The Human Organisation report – part 2:

innovation for everyone

How to create innovative cultures

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how on earth
Corporate Culture Group

Contents

INTRODUCTION: INNOVATION FOR EVERYONE

What is innovation? At its simplest, innovation is doing something new to achieve a shared goal.

Is innovation just for the innovation lab? Is it just for products and services? For people directly involved in creating new technology or consumer goods?

Nope. Innovation is for everyone. It's for any project, any function, any sector.

But how do we make it accessible to all?

That's the question behind this report. And it led me directly to another: What if we looked at innovation through the lens of behavioural science?

Because if we do that, it becomes easier to answer, as we can break our exploration into a number of questions about innovators:

- What do innovators think and feel?
- What do innovators believe?
- What do innovators do when exploring data and gathering evidence?
- What do innovators do to create novel solutions?

And some key questions about innovative organisations:

- What can organisations do to create innovative cultures?
- How do organisations open up, power up, and build creative platforms?

That's what I seek to explore here.

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John Tenniel, public domain, via Wikimedia Commons.

Discover more

I'm going to share lots of sources of further information. Here are the first two. To understand innovation, you could start with a business book like 'The Innovator's DNA'[1], the authors of which have accumulated data on the topic from 15,000 executives in over 75 countries. You could also read Lewis Carroll's 'Alice in Wonderland'.

1 Dyer, Jeff, Boston, Mass. : Harvard Business Press, [2011].

THE EIGHT CORE PRINCIPLES OF INNOVATION

To create this report, we analysed the characteristics that underpin what innovators think, feel, believe and do, and those that shape how organisations create innovative cultures.

As we answered these questions, it was clear that a number of recurring themes were emerging across all of the key characteristics. We call them the eight core principles of innovation – and they apply to innovative people and innovative organisational cultures.

While these eight principles apply across all innovation characteristics in this report, we've highlighted where the themes are especially resonant.

To learn more about creating innovative organisational cultures, or to discuss any of the topics raised in this report, please email:
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Innovation...

...is curious

Be inquisitive, play and explore, but be sure to ask the right questions.

...is sensational

Embrace and take inspiration from all of your senses.

...is everywhere

Know no limits, think widely, and regularly change your perspective.

...is experimental

Pay attention, observe, experiment, and harvest insight.

...is adaptable

Embrace alternatives, mix existing ideas with fresh, interdisciplinary thinking.

...is risky

Be brave, make mistakes, learn from them, go again.

...is collaborative

Listen, share, network and co-create – always with empathy.

...is imaginative

Free your mind, get creative, but remain rooted in purpose.

Section 1:

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What innovators think and feel

1.0

Innovators are endlessly curious, open-minded and sensational.

Consider:

What can we learn about innovation from our eyes? What can we learn about innovation from magic?

Key takeaways:

- **Innovation is curious:** Be inquisitive, play and explore, but be sure to ask the right questions.
- **Innovation is sensational:** Embrace and take inspiration from all of your senses.

1.1 INNOVATORS ARE ENDLESSLY CURIOUS

"Curiouser and curiouser!"

Alice in Lewis Carroll's 'Alice in Wonderland'

What's going on here? Look closely at the picture and say what you see. What country are we in? What kind of environment? What can we see through the glass? What about the colour of the bear, the size of the bear or why a bear at all? What does the bear appear to be doing? What isn't there and why? Some answers are in the box.

The best innovators tend to be children and scientists, for two reasons.

Firstly, they ask naïve questions. My son Alexander, at the age of three, was a genius at asking great questions. Here are a few. Where do bubbles go when they burst? What are spiderwebs made of? Did God make biscuits? (the answer to which is "yes").

Alice, when in Wonderland, asked herself: ***"Who in the world am I? Ah, that's the great puzzle!"***. You might enjoy re-reading 'Alice in Wonderland' just for the questions she asks.

Secondly, children and scientists know what they don't know. Leonardo da Vinci said: ***"I roamed the countryside searching for answers to questions I did not understand. Why shells existed on the tops of mountains... why lightning becomes visible to the eye while thunder requires time to travel."***

Here's Einstein's perspective on the endless quest: ***"As our circle of knowledge expands, so does the circumference of darkness surrounding it."***

Big blue bear

This is the 'I See What You Mean' sculpture outside the Denver Convention Center – a home of exploration and discovery. It is the work of the late artist Lawrence Argent. The colour turns out to be significant. Blue suggests a high level of enlightenment for the Native American Ute tribes who live in Colorado, Utah and New Mexico.

1.2

INNOVATORS ARE OPEN-MINDED

"Why, sometimes I've believed as many as six impossible things before breakfast."

The White Queen in Lewis Carroll's 'Alice in Wonderland'

To develop his personal knowledge, American investor Peter Kaufman printed out 144 interviews of scientific experts from Discover magazine. These people were leaders in a wide range of disciplines. Summarising their insight, Kaufman said: ***"I read every single one… (and) guess what I had at the end of six months? I had inside my head every single big idea from every single domain of science."*** This is multidisciplinary learning.

Why is it important? Because we are often close-minded. We focus only on the immediate skillset or knowledge set we think we need. If we work in fashion, we tune into fashion trends. If we work in banking, we study the financial markets. It's easy for us to become increasingly narrow in our interests. Yet, as we shall see for innovators, we can learn much from many sources: from the police – how to gather evidence; from magic – the limits of our senses; from the arts – the power of imagination; from comedy – how to make rapid-fire connections; and we can all learn from the biggest dataset at our disposal – the multi-billion-year experience of the natural world.

Having an open mindset is a social habit. It involves conversation, seeking others' ideas and sharing your own. Markets are social. We buy and sell from others. Emotions are social. They are expressed to others. Eating, drinking, marriage, sex, friendship, laughter, music, sports, the internet – all social. Innovation is social. It always involves co-creation.

Learning is social too. Here's an example: Synthesis School, set up by Josh Dahn at the SpaceX site at the request of Elon Musk, helps young people aged 8 to 14 learn by solving real-world problems together. Innovation is the Synthesis School for adults.

Being open is a mindset, a skillset, a habit, an emotion and an action. There are two key measures in productive organisations, says Alex Pentland in his book 'Social Physics'. They are the number and frequency of real-world contacts, and the diversity of ideas which people are exposed to. So, being open means openness to conversations with strangers as well as openness to

new ideas. In his compelling book 'Open: The Story of Human Progress', Johan Norberg shares examples from history. Consistently, he finds that it's trade that creates that spirit of openness. He posits that's what led the Phoenicians to invent standardised shipbuilding, dry docks, artificial harbours and cartography.[2]

LIS

THE LONDON INTERDISCIPLINARY SCHOOL

The UK's first interdisciplinary school

In 2021, the UK will have a new multidisciplinary degree course from the new London Interdisciplinary School (LIS). The school aims to prepare students ***"to tackle some of the most complex problems that we face in the world"***. The curriculum ***"cuts across the disciplines, equipping students with knowledge and methods from the arts, sciences, and humanities."***

London Interdisciplinary School logo, Public domain, via Wikimedia Commons

How open should we be?

How far should we go to engage with people whose views are totally different to our own? Here's the story of musician Daryl Davis.[3]

"In 1968, when I was the age of 10, I had a racist incident", Davis recalls in a Guardian interview published 18th March 2020. ***"I was in the Cub Scouts and we were in a parade when people started throwing rocks and things at me. I didn't understand why people would do that and I formed a question: 'How can you hate me when you don't even know me?' The answer was always, 'there's some people who are just like that'. Well, that wasn't good enough for me. What does 'just like that' mean? Where does that come from? You're not born 'just like that'. I was curious about racism ever since, but even still, nobody can seem to answer the question."***

Driven by curiosity, Davis has spent 30 years seeking an answer. It has led to surprising friendships with senior leaders of the Ku Klux Klan, formed from his desire to understand them, to listen to them and, often, by a shared love of music. Sometimes, these civil conversations have led to KKK members quitting the organisation. ***"People must stop focusing on the symptoms of hate, that's like putting a Band-Aid on cancer"***, Davis says. ***"We've got to treat it down to the bone, which is ignorance. The cure for ignorance is education. You fix the ignorance, there's nothing to fear. If there's nothing to fear, there's nothing to hate. If there's nothing to hate, there's nothing or no one to destroy."***

Davis is open to a dialogue with anyone if it helps understand the problem. ***"Give the person a platform. Allow them to air their views. The chances are they will reciprocate"***, he says.

His innovation is dialogue through a shared passion: in this case, music. So how open should innovators be? Ask Daryl Davis.

Daryl Davis holding up Ku Klux Klan robes at Blues and Rock for Humanity in November 2017, U.S. Embassy Jerusalem, CC BY 2.0, via Wikimedia Commons.

2 Norberg, Johan, 'Open, The Story of Human Progress', Atlantic Books, 2020, page 44

3 https://www.theguardian.com/music/2020/mar/18/daryl-davis-black-musician-who-converts-ku-klux-klan-members

1.3

INNOVATORS ARE SENSATIONAL

"There's a new sensation.
A fabulous creation."

Roxy Music, 'Do the Strand'

Innovators seek inspiration from all the senses:

Sight

"All our knowledge has its origins in our perceptions", said Leonardo da Vinci. Processing what we see engages 25% of our brain and over 65% of all our brain pathways, says Amy Herman in her book 'Visual Intelligence'.

Here's an everyday example. There's a reason why Starbucks staff write your name on the cup when you order; it's a visual symbol that makes you feel connected. For more on how we process sight, see 'What can we learn about innovation from our eyes?' on page 12.

Smell

People can distinguish at least one trillion odours, according to a study at Rockefeller University and the Howard Hughes Medical Institute. There is a direct link between smell, memory, emotion and action. According to Professor Charles Spence at the University of Oxford: ***"[Smell] has a much closer, more direct connection with the emotional and memory circuits in our brain than any of our other senses."***

Taste

According to evolutionary psychologist Robin Dunbar: ***"The act of eating together triggers the endorphin system in the brain, and endorphins play an important role in social bonding in humans. Taking the time to sit down together over a meal helps create social networks that in turn have profound effects on our physical and mental health, our happiness and wellbeing and even our sense of purpose in life."***

Sound

"Music taps into primitive brain structures involved with motivation, reward... emotion (and memories)", says record producer and neuroscientist Daniel Levitin.

In a 2018 Live Nation study, 67% of people said the more emotionally engaged they are, the more open they are to new ideas. Tune in for more on music later.

Touch

According to professor of neuroscience David J Linden, social touch can communicate ***"a range of emotional intentions including support, compliance, appreciation, dominance, attention getting, sexual interest, play and inclusion."*** It also reinforces co-operation and loyalty.

All the senses together

"Common Sense is that which judges the things given to it by other senses", said Leonardo da Vinci. And, according to Professor Charles Spence: ***"Changing what a person sees can radically alter what they hear, changing what they hear may influence what they feel, and altering what they feel can modify what they taste."***

Why, when we gather information through our senses, and when we know the senses are the route to our emotions, would we design them out of innovative thinking in organisations?

Big tip: design them in.


STAY HUMAN
ANNA LAURINI

Three ways to tap into our senses

Here are three ways to tap into the senses. **First**, through the arts. Check out HashSciArt. **Second**, travel. We are more likely to notice different sights, sounds and smells in a different city. **Third**, through our imaginations – watching a film, reading a book, dreaming.

Sometimes less sense makes more sense

Scientists from the University of Surrey showed two groups of people short TV clips depicting burglaries, and questioned them on what had happened – the first group were interviewed with their eyes open, the second with eyes closed. Those with eyes closed tended to have greater recall of events.[4]

What can we learn about innovation from our eyes?

We can learn about the power of imagination, and our propensity to innovate, from the way our brains overcome the limits of our sight. There are six significant limits to our eyes:

The blind spot: We have a blind spot of around six degrees in our vision where there are no receptors at all.

Our eye movements blind us: Every time our eyes move from one object to another, our visual system suppresses input. We're not even aware it happens, but with approximately 150,000 daily eye movements, it adds up to about four hours of blindness per day.[5]

We only focus on small parts of what we look at: Like a camera, our eyes focus on particular points. The small part of our retina encoding this information is called the fovea and it equates to about the width of two thumb nails at arm's length. Everything else is fuzzy, and part of our peripheral vision.

We can only give our attention to one thing at a time: Remember the video clip of someone in a gorilla suit walking through the middle of a basketball game as we count the number of passes? Less than half the participants noticed its presence. This is called inattentional blindness.[6]

We fail to notice changes: In an experiment, someone on a campus asks a passer-by for directions. During the conversation, two men carry a door between the people talking. Behind the door, the original experimenter is replaced by someone else. The passer-by doesn't notice that the person they were talking to has changed. This is called change blindness.

We don't see the present: Here's the kicker. It takes around a tenth of a second for the light registered by the retina to get to the brain and be formed into a visual representation. That means we only 'see' the past. For that reason, our brain adjusts and predicts the future. For example, we use something called representational momentum to predict an object's trajectory.

How we plug the gaps in how we see is a tribute to the extraordinary natural gifts of our brain.

4 https://www.surrey.ac.uk/mediacentre/press/2015/closing-your-eyes-boosts-memory-recall-new-study-finds

5 Kahn, Gustav, 'Experiencing the Impossible; the science of magic', the MIT Press, 2019 p84

6 Arien Mack and others, MIT Press, 1998

1.4 WHAT CAN WE LEARN ABOUT INNOVATION FROM MAGIC?

"Even though we think that we believe in the things we see, we actually see the things we believe."

Gustav Kuhn, psychologist and magician

We can learn about being open-minded from magic. It teaches us how we can hold beliefs that aren't true, and how we routinely deceive ourselves based on our assumptions:

What we see may not be what others are seeing: For example, in the 'dual reality' trick a magician might show a volunteer a blank piece of paper and the audience a piece of paper with writing on it. We assume the volunteer is seeing exactly what we are seeing.

The patterns we see may be false: Our brains want to make patterns. Once we spot a pattern, it's difficult to unsee it; like how the sun appears to revolve around the earth.

We suspend disbelief: There is a pleasure in being fooled. That's how ventriloquism works; we take joy in the puppets and like to imagine it's them doing the talking.

Magicians might, for example, give the impression they are able to read your deepest thoughts, or read your body language, or that they have a superhuman memory.

Psychologist and magician Gustav Kuhn explains: ***"People are reluctant to abandon a false solution; they tend to fixate on a false solution even when they know that it is wrong, which prevents them from considering an alternative. Psychologists refer to this phenomenon as the Einstellung effect."*** Einstellung is a German word that loosely translates as having a fixed mindset.

Let's give our innovator's mindset a name – Tim. Tim understands how he can be fooled. He's curious to discover how. He's also open to the idea that there's a ton of stuff he doesn't understand. And he'll remain open-minded until he does understand it.

We're all like Tim. Most of the stuff around us today would feel like magic to our younger selves. Just ask Alexa.

Discover more

You can find out more from ***"Experiencing the Impossible: The Science of Magic"*** by Gustav Kuhn, reader in Psychology at Goldsmiths, University of London.

Section 2:

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What innovators believe

2.0

Innovators believe that everyone is an innovator, that ideas create markets, and that cracks are where the light comes in.

Consider:

How do ideas shape our reality, and how do we learn from failure?

Key takeaways:

- **Innovation is adaptable:** Embrace alternatives, mix existing ideas with fresh, interdisciplinary thinking.
- **Innovation is risky:** Be brave, make mistakes, learn from them, go again.

2.1 INNOVATORS BELIEVE THAT EVERYONE IS AN INNOVATOR

"Power is infinite."

Eric Liu, founder, Citizen University

My son Andrew and I came across this innovator on the Embarcadero in San Francisco. The really bad advice he gave me was: if I had a nice car, I should cut it in half, use the front seats indoors and the back seats as an outdoor couch in the garden.

Innovation is not a cult with a small number of high priests. **Everyone** is creative. There are over nine million photographs and videos posted on Instagram every day. Around 500 hours of videos are uploaded to YouTube every minute.

Innovators don't believe employees are resources to be managed and controlled. They believe employees are imaginative and innovative. They don't believe customers are passive recipients of products and services. They believe they are active participants.

On the cobbled streets of Trinidad in Cuba, near the bus station, you may be lucky enough to find a man with a small wheelbarrow full of notebooks. This is bus porter Luis Martinez. He talks to tourists during the day and studies old atlases in the evening. He's written over 3,000 poems full of vivid detail about cities around the world. And yet, he's never left his home island. He calls himself The Imaginary Tourist.[7]

7 http://www.bbc.com/travel/story/20210114-the-bus-porter-who-travelled-the-world

2.2 INNOVATORS BELIEVE THAT IDEAS CREATE MARKETS

“There is one thing stronger than all the armies in the world and that is an idea whose time has come.”

Victor Hugo, author

Ideas create markets. The history of people is a history of ideas. Ideas create our reality. We are surrounded by ideas. The TV, the computer, the phone, music, books, tables, chairs, houses, cars, money, language, electric lighting, owning stuff, sport, communities, cities, nations.
All are ideas.

There are only two sources for ideas: evidence of human need, and that extraordinary human characteristic, imagination. ***“Fiction has enabled us not merely to imagine things, but to do so collectively”***, says Yuval Noah Harari in his book ‘Sapiens’. Let’s look at a few of these magical fictions.

Farming

Farming is an idea. For 2.5m years, humans were foragers. Then, about 12,000 years ago, they began to cultivate a small number of plants and animals. On the upside, it led to secure food supplies, an increase in population and, some say, prosperity and progress. On the downside, half of the fertile land on Earth is now farmland, and ***“70% of the mass of the birds on the planet are now domestic birds – mostly chickens.”*** [8]

Brands

Any large-scale co-operation is rooted in common myths that exist only in people’s collective imagination, says Yuval Noah Harari in ‘Sapiens’. These myths are ideas that bind us. They may be the idea of a king, an emperor, a president, a state religion, democracy or the market economy. Businesses are acts of collective imagination. As Harari points out, a brand such as car maker Peugeot – a limited liability company – is what lawyers call ‘a legal fiction’. We are strangers that co-operate within the parameters of these imagined ideas.

Money

Money is an idea. It incorporates three other ideas. The first is the idea of giving everything a value in a currency. The second is a promise based on trust that the money can be exchanged for something else sometime in the future. The third is that money has a value in its own right and can be stored as wealth.

8 David Attenborough in ‘A Life on our Planet’, Netflix, 2020, 37m 55s

2.3

INNOVATORS BELIEVE THAT FAILURE IS AN OPPORTUNITY TO LEARN

"There is a crack, a crack in everything. That's how the light gets in."

Leonard Cohen, 'Anthem'

"Failure and invention are inseparable twins", says Jeff Bezos. For every successful Amazon product, like Alexa, many more fail. These include the Amazon Fire Phone, Amazon Restaurants and Amazon Destinations. This, from the founder of a global organisation with revenues of over $380bn in 2020.

Innovators believe that failure is the price of success. ***"If you never want to be criticized, for goodness' sake don't do anything new"***, says Bezos. He points to a mindset in many organisations that fear failure: ***"Companies are rarely criticized for the things that they failed to try. But they are, many times, criticized for things they tried and failed at."***

And that's your choice. Try, fail, blame and stop trying. Or try, fail, learn and try some more.

But innovation is no longer a choice. Carroll's Alice puts it like this: ***"It takes all the running you can do, to keep in the same place. If you want to get somewhere else, you must run at least twice as fast as that!"*** Bezos puts it like this: ***"All businesses need to be young forever. If your customer base ages with you, you're Woolworths."***

In the town of Helsingborg in Sweden is The Museum of Failure, curated by psychologist Samuel West. Its exhibits include the spray-on condom, adult food in baby-food jars, Colgate's beef lasagne, Google Glass, New Coke, the Sinclair C5, the Sony Minidisc, a digital camera from Kodak, who, focusing on digital far too late, filed for bankruptcy in 2012. Another way of looking at the Museum of Failure is as a celebration of innovation. As the Museum says on its home page: ***"Innovation and progress require an acceptance of failure."*** Everyone who has ever taken a photograph knows, for every great picture, dozens are discarded.

"Our education system and our business environment, both realms that abhor failure, are terrible environments for fostering creativity."

Marcus du Sautoy, mathematician and broadcaster[9]

9 Marcus Du Sautoy, 'The Creativity Code: Art and Innovation in the Age of AI', 2020

Section 3:

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What innovators do: exploration

3.0

Innovators follow a process, ask great questions, gather evidence, and practise observation and empathy to harvest insight.

Consider:

What can we learn about insight from storytelling, about innovation from nature, and about gathering evidence from the police?

Key takeaway:

- **Innovation is experimental:** Pay attention, observe, experiment, and harvest insight.

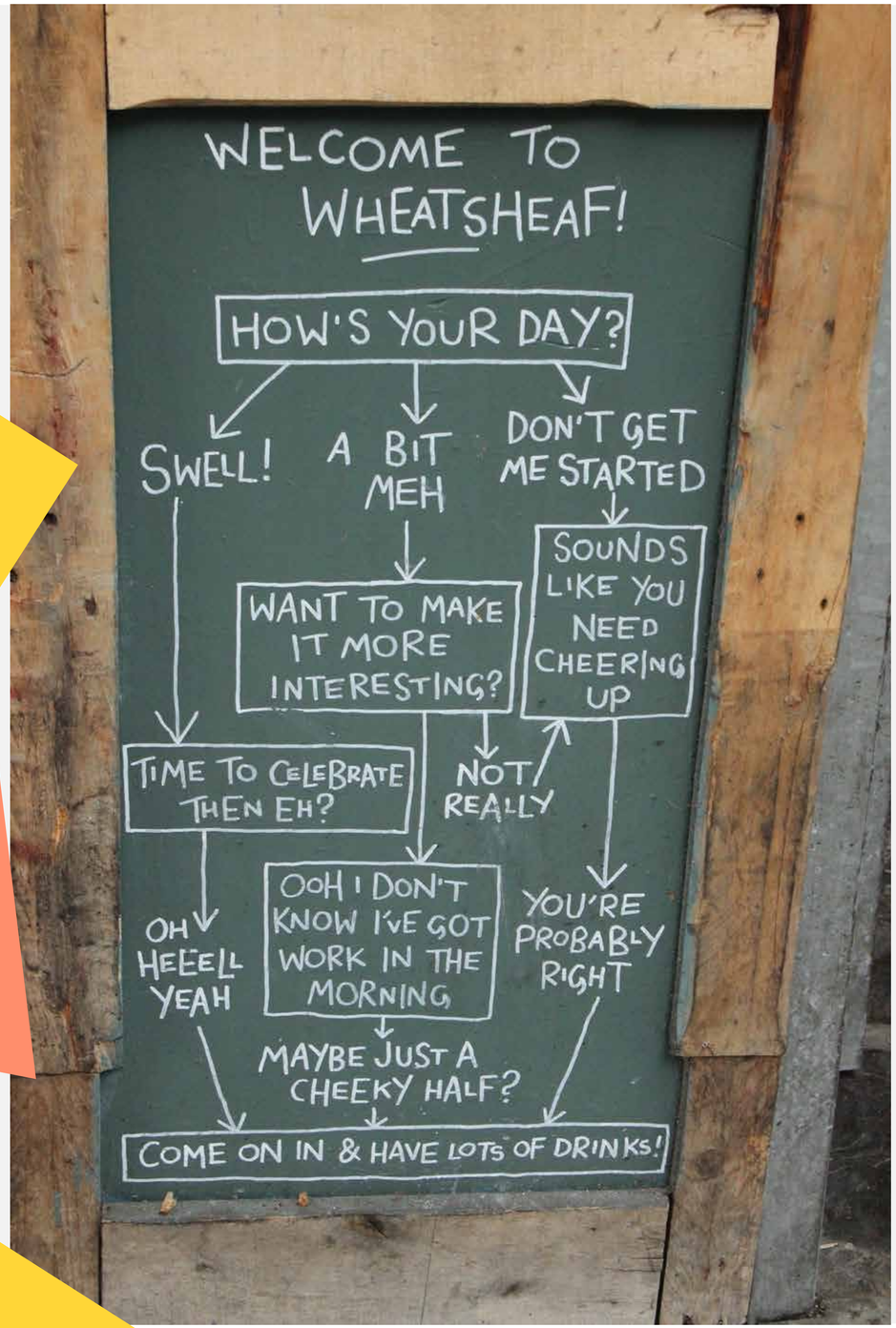
3.1

INNOVATORS FOLLOW A PROCESS

“Make a walk in such a way that everyone learns many things from your each step!”

Mehmet Murat İldan, Turkish playwright

It’s not this process



The innovator's process

The key to successful innovation is the process. It involves five actions or behaviours which we'll explore further in the rest of the report:

- Defining the challenge
- Gathering evidence by asking great questions
- Identifying insights
- Harnessing insights to create great ideas
- Experimenting

If creativity is a process, is AI the future of innovation?

We know that the act of creation is a process. In that case, is it possible that an artificial intelligence, with access to infinitely more information than the human brain can store, can be creative? That is the question asked by mathematician Marcus du Sautoy in his book 'The Creativity Code'.

We now produce in two days the amount of data created in the entirety of human history up until 2003. This volume of information enables artificial intelligence based on algorithms – models of human decision-making coded into machines. These algorithms use ***"historical information to make predictions about the future"***, says mathematician Cathy O'Neil. By analysing evidence, an AI can identify patterns, and these patterns can lead to discoveries.

However, Marcus du Sautoy concludes that, currently, AI is still dependent on human programming to be creative. If, however, an AI was to become conscious, it might wish to express what it's like to be an AI; an act of creation akin to humanity expressing what it's like to be human. Innovation is both a process and an act of creative inspiration.[10]

10 Marcus Du Sautoy, 'The Creativity Code: Art and Innovation in the Age of AI', 2020

3.2

INNOVATORS ASK GREAT QUESTIONS

"I keep six honest serving-men
(They taught me all I knew);
Their names are What and
Why and When
And How and Where and Who."

Rudyard Kipling, 'I Keep Six Honest Serving Men'.

Audacious questions precede audacious answers. ***"Questions have a curious power to unlock new insights and positive behaviour change in every part of our lives"***, says Hal Gregersen, former Executive Director of the MIT Leadership Centre. Good questions, he writes, feel surprising and generate new thinking. They invite people down a fresh rabbit hole with the promise of solutions to a problem they care about. Here's what innovators say about the power of questions:[11]

"If I had an hour to solve a problem and my life depended on the solution, I would spend the first fifty-five minutes determining the proper question to ask." - Albert Einstein

"Great questions are a much better indicator of future success than great answers." - Ray Dalio, founder of Bridgewater Associates

"A lot of times the question is harder than the answer. And if you can properly phrase the question, then the answer is the easy part." - Elon Musk, founder of Tesla and SpaceX

So, what constitutes a great question? There are three types.

'Type one' questions trigger a quest.

There are few bigger quests, perhaps, than discovering if we are alone in the universe (see box on page 24). All great questions require an open mind and, often, a lifetime of searching. 'Type one' questions are often behind the origin story of great companies. Boots the chemist began when John Boot asked how we might make medicine more affordable for the people who need it most. Quest questions are often personal and trigger a continuous search. One of my own quest questions is ***"what great music is out there that I have yet to discover?"***

'Type two' questions frame a challenge with the aim of leading to actionable insight.

These types of question often begin ***"how might we…?"***. They search for causes and for purpose. For example, instead of asking ***"why aren't schools performing?"*** we were to ask ***"why aren't students learning?"***. Here's another: Martin Seligman, when he became president of the American Psychological Association, reframed the focus of the discipline when he tweaked the core question from ***"what are the roots of negative mental health?"*** to ***"what are the positive attributes of good mental health?"***.

'Type three' questions zoom in even further.

These questions often begin 'what if…?' and seek to imagine great solutions. What if we created a taxi service without owning any cars? What if we created a version of TED talks that offered additional insights in return for a membership fee? What if we were to make everything in our shop cost just a penny or a pound?

When imagining new ideas, there are two techniques. Firstly, playing games to let your imagination run wild. Secondly, being disciplined in your analysis. For this latter approach, the '15 questions' tool on the next page might help to challenge existing products or services.

11 Hal Gregersen 'Questions are the Answer', HarperCollins, 2018

15 questions

	WHAT?	WHERE?	WHEN?	WHO?	HOW?
Current method	What happens?	Where is it done?	When is it done?	Who does it?	How is it done?
Reason	Why do it?	Why do it there?	Why do it then?	Why them?	Why do it this way?
Better way?	Can we do something else?	Can we do it somewhere else?	Can we do it some other time?	Can someone else do it?	Can we do it some other way?

Note: This '15 questions' tool is borrowed from another source we can't now find. If it's yours, let us know and we'll plug a credit in here.

Why are questions so powerful? Because of the innate curiosity of the human mind

"Not knowing is more exciting than knowing, because it means there is much more to learn", says Hal Gregersen in his book 'Questions are the Answer'. One of the leading advocates of the power of questions was the engineer and businessman Taiichi Ohno. Credited as the father of Toyota's production system, he developed the 'five-whys' approach. This involves asking ***"Why?"*** five times, to really get to the bottom of an issue. Taiichi Ohno also had a precept: ***"Wisdom is given equally to everybody. The point is whether one can exercise it."*** As we say in the title of this report, innovation is for everyone.

Richard's fantasies

Dr Richard Steckel was brilliant at framing questions that triggered change. When he took over at the Children's Museum in Denver, the question he asked was: ***"How might the charitable sector become more commercial?"*** This was a question he explored further in his book 'Filthy Rich & Other Non-profit Fantasies'. In the 1980s, he began asking how the private sector could become more social – a question that gathered momentum after the 2007/08 financial crash.

Are we alone?

The question ***"are we alone in the universe?"*** is a 'type one' question: a big question that triggers a lifetime quest. 'Type one' questions explore issues that require us to totally refresh the mental models we use to define our understanding of the world.

In 2017, a mysterious interstellar object entered our solar system and sparked the curiosity of scientists. One of them, Avi Loeb, is a respected theoretical physicist at Harvard University, and not someone you'd imagine having fringe views. In his 2021 book 'Extraterrestrial', he explores the mystery.

He concludes that the data does not fit with that of objects like comets and asteroids. It was, for example, ten times more reflective than other space rocks. His hypothesis is that this object, named Oumuamua (oo-moo-a-moo-a) is the first sign of intelligent life beyond Earth. His recommendation is that we invest in what he calls space archaeology, to seek remnants of interstellar civilisations.

3.3

INNOVATORS LOOK FOR PATTERNS

"If there's no meaning in it", said the King, "that saves a world of trouble, you know, as we needn't try to find any."

The King of Hearts in Lewis Carroll's 'Alice in Wonderland'

Look at the three black shapes below and say what you see

You see a triangle, a sphere and a spiral, right? Those objects aren't there, but you see them anyway. They illustrate our need to find patterns, even where they don't exist. The search for patterns is simply how the brain is wired. Information flows in through the senses. We then try to make sense of our senses. For example, we listen for patterns in sound. Patterns bind most of the music we love.

Here's another example. We look for patterns in our emotions. What makes us happy? What makes us angry? We can then do more of what makes us happy and less of what makes us angry. Patterns help us make sense of the world.

"I don't think we can ever fully rationalise ourselves out of the basic and often creative urge to find patterns even where none exist", says David Spiegelhalter, chair of the Winton Centre for Risk and Evidence Communication at the University of Cambridge.

In his book 'Pattern Seekers', Simon Baron-Cohen, psychology professor at the University of Cambridge, argues that it is our search for patterns that makes us human and that has led to all our innovations. Baron-Cohen calls it 'the systemising mechanism', and theorises it evolved between 100,000 and 70,000 years ago and ***"allowed humans alone to become the scientific and technological masters of our planet, eclipsing all other species."***

Innovators look for patterns in human behaviour, where there are two kinds of pattern that are particularly useful.

Note: Image based on original drawing and lithograph by Charles Cheffins.

One critical pattern for innovators to identify is friction – understanding the small obstacles and barriers that prevent us acting. That core idea has helped Booking.com become a major player in online travel. Its main purpose is ***"to take the friction out of travel"***. It is effectively a machine that is continually focused on identifying and removing sources of friction.

A second critical pattern for innovators is to discover what motivates people to act. Motives are the key drivers that accelerate us towards a behaviour. Sometimes the motive is the same for almost everyone. For example, when we were developing the strategy for recycling in the UK, research insight showed that willingness to act was high. The key motive was simply to make it easy to act. The result was that home recycling quadrupled.

Spotting patterns based on evidence is a core skill of innovators. Let's look at another example. It's 1854, Soho, London. There's an outbreak of cholera. The symptoms are diarrhoea and vomiting, which eventually leads to dehydration, kidney failure, shock, coma and death. The accepted wisdom was that the disease was spread through the air. A physician called John Snow visited the area and spoke to families of the dead. He identified 61 deaths that he plotted on a map. He also noted that workers at the local brewery drank ale and water brought in from elsewhere, and they didn't get sick. Snow identified the source of the cholera outbreak as a water pump on what is now Broadwick Street, and convinced the authorities to remove its handle – which helped to significantly reduce rates of the disease in the area.

Over 160 years later, the character Ygritte in the TV series Game of Thrones says: ***"You know nothing, Jon Snow"***. Turns out the lesser-known John Snow knew quite a lot. He focused in on deep data (interviews with the families) and on big data (quantifying incidents and plotting them on a map). In this way, he broke new ground for epidemiology (the study of patterns in diseases), a discipline that now supports the health of billions of people around the world.

It's raining. Where's my pareidolia?

Our need to spot patterns is so strong, we sometimes see them where none exist. This human trait goes under the umbrella of 'pareidolia'. We see faces on the Moon or Mars. We see Jesus on a piece of toast. As Leonardo Da Vinci said: ***"If you look at any walls spotted with various stains or with a mixture of different kinds of stones, if you are about to invent some scene you will be able to see in it a resemblance to various different landscapes adorned with mountains, rivers, rocks, trees, plains, wide valleys, and various groups of hills. You will also be able to see divers combats and figures in quick movement, and strange expressions of faces, and outlandish costumes, and an infinite number of things which you can then reduce into separate and well-conceived forms."***

3.4 INNOVATORS OBSERVE

"Cultivate absolute accuracy in observation, and truthfulness in report…"

Joseph Bell, Scottish physician (1837–1911)

A woman he had never met before entered the Edinburgh lecture hall of the physician Joseph Bell, accompanied by a small child.

"What kind of crossing did you have from Burntisland?", Bell asked.

"It was guid (good)", she replied.

"And had you a guid walk up Inverleith Row?"

"Yes."

"And what did you do with the other wain (wee one)?"

"I left him with my sister in Leith."

"And would you still be working at the linoleum factory?"

"Yes." [12]

Bell then explained. She had an accent from Fife, just over the Firth of Forth from Edinburgh. The nearest town by the crossing was Burntisland. He noticed red clay on the edges of the soles of her shoes. The only clay of this kind was in Edinburgh's Botanical Gardens, and the road beside it is Inverleith Row.

The coat she carried was too big for the child with her, so she must have left with another child. And the dermatitis on the fingers of her right hand were particular to the workers at the linoleum factory at Burntisland. As Joseph Bell, the inspiration for Sherlock Holmes, said: ***"Most people see but do not observe."***

Discover more

'Visual Intelligence: Sharpen Your Perception, Change Your Life', Amy E. Herman, Houghton Mifflin Harcourt, 2016

12 Margalit Fox, 'Conan Doyle for the Defence', Profile Books, 2018, p 71/72

When you are observing, what is it you are you looking for?

Workarounds: Someone I know in the 1970s used a big stick from her armchair to change TV channels. She was predicting the need for the TV remote.

Surprises: What the ?!%^&?

What's missing: Observation includes identifying what's not there – like the murder weapon at a crime scene.

Friction: Find the things that get in the way – is it difficult to get your wheelchair on a train?

The ideas company IDEO also recommends looking for things that prompt behaviour, things people care about, body language and patterns.

There are several skills required here: observing without subjective judgement, articulating what you see (as if others can't see it), and clearly identifying what you don't know. You need to be mentally strong enough to step back and articulate what you observe about your own assumptions.

So, what is the difference between seeing and observing? Seeing is automatic and involuntary, designed to help us find our way around in the world. Observing is seeing consciously and deliberately. Leonardo Da Vinci calls this 'Saper Vedere' or knowing how to see.

Does Uncle Pennybags have a monocle?

Sometimes we think we know something or have seen something that simply isn't true. It's called 'The Mandela Effect', named for a widespread misconception that Nelson Mandela had died in prison, when, of course, he hadn't. Many people think 'Looney Tunes' often appeared as 'Loony Toons'. Nope. Nor does 'Kit Kat' have a hyphen. And Monopoly's Uncle Pennybags character doesn't have a monocle.

Look at this picture and describe only what you see.[13]

Ask yourself the ‘who, what, where and when’ questions. Say what you see out loud. Now describe what you don’t see and don’t know. This is usually as important as what you do see. Imagine you are writing a story for a news website. What do you need to know? Again, ask ‘why and how’ questions. Why are they running? Don’t read the next paragraph until you think you have all the details.

Did you describe what you saw? What were the people wearing? What were they doing? What time of day was it? Who were the two people? Did you avoid making assumptions? The picture is from an advert run by London’s Metropolitan Police in 1988. Both men are police officers. One is undercover.

13 https://www.hatads.org.uk/catalogue/record/a5b4178b-19bf-416f-b765-c73d5b882f10

3.5

INNOVATORS HAVE EMPATHY

"Rarely does an empathic response begin with 'at least'."

Brené Brown, research professor

What's the difference between sympathy and empathy? Sympathy is when an old friend's mum dies, and you express your sorrows. Empathy is feeling with someone. ***"Rarely can a response make something better. What makes something better is connection"***, says research professor Brené Brown. Empathy, she explains, may mean saying nothing and just putting your arm around someone suffering. It means taking another's perspective, recognising emotion in other people, reflecting that emotion, and avoiding judgement.

In a University of Cambridge research project called 'Designing Our Tomorrow', pupils were challenged to solve real-world problems by thinking about the perspectives and feelings of others. The study found that empathy significantly improves creativity.[14]

At the very least, empathy involves tuning in ***"to the emotional states that are produced, or not, at each stage of the customer journey"***, say the authors of 'Humanocracy', as they champion unleashing the creative skills of all employees. Further, they say, you have to look for emotional cues and ask what generates that emotion.[15]

There are a number of social benefits that are born from our ability to empathise:

- It improves interaction because it allows us to have a shared understanding of non-literal forms of communication like metaphor, stories, symbols and humour.
- It improves innovation by enabling us to seek out people we can learn from, and aids us in actively helping others to learn.
- It enables us to imagine or feel together things that aren't literally true, like a shared goal, a dream, the act of creating, music, meaning, identity and even constructive fiction or flexible deception (like constructing a trap for prey to fall into).
- It also improves tolerance, as we seek to understand other perspectives.

Empathy and the brain

According to Professor of Psychology and Psychiatry Simon Baron-Cohen, empathy is networked across at least ten regions of the brain, including the ventromedial prefrontal cortex and amygdala. There are two types of empathy – cognitive and affective. Cognitive empathy is what primatologist David Premack called a theory of mind. This is the ability to imagine what others are thinking. Affective empathy is the ability to respond to what we believe we know about another's thoughts and feelings with an appropriate emotion.

14 https://www.cam.ac.uk/research/news/teaching-pupils-empathy-measurably-improves-their-creative-abilities-study-finds

15 'Humanocracy', by Gary Hamel and Michelle Zanini, Harvard Business Review Press, p187

Photographer Richard Steckel had natural empathy. He routinely connected with strangers. Two of his practices involved asking for permission before taking a picture and then showing the images he had taken. This is an example from a trip to China. Richard didn't speak Chinese; the locals didn't speak English. Their common language was their shared humanity.

3.6 INNOVATORS HARVEST INSIGHT

"Eureka"

Archimedes – from the Ancient Greek for "I have found (it)"

What is insight? It's that crazy little nugget that triggers action. Here are a few examples.

Studies showed that a woman is 47% more likely to be seriously injured in a car crash than a man, and yet, for decades, crash-test dummies were only designed to represent the average male figure. This fact led (eventually) to the use of female crash-test dummies. They were introduced in the US in 2011.

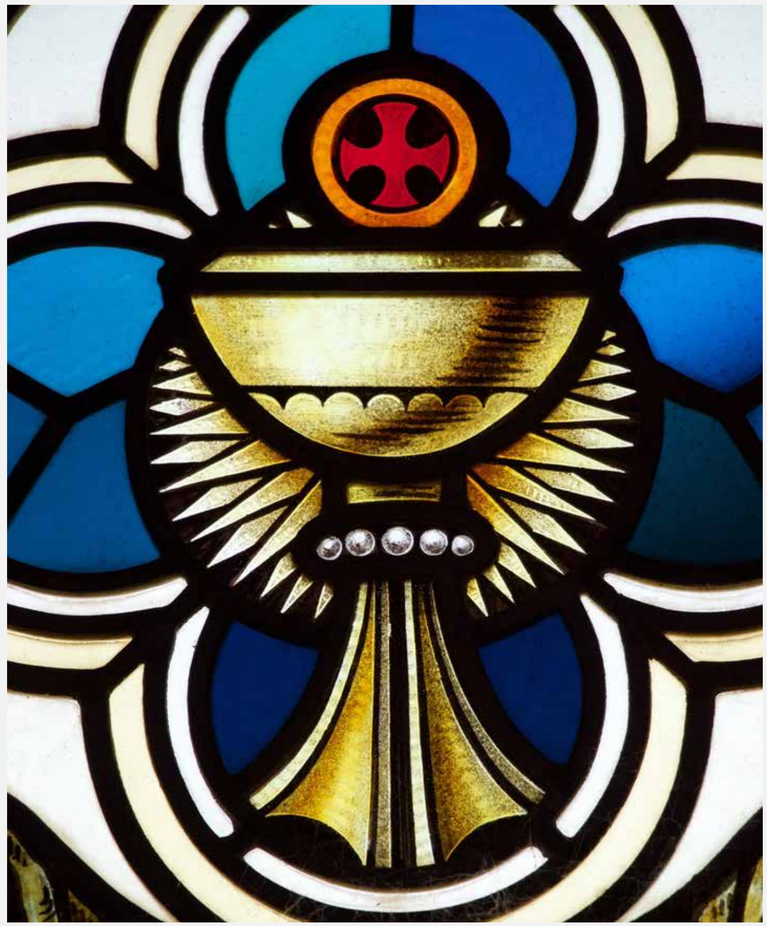
Larry Page's insight connected internet search to the traditional way in which academics rank studies by the number of citations they receive. That insight led to an algorithm that helped Google become the global leader in search.

Gary Slutkin, Professor of Epidemiology and Public Health at the University of Illinois at Chicago, realised that gun violence spreads like an infectious disease. The evidence showed that people who have observed violence are 30 times more likely to commit it. This insight led him to initiate a global charity called Cure Violence, which teaches people to talk someone down, distract them, change the setting, change their perspective and save lives.

Sometimes, insight has an element of serendipity. In 1980, West Germany made it mandatory for motorcyclists to wear helmets. Over the next six years, motorcycle thefts fell by two thirds. The reason was simple: inconvenience. Thieves could no longer decide to steal a motorcycle on the spur of the moment.[16] So, a product introduced to reduce accidents also reduced thefts. Who knew?

Here is Alexander Fleming on his discovery of the antibiotic properties of penicillin: ***"One sometimes finds what one is not looking for. When I woke up just after dawn on September 28th, 1928, I certainly didn't plan to revolutionize all medicine by discovering the world's first antibiotic, or bacteria killer. But I suppose that was exactly what I did."***

And sometimes you have the insight without the evidence. As Jeff Bezos said: ***"If you had gone to a customer in 2013 and said, 'Would you like a black, always-on cylinder in your kitchen about the size of a Pringles can that you can talk to and ask questions, that also turns on your lights and plays music?' I guarantee you they'd have looked at you strangely and said, 'No, thank you'."***



Insight is the holy grail; it emerges from evidence

16 Adam Kucharski, 'The Rules of Contagion', Wellcome Collection, 2020

3.7 WHAT CAN WE LEARN ABOUT INSIGHT FROM STORYTELLING?

"Stories (are) our primary way of making sense of our experience, giving meaning and significance to our lives." [17]

Geoff Mead, storyteller

In the chapel of Mostyn House School in Parkgate, Wirral, England, is a stained-glass window (pictured on the following page) which, in a single sentence, tells a powerful story of a 19-year-old boy who died off Dover in November 1917.

'To Raymond Sylvester Leventon, a boy much loved here (May 1914 – Dec 1916) who fell with his aeroplane off Dover on the eve of going to fight in France, Nov 1917, aged 19. From his Mother.'

In less than 40 words we know his name, his age, when he went to Mostyn House School, how, where and when he died and his occupation. We know more. We know the context of the First World War. We know that so many young men died. We know that this young man was loved. We know his mother survived him. And we know the effect of his story on others and, perhaps, on ourselves as we read it.

Innovators use stories for many reasons. They can reveal insights by sharing a human experience. They can reveal a strongly held belief that we may not be able to consciously express. They give us moments in space and time that act like coat racks for our memories. They create empathy as we put ourselves into the lives of others. They also command attention.

I recall in the 1990s conducting deep research into the views of UK water sector customers. All the research we could draw on was condensed into a single vox pop comment by a young man in Manchester, who said, in a strong Northern accent: ***"You charge me far too much"***. It made the case, in a single moment, for a programme to raise awareness of the value of water in our daily lives.

Our need to create stories is hard-wired into our humanity. In fact, we have a need to make our whole lives into a story. The brain has a default mode which creates a narrative for our lives, incorporating our lessons from the past into our plans for the future. It even has a physical location: the medial prefrontal cortex of the brain. This area is so important, it uses 20% of our calories, even when we're apparently doing nothing.[18]

Stories can also be the enemies of innovators. "The odds are stacked against the preferred future, because the present is anchored to the past by a myriad of stories," says storyteller Geoff Mead. ***"Our view of the world and what is possible and desirable are shaped by the 'big stories' of our time."*** [17]

Sometimes, the only way of challenging strongly held beliefs is to tell new stories. Telling a different story can reframe our understanding, our beliefs and our actions. In this way, stories don't just provide insight for innovators, but are a powerful acceleration strategy to new futures.

Why stories work:

- They are innately human
- They are specific in space and time
- They reveal beliefs that may not otherwise be revealed
- They are memorable
- They allow us to experience the world of others
- They can change beliefs and lead to action

Process and spark

Storytelling is certainly a process, and big data helps us understand how stories are structured. In 1928, Vladimir Propp identified 31 narrative types of Russian folk tale, and in his 2004 book, 'The Seven Basic Plots: Why We Tell Stories', Christopher Booker identified seven basic plots for storylines. But there is something more than patterns and process when you read a book by, say, Lee Child, Dostoevsky or Hilary Mantel; there is a creative spark, an empathy, a use of words in magical forms that engages us as we read.

17 Geoff Mead, 'Telling the Story: The Heart and Soul of Successful Leadership', 2014

18 New Scientist: 'Vacant Mind, Busy Brain'


To Raymond Sylvester Leventon
a boy much loved here
May 1914
Dec 1916
who fell with his aeroplane
off Dover on the eve of going
to fight in France Nov 1917 aged 19
from his Mother

3.8 WHAT CAN WE LEARN ABOUT INNOVATION FROM NATURE?

"If nature gives us enough clues, we just need to pay attention."

Professor Avi Loeb, Harvard University

There are three buckets of human knowledge, says American investor Peter Kaufman. ***"Bucket number one is inorganic systems, which are 13.7 billion years in size. It's all the laws of math and physics, the entire physical universe. Bucket number two is organic systems, 3.5 billion years of biology on Earth. And bucket number three is human history."*** You can't get a bigger sample size, says Kaufman.[19]

Nature is the greatest source of innovation. It offers an 'encyclopaedia of solutions' for those who consult it, says bioengineer Jeff Karp. Reverse engineering part of the visual system of bees and how they navigate helped James Marshall create a fully autonomous drone that avoids obstacles as it flies.[20] Daimler engineer Dieter Gurtler drew on insight about the boxfish's skeletal structure to produce a concept car that reduced air drag. Concrete manufacturers are exploring how to learn from coral and use CO_2 as a raw building material.[21]

The term for learning from nature and applying it to human challenges is biomimicry, from the Greek 'bio' meaning life and 'mimesis' meaning imitation. The website asknature.org features a web of innovations, from passive cooling systems inspired by camels, wind farm designs inspired by schooling fish, to reversible smart glue inspired by mussels. ***"When we look at what is truly sustainable, the only real model that has worked over long periods of time is nature,"*** says founder of the Biomimicry Institute, Janine Benyus.

19 'Three buckets', Peter Kaufman. Listen to his talk to Cal Poly Pomona Economics Club here: https://soundcloud.com/user-339685480/peter-kaufman-on-the-multi-disciplinary-approach-to-thinking

20 New Scientist, February 20th, 2021

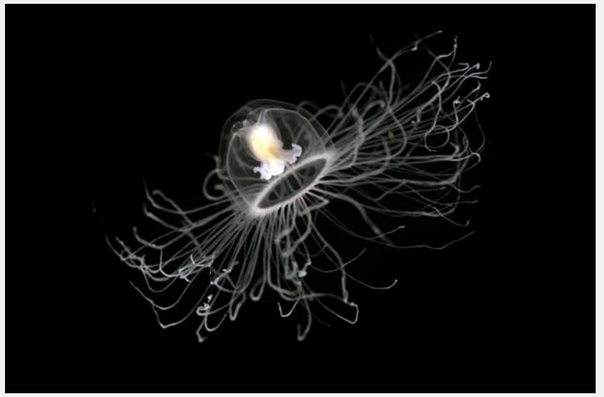
21 https://www.wired.com/2015/09/think-like-tree-new-kind-eco-friendly-concrete-inspired-coral/

The Biomimicry Institute differentiates between three types of learning:

- Biomimicry, which functions like nature;
- Biomorphism, which looks like nature; and
- Bioutilization, which uses nature in solutions.

"We have to listen to what nature tells us", *says Professor of Science at Harvard, Avi Loeb.* ***"It is not a monologue where we show how smart we are. It is a dialogue, and we don't need to show how smart we are. If nature gives us enough clues, we just need to pay attention."*** [22]

22 New Scientist, February 13th, 2021



A natural challenge

Do you fancy a challenge? If so, give yourself 15 minutes to come up with just one innovative household object inspired by one or more of the following critters (pictured clockwise, from top left).

The extraordinary Sacoglossan Sea Slug: Imagine, like this slug, that you could cast off an old body and replace it with a new one. The body may be infected, so the slug discards it and grows a new one. The voluntary shedding of a body part is called autotomy. An electric toothbrush casts off its old head and retains the body. Can you imagine a new household object that retains the head and casts off the body?

The immortal jellyfish: The turritopsis dohrnii is biologically immortal. It grows, through a polyp stage, to become a mature jellyfish. But then, if it gets sick or old, or if it's stressed or under attack, it can revert to its immature stage and start again.

The leaf-cutter ant: Leaf-cutters are among at least 15,000 species of ant. They look scary – their bodies covered with spikes and spines. But the spikes are for gardening, not fighting, and help them carry their leaf cuttings to their underground living quarters.

The distributed brain of the octopus: Two-thirds of an octopus's neurons are distributed along its eight arms. These limbs can effectively make decisions without involving the brain. Can you imagine a household object that might be created to have this ability?

The sleepy yellow-bellied marmot: A recent study in Colorado of these wild, squirrel-like creatures showed that when they sleep they age more slowly. And they hibernate for about eight months a year.

3.9 WHAT CAN WE LEARN ABOUT GATHERING EVIDENCE FROM THE POLICE?

"What's all this then?"

George Dixon, 'Dixon of Dock Green'

Clues into evidence-gathering can be found in how police forces operate.

Let's start in the 1970s with the FBI's Behavioural Science Unit, set up to help solve crimes linked to serial murder and serial rape. Two FBI agents, John Douglas and Robert Ressler, working with Dr Ann Burgess, a professor of psychiatric nursing at the University of Pennsylvania, looked for patterns by interviewing 36 serial sexual killers. The study was called the Patterns of Homicide Crime Scene Project.[23] It used both forms of gathering evidence: deep data from the interviews and big data from spotting patterns.

In crime, as in the search for insight of any kind, we are seeking an understanding of people at key points in space and time. The scene becomes central. Evidence is gathered, including photographs and video. Interviews are conducted and recorded. Timelines are created and geographically mapped. Motive and opportunity are considered. Reason is considered, as well as emotions. A wider understanding of context is identified.

Focusing on evidence can change police practice. One in 26 police efforts to reduce crime actually have the effect of increasing crime, claims Lawrence Sherman, director of the Institute of Criminology at the University of Cambridge. Sherman runs a training course for senior policemen from around the world. ***"We've prosecuted people for thousands of years without testing our approaches – the time has come to challenge them"***, says Sherman. Evidence creates insight.

For example, police in the UK no longer perform intense interrogations, says Peter Neyroud, a former detective superintendent now at the Institute of Criminology, as interrogations are likely to elicit false confessions.[24] Police interviews are now based on cognitive science insights to aid recall. One technique is to focus on the smallest detail, because this is known to trigger other relevant memories. Another is to ask interviewees to tell their story in reverse, because people recall recent memories more clearly.

Another learning from solving crimes is the two ways of using reason to reach conclusions.

You could start with the evidence (for example, a crime scene) and allow conclusions to emerge. In the jargon, this is known as 'deductive reasoning'.

Alternatively, you could start with a theory (for example, the common characteristics of serial killers) and use these patterns to help identify a solution. This is known as 'inductive reasoning'.

23 A. Burgess, Hartman, Ressler, Douglas, & McCormack, 1986

24 New Scientist, November 7th, 2015

Section 4:

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What innovators do: creation

4.0

Innovators change perspective, network and make connections, use their imaginations, reflect, and create mental models.

Consider:

What can we learn about innovation from play, sport and exercise? What can we learn about making connections from comedians?

Key takeaway:

- **Innovation is everywhere:** Know no limits, think widely, and regularly change your perspective.
- **Innovation is collaborative:** Listen, share, network and co-create – always with empathy.

4.0 INNOVATORS CHANGE PERSPECTIVE

"The new dawn blooms as we free it.
For there is always light,
if only we're brave enough to see it.
If only we're brave enough to be it."

Amanda Gorman, 'The Hill We Climb'

We are each confined by our bodies, our genetics and our experiences. We know there are limits to our senses (see page 10). But there is genius in our humanity. Our imaginations allow us to break free from the limits of space and time.

We have three choices – go back, forward or stay where we are

If we go back, we can gather great ideas from past breakthroughs. For example, around 4,000 years ago, a Babylonian King called Hammurabi literally laid down the law in 282 rules, carved into a black stone pillar. He introduced some principles we hold onto today, like the presumption of innocence (we can also learn a lot from what he didn't get right by today's standards). We can learn from the natural world, billions of years in the making (see page 35). We can learn from indigenous communities like the Aborigines, who use song and art to recall history and strengthen their connection with the natural world. We can also learn from women in history whose roles may be unknown. Have you heard, for example, of the American, Grace Murray Hopper, who helped to create the first all-electronic digital computer? How about the American-Polish chemist Stephanie Kwolek who created Kevlar?[25]

We can gather great ideas from the present by embracing new experiences and viewpoints. We could do this by moving to a different physical place. For example, walking around a new city for the first time makes us alert to new food, music, architecture, opinions and culture. The more countries a person lives in, the more they use those experiences to innovate, according to research from Hal Gregersen, Mason Carpenter and Gerard Sanders. In another example, researchers from the ideas company IDEO put themselves through the hospital admissions process in order to help improve it.

We can also change our mental perspective. We can talk to people with totally different opinions. We can face our critics. ***"Immerse yourself in situations where you feel less right, less comfortable, or less compelled to speak, and your questions will multiply"***, says Hal Gregersen, former Executive Director of the MIT Leadership Centre. Or we can shine a light on unlit corners, like the experience of today's black leaders, including innovators like Dr Kizzmekia Corbett, the lead scientist on the Moderna COVID-19 vaccine team, or the extraordinarily powerful use of words by Amanda Gorman, aged just 22, at the Presidential Inauguration of Joe Biden.

Our rich imaginations can also make it easy to move into anyone else's shoes. What would others do if they were looking at our challenge? What would Bezos do? What would da Vinci do? We can even use fiction to imagine new ideas. We can draw inspiration, for example, from books we read and films we watch.

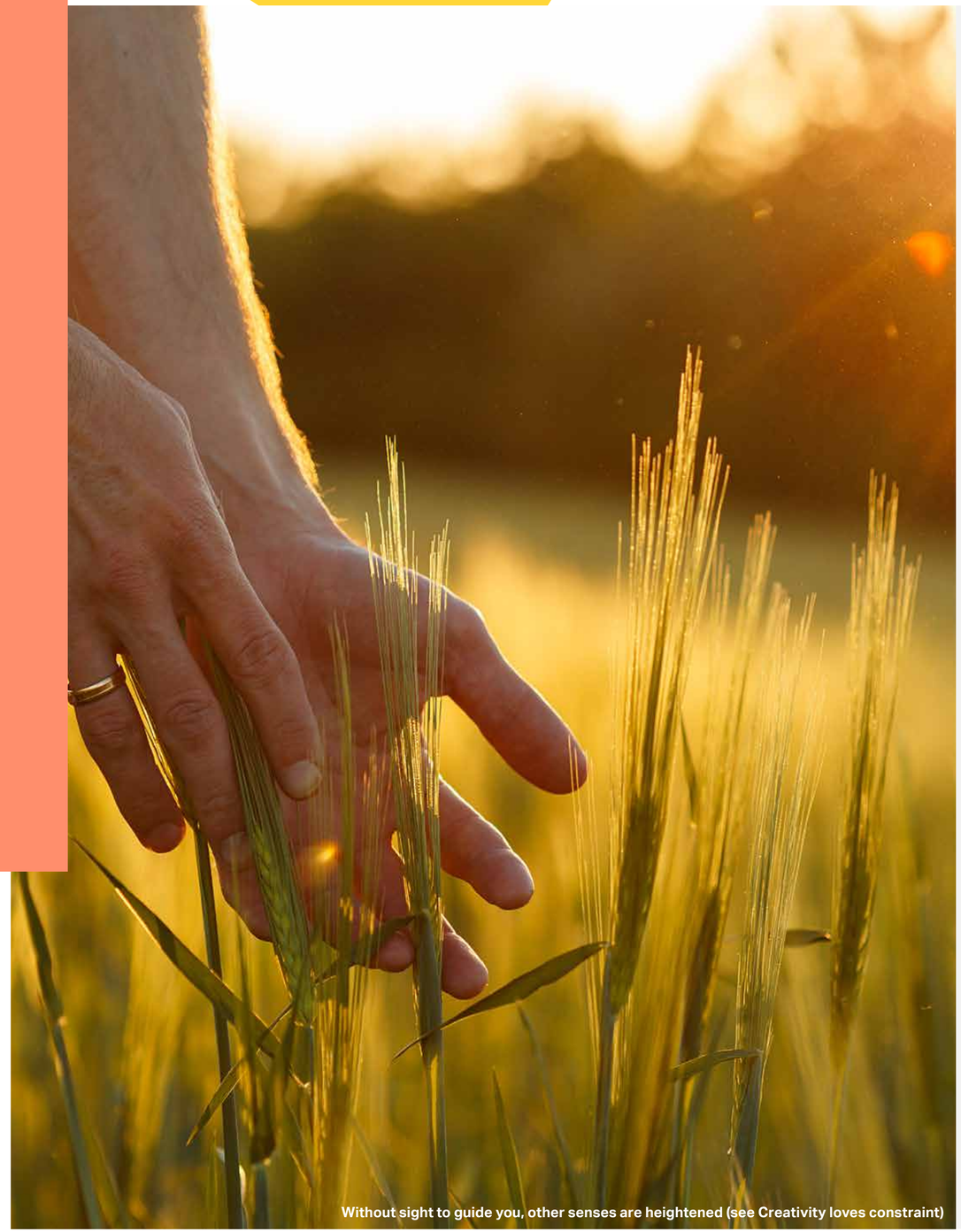
Moving along our timeline, we can also gather great ideas by imagining the future; or creating it. That's what innovators do. They create the future by lobbing ideas into a future space/time continuum and watching for the ripples.

There are three kinds of future.

'Future one' is the probable future if nothing changes. Jeff Bezos has an intriguing take on the opportunity of this future. He asks what's not going to change? ***"The answer to that question can allow you to organize your activities. You can work on those things with the confidence to know that all the energy you put into them today is still going to pay dividends in the years to come"***, he says.

'Future two' is your preferred future. This involves imagining the future you want to create. The most powerful thing you can do is to step into that future. Imagine you are there. There's a valuable technique from neuro-linguistic programming called visualisation that involves being present in the future and looking back. Economist Yanis Varoufakis does this in his 2020 book 'Another Now', imagining a world with no banks and no stock market. A similar conceit is expressed as 'The Future we Choose', by the authors of the Paris Climate Agreement, Christiana Figueres and Tom Rivett-Carnac.

25 www.women-inventors.com



Without sight to guide you, other senses are heightened (see Creativity loves constraint)

'Future three' exaggerates a trend from today that may dramatically change the future. It might be GPT-3, a language-based AI that mimics human-written text; biomimicry in architecture; green hydrogen fuel, created using renewable energy; working from home; climate-driven migration; or rechargeable lithium-metal batteries that might extend the range of electric vehicles by 80%. This is the world of possible futures. There are many of them. All we can do with possible futures is start with where we are now, identify the signals, and imagine their impact on our organisation if current trends continue. Once again, we are forced to change perspective. And once again, it leads to creativity and innovation.

Types of creativity

Creativity is usually associated with key characteristics: something new, surprising, valuable and inspiring to others. There are three types of creativity, says research professor of cognitive science Margaret Boden:

- **Exploratory creativity:** this is rules-based, where creativity is enabled within a strong framework;
- **Combinatorial creativity:** this involves the combination of ideas; and
- **Transformational creativity:** this is creativity that is strikingly original and transformational.

Creativity loves constraint

Around 10 years ago, we ran a series of experiments inviting people from the NHS to close their eyes and imagine patients or visitors arriving at a hospital, from the time they parked to finding reception, to getting to their destination. We invited participants to close their eyes as they pictured that journey. Immediately, their other senses were heightened: particularly what they could hear and smell.

That's also the experience of attendees at an international sensory exhibition set in total darkness called 'Dialogue in the Dark'. Here's how the exhibition is framed in London: ***"Without visuals to guide you, your other senses awaken, helping you to navigate by sound and touch. You begin to think more creatively. More expansively. Find yourself in the dark."***

"Creativity loves constraint", says Marissa Mayer, former vice president of Google Search Products and User Experience. Creations like haikus and sonatas ***"are beautiful, because creativity triumphs over the rules."*** [26]

26 'The Innovator's DNA', Jeff Dyer, Hal Gregersen and Clayton M Christensen, Harvard Busines Press, 2011

4.1 INNOVATORS NETWORK

"To do big things… means recruiting and motivating others to take up the cause."

Hal Gregerson, former Executive Director of the MIT Leadership Center

Innovators network. ***"Innovators go out of their way to meet people with different backgrounds and perspectives to extend their knowledge. And they are constantly bouncing their ideas off of others to get feedback"***, say Clayton Christensen, Hal Gregersen and Jeffrey Dyer in 'The Innovator's DNA'. Here are five tips for effective networking.

One: focus. ***"Start by focusing on the problem you are trying to solve, and then seek out the people who share that interest"***, advises Dr Zella King, an associate professor at Henley Business School. That's what we've been doing at Corporate Culture for the last 10 years, with 90-minute roundtables on focused topics that create a melting pot for people to share ideas and experience. Conversations over the course of 2020 about the impact of COVID-19 on the world of work led to our recent report 'The Human Organisation' and new thinking on the once-in-a-hundred-year opportunity to reimagine organisations with built-in humanity.

Two: find a balance of insiders and outsiders. There's a sweet spot in balancing your networks. ***"The key seems to be the right mix of insiders and outsiders, and neither too many nor too few of each"***, says Zella King.[27] Too many insiders and you have an echo chamber. Too many outsiders and you risk a loss of focus. A balanced network will also, according to 'The Innovator's DNA', involve ***"a conscious effort to meet people with different educational backgrounds… [who] hail from different countries, industries and business functions; and who are different ages and ethnic backgrounds."*** [28]

Three: join a diversity of networks. If you belong to several unrelated social groups, it increases the probability of being able to uproot ideas from one network and use them in another, according to research by sociologist Ronald Burt.[29] ***"Take Johannes Gutenberg's invention of the printing press"***, says Zella King. ***"He was a goldsmith, but his connections to wine-makers enabled him to see the potential of the screw press for printing."***

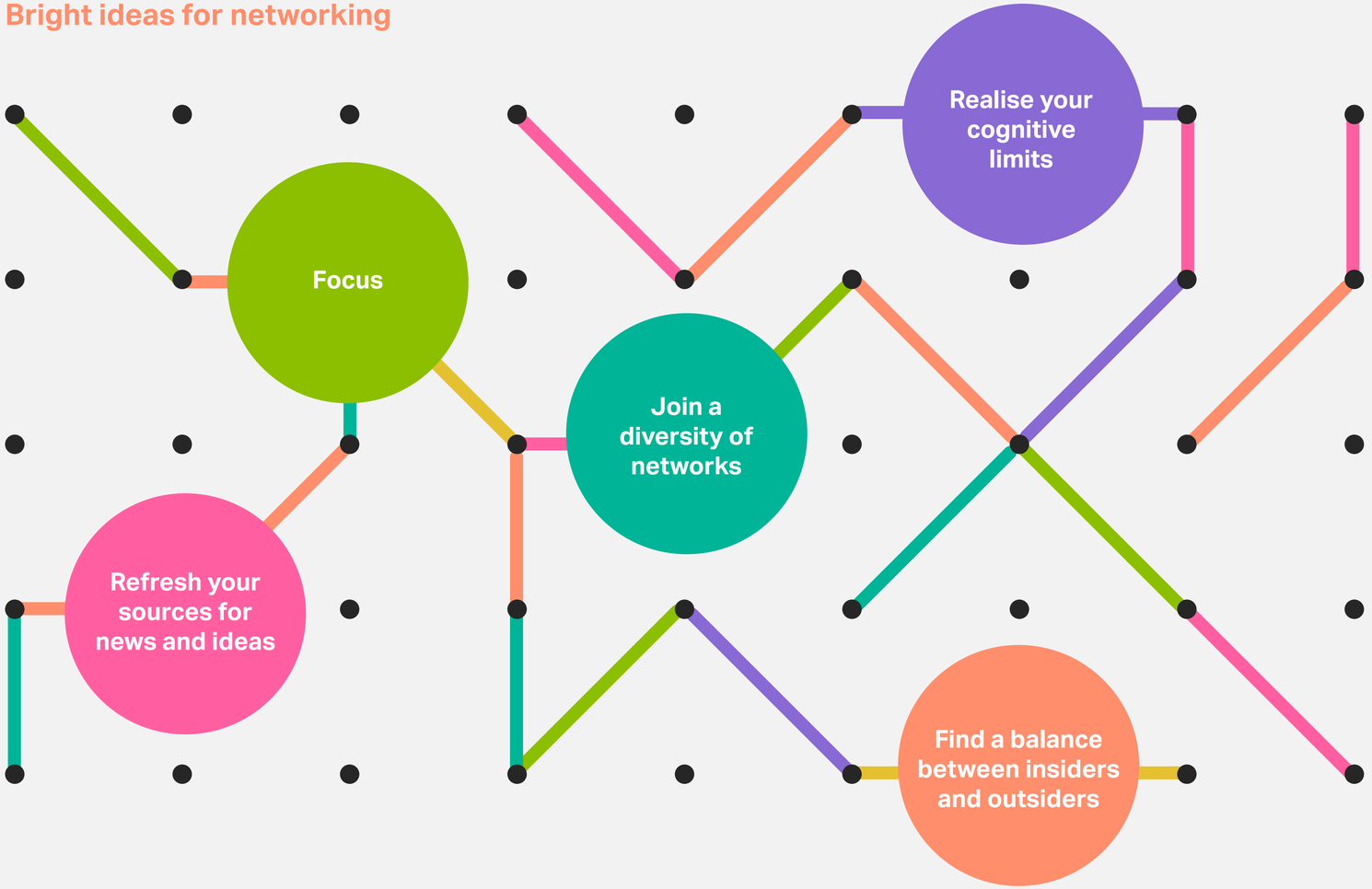
Four: realise your cognitive limits. The maximum number of people in your network is 150. This is called Dunbar's number, after anthropologist Robin Dunbar. He identifies 150 as the cognitive limit to the number of people we can hold in a network and maintain strong social relationships. The number seems to work across business, the military and local communities.

Five: refresh your sources for news and ideas. Periodically replace 25% of your usual news sites, blogs or Twitter feeds, recommends Zella King. Great sources include idea networks (such as TED or the Aspen Ideas Festival), news networks (like Tortoise Media or the Global Investigative Journalism Network), regular journals (New Scientist, MIT Technology Review or Wired), music journals (such as Uncut), global radio platforms (like Radio Garden), film festivals (including London Film Festival and Sheffield International Documentary Festival), and member organisations (such as the RSA).

27 'The Goldilocks Network', by Dr Zella King, New Scientist article, May 26th, 2012
28 'The Innovator's DNA', Jeff Dyer, Hal Gregersen and Clayton M Christensen, Harvard Busines Press, 2011

29 American Journal of Sociology, volume 110, p349.

Bright ideas for networking



What constitutes an expert?

Roger Kneebone is an expert at being an expert; he is Professor of Surgical Education at Imperial College London and the author of 'Expert: Understanding the Pathway to Mastery'. An expert, he says, is extremely good at what they do, recognised by others as being extremely good at what they do, and passes their knowledge on to other people. Experts aren't just brain surgeons or fighter pilots, but mechanics or plumbers. They are not a different species. The process of becoming an expert is open to anyone in three stages he says.

- **As an apprentice**, you have a supportive environment and somebody else takes responsibility for your cock-ups.
- **As a journeyman**, you become focused on who benefits from your expertise and find your own voice.
- **As a master**, you know how to coach others, to deal with error and to improvise.

4.2 INNOVATORS MAKE CONNECTIONS

"When we try to pick out anything by itself, we find it hitched to everything else in the universe."

John Muir, Scottish naturalist

How are ideas created? Easy. Smash things together. Or, to play nice, by making connections. Einstein called creative thinking 'combinatorial play'. Steve Jobs said: ***"Creativity is just connecting things."***

You can make connections by:

- spotting patterns in the evidence;
- spotting patterns from the past;
- identifying recurring frictions in how humans behave;
- learning from other companies or cultures;
- changing perspectives and tuning into networks;
- stealing great ideas from current businesses, from nature, from other cultures or other disciplines;
- seeking conflict or commonality in ideas, beliefs, feelings or attributes; or by
- having fun with seemingly unconnected ideas.

Imagine a circle. In the middle of the circle is your challenge. Around the outside are an infinity of sources you can draw upon to connect with your challenge. This is what I call the power of the edge; you can take ideas from the edge and combine them.

Combining ideas uses the power of asking questions that begin "What if….?". Why is "What if?" so powerful? Because it allows us to predict the future. It forces answers with a very specific construction. As clinical psychologist Simon Baron-Cohen puts it: ***"If there are cumulonimbus clouds and there is thunder then there will be severe weather. If a glider has a fixed wing and the wing has an angle of six degrees then the glider will be lifted up."***

Baron-Cohen says this ability is uniquely human and was the result of changes in how the human brain began to function around 100,000 to 70,000 years ago. He calls this 'if and then' thinking or the 'systemising mechanism', and says it is directly responsible for dramatic human progress because it opened the door to invention.

Let's look at some examples of creative ideas that emerge from combining things together.

Find a pattern in the evidence to make a discovery: It might be kids connecting light with the light switch. Or it could be gravity (if an apple falls from a tree). Or it could be that smoking causes lung cancer.

Smash an attribute you need against something that already has that attribute: It's 5,000 years ago, I need to move a big stone. I'm not strong enough. What might be strong enough? How about an ox?

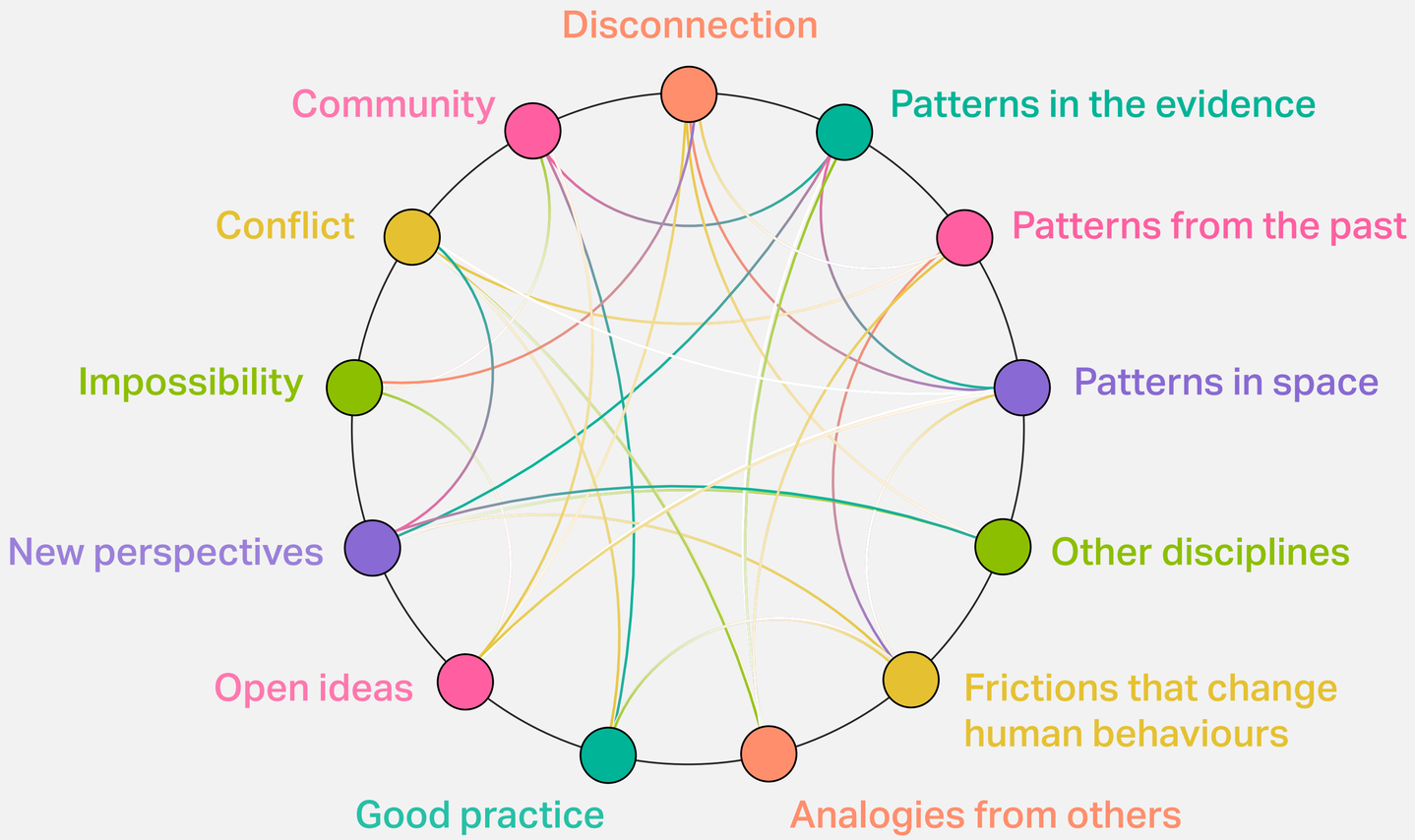
Connect science, engineering and design thinking together: Emerging tech expert Antoine Gourévitch calls this combination of disciplines 'deep tech', and says it is ***"the next chapter in the innovation story"***. His analysis followed visits to 100 research labs around the world in 2019/20, where he observed the ways they were combining a range of technologies, such as robotics, nanomaterials, block chain and quantum computing, to address real-world problems. For example, Lilium Air Mobility is developing all-electric air taxis, combining disciplines like big data, engineering and design thinking to evolve its offer.

Smash a question against a new perspective: I remember attending a one-day introduction to innovation, run by lateral-thinking genius Edward de Bono. He recalled a challenge he was given about a polluting chemical plant that dumped its waste downstream into a river. What if, he asked, the plant was required to dump its waste upstream before it drew the water it needed downstream? How would that change behaviour?

Smash a need against a seemingly conflicting idea: What if we rented out space we don't own to people we don't know? You get Airbnb. What if we rent music rather than sell it? You get Spotify.

Smash one idea against another in a similar space: What if we smashed one kind of food into another? You get fusion food. What if you smash classical music together with popular music? You get a whole new genre and some genius new music (just ask music producer Rick Blaskey who has managed fusion acts and created 'The World in Union' anthem for Rugby Union World Cups.

How to make connections



According to Jacob W. Getzels and Mihaly Csikszentimihalyi, creativity begins when someone *"experiences a conflict in perception, emotion, or thought."*

Innovators steal great ideas from others

Here's an extract from an interview with David Bowie[30]: *"The only art I'll ever study is stuff that I can steal from. I do think that my plagiarism is effective. Why does an artist create, anyway? The way I see it, if you're an inventor, you invent something that you hope people can use. I want art to be just as practical. Art can be a political reference, a sexual force, any force that you want, but it should be usable. What the hell do artists want? Museum pieces? The more I get ripped off, the more flattered I get. But I've caused a lot of discontent, because I've expressed my admiration for other artists by saying, 'Yes, I'll use that,' or, 'Yes, I took this from him and this from her.' Mick Jagger, for example, is scared to walk into the same room as me even thinking any new idea. He knows I'll snatch it."* So, if I smash what you do into what I do, I can create something new.

Discover more

'The Pattern Seekers: A new theory of human invention', by Simon Baron-Cohen.

30 From a 1976 interview. Widely quoted, for example: https://fashionunited.uk/news/fashion/david-bowie-desperately-seeking-the-goon-squad/2016011919094

4.3 INNOVATORS CREATE MENTAL MODELS

"You've got to hang experience on a latticework of models in your head."

Charlie Munger, Vice Chairman, Berkshire Hathaway

We create mental models to make sense of our world. We'll have a model in our minds of how our lives should progress, of what makes a good parent and of our neighbourhoods. They are like maps. We can find our way from A to B if we have a map. We can make sense of politics, for example, when we think of being on the left or the right.

Mental models help us make day-to-day decisions. Paediatric neurologist Douglas Larsen put it like this when consulting with a patient: ***"The patient comes in and gives you a story. As you listen, you're consciously thinking through your mental library to see what fits, while also unconsciously polling your past experiences to help interpret what the patient is telling you."*** [31]

Some of my own mental models:

- I have an 'ABCD' mental model for good journalism; a professional news story is accurate, balanced, concise and dynamic.
- I have a mental model for how people make decisions; what we think and feel influences what we believe, what we believe influences what we do.
- I have a mental model for personal power. It spells CIA; there are things we control, things we can influence, and things we need to accept.

Sometimes our mental models are products of our time. It used to be a common mental model that the sun revolved around the Earth. Another said that the Earth was flat. Another that kings and queens were appointed by God.

Sometimes, mental models are strong and difficult to change. Is the main purpose of business to make money for shareholders? Is marriage a commitment between a man and a woman? Are people fundamentally good or bad? Are humans a part of nature or apart from nature?

"We carry around sets of assumptions in our heads about how things work", says Hal Gregersen, former Executive Director of the MIT Leadership Centre, ***"allowing us to operate on autopilot in many respects so we can allocate our rational attention to things that really do require new thinking. The thing is, mental models themselves have shelf lives, so we need to find mechanisms for revising and updating them."*** [32]

Here are three things we think we know for sure about mental models:

- Existing mental models are hard to change. Cognitive and learning scientist Michelene Chi says getting mental models wrong is the ***"fundamental source of robust misconceptions"***, even among scientists. That's largely because ideas in our brain are like rivers. The more we have a thought, the more it carves a riverbed between neurons. Changing the flow of the river is challenging.
- Innovators create new mental models. Martin Seligman, ex-President of the American Psychological Association, changed the direction of psychology by reframing a question. Instead of hunting for the roots of negative mental health, what if psychology explored the positive attributes of good mental health? This led to his PERMA mental model; good mental health was about Positive emotions, Engagement, Relationships, Meaning and Accomplishments.
- Visualising mental models make them easier to recall. Psychologist Kurt Lewin, in the 1930s, came up with the mental model of force field analysis. Imagine in the centre of an A4 sheet of paper is the change you are seeking. On the left-hand side are arrows that are compelling your movement towards your goal. On the right-hand side are arrows repelling you away from your goal.

31 Brown, Peter C. 'Make It Stick: The Science of Successful Learning.' The Belknap Press of Harvard University Press, 2014

32 'Questions are the Answer', Hal Gregersen, Harper Business, 2018, p104

How an egg broke Italian architecture

In 1418, a young architect called Filippo Brunelleschi was taking part in a competition to build the dome for Florence's cathedral. He described his solution as a dome within a dome, octagonal in shape, capped by a cupola to let in light. He was asked to share exactly how this could be done. He didn't want other architects to steal his ideas, so he suggested the commission should be given to the architect who could make an egg stand upright. Everyone tried and failed. Brunelleschi then smashed the egg in two, and stacked one half of the shell on the other, causing the egg to stand upright. He was granted the commission. Sometimes you have to break something to build something.

Discover more

'The Great Mental Models', Shane Parrish and Rhiannon Beaubien, Farnham Street, 2019

4.4 INNOVATORS REFLECT

"If you don't have a dream, how you gonna have a dream come true?"

'Happy Talk', from Rodgers and Hammerstein's 'South Pacific'

Have you ever had a great idea in your sleep, in the shower or when out for a walk? Of course you have. It's one of the magical habits of innovators. Some of the best innovations emerge from (seemingly) doing nothing. One reason for this is that the brain has a 'default mode' of daydreaming that uses 20% of our calories even when apparently doing nothing. This mode, focused in the medial prefrontal cortex, doesn't just make unconscious connections; it creates a narrative for our lives, incorporating our lessons from the past into our plans for the future.[33]

"Often the best way to solve a problem is to not focus", says Jennifer Wiley, Professor of Psychology, University of Illinois at Chicago.[34] The thinking is that a wandering mind loosens the ties of our brain's executive control.

So, can you deliberately seek this state of doing nothing? Sure. In at least five ways:

- **Go for a walk:** A whole bunch of creative people apparently found walking encouraged creativity, including Beethoven, Nietzsche and Steve Jobs. Research by Stanford University found that the act of walking was more important than the surroundings.[35] In other research, conducted by Adam Galinsky at Northwestern University, Chicago and William Maddux of INSEAD, exploring somewhere new was seen to trigger great ideas.[36]
- **Let your eyes seek patterns:** ***"It should not be hard for you to stop sometimes and look into the stains of walls, or ashes of a fire, or clouds, or mud or like places, in which... you may find really marvellous ideas"***, said Leonardo da Vinci.
- **Meditate:** Meditation might increase our ability to reach spaces in the brain normally hidden from the conscious mind, according to research by Dr Madelijn Strick of Utrecht University.[37]
- **Listen to music:** His studies of what happens when we have 'Aha!' moments have taken Joydeep Bhattacharya, Professor of Psychology at Goldsmith University, on a 25-year journey that includes understanding the role of music in influencing brainwaves, emotion and wellbeing.
- **Just switch tasks:** Switching tasks reduces fixation and can lead to making unsought connections. That's according to cognitive scientists Henry Roediger and Mark McDaniel, and storyteller Peter Brown, the authors of 'Make It Stick: The Science of Successful Learning'.

So, if you are struggling for ideas, just try doing nothing.

33 'Our restless minds', New Scientist, December 5th, 2020
34 New Scientist, June 16th, 2012
35 The Times, May 2nd, 2014
36 https://knowledge.insead.edu/leadership-organisations/how-to-stimulate-creativity-go-live-abroad-1542

37 New Scientist, June 9th, 2012

4.5 INNOVATORS COLLABORATE

“Me, We.”

Muhammad Ali, with the shortest poem in the world

Over 60,000 years ago, humanity invented boats. At least 43,000 years ago, we invented a tool for counting. Over 40,000 years ago, we were able to catch and eat fish. In that same timescale, we were adapting materials to make music. At least 35,000 years ago, we carved sculptures. Around 30,000 years ago, we built and lived in homes. Then, between 5,500 and 4,000 years ago, came mathematics, the wheel and writing. None of this was the result of a single individual having a eureka moment.

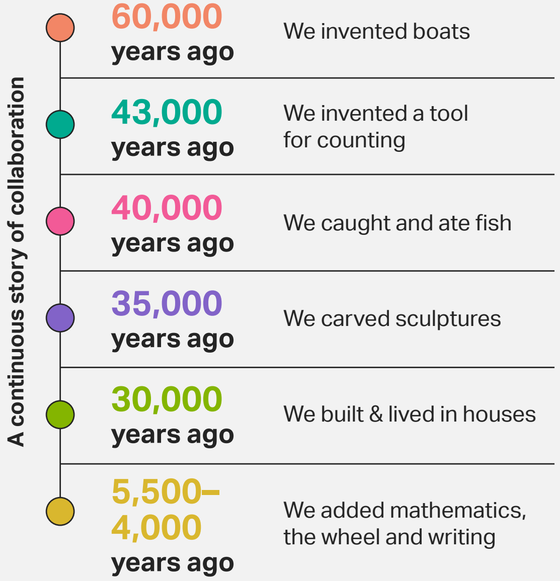
In the 20th century, a review of two million US patents issued since 1975 found that teams are dominant in all 36 patent classes. The private sector gets this. The not-for-profit XPRIZE Foundation uses collaborative competitions to trigger innovation. In 2020, almost 1,000 teams from 76 countries competed for a million-dollar prize to reimagine surgical grade masks to reduce the spread of viruses. Interestingly, the prize was only available to young innovators aged 15 to 24.

To write a hit pop song, the average number of accredited songwriters seems to be increasing. In 2018, the average number of songwriters for songs in the US top 10 was 9.1 with one accrediting 21. In 2016, according to Music Week magazine, the average for the top 100 was 4.53 writers. To create a song requires four key skills: lyric writing, melody writing, production and performance. It’s rare to find one individual who can do all four of these.

The Innovation Festival from Northumbrian Water is an example of speed collaboration in action. In 2019, it attracted 1,800 young people from local schools, colleges and universities, and 665 local businesses and organisations. Innovative projects are progressed using the five-day SPRINT model. Participants are surrounded by music, comedy, food and drink. The focus is way beyond water issues, attracting some of the world’s leading innovative businesses.

For business, collaborative alliances like joint ventures have increased from around 2% of corporate value in 1980 to over 25%. Collaborative action on the world’s biggest social issues is now routine. Action on the pandemic was truly global, crossing every sector and every community. Collaboration is everybody’s business.

Innovators collaborate



4.6 INNOVATORS EXPERIMENT

"Every autumn, an oak tree drops thousands of acorns, but only a handful ultimately germinate. In sexual reproduction, millions of sperm will fail to find the egg. Innovation is similarly a numbers game." [38]

Gary Hamel and Michele Zanini, 'Humanocracy'

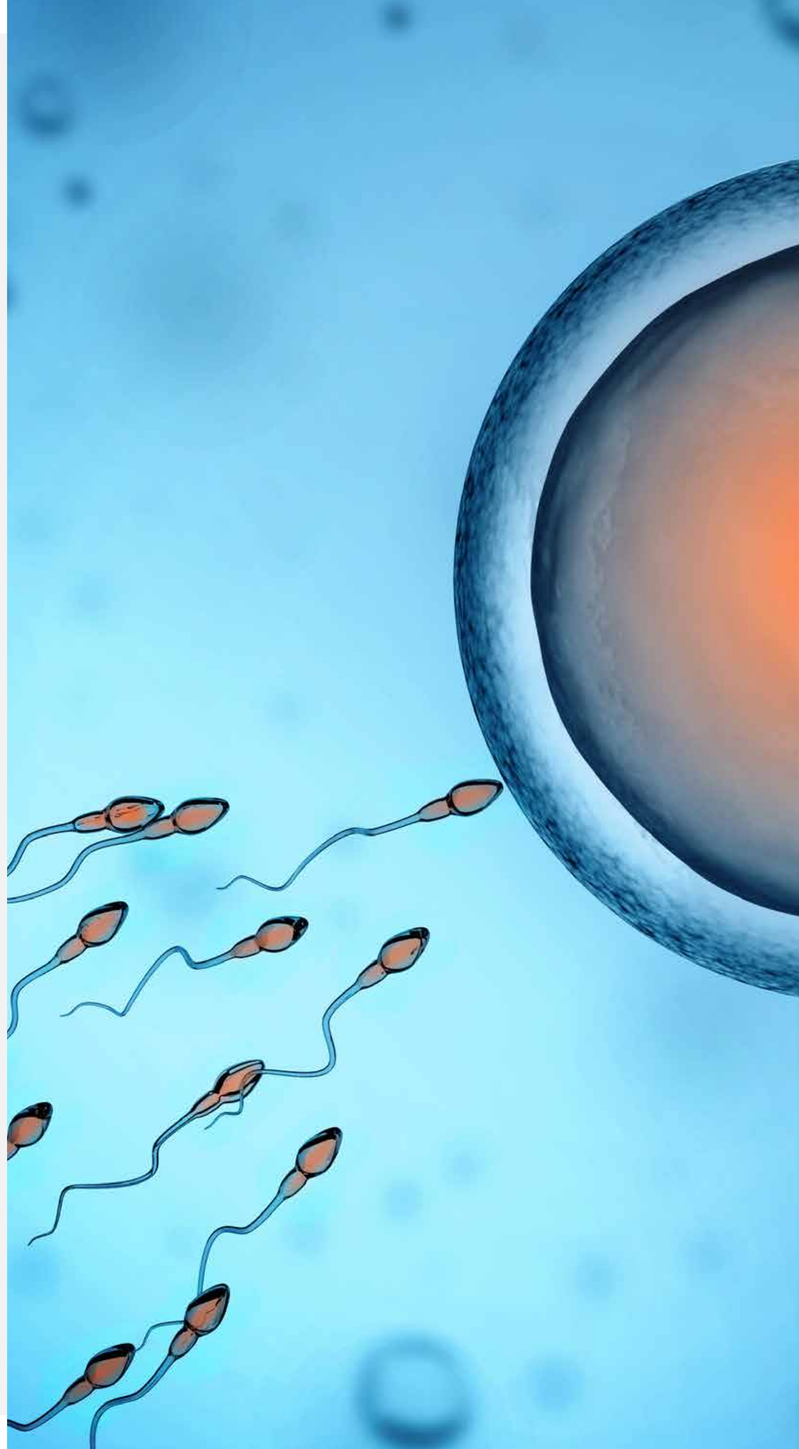
38 Gary Hamel, Michelle Zanini, 'Humanocracy', Harvard Business Review Press, 2020

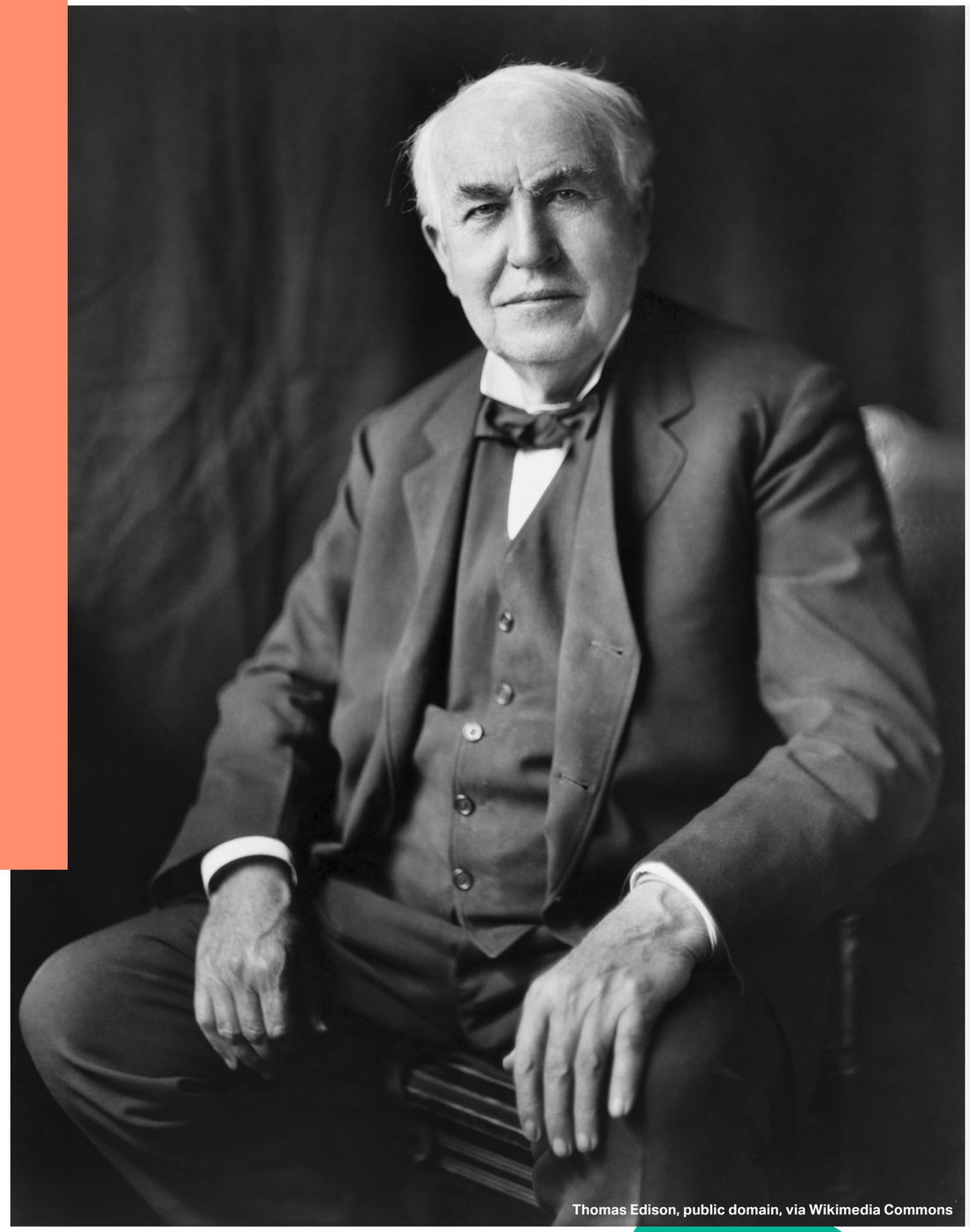
Innovators experiment. It's what they do. It's the scientific method. Experiment. Learn. Modify. ***"The only way to know how a complex system will behave – after you modify it – is to modify it and see how it behaves"***, says George Box, former President of the American Statistical Association.[39]

Here's Jeff Bezos, quoted by Johan Norberg in his book 'Open': ***"Experiments are key to innovation because they rarely turn out as you expect, and you learn so much… I encourage our employees to go down blind alleys and experiment. We've tried to reduce the cost of doing experiments so that we can do more of them. If you can increase the number of experiments you try from a hundred to a thousand, you dramatically increase the number of innovations you produce."***

Johan Norberg, a senior fellow at the Cato Institute in Washington, is a big believer in open innovation. He says: ***"The way to maximize our chances is to allow as many people as possible to test their ideas and experiment with their solutions… the chance that we will find someone who improves our way of doing things or comes up with useful innovations increases when more people are allowed to try their luck."*** According to Norberg, a great example of open, collaborative, peer-to-peer innovation is the Internet. He imagines a retrospective hypothetical. What if the UN had proposed a committee to create a worldwide technology platform in 1993 that had all the information we might be interested in, and accessible from anywhere? ***"But we didn't have such a committee; we had no plan, no hierarchy, structure or co-ordination," he says. "We only had a platform open to all, and we had everyone."*** [40]

39 Jeff Dyer, The Innovators DNA, Harvard Business Press, 2011
40 Johan Norberg, Open, The Story of Human Progress, Atlantic Books, 2020





Thomas Edison, public domain, via Wikimedia Commons

Thomas Edison was a prolific experimenter. He had over 1,000 patents, many of them born in his experimentation lab at Menlo Park. You don't experiment on the basis that you'll get it right first time. Today, everyone is a photographer. Do you get it right every time you take a picture? Even the professionals reject the vast majority of their work. Sometimes, your experiments will fail completely. Edison's talking doll ceased production within weeks. His concrete home with fitted concrete furniture bombed. ***"Most ideas don't work"***, is how Stefan H Thomke, Professor of Business Administration at Harvard Business School, puts it in his book 'Experimentation Works'.

What constitutes evidence when you are innovating? A lot of the time evidence won't be available. ***"The greater the novelty of an innovation, the less likely it is that reliable data will be available"***, says Thomke. ***"In innovation, uncertainty is necessary because it creates opportunity."*** Randomised trials work when you are testing iterative changes. But sometimes you just need to launch and see what happens.

But don't make the mistake of John Harrison. In the early 1730s, he took up the challenge to win a UK government competition to create a marine timepiece. The prize was £20,000 (worth around £3m today, by my estimation). The goal was to create a chronometer that worked at sea to accurately measure the time at a fixed location. Harrison's first sea clock, H1, was completed in 1736, his second, H2, in 1741; but neither were good enough for him. He waited until 1761 before submitting his winning H4 sea clock to the competition. He died in 1776, so had a lot less time to enjoy his prize.

Different types of innovation

There are four types of innovation:

- Improving current actions;
- Creating a new platform;
- Creating a transformational programme; and
- Innovating outside your purpose.

Same idea, new market

Sometimes the same products or services can be reinvented for different markets and different eras. Responsible investment, for example, has been around for many, many years, often championed by religions such as Judaism, Islam and Methodism. It evolved to become 'impact investing' in the 2000s, and has grown to be worth $715bn according to a 2020 survey from GIIN, the Global Impact Investing Network. It's also evolving to be personal. One new app called Tumelo can help you track your personal investments and give you a voice on issues like female leadership, climate change or executive salaries.

Principles of experimentation

Some tips about experimentation from the experts:

- Prototype just enough, and no more;
- Test stuff in the real world;
- You are seeking real, not stated, behaviour;
- You can test if something is working using randomised controlled trials (where people are randomly assigned to either a control group or the group where you are testing your innovation); and
- Build in a feedback loop – learn what does and doesn't work, then tweak or discard.

4.7 WHAT CAN WE LEARN ABOUT INNOVATION FROM PLAY?

"Play, laugh, share."

Richard Steckel

When my friend Richard Steckel died, a remembrance garden was created in the grounds of the Children's Museum, Denver – the organisation he used to head up. On the memorial plaque were the words 'play, laugh, share'. I wasn't sure I understood their significance then. I think I do now.

What defines play? My mum used to give us a simple command when we were little: ***"Go out and play"***. No instructions. But instinctively we knew what it meant. Freedom from responsibility. Freedom from time. Our choice. Apparently, without purpose except pleasure. It was a chance to lose ourselves, improvise, invent and imagine.

But, actually, we were learning about our world.

Play matters

Play is hugely important for our personal development. My 'bible' here is 'Play' by Stuart Brown, founder of the US National Institute of Play. There is one single, massive benefit: play allows us to explore our world and make sense of it with little risk. "The period of maximum play in each species is tied to the rate and size of growth of the cerebellum," says Brown.

This seems to link to how our brains work. In his new theory of intelligence, neuroscientist Jeff Hawkins shares his latest research into the neocortex – the newest and largest part of the brain. This is the outer region of the brain, with all the folds. It takes input from the senses and then makes sense of them. It does this by creating reference frames of the objects that surround us, and of our experiences. Imagine this as thousands of 3D wireframe images that are continuously updated.

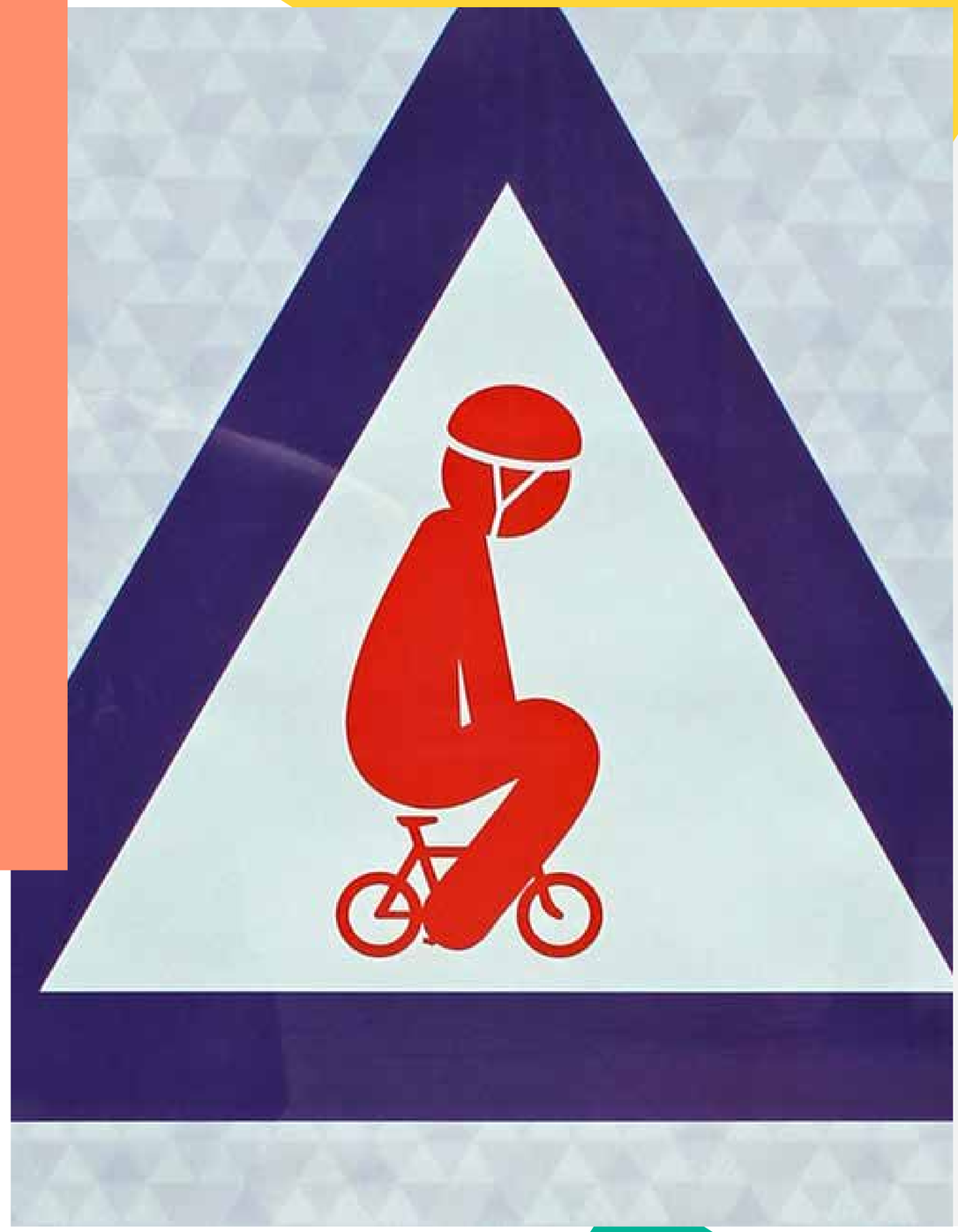
What we then do, unconsciously, is compare our real-world experience to our mental reference frames. Then, only when there is a gap between them do we become consciously aware – something isn't as it should be. The birds stop singing. The coffee's too hot. A letter on the keyboard doesn't work. A conversation feels awkward, and we can't quite put our finger on it.

In other words, as we are enjoying our playful youth, we are exploring our world, creating reference frames, learning about relationships, growing our brain and increasing the strength of connections between neurons. Humans spend more time in this youth phase than other mammals – extending to around the age of 15. But we can choose to make it longer. We can choose to be playful throughout our lives.

How does play link to innovation? It enables experimentation. It frees the imagination. It allows us to make connections between ideas. It creates rapport between people. And it's fun. The problem is that we underplay the role of play as we work. ***"However much we as adults imagine, we don't do it nearly as much as children"***, says psychologist and philosopher Alison Gopnik.

Play is divine

In Hinduism, Lila or Leela is the idea of divine creative play, where all reality is the result of play by the divine absolute (Brahman).



Active play frees us to learn by empowering us to explore our world with low risk. It also allows us to imagine entirely new ways of thinking and acting, which, when we create them, have the power to change the real world. These new ways of thinking can be products, services and ideas, or simply creative expressions like the arts.

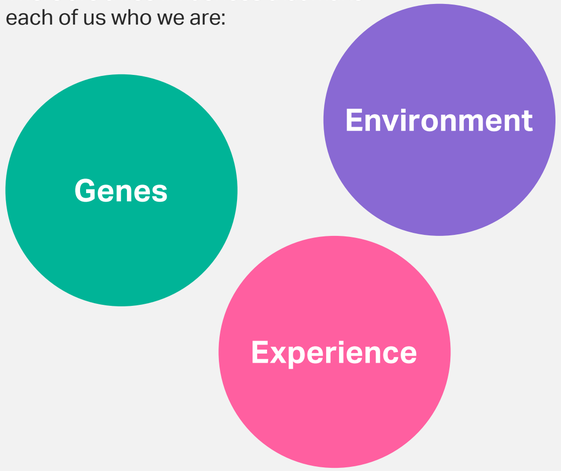
In fact, the arts are one of the most powerful results of play. Music, dance, theatre, festivals and crafts appeal to our senses, tap into shared emotions, give us a shared experience, create psychological safety, strengthen relationships and improve mental health. Some studies suggest play-based cognitive activities can reduce the risk of dementia. Play isn't the opposite of work. Play enables teamwork and innovation. There's a reason that IDEO, one of the world's leading design companies, has a Play Lab and Directors of Play.

Neoteny: staying young

The extension of play throughout our lives is called neoteny, from the Greek for young, and to stretch or extend. Neoteny extends our curiosity, our openness to new ideas and fun, resulting in social cohesion and positive mental health. ***"Neoteny has fostered civilisations, the arts, and music"***, says Stuart Brown, founder of the US National Institute for Play. He quotes psychiatrist Erik Erikson who said: ***"It is human to have a long childhood; it is civilized to have an even longer childhood."*** There's a good reason for our love for sport, TV game shows, board games, computer games and crosswords.

GEE whizz!

There are three influences that make each of us who we are:



Discover more

'A Thousand Brains: A New Theory of Intelligence', Jeff Hawkins.

'Play: How it Shapes the Brain, Opens the Imagination and Invigorates the Soul', Stuart Brown.

Arizona State University Center for Games and Impact: https://gamesandimpact.org/pursuits/mission/

4.8 WHAT CAN WE LEARN ABOUT MAKING CONNECTIONS FROM COMEDIANS?

"Funny ha-ha."

Common phrase

The typical four-year-old laughs up to 300 times per day. Then we grow up. The frequency with which we laugh, or smile, declines dramatically from around the age of twenty-three. And yet, 98% of executive leaders prefer employees with a sense of humour, according to a survey by Robert Half International and Hodge-Cronin & Associates.

According to behavioural scientists Dr Jennifer Aaker and Naomi Bagdonas of Stanford Graduate School of Business in their book 'Humour, Seriously', laughter releases dopamine that makes us feel happier, oxytocin which makes us feel less stressed, and endorphins which can make us feel slightly euphoric.[41] Humour at work, they say, can improve relationships, creativity, resilience and authority.

The genius of comedians is in their ability to make connections: connections between people (rapport), and connections between ideas – both of which are essential for innovation. Here's Milton Jones: ***"About a month before my grandfather died, we covered his back with lard. After that he went downhill very quickly."*** And here's a four-word attempt from me: ***"Fishing's a buoyant market."***

What makes something funny? ***"The surprising truth"***, say Aaker and Bagdonas. Things are funny because they are true and because a connection is unexpected. Pay attention to your emotions. Find out what triggers anger or frustration or euphoria. It may just be something unexpected. And pay attention to what you believe. Make a list starting with the words: ***"I will never understand why..."***. It'll be a long list. There will be nuggets in there that surprise you and others.

Here's another thing we can learn about innovation from humour: innovation is strongly connected to improvisation. By its nature, when we innovate we are at the edge of what currently exists and exploring something new; we must improvise. Consider the principles of comic improvisation shows. They usually share three principles. One, the audience sets the framework. Two, the actors work as a team, setting each other up. Three, failure is welcomed as part of the show.

41 Jennifer Aaker, Naomi Bagdonas, 'Humour, Seriously: Why Humour is a Superpower at Work and in Life', Penguin Random House, UK, 2020

To succeed at using laughter in the workplace, explain Aaker and Bagdonas, we need to differentiate between levity, humour and comedy. Levity is a mindset of light-heartedness. Humour is more intentional (but needs to be appropriate). Comedy is the practice of humour as a structured discipline.

As a final thought: seek out a personal characteristic that you can build on. For me it's exaggeration. I'm serious. Nobody loves to exaggerate more than me.

Innovators free their imaginations

Every human-made object you can see right now was imagined before it was created. There are seven steps in the evolution of human imagination, according to anthropologist Professor Steven Mithen, University of Reading.

Theory of mind: understanding that others have thoughts and beliefs different from your own.

A long childhood: giving us the opportunity for years of imaginative play.

Specialised intelligence: having specialised types of knowledge and thinking, which can then be combined to create new ideas.

Language: making it easier to articulate and share ideas collaboratively.

Cognitive fluidity: using language in new ways, like metaphors and symbols.

The extended mind: using technologies like writing, printing and computer memory to store and share ideas.

A sedentary lifestyle: having time to create.

4.9 WHAT CAN WE LEARN FROM SPORT AND EXERCISE?

"I've missed more than 9,000 shots in my career. I've lost almost 300 games. Twenty-six times I've been trusted to take the game-winning shot and missed. I've failed over and over and over again in my life. And that is why I succeed."

Michael Jordan, basketball legend

Exercising the body exercises the mind. How could it be otherwise – the brain and the body are a single organism. New insights into how this works are being explored in emerging research in evolutionary biology, physiology, neuroscience and cell biology. Here are some of the insights shared by Caroline Williams in her book 'Move!: The New Science of Body Over Mind', and a related New Scientist article:[42]

- An easy walk or run before a brainstorm can increase blood flow and reduce straight-line thinking, but only for a limited time (during the walk and for 15 minutes afterwards).
- Dancing can release dopamine and make us feel good. This happens because we are prediction machines, and predicting beats can give us a shot of dopamine. Our brains also give us the illusion that our dancing is creating the beat, which gives us a second shot. Dancing also creates a feeling of social connection, which feels good.
- Even stretching, standing straight and breathing between three and six breaths a minute can help reduce stress, build confidence and make you feel good.

Sport also shows the importance of teamwork and having a diversity of skills. A team wouldn't function if everyone was an attacker or defender. And there is a reason why assists in football are tracked as an indicator of success. Lionel Messi, as well as being a prolific goal scorer, also has the most goal assists in football history. NBA legend John Stockton made over 15,000 assists in his record-setting basketball career.

Swimmer Michael Phelps, who has won the most Olympic medals in history, used the technique of visualisation to help prepare for races. He would imagine each race: visualising the start, the strokes, the turns. He even imagined what might go wrong, and how he would react. Repeatedly imagining something fires up the neurons and carves a 'riverbed' that can help make actions instinctive.

42 'Mind-altering Moves', New Scientist, May 22nd, 2021

Section 5:

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What organisations can do to create innovative cultures

5.0

Organisations create innovative cultures by providing freedom within a framework, opening up, powering up, and by triggering self-perpetuating creative platforms.

Consider:

What can we learn from history about openness? What can we learn about innovation from the arts?

Key theme:

- **Innovation is imaginative:** Free your mind, get creative, but remain rooted in purpose.

5.1

INNOVATIVE ORGANISATIONS GIVE FREEDOM WITHIN A FRAMEWORK

"Permission to speak, Sir!"

Lance Corporal Jack Jones, 'Dad's Army'

All freedom is within a framework. We are all innovators. But how much freedom do we give ourselves? How much freedom are we given? Do we need permission to perform? When it comes to freedom, this checklist will give you a good feel for where you currently are: rate your organisation (1-10) against each of the criteria:

Purpose									
1	2	3	4	5	6	7	8	9	10
Our purpose is not clear. We don't feel we contribute to a greater cause.							We have a clear purpose. There is a strong sense of meaning in our work.		
Beliefs									
1	2	3	4	5	6	7	8	9	10
We believe our employees are resources to be managed.							We believe our employees are imaginative and innovative.		
Transformational priorities									
1	2	3	4	5	6	7	8	9	10
Our long-term priorities are unclear.							Our long-term priorities are clear.		
Leadership									
1	2	3	4	5	6	7	8	9	10
Our employees feel discouraged to propose and implement new ideas. (Jeff Bezos calls this the "institutional yes")							Our employees feel encouraged to propose and implement new ideas.		
Power									
1	2	3	4	5	6	7	8	9	10
Employees are not given the time or resources to come up with new ideas.							Employees have the time and resources to come up with new ideas.		
Experimentation									
1	2	3	4	5	6	7	8	9	10
Failure would be seen as an embarrassment.							Failure is regarded as an opportunity to learn.		
Exploration									
1	2	3	4	5	6	7	8	9	10
Employees focus tightly on their remit. New ideas here are as rare as a shiny Pokémon.							Employees are encouraged to explore. As a result, we are continually sharing new ideas.		
Sharing									
1	2	3	4	5	6	7	8	9	10
Ideas are spread only through official channels.							Ideas around here spread as if they are contagious.		
Openness									
1	2	3	4	5	6	7	8	9	10
We are only open to great ideas from people who are senior in our organisation.							We are open to great ideas from anywhere and everywhere.		
Creativity									
1	2	3	4	5	6	7	8	9	10
You'd struggle to describe our organisation as creative.							We are surrounded by creativity, and we are free to contribute.		

Having colleagues share stories and ideas will help define your current landscape

Where are we now?

David Bowie posed this question in a song on his album 'The Next Day'. If you're asking yourself ***"Where are we now?"***, I'd recommend two early actions. First, engage your team in a 'question-storm' to get them to pose the questions you think you need to ask and answer. Second, invite them to share stories on when they have shared new ideas successfully and unsuccessfully. The questions and the stories will help define your current landscape.

Innovation as a belief

Booking.com has a stated belief: ***"We believe in the power of curiosity, experimentation, and continuous learning."*** Beliefs lead to actions. This is an example of freedom within a framework.

5.2 INNOVATIVE ORGANISATIONS OPEN UP

"The border of the company is not important."

Tan Lixia, Chief Financial Officer, Haier

There are five good reasons to open up your organisation. Let's call them the high five.

Open up to everyone in our human community: In his book 'Open', Johan Norberg makes the case: ***"The more people there are, the greater the chance that someone will come up with a useful idea or technology."*** And yet, he continues, ***"most societies throughout most of history have discriminated against women, thereby in effect halving the ability to make progress."*** [43] An example of this can be seen in the creative industries. Two-thirds of art gallery visitors are female, and yet displayed artworks are more likely to be produced by men. Furthermore, the Royal Academy of Arts only elected its first female president in 2019.

Open up innovation beyond the organisation: Tan Lixia is the chief financial officer at Haier, a Chinese home appliance and consumer electronics business. She sums up the company's mindset to open innovation this way: ***"The border of the company is not important. If you can help create value for users, it shouldn't matter whether you're an employee or not."*** [44] The world's successful corporate innovators, like 3M, Procter & Gamble and Reckitt Benckiser, have open innovation platforms that encourage ideas from anywhere.

Create open spaces: Pixar has designed its central atrium to enable casual contact. ***"Most buildings are designed for some functional purpose, but ours is structured to maximise inadvertent encounters"***, says Ed Catmull, co-founder of Pixar. The Francis Crick Institute opened Europe's largest biomedical lab in London in 2016. It is home to 1,200 scientists. The layout was designed to get people interacting by creating ***"a bit of gentle anarchy"***, says director Paul Nurse.[45] ASDA's main office in Leeds is a vibrant hub of activity with music, the smell of fresh food, charities promoting new initiatives, and employees gathering and chatting.

Open employee eyes and ears to ideas from everywhere: Innovative organisations actively encourage employees to go to conferences and arts festivals, tune into TED talks or the RSA, subscribe to magazines like New Scientist or Uncut, read books and watch documentaries. This isn't an indulgence. It's how to tune into new thinking, learn from other disciplines, make connections and make curiosity a habit. Innovative organisations catalyse informal networks between colleagues who share similar passions. They also encourage active creation of art, music, photography and any other way employees can express their creativity.

Spread new ideas as if they were contagious: There is a range of platforms on which we can meet people with different ideas. Their uses include learning together, solving problems collaboratively, finding shared passions, laughing together and eating together. ***"It's totally possible for you to be sitting by someone who has been working in an area that you were not interested in. And then suddenly a discussion with that person may trigger some new ideas for both of you"***, says Gagan Saksena, former software engineer at Google.[46] Yuval Noah Harari, in his book 'Sapiens', does the maths: ***"In a band of fifty individuals, there are 1,225 one-on-one relationships, and countless more complex social combinations."*** Any one of these connections can spark an idea.

Discover more

InnoCentive is just one of a number of open innovation platforms engaging people on the world's biggest challenges.

www.innocentive.com

43 Johan Norberg, 'Open: The Story of Human Progress', Atlantic Books, 2020
44 Gary Hamel, Michelle Zanini, 'Humanocracy: Creating Organisations as Amazing as the People Inside Them', Harvard Business Review Press, 2020
45 Adam Kucharski, 'The Rules of Contagion: Why Things Spread and Why They Stop', Wellcome Collection, 2020

46 Jeff Dyer, 'The Innovators DNA', Harvard Business Press, 2011

Social media can be the opposite of openness

Adam Kucharski, Associate Professor at The London School of Hygiene and Tropical Medicine, shares why social media platforms usually do the opposite of opening our minds. ***"When sociologists at Duke University got US volunteers to follow Twitter accounts with opposing views, they found that people tended to retreat further back into their own political territory afterwards"***, he says. ***"Although having meaningful face-to-face conversations can help change attitudes, viewing opinions in an online feed won't necessarily have the same effect."*** We are attracted to an article or post, however, if it evokes a positive emotion, is surprising, has 'new' news, is funny, or is of practical value. Researchers at MIT found that 'false news' spreads further and faster than 'true news' and generally originates from people with fewer followers. Why? Because, according to Kucharski, ***"false news is generally more novel than true news"***.

5.3 WHAT CAN WE LEARN FROM HISTORY ABOUT OPENNESS?

"[If anyone] comes up with new ideas, he can go, or I will remove him."

Emperor Franz Joseph I of Austria-Hungary to a group of teachers, 1821

The key to rapid expansion of empires has been strategic tolerance, says Johan Norberg, author, lecturer and film-maker and our guide to openness through history: ***"Persia thrived not because the Persians were superior themselves, but because they understood that they benefited from Phoenician explorers, Greek scientists, Egyptian doctors and Babylonian astronomers."*** [47] Two innovators help prove his point. 11th century Persian polymath Omar Khayyam measured the length of the year as 365.2421986 days – a figure still accurate enough for most modern-day uses. The Arab geographer Muhammad al-Idrisi produced, in the 12th century, the most accurate map of the world that anyone had seen.

Rome thrived for hundreds of years because it tolerated different cultures and religions. America thrived because it was open to immigrants. Between 1880 and 1920, the United States opened its arms to almost 24 million migrants. Eight of the people who signed its Declaration of Independence were born in another country.

On the other hand, the failure of empires has often been because of strategic intolerance. Emperor Constantine converted to Christianity, banned books by 'heretics', and imposed a death penalty on people hiding copies. The Spanish Empire imposed Christianity on others and introduced the Inquisition (which nobody expected). In 1433, the emperor of China reversed a policy of openness and trade. ***"Three years later, the construction of seagoing ships was made illegal"***, says Norberg.

It is openness to ideas from everywhere that has created Western culture. ***"What we now think of as Western civilization is a combination of philosophical heritage from the Greeks, religions from the Middle East, creatively interpreted by Romans in what is now Turkey, and scientific ideas borrowed from the Arabs and the Chinese. We got our alphabets from the Phoenicians, and our numbers are called Arabic numerals because we learned them from mathematicians in Baghdad, who got them from the Indians"***, says Norberg.[47]

We are all mixed race

"Many of us still think in racial categories that eighteenth-century Europeans invented", says Norberg. ***"In 2018, an official document from the American Society of Human Genetics, the primary professional organization for experts in human genetics…"*** said that the concept of biological races are ***"bogus claims"*** based on ***"discredited or distorted genetic concepts"***.

47 Johan Norberg, 'Open: The Story of Human Progress', Atlantic Books, 2020

5.4 INNOVATIVE ORGANISATIONS POWER UP

"I've got the power."

Snap!, 'The Power'

"The hierarchical approach is based on the absurd proposition that lower-level employees are unable to think beyond their own role or unit", say Gary Hamel and Michele Zanini in their book 'Humanocracy'. In fact, an analysis of 300 real-world projects since 1972 found that those led by junior managers were more likely to succeed.[48]

Innovation is dependent on the devolution of power. Hamel and Zanini illustrate that with an example from Haier, a Chinese consumer appliances business. The business seeks to create zero distance between employees and customers. It has divided 56,000 employees into 4,000 microenterprises. The microenterprises are a combination of market-facing units, start-ups and 'nodes' that sell components and services. Each microenterprise is free to contract, or not, with others.

Innovative organisations don't just distribute power; they power up by investing in learning, by giving employees the time they need to innovate, and by recruiting innovators. Here are some examples:

Learning: The Adidas Group Innovation Academy gives a four-week module on the innovation process.[49] Intuit gives training on experimentation.

Time: Google employees (Googlers) can choose to spend 20% of their time on projects they choose. ***"Roughly half of Google's new product launches in recent years emerged from 20 per cent projects."*** Gmail, Google News and AdSense all came from this programme.[50]

Recruitment: The idea company IDEO searches for individuals that have one of three areas of expertise: human factors (observation/empathy), technical factors (design/build), or business factors (viability/profitability). According to Christensen, Gregersen and Dyer, the skills innovative organisations look for are a track record of discovery skills (e.g. inventing something), a deep expertise in one area, a breadth of interest in others, and a passion to change the world.

There's one important pre-requisite of distributing power – a sense of confidence that you won't be embarrassed or punished for speaking up. This was evidenced by Google's multi-year Project Aristotle to pinpoint what made the difference in the performance of internal teams: ***"The strongest predictor of team success was a high level of psychological safety."*** [51]

The more power we give colleagues, and the more we spread that power to include customers, citizens and others who are happy to contribute their time and expertise to our ambitions, the less risk we accept and the more opportunity we create. This is the power of the edge.

One dissenting opinion

According to Johan Norberg, the American psychologist Charlan J. Nemeth has found we tend to follow the majority: ***"But she has also found that a single dissenting opinion or another sort of perspective on the issue opens the minds of the others. People start searching for more information, consider more opinions, become more creative and make better decisions."*** [52]

Everyone an innovator

Also from Norberg's book: ***"Over two decades, the American psychologist Philip Tetlock elicited 82,361 forecasts from 284 individuals whose job is to comment and advise on trends about the world, economics, politics and major events. He found that the experts were not much better than informed non-experts."***

48 Matthew Syed, 'Rebel Ideas', quoting a Rotterdam School of Management study
49 Gary Hamel, Michelle Zanini, 'Humanocracy: Creating Organisations as Amazing as the People Inside Them', Harvard Business Review Press, 2020
50 'The Innovator's DNA', Jeff Dyer, Hal Gregersen and Clayton M Christensen, Harvard Busines Press, 2011
51 Hal Gregersen, 'Questions are the Answer', Harper Business, 2018
52 Johan Norberg, 'Open, The Story of Human Progress', Atlantic Books, 2020

5.5

INNOVATIVE ORGANISATIONS GIVE BIRTH TO CREATIVE PLATFORMS

"Ideas do not have a hierarchy… nor do you have to be blessed in any special way. Anyone can have an idea."

John Hunt, Worldwide Creative Director, TBWA

Let's imagine we want to create an organisational culture where everyone is an innovator. First, we need to be clear about what we mean by culture. I'm defining it as 'what people do' – with all our individual behaviours adding up to the organisation's culture. This is a little like the New Guinea word 'Mokita', which means the truth that everybody knows but nobody speaks. In this case, it's the actions that people take, not what they say that they'll do.

You have three options for creating 'initiatives', though I would call them 'platforms' because they are substantial, long-term, and continue with a life of their own. Platforms can be created top-down, peer-to-peer, or through very specific processes I would call 'micro-actions'. Let's look at some examples:

Google learning: Around 75% of learning at Google is delivered Googler to Googler. Any employee with a passion or an interest in any topic can share learnings with others across the organisation. Even the name, Googler, implies a platform.

HSBC creative community: At HSBC there is a platform for creative colleagues from around the world. While aimed at colleagues involved in disciplines like marketing, branding, training and communications, it is open to others. One initiative on the platform is 'Create. live', which hosts external speakers to challenge and inspire.

Government platforms delivering change at scale: The National Social Marketing Centre was a national platform, set up by the UK's Department of Health to introduce skills in behaviour change across the community of health professionals. The mindset of the director, Jeff French, was that it was a free market. Everyone could contribute ideas and services. The result was a tsunami of change, not just within health, but across many government departments. It created a festival of innovative ideas and projects that changed real behaviours in real lives in real communities, and at scale. It was disbanded by the Cameron government.

The Welsh Government: Another government example is the work of change manager Diana Reynolds on behalf of the 5,000 members of the Welsh civil service. The Welsh Government passed the Wellbeing of Future Generations (Wales) Act in 2015. It provides a framework for long-term action. On its own, this Act with a capital A is a phenomenal catalyst for innovation. What is also impressive is the recognition that it would require a change in thinking and acting across every institution. Diana's insight was the importance of micro-behaviours to change daily routines. For example, she regularly begins meetings by asking participants how they are feeling, and the one question they have on their mind relating to the topic being discussed. This simple intervention provides focus, human connection and leads to more productive meetings.

Discover more

Get more tips and learning resources from the Welsh Government via Academi Wales at:

https://academiwales.gov.wales/pages/quick-tips-awgrymiadau-cyflym

Tortoise Media: This UK news organisation imagines news in a very different way; it's less interested in the buoys on the surface of the ocean than the currents below. Its platforms include weekly Tuesday editorial meetings. The company's 100,000 or so members are active participants in these meetings. Its 'ThinkIns' are short, one-hour meetings on topics that may be primed by experts, but where every opinion is invited.

Innovation catalyser: Gary Hamel and Michelle Zanini, authors of the book 'Humanocracy', have a powerful idea. They imagine a company, or a function, giving employees a virtual budget, say £1k, for imagining and implementing an innovation. Employees have a choice of a solo project or pooling budgets with other colleagues. The big idea is that all proposals are reviewed by peers. Those that are approved are owned and delivered by the proposers.

Creative platforms: There is phenomenal creative talent everywhere. It just needs an opportunity to express itself. Imagine a company that deliberately gives birth to creative platforms that give time and space for colleagues to share their art, photography, songs, films or stand-up comedy routines. These are not competitions. They are employee-led projects to share creative expression.

New York Times investigative journalist Charles Duhigg began a quest to understand how individual and social habits were formed. He reviewed hundreds of academic studies and interviewed over 300 scientists and executives. The result of his quest was the book 'The Power of Habit'. In it, he summarises how new social habits are created. ***"Movements don't emerge because everyone suddenly decides to face the same direction at once"***, he says. ***"They rely on social patterns that begin as the habits of friendship, grow through habits of communities, and are sustained by new habits that change participants' sense of self."*** [53]

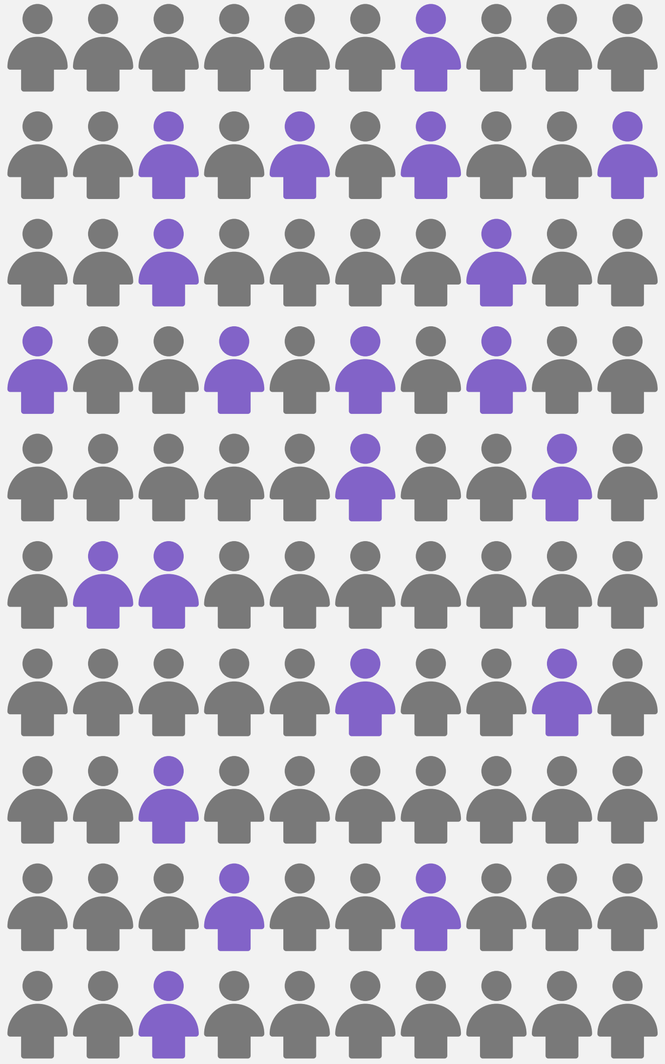
Only when humans are involved

A McKinsey Global Institute report concluded: ***"Findings suggest that it is only when IT enables managerial innovations, facilitates the reorganisation of functions and tasks into more productive approaches, and is applied in labour intensive activities that it plays a major role in driving productivity."*** [54]

21: The magic number

Ronald Ross was a British medical doctor who won the Nobel Prize in Medicine in 1902 for discovering that malaria was spread by mosquitoes. He championed the use of statistics to understand the rules of contagion. The rules he identified work not just in the spread of infections, but also in the spread of ideas. ***"In Ross's simple model, the fastest growth occurs when just over 21% of the potential audience have adopted the idea"***, says Adam Kucharski in his book 'The Rules of Contagion'. In other words, if you can get 21% of colleagues engaged in innovation platforms, you've done the hard graft towards creating a culture of innovation.

The fastest growth of an idea occurs when just over 21% of the potential audience have adopted it.



53 'The Power of Habit: Why We Do What We Do in Life and Business', Charles Duhigg, Random House, 2014
54 'Experimentation Works', Stefan H Thomke, Harvard Business Review Press, 2020

5.6 WHAT CAN WE LEARN ABOUT INNOVATION FROM THE ARTS?

"Imagining what it is like to be someone other than yourself is at the core of our humanity."

Ian McEwan, author

For most of human history, art and science were the same thing. All the significant periods of our cultural progress combined science and the arts. Imagine telling Leonardo da Vinci that art and science were mutually exclusive as he sketched faces or considered birds in flight. In fact, the term 'scientist' is an 18th century invention.

Similarly, many of the world's best scientists are also artists. A study by Michigan University, comparing Nobel prize-winning scientists with all scientists, found that they were twice as likely to play a musical instrument, seven times as likely to draw or sculpt, twelve times as likely to write poetry or popular books, and twenty-two times as likely to be amateur actors, dancers or magicians.

We can imagine the value of culture if we strip it away from the world's great cities. Imagine Florence without its public art, or London without its music venues, art galleries or museums. Imagine entire civilisations without their defining cultural traits – the Khmer without the architecture of Angkor Wat, or Native Americans without dance, song or traditional dress.

But why are we this way? Why would our ancient brains have evolved to paint handprints on the side of caves, or blow through the bone of a cave bear to create music? There are several explanations:

- **Imagination.** One theory is that imagination, like play, is a low-risk way of making sense of our world.
- **Identity.** Another view is that it is a way of expressing ourselves. Jackson Pollock has said: ***"Every good artist paints what he is"***. It may also be a way of keeping our memories alive for future generations. Consider the use of art in ancient Egypt.
- **Sharing.** Art is also valuable as it lets us 'live' the experiences of others, share emotions, and share concepts and ideas through all the senses. ***"Art is a means of union among men, joining them together in the same feelings"***, said Tolstoy. Australian aboriginal people used song and art to share stories from the past and information about natural resources.
- **Invention.** Because we are creatures of space and time, we find patterns. Often these are patterns in what works and what doesn't. We learn from the experience and, without living it again, we can ask ***"What if?"*** questions, to imagine how something would unfold if we changed some of the characters, actions or variables. That's what a good story is. We can then share the story. ***"Being able to share our conscious worlds through stories is what makes us human"***, says Marcus du Sautoy in his book 'The Creativity Code'.

If innovation is about making connections, then we should all tune into the arts. Two of our brain's key networks are involved in the arts and creativity. The first is the Default Mode Network (DMN), active when we are reflecting or letting our mind wander. The second is the Executive Control Network (ECN), active when we are giving something our attention. As George Mather, a professor of psychology at the University of Lincoln puts it: ***"Art really does give all of our cognitive functions a full work-out."*** [55]

The power of our imagination

When we play, we use our imagination. It allows us a low-risk way of exploring different scenarios without making mistakes in the real world. It's the same with art. We tune into cartoons, stories, novels, plays, TV shows and film. Each has a role in helping us develop empathy and, in a way, lead multiple lives – for example, imagining what it was like to be alive during the Roman Empire, or being a character in the TV show 'Friends'. We use our imaginations to shape the small (what we might have for lunch) and the large (the idea of nations or laws or religion). Imagination can be seen as the fuel that drives innovation.

55 George Mather, 'The Psychology of Art', Routledge, 2021

5.7 WHAT ARE THE OBSTACLES TO AN INNOVATION CULTURE?

"It is difficult to get a man to understand something, when his salary depends on his not understanding it."

Upton Sinclair, author and activist

There are (at least) six common obstacles to an innovation culture.

The innovation may be against established opinion. In 19th century Europe, Hungarian physician Ignaz Philipp Semmelweis discovered that childbed fever – a potentially fatal bacterial infection for new mothers – was caused by obstetricians and medical students not properly washing their hands. His experiments reduced deaths by a factor of ten. The medical establishment ignored and ridiculed his findings. He was removed from his hospital post, suffered a nervous breakdown and died in a mental hospital. The rejection of a new innovation or mental model is called the Semmelweis effect.

Innovation may be presented in the wrong context. Humans are victims of thinking within current context. In the film 'The Yes Men', two activists pretend to be from McDonalds and the World Trade Organisation as they present an absurd idea to economics students in London. It never occurs to the students that they are fraudsters no matter how absurd the proposition. This is known as bounded rationality. All of us find it extremely difficult to work against the very strong contexts within which we live.

Innovation may be against vested interests. In England in 1621, there were about 700 monopolies granted by the courts in return for favours and bribes. A study of European guilds by economic historian Sheilagh Ogilvie concluded that over a 500-year period, opposition to innovation was central to guilds' policies, especially if it was seen to threaten their business interests. Vested interests have also been a contributing factor for diminishing over half the human race for much of history. Only from 1800 did women begin to get some rights to education and ownership. And it took much of the 19th century for slavery to move from a standard practice to abolition in most countries.[56] On a more commercial note, Kodak didn't want to develop the digital camera because it would threaten the sale of camera film.

Innovation may go against ingrained practices. If you have a problem, and tackle it in the same way consistently, it becomes not just a habit, but a habit of thought. If you are then given a similar problem, even if there is an easier solution, you will more than likely stick to your current practice. This is known as the Einstellung effect (or Plan Continuation Bias). It is similar to having a plan that you stick to even when circumstances change. This is considered a contributing factor to why ships run aground.

If someone benefits from an innovation, someone else is seen to be losing. An obstacle to openness to ideas is zero-sum thinking. Here are four examples. ***"If some people are getting rich, it's at the expense of others getting poor"***; ***"If my competitors are winning, it's at my expense"***; ***"If I share my intellectual capital, it will slow down my own growth"***; and ***"If the economy is struggling, it's because immigrants are taking my job"***. Johan Norberg puts this in the context of time. If we look at the evolution of humanity over 300,000 years, almost all the breakthrough innovations have happened in the last 200. Our brains are wired for zero-sum thinking. In hunter-gatherer communities, if you have more of the food, I have less. It's difficult to break out of this habit of thought, even when a change is a win-win.

'Them and us' thinking may be dominant, and suffocates innovation. One of the biggest hoary beasts of 'them and us' thinking is nationalism. In the early 16th century, there were around 500 or so independent political units in Europe. Norberg says: ***"In the Holy Roman Empire of the German Nation only a quarter spoke German."*** Even in France ***"not many more than half spoke French as their native language in 1900."*** [56] We are wired to co-operate, and we are wired to think in terms of tribes. Both habits are a part of the human condition. We may be reluctant to acknowledge innovation from a group we perceive as 'them'.

56 Johan Norberg, 'Open, The Story of Human Progress', Atlantic Books, 2020

Vladimir's story

In an Eastern European folk tale, God appears before Vladimir and offers him a wish. The one rule is that anything that Vladimir wishes will be granted to his neighbour Ivan, twice over. Vladimir's face lights up:
"Ok, he says, take out one of my eyes."

Sometimes we just don't understand the math

How many people need to be in a room to make it more likely than not that any two will share the same birthday? The answer is 23.

Douglas Adams' rules of technological innovation

"I've come up with a set of rules that describe our reactions to technology", said author Douglas Adams. The three are:

1. Anything that is in the world when you're born is normal and ordinary and is just a natural part of the way the world works.
2. Anything that's invented between when you're 15 and 35 is new and exciting and revolutionary and you can probably get a career in it.
3. Anything invented after you're 35 is against the natural order of things.

Sometimes we just find ourselves facing different directions...
Image: Richard Steckel

Summary:

Innovation is a behaviour. It's a behaviour everyone and anyone can adopt.

And, because it's a behaviour, it's easy to break down what we need people to think, feel, believe and do.

If I had just two words to summarise, I'd end where we began: "stay curious".

John Drummond
Autumn, 2021

John Tenniel, CC0, via Wikimedia Commons

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