Leadership

Inside the Wise Leader’s Brain

The Neuroscience of Leadership

By
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Amrop

Leaders For What’s Next

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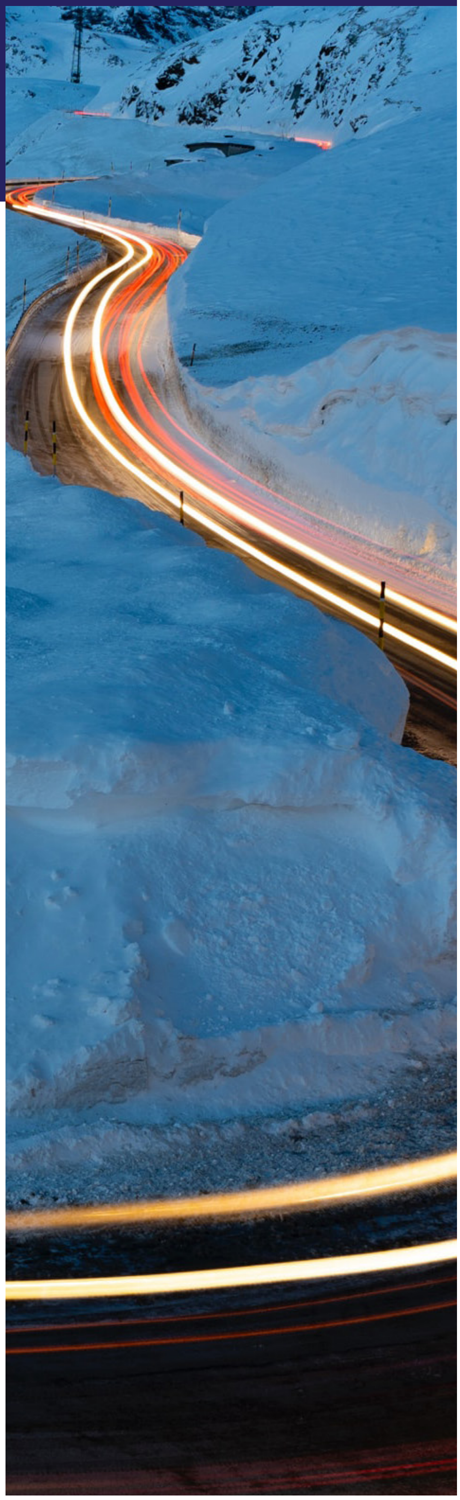
Executive Summary



These days, you're probably used to being challenged by online platforms to prove you're 'not a robot'. As you click on squares of 'car parks', have you ever thought that your brain might indeed be an algorithm? Because, to a certain extent, it is. As you read this, your algorithm is hoovering up data, running an astonishing series of unconscious protocols, ordering and structuring the information in 'conscious reflective mode'. You may now form a sentence — a linguistic, meaningful communication. This may be with yourself, the online platform that after five years still doesn't know who you are, or your cat who has picked this precise moment to attack your keyboard.

Our emotions and rationality are closer co-workers than we may admit. What is going on in our brains when we make a decision? To shed light on this intriguing subject, we're going to dive into our neural processes and gain a deeper understanding of the brain's workings. We'll look at the navigation between two modes: our unconscious intuitive and its conscious, rational and reflective equivalent. Our exploration will also help us understand how wise leaders 'think' differently from their peers and how we can train ourselves to become expert wise decision-makers.

Looking at AI in this respect is fascinating for several reasons. Firstly, advances in AI are teaching us a great deal about how our brains work (and vice versa). Secondly, it is in understanding the power (and limits) of machines that we are truly beginning to understand what makes us so extraordinary. Thirdly, these insights enable us to understand how we can collaborate better with AI, with ourselves and each other. And finally, how we are uniquely equipped to make decisions that are not only smart, but wise; *ethical, responsible and sustainable*.

AI scientists are getting ever better at mimicking how the 'layered neural network' of our brain constructs ideas — how we see, hear and think. Machine learning algorithms use building blocks to create *'convolutional neural networks'*. These enable self-driving cars, translation bots, and the interventions of personal assistants such as Siri and Alexa (however annoying). In short, to a certain but still limited extent, algorithms and their basic architecture are trying to *copy human intelligence*. When we read about a machine learning breakthrough in the news, we're witnessing a successful leap in the way big data and the huge processing power of the cloud are rising to the challenge.

Despite the astounding achievements of AI engineers, humans remain superior decision-makers. Why? For one thing, we're better learners than even the smartest, big-data-guzzling AI. If you are anything like most business leaders, you'll be happily aware of the intellectual superiority of *homo sapiens* over *machina sapiens*. You'll be equally aware that digitization and AI carry not only enormous potential, but considerable challenges — not least in the Industry 4.0 context.

Wise leaders operate differently to their peers, however smart or accomplished. Take, for example, the digital environment. Wise leaders combine two modes of operation. On the one hand, they use AI to augment their rational decision-making processes. On the other, they draw on intuitive, gut feelings (most often based on experience and expertise). Especially when little data or information is available, they deploy *heuristic thinking* (or mental shortcuts). They are also able to better manage the biases that mental shortcuts may involve, via self-awareness. They involve carefully selected stakeholders in decision-making and deploy a range of bias-checking measures, such as forcing themselves to imagine alternative scenarios, or asking themselves what they would do if they were not involved in the decision.

And there's good news. We can change. Thanks to the brain's neuroplasticity, executives can learn, through *mentalizing* and *mindfulness meditation*, to tune into the more holistic perspective that is a key feature of wise decision-making. These practices have actually been observed to stimulate a key part of the brain — the dorsal part of the lateral prefrontal cortex. Activating this zone allows us to pay attention to our "wise advocate". In so doing, we are directing ourselves away from the easier *'Low Road'* of tactics (Kahneman's System 1), to the reflective *'High Road'* of strategy (System 2). This high road is also loftily known as *'moral deliberative reflection'*. Taking it is no miracle practice. But executives who do will likely strengthen their capacity to make wise decisions.

And this means decisions that are ethical, responsible and sustainable.

About Dr. Peter Verhezen

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1 Could Homo Deus Replace You?

Our brain is an organ of extraordinary resilience and plasticity. Its ability to change itself and adapt allows it to overcome massive difficulties. Could AI scientists draw inspiration from human brainpower to build more efficient machines?

Professor Yuval Harari goes further. He foresees that organic algorithms (*homo sapiens*) will gradually melt together with digital platforms. In Davos (2018), he asked the unnerving question: *"Will the future be human?"* For Harari, the even more unnerving answer is a mechanistic *no*.

He and fellow AI enthusiasts such as Ray Kurzweil at MIT believe that a new "transhuman" is poised to emerge, rooted in data-, bio- and brain engineering. *Homo deus* may well rule markets, and even the world. This cyborg will be more effective and efficient than homo sapiens. We may end up serving it.

Really? Well, organisms don't necessarily work purely as algorithms. Wise leaders will always be able to conceive a better future and do so in a way that is not completely dependent on patterns found in historical data, patterns which are often mere coincidences.

Organisms don't necessarily function purely as algorithms, and wise leaders will always be able to conceive a better future. They'll do this in a way that is not completely dependent on the patterns found in historical data.

Many scientists also think that homo deus may be a little premature.

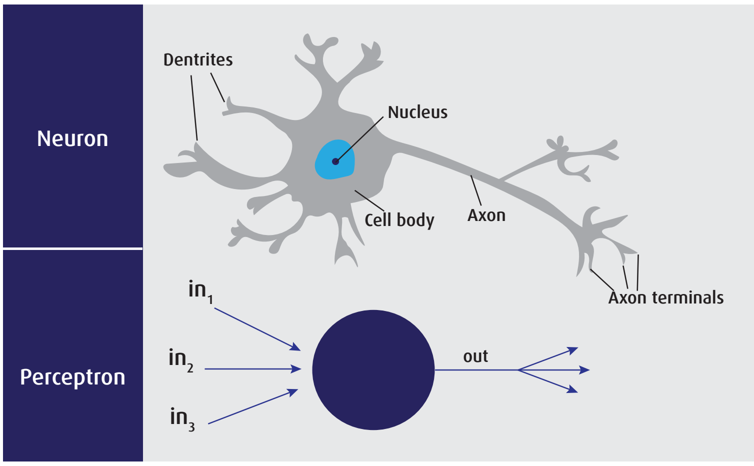
Nature and nurture seem to have found an incredible form of 'collaboration' in the evolutionary sense. Natural selection is a remarkably efficient algorithm, adapting an organism to its ecological niche. Even if it does this at a painfully slow rate.

However, animals and humans have an 'innate' ability to learn *rapidly*. To swiftly adapt to unpredictable conditions.

Similarly, corporate leaders and their organizations (an artificial organism where group collaboration is crucial) need to strategically and tactically adapt to an ever-changing business context.

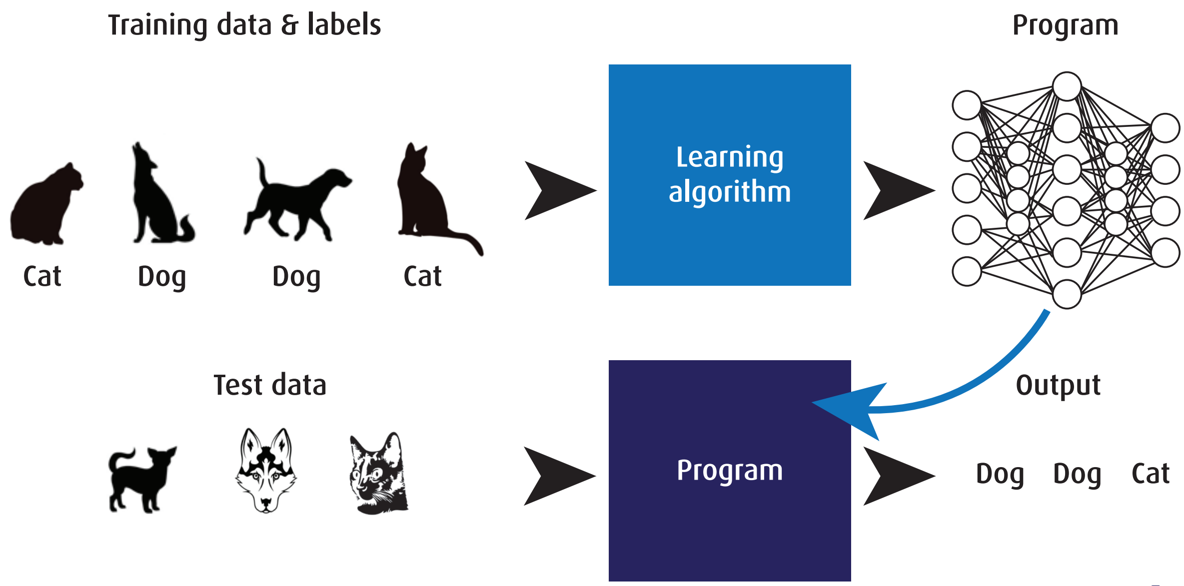
2 Cat or Dog? How Machines Learn

From facial recognition technology, virtual assistants and machine translation systems, to stock trading bots, machine learning breakthroughs can be ascribed to enormous leaps in the amount of data available and the processing power (in the cloud) to find patterns.



The perceptron pictured (left) simulates human neurons. *It can learn.* This inspired AI scientist Yann Le Cun (now CTO at Facebook) to develop an algorithm that could recognize pictures. A crucial breakthrough, it allowed AI to apply the neural network — or *deep learning* - to concrete applications. From face recognition to pattern recognition in general.

Imagine that you're teaching your AI to tell the difference between drawings of cats and dogs. You give it a set of 'training data' — cat and dog pictures. You give it a set of labels for the training data. The learning algorithm can now teach the neural network to distinguish cats from dogs. With your silicon friend trained up, you can use the resulting new program to label unfamiliar, test data.



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The black box

Once the algorithm is up and running, we don't necessarily need to understand its precise, layered workings. (This is how we arrive at the 'black box' notion, wherein the complex operations of the AI are incomprehensible to normal mortals). To make decisions, we'll likely want to focus on the output. We trust it has been well designed. *By the way, our trust may be misplaced.* Human architects may build bias, or biased data, into their creations. We cover this in our article: 'Wise Leadership and AI, Can We Trust AI to Tame Complexity?'

Supervised learning

Whether in silicon or organic neural circuits, learning is about forming an internal model of the outside world. This can be in terms of *tacit* knowledge, such as riding a bike, or *explicit* knowledge that we can easily communicate with others, such as how the bike's gears work. Similarly, a computer algorithm learning to recognize faces is acquiring template models of possible shapes and combinations of eyes, noses, and mouths. So too is a computer that is trained to recognize and 'understand' a sentence.

Computer algorithms and their artificial neural networks are called *deep networks.* Each layer can only discover an extremely simple part of the external reality. On each trial the network gives a tentative answer. *Cat.* If it is told it made an error, it adjusts its parameters to try to reduce its error on the next trial. *Dog.* Every wrong answer provides valuable information.

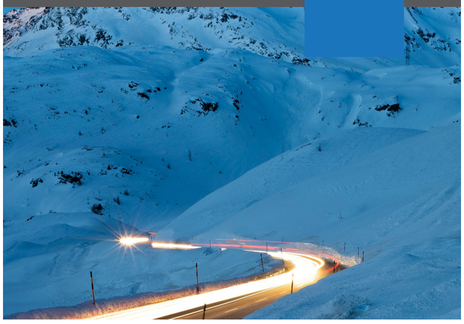
In machine learning, this is called *'supervised learning'* (a supervisor knows the correct answer) and *'error backpropagation'* (error signals are sent back into the network in order to modify its parameters). This kind of learning remains at the heart of many AI applications, for example, your smartphone's ability to recognize your voice. The artificial network can only correct itself by calculating the difference between its response and the correct answer given by its supervisor.

Fuzzy relationships

If a designer adds enough variables into the black box of algorithms underpinning machine learning, he will eventually find a good combination of variables. But she won't know whether the correlation is just a matter of luck. And she certainly won't be able to explain the relationship between one thing and another (causality). As she piles on more of the variables needed to make predictions, she needs exponentially more data to distinguish true predictive capacity from a happy accident. If it's just a case of luck, the prediction success is the result of a coincidental alignment in the data and nothing more. This can result in funny or nonsensical correlations. To take one example, correlating deaths caused by anticoagulants with sociology doctorates awarded in the USA between 1998 and 2009 (Bergstrom & West, 2020: 70) has no meaning whatsoever.

3 Why is a Cat Not a Dog? How Humans Learn

Learning is basically a massive research problem.



The word 'learning' has the same root as 'apprehending'. As an adult or a child, it is about grasping a fragment of reality. We catch this fragment through our senses and bring it inside our brain. Our brain then forms an internal model of the world.

Looking inside human brains allows us to understand how enormous our adaptability is. Every human inherits a great deal of innate circuitry. We also inherit a highly sophisticated learning algorithm that can refine early skills according to our education and individual experience.

Our human cortex breaks down the problem of learning by creating a model. This model is hierarchical, multilevel, like a step pyramid. From it emerges the ability to detect increasingly complex objects or concepts.

In both human and machine brains, learning requires searching for an optimal combination of parameters. Together, these define the mental model in every detail. Learning, *in silico* or *in vivo,* is basically a massive research problem.

From the unconscious to the conscious

Through learning, then, raw data that strike our senses turn into refined ideas, abstract enough to be re-used in a new context. Neuroscientist Stanislas Dehaene calls these "smaller-scale models of reality". Via learning, the brain internalizes a new aspect of reality, adjusting its neural circuits to master a new domain.

Recent neuroscientific research suggests that the initial activity is unconscious. Only if it spreads to the distant regions of the *parietal lobe* and *prefrontal cortex* does conscious experience occur — a sudden transition toward a higher state of synchronized brain activity.

Most artificial neural networks only implement the operations that our human brain performs unconsciously, in a few tenths of a second, when it perceives an image, recognizes it, categorizes it, and accesses its meaning. However, the human brain *explores the image consciously*. It formulates symbolic representations, explicit theories of the world that we can share with others through language. Our brain is much more flexible than the strongest AI today. However, computer scientists, such as MIT professor Josh Tenenbaum and his team, are attempting to incorporate this type of self-organization into AI as well.

Learning[1] is grounded on some basic principles: focus, patience, a systematic approach, a tolerance to error. Human learning possibilities are almost infinite and not (yet) matched by the learning abilities of smart machines.

[1] See Dehaene (2014, 2020); and Dehaene, Le Cun & Girardon (2018). For executives, we emphasize focused attention, active engagement, positive feedback on mistakes (inherent to any trial and error approach), and the need to consolidate what has been learnt.

Born clever

Our brain is molded with all kinds of assumptions. Babies are delivered organized and knowledgeable. Only specific parameters from different contexts remain to be acquired. Natural evolution and cultural nurturing are intertwined, not opposed. There is apparently some innate knowledge that constitutes our human cortex that the human species has internalized as it evolved.

The intuitive logic with which their brains are born allows infants to constantly experiment. As any parent knows, kids are endlessly curious and their favorite utterance is often "why?" Their scientist brain ceaselessly accumulates the conclusions of their research.

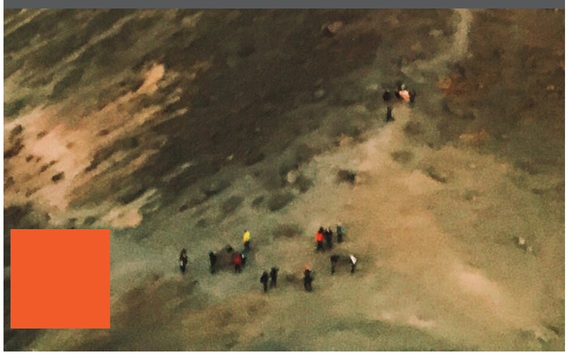
Plastic brains

Babies are "learning machines during their first years because their brains are the seat of an ebullient synaptic plasticity. The dendrites of their pyramidal neurons multiply at an impressive speed[2]." Enriching a young child's environment helps her build a better brain. As we age, our brain plasticity diminishes. Learning, while not completely frozen, becomes more difficult. But as adult executives we can still broaden our perspective and embrace different and unusual views. We can get better at resolving contradictions, dilemmas, paradoxes, and business challenges in general.

When it comes to the plasticity of our brains, neuroscientists have observed a fascinating phenomenon. In the case of certain individuals who suffered injury to their brain's left hemisphere, the right automatically took over some of the lost synapses.

The enticing aroma is coming from the machine just down the corridor. Sarah, a senior executive, has quite literally just smelled the coffee. The first stages of sensory, relatively fast processing of the smell take about 200th of a second, operating in a mainly unconscious manner in her brain. The subsequent conscious, slower, and reflective part of her learning process allows her to deploy reasoning, inference and flexibility.

"That coffee smells of vanilla. That's new. I doubt if it's Fair Trade? Should we check it's in line with our CSR policy?"



[2] Dehaene 2020: 103

Seeing meaning and communicating it

Unlike a computer, humans recognize the essence of an (abstract) object. We can question our beliefs and refocus our attention on those aspects of an image that don't fit our first impression. Human learning is not just about setting a pattern-recognition filter, as an artificial neural network function does. It's about forming an abstract model of the world. This simulation lets our brain impose meaning on the statistical noise, selecting what is relevant and ignoring the rest. In every waking moment, the human brain uses past experience (stored in our memory), organized as concepts, to guide our actions and give meaning to specific sensations.

What about language? Hardwired in *homo sapiens* is not so much language itself, as the ability to acquire it. Noam Chomsky suggested that our species is born with a language acquisition device, a specialized system. These innate *"brain highways"* are automatically triggered in the first years of life. Baby brains come with an instinct to learn any language.

4 It's Probably a Cat. Meet Your Statistical Brain Team

Scientists formulate hypotheses and apply them to probabilities and uncertainties. So does our brain. It selects the hypotheses that best fit with our environment. As it hypothesizes, collects data and re-adjusts, it learns.

Evolution wired our brain for prediction

Millions of nonstop predictions give meaning to the external environment that our senses perceive, and so our brain constructs the world we experience. During its evolution, our brain seems to have acquired these sophisticated algorithms that constantly keep track of the uncertainty associated with what it has learnt.

Deeply inscribed in the logic of our learning, reasoning with probabilities happens under the radar. A whole array of mental processes can be launched *without consciousness*[3]; even though, in most cases, they don't run to full completion.

Conscious perception has a major role to play, too. It transforms incoming information into an internal code that allows it to be processed in unique ways. Our brain uses a division of labor: an army of unconscious statisticians and a single decision maker (or "interpreter").

A strict logic governs the brain's unconscious circuits

These appear ideally organized to perform statistically-accurate inferences from sensory inputs. Our unconscious perception works out the probabilities, our consciousness takes a random sample. Consciousness acts as a discrete measurement device that gives us a glimpse of the vast underlying sea of unconscious computations. The mighty unconscious generates sophisticated hunches, but only a conscious mind can rationally think through a problem. Language (and memory[4]), put together, allow us to structure our mental world and share it with other minds.

All (human) knowledge is based on two components

Firstly, a set of innate 'a priori' assumptions, before any interaction with the environment, and secondly, the capacity to sort them out according to an 'a posteriori' plausibility, once we have met some real data.

[3] Dehaene, 2014: 86. The unconscious human mind proposes while the conscious mind selects. The unconscious "clearly has a large bag of tricks, from word comprehension to numerical addition, and from error detection to problem solving. Because they operate quickly and in parallel across a broad range of stimuli and responses, these tricks often surpass conscious thought"

[4] Heffernan, 2020. Humans use models to understand. Indeed, we create models of the future by recruiting our memories of the past. We draw from the past in order to imagine what lies ahead. Mentally, we are all time travelers. And what gives life meaning is the rich and constant interplay between past, present and future. Our brains are "prediction machines" helping us to see the future, to prepare us to find meaning in all the phenomena (or data input) we encounter. Memory requires a state of alertness, attentiveness, and awareness of the present. At the same time, our capacity to generate a vast range of scenarios is what gives us the capacity for change. Humans map thousands of possibilities with a lively, free-flowing combination of routine and creative prescription and foresight knowledge.

Adjusting as we go

Through prediction and correction[5], the human brain continually creates and revises our mental model of the world. This huge, ongoing simulation constructs everything we perceive, while determining how to act. Even babies seem to understand probabilities, deeply embedded in their brain circuits *("if I cry, I'll get some attention around here...")*.

Humans are very good at making decisions with limited data, but not when overloaded. Machine learning algorithms, on the other hand, are very good at finding patterns in big data.

In machines, just as in humans, learning always starts from a set of hypotheses. These are projected onto the incoming data and the system selects the ones that best fit the current context. Despite this similarity, our brain (so far) learns better than machines do.

The idea that every unexpected event leads to an adjustment of the internal model of the world is also known as the 'theory of error backpropragation' — we visited error backpropagation earlier when discussing supervised machine learning. Learning by error correction is a feature not only of AI and humans, but animals too.

Returning to our pyramid image, the brain is a massive hierarchy of predictive systems. Generating a prediction, detecting our error, and correcting ourselves, are the foundations of effective learning. Stanford psychologist Carol Dweck has called this a growth mindset, versus a fixed mindset.

Once again, the result is a compromise, a selection, of the best internal model from the selection our prior organization makes available to us. A (young unexperienced) person 'knows' what a face (a conceptual output) looks like. A human can easily recognize and thus predict a specific face. A computer doesn't have this pre-understanding. Through layering and error backpropagation (which we can also see as feedback), the input of an "object face" finally enables it to see "the face of x". Moreover, a human can be self-confident and show confidence in others.

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[5] See Lisa Barrett, 2017: 62-64. "Your brain's colossal, ongoing storm of predictions and corrections can be thought of as billions of tiny droplets. Each little droplet represents a certain wiring arrangement – a prediction loop… Neurons participate in prediction loops with other neurons…[…] As each prediction propagates through millions of prediction loops, your brain simulates the sights, sounds, and other sensations that the predictions represent, as well as the actions you will take…[…] Your brain works like a scientist. It's always making a slew of predictions, just as a scientist makes competing hypotheses. […] Your brain does not just predict the future; it can imagine the future as well. As far as we know, no other animal brain can do that."

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5 In a Nutshell - the Problem with Homo Deus

Smart machines copy certain behaviors. Autonomous cars can drive. But they don't really understand what they are doing (or why). Deeper understanding requires an abstract, causal model as a representation of this world. And we seem to be born with that incredible ability as part of our human evolution. Understanding contexts is possible for us because we see relationships and subtleties that machines can't.

As long as *machina sapiens* doesn't master how to learn by itself, its intelligence will remain behind that of *homo sapiens*. This means that even the most advanced computer architectures can't yet match the ability of a human infant to build abstract models of the world. Let alone the aspirational power of corporate (and political) leaders, guiding organizations and countries towards a better future.

Let's summarize what we have seen so far. Machines may make us more efficient and effective, or 'see' hidden patterns that improve our predictive power. But they don't change the context, or create a new and better landscape. Today's AI neural networks need billions of data points to develop an 'intuition' of a particular domain. Here, too, the human brain is still unmatched. A human baby can identify a cat after being shown only one or two examples. Machines are data-hungry, humans, data-efficient: human learning makes the most of the least amount of data. And the efficiency with which humans share their knowledge, using a minimum number of words, remains unequaled.

To learn also means inserting new knowledge into an existing network. Human brains can extract very abstract principles, systematic rules to re-apply in different contexts. We can draw extraordinarily general inferences. *Machina sapiens* is almost entirely incapable of profound insight: it is largely unable to represent the range of abstract phrases, formulas, rules and theories with which *homo sapiens* models the world. It solves only extremely narrow problems. In the human brain, however, learning almost always means rendering knowledge explicit, so that it can be reused, recombined, explained to others or transferred into useful, reusable tacit knowledge. The major strength of homo sapiens over machina sapiens lies in two abilities:

1 - to make a [causal] representation of our world, and even of a future that does not yet exist
2 - to share our ideas with others through communication.

Humans can even imagine the unimaginable: "faire de l'infini avec du fini." Our unique capabilities reside in our ability to represent the world, to model a complex reality with causal relationships, sharing ideas through language. It is this capacity to imagine and share, to communicate unlimited combinations of possibilities and create an infinite potential of futures, that makes us so powerful and special.

6 The Ethical Brain

Mentalizing helps us, as executives, to develop a more nuanced, sophisticated understanding of others.

Executives must increasingly deal with social, ethical and environmental dilemmas, uncertainties, opposing ideas and paradoxes. Understanding our brain mechanisms gives us insight into how.

Ethicists deal with *'should be's'*, clues on how to live a good (executive) life. Scientists describe *'what is and what can be expected'*.

Let's assume that nature has provided us with a natural ability to think in terms of moral dilemmas, paradoxes and probabilities. If so, neuroscience may point us to a form of *ethical thinking* that is built into our brains and differs from, say, more *egocentric* thinking. The way a self-aware thinker's brain functions is slightly different from the brain of someone who is not.

The Theory Of Mind

In ethics the notion of *intention* plays an important role. Is this also hard-wired in our brains? The *'theory of mind'* suggests that it is. This theory describes conscious processes that enable us to understand the desires, intentions and beliefs of others. In fact, intention may be one of the defining characteristics of human consciousness. Intention is context-dependent. The human brain allows us to analyze, reason, form theories and flex to a wide spectrum of contexts.

Developing our brain's capacity to broaden our perspective can be labeled as *'mentalizing'*. Instead of viewing what is going on around us through an individualistic lens, we take a more dispassionate, 'outside-in' view. Mentalizing helps us, as executives, to develop a more nuanced, sophisticated understanding of others. It enables us to see a socio-ethical context that can help us manage better. Executives who are not just *mentalizing*, but also *mindful* and *self-aware*, can more easily articulate what other people are thinking, and why this matters. These leaders give the impression of genuinely caring about what other people think.

As we'll see, mentalizing and mindfulness allow executives to become more responsible, training the ethical brain to make wiser decisions in the process.

Cognitive scientists no longer oppose emotion and rational thinking. Each emotion has a reason to exist. It contributes to the survival of the species. Our incredible appetite for the unknown is an emotional desire.

There's a logic to emotions

Neuroscientifically speaking, *emotional intelligence* is about getting the brain to construct the emotions that best fit a specific situation. These emotions help us to make moral and other (survival) decisions. Emotions are actually a social reality[6].

Organizations are social set-ups. And in order to create the trust that is so necessary for them to function, it's not enough to be cognitively smart. We need four forms of intelligence: emotional intelligence (EQ), intellectual intelligence (IQ), moral intelligence (MQ) and risk Intelligence (RQ). (See our article: From Tension to Transformation, how Wise Leaders Transcend Paradoxes and Ambiguity).

Cognitive scientists no longer oppose emotion and rational thinking. Each emotion has a reason to exist. It contributes to the survival of the species. Moreover, our incredible appetite for the unknown is an *emotional* desire. It is linked to a brain circuit fed by *dopamine* (a neurotransmitter which rewards us when we learn and understand something new). The motivation in the human brain to explore passes through the same neural networks or circuits as the ones that 'create' the desire for food, sex or money.

The emotion 'fear' [7] corresponds to anticipating a particular danger in a particular context. Traditional thinking suggested that these sentiments (initially subconsciously) alert several zones in the human brain. Enzymes and hormones then trigger further physical reactions which can be translated into more conscious decisions. However, the most recent research indicates that a *single* brain area or network contributes to *many* different mental states. And this makes most neurons multipurpose.

[6] Under crisis conditions we often lack the time and information to make considered choices. The management literature has recently produced support for intuition and tacit knowledge in decision-making, less so, for emotions. We propose that in crisis conditions, managerial decision-making should underscore the role of emotions in an intuitive decision process. These decisions carry a lot of ethical and financial weight, and their importance is magnified in a crisis.

[7] A threat stimulus, such as the sight of a predator, triggers a fear response in the amygdala, which activates areas involved in preparation for the motor functions involved in fight or flight. It triggers stress hormones and the sympathetic nervous system. The brain becomes hyperalert, the pupils and bronchi dilate and breathing accelerates. Heart rate and blood pressure rise. Blood flow and the stream of glucose to the skeletal muscles increase. Organs not vital to survival, such as the gastrointestinal system, slow down. The hippocampus is closely connected with the amygdala. The hippocampus and prefrontal cortex help the brain interpret the perceived threat. They are involved in a higher-level processing of context, which helps a person know whether the threat is real.

So, subconscious emotions actually drive our rationality

Our emotions are not as subjective as people often think. Our *'cognitive emotions'* reflect a sense of phenomena in the world, captured via our senses. They are the engines of our moral appraisal, of action in the *'intuitive track',* and our moral cognition. They are on-the-ground responses to our (mostly) non-conscious assessment of a situation. They play a crucial role in our reasoning, the thought processes that assess competing values and courses of action. This moral deliberation is a case of genuine ethical consideration of what we ought to do.

Recent neuroscientific understanding explains the mechanics of how we learn and decide. So should we give up any idea of personal moral responsibility? Given all these unconscious processes, how we can be held responsible for anything at all? Surely all events, including our moral choices, are driven by pre-existing causes beyond our control?

Perhaps it's time to do some insider trading and use the profits to buy a Ferrari.

Or perhaps not. Philosophers and scientists alike argue that free will can exist, even if the brain is as mechanical as clockwork. For the neuroscientist Michael Gazzaninga, our brains may be automatic, rule-governed, determined devices. But we remain personally responsible agents, free to make decisions.

Responsibility is a social choice

Responsibility may be a moral value that we demand of our fellow, rule-following human beings. It exists within the rules of a *society*. And this *social construct* does not pre-exist in our neuronal structures. Responsibility, however, would mean that we make deliberate choices that can change our concepts and therefore the model applied in our brain.

We also bear the responsibility for continuing conflicts rather than defusing them. No particular conflict is predetermined by evolution. Conflicts persist due to social circumstances that wire the brains of the participants. Someone has to take responsibility to change the circumstances and concepts[8]. That is what can be expected from a wise leader, one who usually takes full responsibility for his or her actions.

[8] Barrett, 2017: You are born with some brain wiring as determined by your genes, but the environment can turn some genes on and off, allowing your brain to wire itself to your experiences.

Your brain is shaped by the realities of the world you are in, including the social world made by agreement among people. And if your brain operates by prediction and construction and rewires itself through experience, it is no overstatement to say that if you change your current experiences today, you can change who you become tomorrow. You can train yourself to become aware of these experiences and control them.

A two-road problem

Let's try to decipher the individual responsibility in the brain of, say, a CEO. Neuroscientists have distinguished two key roads in the brain: the 'Low Road' and the 'High Road'.

The 'Low Road' (Kahneman's 'System 1') emphasizes the subjective valuation of what is valuable and relevant: *"What is in for me?" "How much is it worth?" "How might we close the deal?" "What might others want?"* Whilst these 'questions' are powerfully related to incentives, they are not purely selfish. The Low Road is also involved when you observe others being rewarded.

The "High Road" (System 2) focuses on others and a strategic longer term. It is activated by considerations of others: *"What is she thinking?" "What will they do next?"*

Which road you take is a moral, deliberate choice.

It is not mechanically predetermined by the brain, even if imaging does reveal the different areas of the brain involved[9].

Executives can train to focus their attention on:

1. Taking an easier tactical perspective that activates the brain's 'Reactive Self-referencing Center' (System 1)
2. Taking a more reflective strategic view, connecting to the 'Deliberative Self-Referencing Center' (System 2).

You can find more explanation in the box to the right.

All in all, it seems that we don't act completely randomly, We're somehow guided by moral values. An internal core — our self-consciousness – functions as a barometer of what is more right than wrong. Our appeal to it influences our final course of action. Let's recall that our brain is also adapted to operate with extreme efficiency. For this reason, in order to make sense and understand, the brain and its memory[10] distort incoming information to fit our current assumptions and beliefs, our mental, culturally-influenced models. As such, this useful device memory is also very "subjective".

[9]See Schwartz, Thompson & Kleiner, 2016.

High road and low road, a complex system

The high road (or moral road) is associated with two Centers:

A — the Executive Center. This is associated with the lateral prefrontal cortex, which is goal- and planning-directed. Working memory, keeping information accessible so your conscious attention can work with it, lives here.

B — the Deliberative Self-Referencing Center. This is associated with the dorsal (upper) medial prefrontal cortex, which has to do with mentalizing. When you reflect on your most meaningful aspirations, and plan on bringing them to pass, you also generate activity in the Executive Center.

This is why the high road gives rise to cognitive flexibility: seeing a situation from multiple perspectives and acting according to their potential, subtle connections. It is also the home of self-regulation — the inhibition of habitual, impulsive behaviors. It is invoked by mindfulness and our 'wise advocate' (a kind of moral consciousness) that emphasizes long-term value.

The low road (of lower moral instincts) is located below the Executive Center. It's associated with the ventral medial prefrontal cortex, as well as two further Centers:

A — the Habit Center. This is associated with the basal ganglia, a reptilian-evolved brain function, which has to do with automatic responses

B — the Reactive Self-Referencing Center. This is associated with the ventral medial prefrontal cortex, and subjective evaluation.

This is why the lower moral road focuses on tactical and expedient problem-solving. It provides no real impetus for strategic leadership capabilities. Moreover, deceptive tactical messages travel easily along this road (or circuit) and can even reinforce it.

[10] While useful, memory can be narrow-minded and biased. It is sobering to contemplate the reliance of the criminal justice system on something so fallible and malleable.

7

The Social Brain

Do we have an innate moral sense? Some impulses are so universal and have such a negative effect that they scarcely need stating as rules. Murder and incest, for example. If the human brain is a decision-making device, then it isn't too far-fetched to assume that we also possess a universal moral compass. And this is essential for societies to function.

'Moral emotions' are driven (mostly) by the brain stem and limbic axis, which regulate basic drives. The mirror neurons, the orbital frontal cortex, the medial structures of the amygdala, and the superior temporal sulcus are believed to be responsible for our 'theory of mind' — these conscious processes that enable us to understand the desires, intentions and beliefs of others. This skill typically develops between 3 and 5 years of age in humans.

Abstract moral reasoning, as brain imaging is showing us, uses many brain systems. Neuroscientists have concluded that the neural processes responsible for seeking patterns in events are housed in the left hemisphere. This zone engages in the human tendency to find order in chaos, to fit everything into a story, to put it into context. It seems that the human brain is driven to hypothesize about the structure of the world even when presented with evidence that no such pattern exists.

Another interesting argument suggests that common subconscious mechanisms are activated in the human brain (irrespective of gender, age and culture) in response to moral challenges. These moral judgments are initially perceived as intuitive. In other words, they are almost an automatic reaction to a situation — a brain-derived response. Gazzaniga has argued that our brain generates an *"interpreter"* process[11] (in the left hemisphere) to translate this situation into an (ethical) choice[12]. And this could explain our pro-social behavior.

However, Gazzaniga also argues that the interpreter in the human brain is only as good as the information it gets. And this is quite similar to the 'garbage in, garbage out' that we associate with *machina sapiens*.

[11]See Gazzaniga 2011 and 2005: 162. Specific areas of our brain interpret incoming data to create meaning, to make sense. The interpreter in our left brain seeks patterns, order, and causal relationships. Recent research indicates that nowhere does this interpreter operate more than in the case of religious belief. Could it be that this urge to create some order originates from a moral core we all possess, to interpret surrounding cultural realities? "It appears that all of us share the same moral networks and systems, and we all respond in similar ways to similar issues. The only thing different, then, is not our behavior but our theories about why we respond the way we do".

[12]The human 'mirror neuronal system' may be at the basis for learning to make an ethical choice by imitation. These universal moral rules that are contextual and social seem to allow humans to deal with these challenging situations. The brain reacts to such socio-ethical challenges on the basis of its hard-wiring to contextualize and debate the gut instincts that serve the greatest good given a specific context. Something a smart machine is not able to perform at all.

Big brains make for big groups

Responsibility and the choices we make as individual executives are a crucial notion in wise decision-making. As our choices arise out of social interaction, our individual minds will likely also be molded by social processes. We are born social: even children as young as fourteen months old will act to help others.

The anthropologist Robin Dunbar has found that in primates, brain size correlates with social group size: the bigger the neocortex, the bigger the social group. The chimpanzee has the most advanced social group among the great apes; about 55 individuals, humans, a group of about 150. And guess what? This even applies to our social networking. Although we may have hundreds of 'friends', we typically interact with an inner circle of about 150 people.

Similarly, research has shown that 150-200 people is the maximum number that can be controlled without an organizational hierarchy[13]. To develop the level of cooperation we need to live in larger groups, humans have had to become less aggressive and competitive. Call it a self-domestication process if you will. Over time, the gene pool was modified, which resulted in the selection of systems that controlled (even inhibited) forms of emotional reactivity, such as aggression. The social group constrained the behavior — and this eventually affected the human genome.

A social dance — ethical choices and moral systems

Ethical choices and moral systems are interlocking sets of values, virtues, norms, institutions, practices and evolved psychological mechanisms. These work together to suppress or regulate pure selfishness and make social life possible. Researchers such as Michael Gazzaniga, Jonathan Haidt, Joshua Green, and Marc Hauser have all reached a similar conclusion. Moral responsibility reflects a rule that emerges out of one or more agents interacting in a social context, and the shared hope that each individual will get in line. An 'abnormal brain' — that of a narcissistic CEO for example – deviates from the standard. However this doesn't mean that this CEO cannot, or should not, follow social rules.

Abstract moral reasoning, as brain imaging is showing us, uses many brain systems. Neuroscientists have concluded that the neural processes responsible for seeking patterns in events are housed in the left hemisphere.

[13]Gazzaniga, M. 2011, Who's in Charge & Dunbar, R.I.M., 1993, Coevolution of neocortical size, group size and language in humans, Behavioral and Brain Science, 16(4): 681-735

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8 Wising up your brain -Down to Business

So far we have explored a wealth of neuroscientific theory. As a senior executive, how can you train your brain in practice? In 2018, we conducted a global study[14] to explore the approach of leaders to wise decision-making. Drawing on our study we present eight key practices to 'wise up your brain', and a snapshot of how widespread these may (or may not) be.

8 Keys to Wising Up

1 Blending intuition and reflection

Let's recall the two different 'roads' in the brain: The High Road (System 2 thinking) is closely related to taking decisions focused on other-centeredness (more difficult and slightly longer). The Low Road (System 1 thinking) is closely related to basic survival emotions and emphasizes self-centeredness (easier and faster).

The more reasonable and responsible our choice, the more our brain has taken into account the claims of competing habits and impulses, overcoming and 'federating' them.

Intuitive, gut feelings are enormously useful. However, in deliberating the best course of action, a wise leader will back these up with a critical and conscious reflective process. This is all the more important because of our ability to 'see' causal relationships. Sometimes, however, these relationships don't exist. The more we exercise this duality, the more easily and 'automatically' we'll be able to reach wise decisions. Only around half of the leaders in our study say that they listen to their intuition or 'gut feeling' and the information gathered during a decision-making process.

[14] Wise Decision-Making, Stepping Up to Sustainable Performance

2 Drawing on experience

Leaders face relentless pressure to get things done. Wise decision-making means taking time to consciously look back to your past experience in order to move forward in a sustainable way. Doing so helps you to gain insights, become more mindful and take a broader perspective. These insights from the past (via experiences) and being more mindful (about experiencing) can be important resources. Yet only 10% of the leaders we surveyed habitually draw on their experience. Three times as many report gains in knowledge and perspective when they do.

3 Checking bias

Much has been written about bias. Less, about avenues that can help leaders reduce their likelihood of falling into the thinking traps that lurk beneath the surface of supposed rational decision-making. Here is a set of processes to help you spot possible bias in your thinking: The last three are generally or always practiced by between 30 and 40% of the leaders we surveyed.

1. Systematically work through the information available
2. Work through several scenarios, estimates or forecasts
3. Imagine none of the options you have in mind are possible and ask: *what else could I do?*
4. Think about what you'll miss if you make a certain choice
5. Imagine the advice you'd give someone else, if you were not involved
6. Conduct a 'pre-mortem' – imagining the reasons why the decision could fail.

4 Involving the right stakeholders

As a leader it is for you to decide how high you set the 'consultation bar'. However, involving other brains in your decision-making can reduce the risk of thinking errors. Here are the *do's and don'ts* as practised (more or less) by the leaders we surveyed.

The (challenging) do's:

Getting in-depth or diverse viewpoints. Only a quarter to a third systematically conduct one-on-one interviews with selected top executives, or involve different stakeholder groups.

Selecting stakeholders on the basis of their knowledge or competence. Only around a third always take this avenue.

Involving 'difficult' people who raise blocking/delaying questions. Only 4% systematically take this metaphorical trip to the dentist.

The (tempting) don'ts

Using stakeholders as allies to validate their opinions. A small minority of leaders (14%) systematically fall into this honeypot.

Selecting who they involve on the basis of a harmonious working relationship. Around 20% systematically take this road.

[15] Soll, J.B .; Milkkan, K.L. & Payne, J.W., (2015), "Outsmart Your Own Biases", Harvard Business Review, May; Heath, C. & D. Heath, (2013), Decisive. How to make better decisions, London, Random House.

[16] 4LS Evaluation – a Management Assessment Tool, Magnien, L., Eppling, E. Fransès, G., (2002) (adapted) ©Krauthammer.

5 Mastering reflection in action

Reflection in action is about taking a step back, 'thinking about thinking', when taking a difficult decision. It involves looking at the content of what is going on, framing a problem, checking our habits, feelings, mental leaps and generalizations. Only around one in ten leaders systematically exercises reflection in action. And only around a third generally or always do. Around twice as many stay on the level of content (19%) than on the level of judgments and habits, or checking their mental leaps and generalizations. Only around one in ten always tries to see negative ideas or opinions in a new light.

6 Safeguarding social ethics

Wise leaders cultivate — even institutionalize – the signal-spotting reflexes that ensure a company's ethical antennae are fit for purpose. Any firm is a potential breeding ground for unethical behavior. *Ill-conceived goals and incentives* may intend to promote a positive behavior, but encourage a negative one. *Ambiguous goals* may lead to corner-cutting. In cases of *indirect blindness*, third parties are not held sufficiently accountable. *Motivated blindness* means overlooking unethical behavior because it's in our interest to remain ignorant. When we allow unethical behavior because the outcomes seem to serve the firm, we are *overvaluing outcomes.* All too easily we find ourselves on the *slippery slope* — unethical behavior develops gradually - and ends in a reputational crisis.

7 Seeking Feedback

Constructive feedback, especially on our attitudes and behavior, is a core part of the continuous learning that is a facet of wise leadership. Seeking out feedback in a conscious and proactive way is a key element of a leader's self-knowledge and ability to make wise decisions. But 42% of leaders are (understandably) a little shy of feedback. They accept what comes their way, and in a small minority of cases, react defensively when it does. Feedback-seeking is admittedly difficult. Here are some avenues to help executives master the reflex and to help others give feedback in a constructive manner.

1. *Declare your goals and fields of interest:* for more concise and relevant feedback
2. *Give feedback on the feedback:* this is a learning process for both sides. Irritations should be aired early on to enable the process to move forward.
3. *Ask clarifying questions:* look for examples, recommendations on what to do differently
4. *Never self-justify:* No-one is fully right. Holding back is an art, linked to reflection in action
5. *It is up to the receiver to process and apply feedback:* control, follow up and warnings are not part of the process.

8 Practicing Mindfulness

Mindfulness meditation can enhance and speed up the automation process of taking the High and Low Roads. One of many forms of meditation, it teaches us not only to stay alert and present in the moment, but also to observe sensations as they come and go, in a non-judgmental way. Meditation has a potent effect on the brain structure and function[17] and helps to us to take distance from our (often selfish) self or ego. Our research suggests that consistent practice may direct executives to make wiser decisions (see below). Wise decisions usually imply a more holistic perspective that goes beyond self-centeredness. The higher moral road in our brain prevails over the lower, self-centered road.

Meditation is not for everyone. Fortunately there are other forms of 'mindfulness' or 'reflective' practices open to leaders. The aim is to gain awareness and insight. Such practices often bring about a state of 'flow'— a state of total absorbtion in activity. Examples include walking, writing, yoga, and the arts (practicing or observing music, dance, visual arts, or handicrafts).

We asked leaders which of these practices they engaged in regularly (several times a week or daily), and their effects on wise decision-making. Walking was most commonly and regularly practiced, with three quarters of walkers reporting a highly positive effect. Only one in five leaders meditated, (over half on a regular basis). However 95% of meditators reported a highly positive effect on their decision-making — the highest numbers of any of the specific practices we surveyed.

Conclusion

Wise decision making is not limited to moral superheroes. Nor are we at the mercy of a clockwork brain over which we have no control. Instead, wise decision-making is the result of a continuous practice of mentalizing. Mindful awareness is a must for any executive who wants to make a wise decision.

The power of prospection and better (hypothetical) foresight — while acknowledging the inherent uncertainty we all face - is what makes us wise(r). And this foresight, our ability to predict and contemplate the future, may be the defining attribute of human intelligence. Deploying our innate and learned (cultural and personal) beliefs and concepts is a central function of our fascinating and extraordinary brain.

Wise decision-making is, in essence, holistic; wise leaders take multiple perspectives into account, managing in the gray, making decisions that are ethical, responsible and sustainable.

Our journey reveals that wise leadership is holistic not only on a conceptual, but on a neuroscientific level. As a wise leader, we make better use of the brain's multiple and inter-connected zones, its in-built inclination towards wise behavior. When we exercise wise leadership, we are managing with our gray (matter). We are activating the potential of a highly-evolved organic machine. Its power for learning, abstraction, innovation and imagination is unmatched, and something that we are only just beginning to understand. What we do know is that all leaders can, and should, learn to exercise its incredible potential. Doing so has never been more important than it is today

[17]Goleman, D. & R.J. Davidson, (2017), Altered Traits. Science reveals how Meditation changes your Mind, Brain and Body, New York, Avery-Penguin

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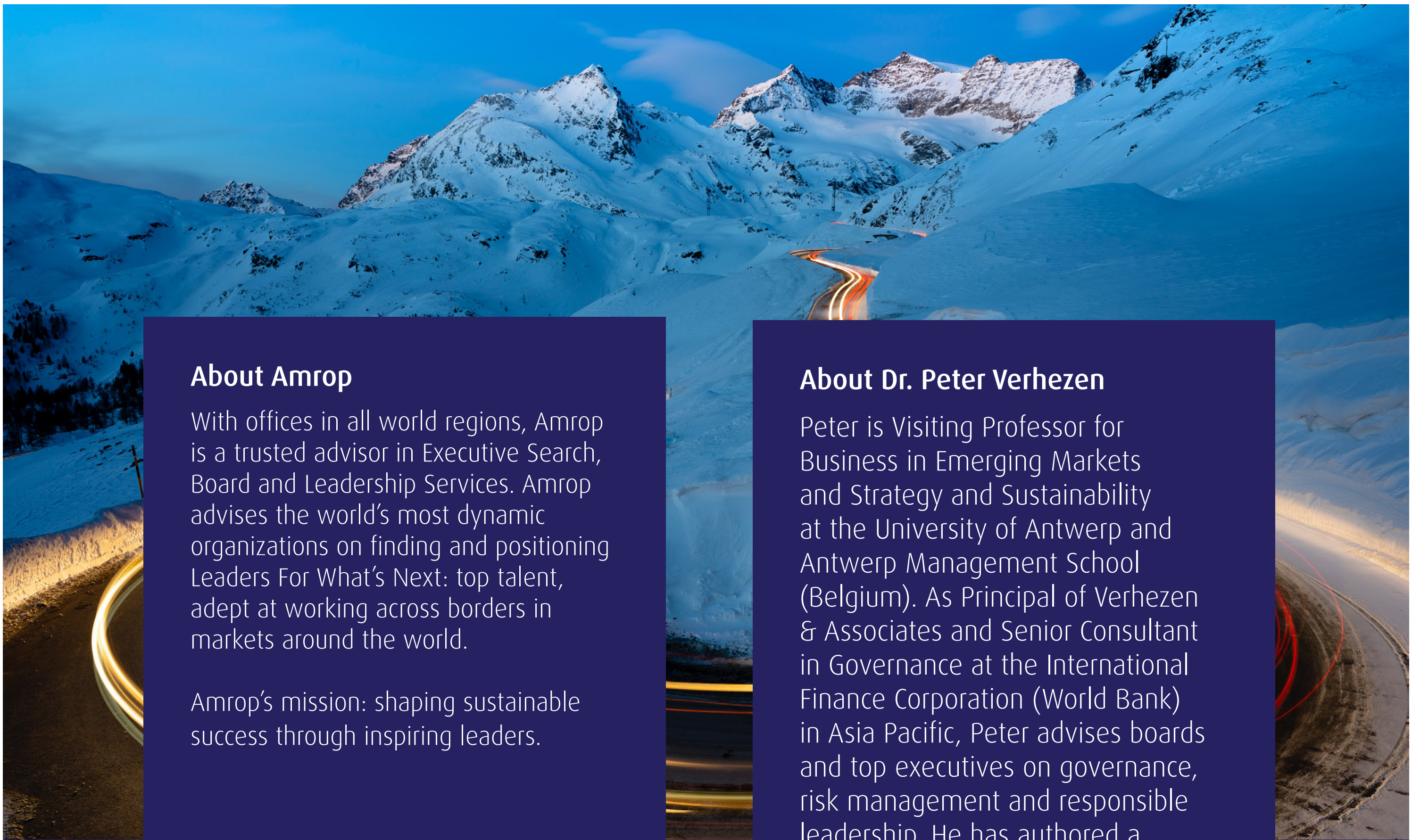

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About Amrop's global digital Practice

The digital transformation has already wrought profound change in industries and business models. Managing it demands strong leadership from Boards, CEOs and Management teams; in developing digital roadmaps, in executing digital strategy and in fundamentally re-thinking the way companies interact with customers in a global multi-channel environment.

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— Cybersecurity
— E-Commerce
— Scale-Up, Venture Capital
— Media & Entertainment
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