



Man, machine and strategy

How technology will – and won't – disrupt your business strategy

Winning with technology series

Man's ability to think and formulate hypotheses is an art that is difficult for machines to replace. Machines will help people work better and quicker, but there will still be a need for talented humans at the heart of strategy formation and implementation. The best strategies of the future will be richer and more dynamic, developed based on a collaborative, human-computer symbiosis.

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Technology loves hype

While it is important to adopt a healthy skepticism, there is strong collaborative potential between humans and technology in strategy development.

Maybe you are under pressure not to fall behind in technology investments, or perhaps your recent strategic plan didn't quite deliver the results you wanted.

There is much hype over big data and new analytical technologies, some of it justified, much of it not. We are interested in whether, and how, technology can practically improve your business strategy.

We believe man's ability to think and formulate hypotheses is an art that is difficult for machines to replace. Man and machine will increasingly cooperate and divide their labor according to their different abilities. This human-computer symbiosis will be collaborative, with machines helping people work better and quicker – but you will still need talented humans at the heart of your strategy formation and implementation.

Thus, we urge healthy skepticism towards reported technological advances in strategy formation, while seeing the collaborative potential. In the pages that follow, we explore what this collaborative potential may look like, and how it should impact your hiring decisions today.

Get the balance between investing in humans and analytics wrong, and you will have made an expensive mistake.

Almost every technological innovation is overhyped, for the business reason that by overhyping it you get investment. It's hard to imagine a reasonably interesting new technology not being overhyped.

– Terry Winograd, Professor Emeritus of Computer Science, Stanford University. Credited by Larry Page for pushing him towards the research project that became Google.

Smart computers: a reality check

Can truly intelligent machines replace humans? Artificial intelligence (AI) has both captivated and frightened mankind since it grew in prominence in the 1950s. But the reality has been less dramatic. Rather than the flashy triumph of artificial intelligence, we have witnessed the steady growth of intelligence augmentation. As J.C.R. Licklider commented:

*"Men will set the goals, formulate the hypotheses, determine the criteria, and perform the evaluations. Computing machines will do the routinizable work that must be done to prepare the way for insights and decisions in technical and scientific thinking."*¹

We believe this paradigm, developed in 1960, is just as relevant today to the role of big data and new analytical technologies in business strategy.

A note on terminology

This piece considers the interplay of data and analytics with 'business strategy'. We use 'business strategy' to refer to those in-house or outsourced services linked to the creation, review, and implementation of plans across financial, business and operating models.

The future of AI in business

Curb your enthusiasm.

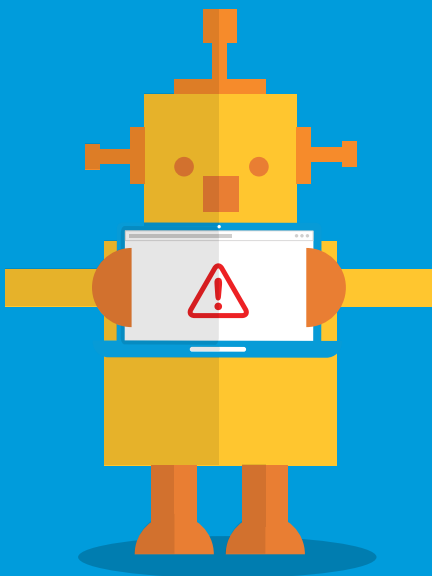
Type 'robots will' into Google and the algorithm will helpfully autocomplete with the five most popular associated searches: 'take over', 'steal your job', 'take your job', 'kill', 'replace humans'.² Clearly, suspicion runs deep, so why do we have such confidence about the durability of human advantage?³ For the coming decades at least, there are good reasons to think that a machine takeover of the boardroom will remain a fantasy. Our view on the limitations of AI stems from three factors:

1. Computing technology might not develop as fast as we think

Predictions of the end of Moore's Law are not new, but many experts think they are newly credible as we approach the molecular limits of how far we can shrink circuit features.⁴ Successor technologies such as quantum, molecular or optical computing are exciting but far from guaranteed. We have to acknowledge the possibility that *"things are slowing down. In 2045, it's going to look more like it looks today than you think."*⁵ That is not to say that innovation is at an end, just that the directions it takes might be more about how we connect and where we put computers than how much smarter we can make them. Here is Jerome Pesenti, lead developer of one of today's most famous machines, IBM's Watson:

"The biggest network we are able to create today has millions of nodes and billions of connections. The brain is much more powerful than that, actually 100,000 times more powerful. It has 100,000 billion nodes, and a hundred trillion connections. Now if you believe in Moore's Law... you get to a number which in 25 years we should be able to match this.

*Now does that mean we would be able to match all human power, I don't know. If you ask me, I would say no...it's a real possibility that in our lifetime we will see computers become as powerful as humans, but would I bet on it? I don't know. I don't think so."*⁶



2. Regulatory risks will create unanticipated and different barriers by geography

There is no reason to assume that just because we can build machines capable of making decisions for us, society will tolerate them doing so.

This problem becomes acute when you imagine driverless cars. How will societies and national legal systems respond to the fatalities they cause? Where will we apportion blame for the decisions they make in collisions? The same is true in the boardroom; you may be able to cede control for a key decision to an algorithm (and at least one company already 'employs' an algorithm as a board member), but who will be held responsible if the decision turns sour? With prominent voices like Elon Musk and Stephen Hawking raising warnings about AI and calling for regulatory oversight, it is clear that as new technologies get smarter, there may well be a divergence between what is technically feasible and legally or ethically acceptable.⁷

The promise has jumped ahead of law and policy. Who really cares how Amazon or Netflix rate movies? As long as Google returns useful results and as long as Netflix recommends interesting movies, I don't really have to care about the underlying analytics engine. But if it's about telling me why I didn't get a high enough credit score to buy a new car, I'm going to demand an explanation.

– Patrick Wolfe, Professor of Statistics, University College London; Executive Director, UCL Big Data Institute

3. We can't program what we can't explain

Even if we could create a computer as powerful as the human brain, we don't understand our own cognitive processes well enough to code them. This remains arguably the most fundamental challenge to the vision of AI replicating human intelligence:

"There are many tasks that people understand tacitly and accomplish effortlessly but for which neither computer programmers nor anyone else can enunciate the explicit 'rules' or procedures...When we break an egg over the edge of a mixing bowl, identify a distinct species of bird based on a fleeting glimpse, write a persuasive paragraph, or develop a hypothesis to explain a poorly understood phenomenon, we are engaging in tasks that we only tacitly understand how to perform."⁸

As a consequence of these gaps, says Terry Winograd, Professor Emeritus of Computer Science, Stanford University, "there's been a shift away pretty completely from...AI as a theory of how the mind works to AI as a good practical tool for getting lots of things done in the world." A useful tool, but not a proxy human.

At the end of the day the value of those who can really understand and strategize will not go away. Machines do not strategize... machines learn from the experiences that they had before, and therefore they are subject to the orthodoxies of the past.

– Sid Mohasseb, Professor, University of Southern California

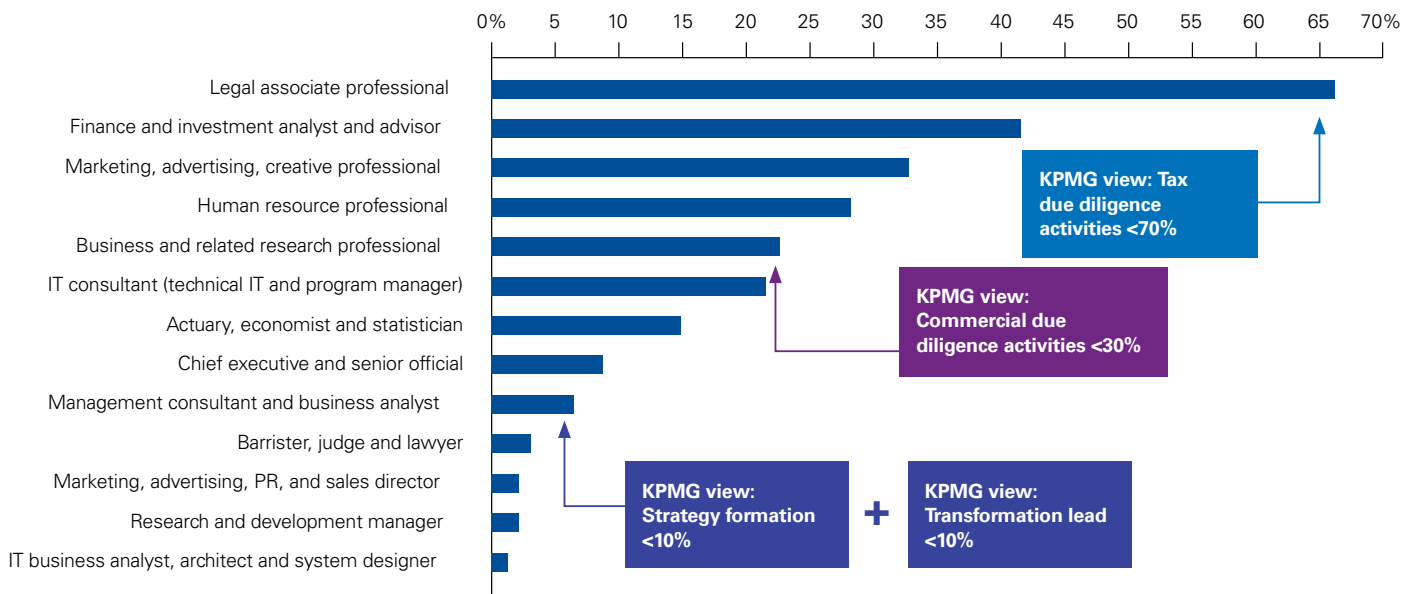
How far will business strategy become automated?

There are hard limits to automation.

One ambitious study from the Oxford Martin School at the University of Oxford developed a model of computerization for no fewer than 702 occupations. The authors were clear that some jobs are not as vulnerable to the trend:

*"In short, while sophisticated algorithms...now allow many non-routine tasks to be automated, occupations that involve complex perception and manipulation tasks, creative intelligence tasks, and social intelligence tasks are unlikely to be substituted by computer capital over the next decade or two."*⁹

Figure 1: A selection of job categories by probability of computerization, according to the Oxford Martin School study (overlaid with our view of several strategic and non-strategic service types)¹⁰:



Note and key:

Since jobs related to business strategy involve both 'creative intelligence' and 'social intelligence' tasks, we think they are unlikely to be substituted. Our view overlaid on the graph above is based on a KPMG survey of institutional investors, covering human skills and their perceived likelihood of automation across a range of deal rationale and due diligence work streams, including job types more directly comparable to business strategy than those job titles available in the Oxford Martin School analysis. Please also refer to note (a)

- Probability of computerization across a selection of job types, according to the Oxford Martin School study
- Our view that, as an example of a non-strategic service, M&A tax due diligence will see relatively high degrees of computerization at the expense of humans
- Our view that, as an example of a strategic service, M&A commercial due diligence will see a moderate degree of computerization at the expense of humans
- Our view that, strategy and transformation lead work will see relatively low degrees of computerization at the expense of humans (as opposed to increased productivity through symbiosis)

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AI right now

The real status quo.

Peer behind the curtain at how cognitive computing and big data analytics are actually applied in businesses today and the reality can be underwhelming. Much of the work being done – staid algorithmic solutions to data modelling challenges such as predicting credit or insurance risk, for instance – is valuable drudgery, not revolution.

Products that are marketed as being able to cope with 'raw data' turn out to have their own definitions of 'raw'. We have tried several of the more visibly marketed analytic tools currently on the market and we maintain that a lot of experienced human labor to clean and prepare 'raw' data is still a prerequisite for effective data analysis.^b Arnab Gupta, founder of Opera Solutions, a leading machine learning and data analytics company, is frank about the state of play: *"most of analytics is mucking about with lousy data."*

Even the flagship accomplishments of machine intelligence need to be put in perspective. Winograd's verdict on the highly-publicized triumphs of machine over man in games such as Go or chess:

They're all games which have a completely bounded finite set of rules and outcomes and measures. They're nothing like: 'what are the CEO's options on entering a new industry?' You can tell something is an artificial intelligence if it makes a perfect chess move while the room around it is burning down. That's the point...it's not smart in the larger sense.

– Terry Winograd, Professor Emeritus of Computer Science, Stanford University

And then there is the growing list of high-profile mis-steps, such as Microsoft's chatbot, terminated after indulging in casual racism and homophobia¹¹, or Google Flu Trends, poster child for big data hubris.¹²

None of the above is to say we don't think cognitive computing technologies and data analytics have enormous potential. Undoubtedly they do. But when deciding whether to lay out substantial investments in technology or expertise, businesses need to be clear-eyed about both costs, and the limits of what will be achieved if the right people are not also in place.

Most people are not strategizing with data analytics, they are just optimizing. 'Let me sell more of this. Let me try and optimize my debt.' It's really not strategizing. Strategizing means looking ahead, having an interconnected organization, something that has innovation in it, progress, tapping into new areas and new things, growing and evolving. That is very different from having three data scientists pore over our sales data and say what can I cross sell to x or y?

– Sid Mohaseb, Professor, University of Southern California

Balancing the human edge and machine capability

Strategic thinking still requires core human capabilities.

When it comes to ‘strategic thinking’ not a single person interviewed for this piece believes that the core human abilities are close to being replicated by machines. But what are those core abilities? Different people have different answers, but words that come up a lot are: creativity, wisdom, domain expertise, empathy, social intelligence, 80:20 thinking, dealing with ambiguity, symbolic reasoning.

Exact definitions are tricky, but everyone we spoke to agrees that ‘creativity’ or ‘inspiration’ – the ability to look at information or cues, transfer learning from something unassociated, superimpose it and arrive at a new conclusion – is a uniquely human contribution to really good strategy.

If there’s still debate about that – and there is – ‘empathy’ is where computers really come up short.^c The qualitative insights an experienced consultant gets from reading an interviewee’s non-verbals, the human intelligence that no data set is going to capture but that can be pivotal to a big decision – few think these things can be captured by a machine.

And then there’s persuasion, bringing people along, politics – less about insight but critical if you want your strategy to actually deliver results.

Stakeholder engagement and involvement is where AI and cognitive computing fall down. It’s not going to help you with the key aspects of dealing with people, politics and helping build alignment for cultural change, which are all indispensable parts of strategy.

– Paul Merrey, Partner in Financial Services, Global Strategy Group, KPMG in the UK

The results are only as good as the person in the driving seat. This means not just any person, but rather someone with a knack for asking the right questions, someone with a track record of focusing on relevant hypotheses, and someone who knows how to best convey the findings back to a particular audience.

– Dr. Christoph Zinke, Partner, Global Strategy Group, KPMG China

Bringing man and machine together.

We don't want this to be another man-versus-machine narrative. As we began by saying, the future of business strategy belongs to man-computer symbiosis: expert people using machines to vastly leverage their cognitive powers, just as we have already done with our mechanical powers. The relationship will be collaborative, with the machines helping people work better and quicker. As a former strategy consultant turned big data entrepreneur, Arnab Gupta puts the vision well:

What do people in strategy actually do? What clients value is the fact you can provide interpretation and insight of a high order, which is uniquely in the human domain of symbolic reasoning. What people actually pay for is that. But in order to get to that I have to spend an extraordinary amount of time doing the janitorial work on the data. So what these technologies are doing is releasing capacity of talented people as they figure out how to take a company from point A to point B. That is their real value.

– Arnab Gupta, Founder and Chief Executive, Opera Solutions

The following example brings this to life:

Take predicting employee attrition. Eventually a manager needs to intercede. If the problem was 'I have childcare issues and I didn't realize that my company has childcare on campus or has a subsidy for childcare', pretty much send me an email and I'm happy. But what if there's a bereavement and what you really need is your manager to sit down and cry with you and put their arms around you? That can't be found in an algorithm.

– Bill Nowacki, Managing Director of Decision Science, Lighthouse, KPMG in the US



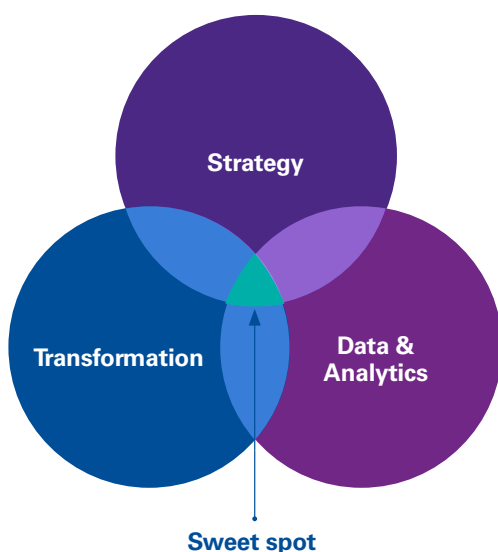
Lean on me

Human-computer symbiosis in strategy.

As a result of the predicted increases in productivity, businesses of the future will demand a richer, more responsive and complex approach to strategy – and tangible results. Indeed this expansion is already happening in the form of more intelligent interlock between strategy formation, transformational implementation and data analytics.

Companies that are able to marry and harmonize this trinity of elements will win. As data analytics becomes more capable of enriching strategists' work, so the premium on tightly integrating both with the very human work of organizational transformation grows.

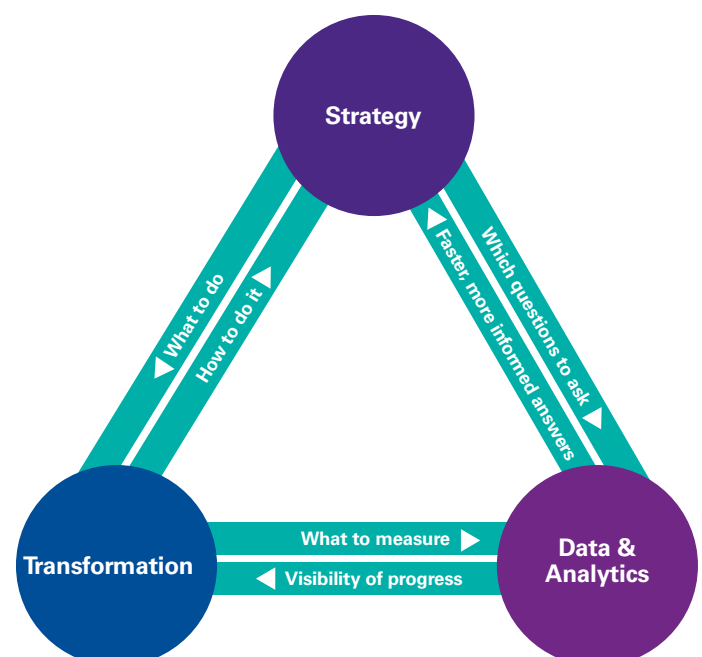
Figure 2: Key elements for successful 'Innovation to Results'



As the diagram indicates, this too is symbiosis, each corner of the triangle continuously supporting, informing and depending on the other in an evolutionary process. Strategy steers data analysis, data analysis informs and hones strategy, which in turn informs the direction of transformation, which depends on data for tracking and course correction.

At its core, however, is the often underplayed link between strategy and the ability to enact the required transformation. The feedback loops are constant. Major e-commerce players are already doing this, creating corporate structures based on constant data collection, analysis, experimentation and action.

Figure 3: How those elements interact: data and analytics is a useful enabler, but the core remains the human-centric interaction between strategy and transformation.



Getting the best of that human edge

A strategic framework that drives 'Innovation to Results'.

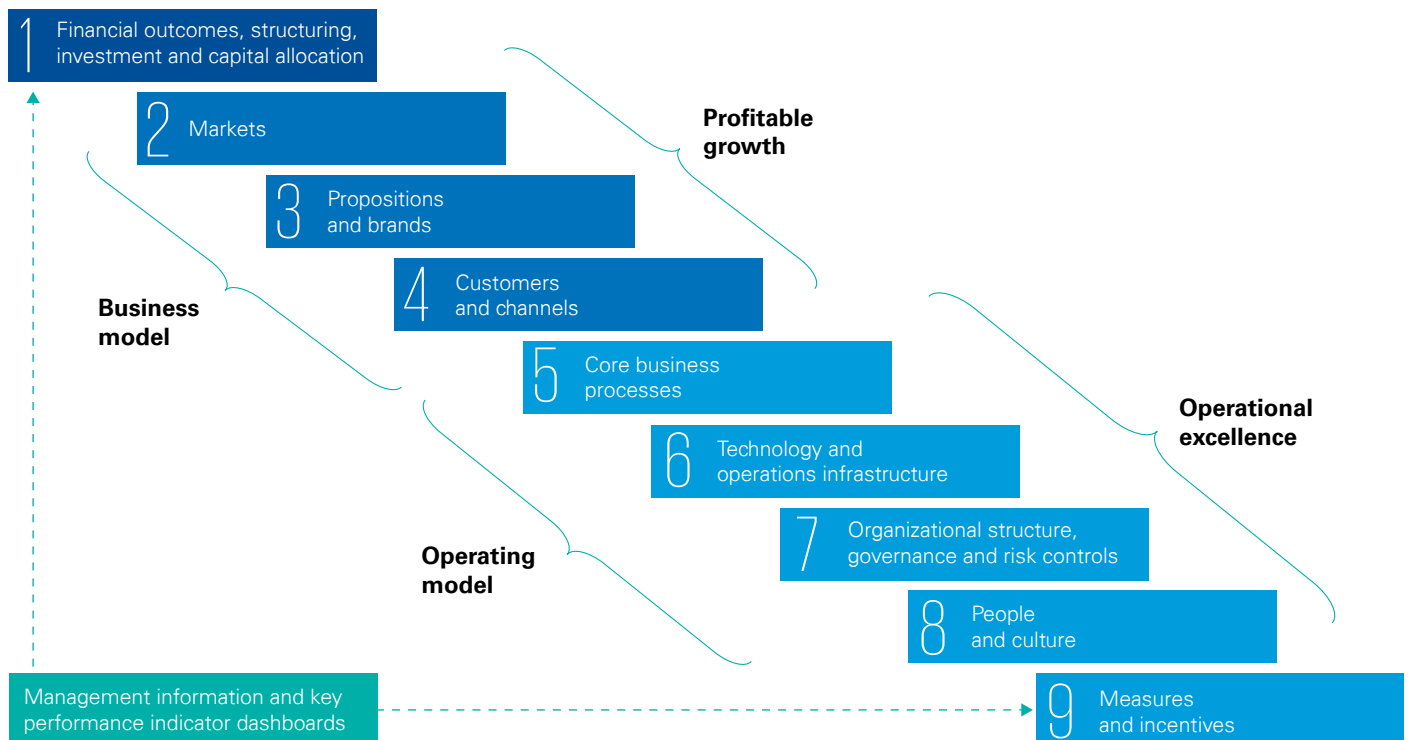
How do you train capable human minds to consistently focus in, 80:20, without losing sight of the bigger picture? How do you think of your strategic choices while allowing for structured interaction with data and analytics, as well as the identification of interdependencies during the transformation?

Tried and tested frameworks help. Our '9 Levers of Value' is a simple, complete depiction of the levers that exist in organizations – covering financial, business and operating models, and the interdependencies between them.

It has enabled our network of Global Strategy Group practitioners from Shanghai to São Paulo, San Francisco to Sydney, to consistently and effectively hone in on key client issues without losing sight of interdependencies within the bigger picture. Rather than being separate, standalone considerations, both data and analytics, and transformation, interact and are embedded in our thinking for each of these levers. That, in turn, enables the human interplay required for 'Innovation to Results.'

For more information see: kpmg.com/strategy

KPMG's 9 Levers of Value



Our point of view

Balancing investment in people and technology.

Big data analytics, cognitive computing, machine learning. These terms have attained their recent prominence because their promise is so vast. They have the potential to radically alter our approaches in all fields of human endeavor, and to transform the world around us.

However, when it comes to business strategy, determining the exact scope and potential of these technologies is going to take time and, crucially, will be driven by skilled people. For good reasons, machines and algorithms are not about to replace the c-suite or strategy functions – though they will help those employees get better results.

So what does this mean in practical terms?

You need data-driven strategies, so it makes sense to embed data analytics guys alongside your strategy teams. Banks and insurance companies are currently learning this the hard way.

– Dr. Thomas Erwin, Data and Analytics Lead, Management Consulting, KPMG in Germany

Get the right talent and make sure they are talking to each other. Making analytics technology work effectively for your company means having people who can find, marshal, clean and link data, all of which needs specialists but also strategic people to work with them, guide them, and develop solutions.

Closer integration of your strategy and data individuals can also bring other advantages – such as a shortening of strategic planning cycles.

I don't think you just heavy up on quant guys. You need somebody who can stand back and very quickly survey a marketplace and see how it can work better. Modellers work better when they follow somebody who has that kind of big picture ability. So heavy up on both.

– Bill Nowacki, Managing Director of Decision Science, Lighthouse, KPMG in the US

In other words, for every big investment in technology, are you sufficiently investing in talent acquisition, development and culture?



Focus on recruiting and retaining people who can:

- develop hypotheses for machines to test, i.e. ask the right questions
- define what is of interest, what data is needed, and sense which sources of data to prioritize
- set parameters for analysis
- capture softer insights to factor into the analysis
- make informed judgement calls on alignment and comparability of data sets for machines to then work on
- reflect on analyses and innovate actions
- engage key stakeholders for early buy-in and subsequent change management
- drive transformation, managing the complexity of multiple workstreams, constituents and personalities.



Escalate your investment in technologies that:

- find, read, filter and tag key insights from secondary source materials
- analyze datasets best provided and sanity-checked by people
- deconstruct and test hypotheses created by humans
- model and test innovative ideas
- quickly create consistent visualizations of data and results
- monitor the implementation of strategy through human-agreed metrics, alerting people to typical warning signs when the transformation journey is at risk.

Actions for CEOs

Three key considerations.

We are optimistic about the future for technology and its role as a tool to be used by talented humans. We caution, however, against large investments in data and analytics without having the supporting human element in place. The best strategies of the future will be richer and more dynamic, created by expert strategic minds employing advanced technological enablers. To get there, you will need:



1. **Continued focus on strategy personnel:** people with domain expertise and a full strategy toolbox as well as the ability to implement strategy through shoulder-to-shoulder transformation.



2. **Technology enablers:** people who can translate strategic hypotheses into concrete data analysis demands and source the data to meet those demands, as well as develop appropriate metrics to force and measure transformation.



3. **Phased investment** in appropriate data analytics technologies, with aggressive scrutiny of aims, focus, hidden costs, and return on investment.

So before that next big investment in big data, ask yourself about what you're plugging that investment into and why.

Reader comments

Actions:

Share with:

Reader comments

Actions:

Share with:

- a. Distinguishes between those work streams often staffed with strategists (e.g. deal rational, commercial due diligence and upside identification) and those more likely to be staffed by other career types (e.g. lawyers, accountants and tax advisors).
 - b. Both in our daily work and as research for this article, KPMG Global Strategy Group has used a range of data analytic tools on the market. While many have attractive uses, their ability to intelligently scan raw data and pull out meaningful and insightful comparisons and trends can be easily overstated.
 - c. Although everyone interviewed for this piece agreed that creativity would be a major challenge for computers, there are those who believe that algorithmic experimentation could eventually lead computers to an approximation of the process we call 'creativity.'
1. Man-Computer Symbiosis, J.C.R. Licklider, 1960
 2. <http://www.google.com> as at 21 May 2016
 3. We are not alone. See Carl Benedikt Frey and Michael A. Osborne, 'The Future of Employment: How Susceptible are Jobs to Computerisation?', 2013, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf Frey and Osborne are far from the only authors to conclude that humans exhibit uncomputerisable abilities. David Autor ('Why Are There Still So Many Jobs? The History and Future of Workplace Automation', Journal of Economic Perspectives, Vol.29, No.3, 2015) has also argued that many human cognitive abilities are unlikely to be replaced, and Andy Haldane, Chief Economist at the Bank of England has suggested a human "edge" in "tasks requiring high-level reasoning – large logical leaps of imagination rather than repeated small experimental steps...It is in tasks where the focus is on cognition and creativity, rather than production and perception. And it is activities where EQ trumps IQ, where social capital is scored as or more highly than financial capital."
 4. See for instance: <http://www.nature.com/news/the-chips-are-down-for-moore-s-law-1.19338>
 5. Pulitzer-winner John Markoff: https://www.edge.org/conversation/john_markoff-the-next-wave
 6. Jerome Pesenti TEDx talk: <https://www.youtube.com/watch?v=8zYp4yH4PoQ>
 7. Elon Musk: "We need to be very careful with artificial intelligence. I'm increasingly inclined to think that there should be some regulatory oversight, maybe at the national and international level, just to make sure that we don't do something very foolish." 'With artificial intelligence we're summoning the demon.' https://www.youtube.com/watch?v=_rfHNvHu8OE. Stephen Hawking, 2014, <http://www.bbc.co.uk/news/technology-30290540>: "The development of full artificial intelligence could spell the end of the human race."
 8. David Autor, 'Why Are There Still So Many Jobs? The History and Future of Workplace Automation', Journal of Economic Perspectives, Vol.29, No.3, 2015
 9. Carl Benedikt Frey and Michael A. Osborne, 'The Future of Employment: How Susceptible are Jobs to Computerisation?', 2013, http://www.oxfordmartin.ox.ac.uk/downloads/academic/The_Future_of_Employment.pdf
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 12. Big data: Should it come with a big health warning?," BBC News, 13 June 2014 <http://www.bbc.co.uk/news/business-27683581>

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