, responsible for some 6,000 engineers. During this period of extraordinary development in the automotive sector he was responsible for the 'peoples' car', otherwise known as the Nano, in India and the introduction of the Vista electric vehicle in the UK.

Christopher Barnatt, Futurist, ExplainingTheFuture.com



Christopher Barnatt has been a professional futurist for over 20 years. He has published eleven books and numerous articles, with over 200 media contributions to broadcast,

print and online programmes and publications. He runs the websites ExplainingTheFuture.com and ExplainingComputers.com, as well as associated YouTube channels that have received over 19 million video views.

For 25 years, Christopher lectured in computing and future studies in Nottingham University Business School, where he spent seven years as Director of Undergraduate Programmes. As a keynote speaker, he now delivers presentations for a wide range of organizations in sectors including food production, financial services,

healthcare and the arts.

Gerd Leonhard, Futurist, The Future Agency



Gerd Leonhard is a musician by origin, and connects left and right brains for a 360-degree coverage of the multiple futures that present themselves at any one time.

Delivering the 'Realopia' that one can work on immediately, Leonhard coaches, consults and influences around the world. Turning futurism into a pragmatic science designed to reinforce strategic thinking, Leonhard and his boutique The Futures Agency represent an additional mind for mastering the complex nodal points of change that dictate evolution or extinction in the Digital Age. 'Technology vs. Humanity', his newest work, reminds every one of us what is at stake as we enter a Faustian pact with the computing entities now serving us.

Ben Hammersley, Journalist, Technologist, Futurist



Ben Hammersley is a British writer and technologist, specializing in the effects of the internet and the ubiquitous digital network on the world's political, cultural and social

spheres. He now enjoys an international career as a speaker, explaining complex technological and sociological topics to lay audiences, and as a high-level advisor on these matters to governments and business.

He is the British Prime Minister's Ambassador to TechCity, London's Internet Sector; Innovator in Residence at the Centre for Creative and Social Technologies at Goldsmiths, University of London; A non-resident fellow of the 21st Century Defense Initiative at the Brookings Institution in Washington D.C; A member of the European Commission High Level Group on Media Freedom; A fellow of the European Policy Centre in Brussels, and Editor-at-Large of the UK edition of WIRED magazine. His latest book, his fifth, "64 Things You Need to Know Now For Then" is published internationally.

Brice Le Blévenec, CEO at Emakina



Brice Le Blévenec is joint CEO of Emakina Group. A specialist in new technologies, he is regularly invited to speak at seminars, meetings and

conferences in Belgium and abroad.

In 1991 he founded Ex Machina, a company working in communication and new technologies. A few years later, in 1998, Le Blévenec created the business Ex Machina Interactive Architects (a web agency), which would join with Emalaya in 2001, and Ex Machina Graphic Design (studio graphics). In 1999, he co-founded NetBusiness SA (now ContactOffice Group SA), which develops ContactOffice.com groupware.

For twelve years, Mr Le Blévenec created and hosted radio and television programmes, including CyberCafe21 (Radio21), CyberCafe 2.0 (RTBF La Deux), NetBusinessNews (BfM), Single and Elle et Lui (both Pure FM). In 2007 he co-founded TUNZ.COM, a company specialising in mobile payments. At the beginning of January 2014, he was appointed joint CEO at Emakina Group with Mr Karim Chouikri, replacing Mr Denis Steisel, who became chairman of the board of directors.

Clinton Wingrove, HR Futurist



Clinton Wingrove is an HR professional, consultant, coach, trainer, author and speaker with over 30 years of HR experience. He believes passionately in HR and its

ability to make positive and measurable impact on the bottom line of organizations as well as on the life of every individual employee.

Wingrove helps others to be effective managers and leaders, either by working with them directly, or by working with the HR departments to design the processes and tools that they will use. He combines skills in process design, data management, and contemporary technology during the design phases, with an ability to communicate with, train and inspire people during implementation.

Dr. Bertalan Mesko, The Medical Futurist



Dr. Mesko, a physician with a PhD in genomics and an Amazon Top 100 author, envisions the impact of digital health technologies on the future of healthcare and helps patients,

doctors, government regulators, and companies translate it into reality.

With over 500 presentations under his belt, including courses at Harvard, Stanford, Yale and Singularity University, as well as for organizations including the 10 biggest pharmaceutical companies, he is one of the top voices globally

in healthcare technology. Dr. Mesko has been featured by dozens of top publications, including CNN, WIRED, National Geographic, Forbes, TIME magazine, BBC, and the New York Times. His blog has more than 3 million readers, and he is one of LinkedIn's Top Voices in Healthcare.

Giuliano Noci, Professor of Politecnico di Milano



Professor Noci is a Marketing Professor at Politecnico di Milano University and an expert in business strategies and marketing. Noci's recent studies are devoted to the analysis of the impact of ICTs on Marketing and branding strategies in a global world. He has also focused on the following topics: design and management of valuable experiences for the end-market and Omnichannel Marketing, where he analyses the impact of Internet and social networks on companies' communication strategies and business models in media industry. He chairs the Bio-Marketing Research Lab and several research Observatories aimed at investigating changes taking place in the relationship between a company and its market and; he also advises several companies operating in Italy and in China. Professor Noci is the scientific director of the following Labs: Multichannel Marketing, Omnichannel Customer Experiences, Internet Media, Media Convergences and e-Government.

In addition, he is a Research Fellow at Shanghai Jiao Tong University, Honorary Advisor of the Advanced Management Program in Fashion and Luxury at Tsinghua University, Beijing, as well as Member of the Scientific Committee of Centro Alti Studi sulla Cina Contemporanea and Osservatorio Asia.

Richard Webber, Professor



Richard Webber, dubbed the 'Postcode Professor' by the Daily Mail, pioneered the two leading European systems for classifying people on the basis of where they live – Acorn and Mosaic. After graduating with Masters Degrees from both Cambridge and Liverpool, he has spent the last 40 years developing geodemographic classification in senior roles at the Centre for Environmental Studies, Experian and Origins Info. In early 2016, he co-founded Webber Phillips, a customer insight business in the field of diversity which infers people's ethnic backgrounds from their names. He is a visiting Professor at Newcastle

University, and prior to this, he was a Fellow of the Institute of Direct Marketing and an Honorary Fellow of MRS at King's College London.

Dr. Tobias Gantner, MBA, LL. M. Healthcare Futurist, HealthCare Futurists GmbH



Dr. Gantner is a restless resident of different worlds: A medical doctor by training, a health economist and jurist by education, a philosophy aficionado by academic passion and curious by default.

He has worked in a number of leading positions in hospital patient care in transplant surgery and in leading positions in major industry companies such as Siemens, Novartis, Bayer and Johnson&Johnson.

Dr. Gantner is the founder and CEO of the HealthCare Futurists GmbH and the Director of the European Center for Patient Centric Innovation and Medical Entrepreneurship in Maastricht.

Mariano Corso, Scientific Officer, Partners for Innovation



Mariano Corso is Professor of "Leadership and Innovation" at the School of Management of Politecnico di Milano. He also co-founded the Digital Innovation Observatories at Politecnico di Milano and is responsible for many Observatories including Smart Working, HR Innovation Practice, Digital Agenda, ICT in Healthcare, Cloud and ICT as a Service and the Digital Transformation Academy. Corso is co-founder and Scientific Director at P4I - Partners4Innovation the Advisory Company of the Digital360 group and is senior advisor in management and Digital Transformation and managing projects for companies, Local Governments and Public Administrations.

He has promoted and co-ordinated national and international research projects and authored many scientific publications of which more than 140 at the international level. His specialties include: Digital Innovation, Smart Working, Digital Transformation, Knowledge Management, Enterprise 2.0, Communities of Practice, Outsourcing, ICT Governance, Change Management.



Presenting the future opportunities and challenges of technology through the eyes of 17 global industry experts and over 7,000 Europeans in work.