ON INDUSTRIALIZATION: A TECHNOLOGY-DRIVEN PATH TO THE NEXT GENERATION ORGANIZATION

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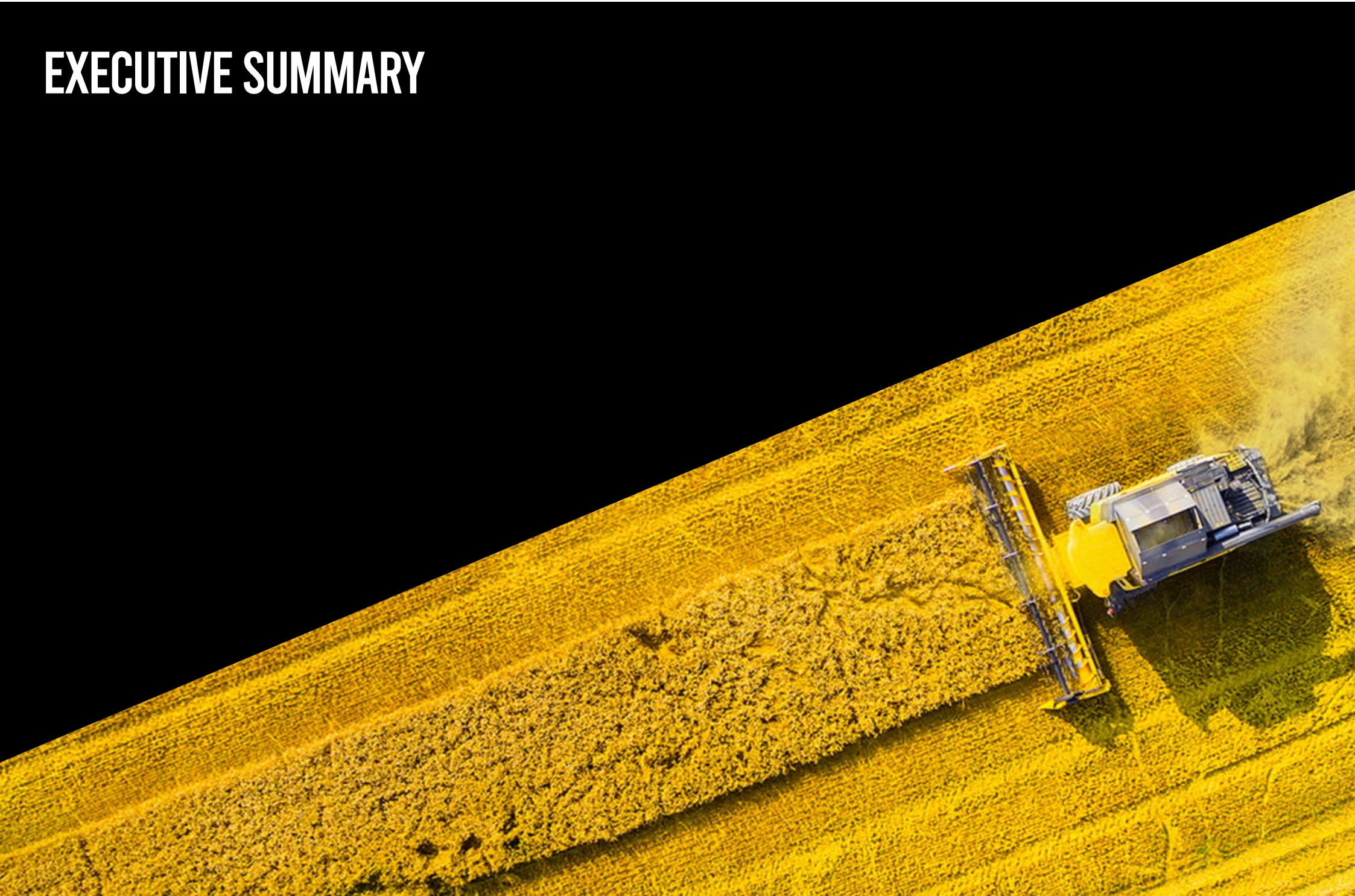
EXECUTIVE SUMMARY



Throughout history, the industrialization of technology has led to new practices and behaviours within organizations. What matters in competition is not so much the change in technology as the behaviours and practices that it enables (e.g. being data driven is more important than owning a data lake). In the recent past, compute has undergone industrialization to cloud, which has over the last decade led to a significant change of practices known as DevOps.

In 2011 we sought to test this hypothesis and find whether the growth of cloud computing had led to two forms of organization, **traditional** and **next generation**. Our report (published in January 2012) showed that two different forms of organization did exist at that time and they had very different behaviours. Its aim was to forewarn our clients about behaviours or practices they needed to examine and adopt. As those practices were still emerging, the report was not prescriptive, but more about setting a direction (e.g. to shift away from learning through analysts toward learning through ecosystems.)

Today we are again being impacted by industrialization in many areas and this change is being accelerated by the isolation economy caused by COVID. Hence, we repeated the study to see if we could find what behaviours would matter.

	TRADITIONAL	NEXT GENERATION	RECOMMENDATION
PRE CONDITIONS	PROCEDURES OFFICE FIRST	GUIDING PRINCIPLES REMOTE FIRST	*STEP 1 - SETUP*
	STEP 2 - EMBED		
ORCHESTRATION	TOP DOWN DIRECTION 'HEROIC' LEADERS UNENFORCED OR UNSTATED PRINCIPLES	SWARMING OF PEOPLE LEADERLESS LEADERSHIP ENFORCED PRINCIPLES	*STEP 3*
STRUCTURE	HIERARCHICAL	NON HIERARCHICAL	
AWARENESS	FOCUS FOR LEADERS KNOW WHO WE SOLD TO & BOUGHT FROM SHIFTING RESPONSIBILITY	SYSTEMIC MODEL ENTIRE SUPPLY CHAIN MAINTAINING RESPONSIBILITY	
BUSINESS MODEL	OUTPUT DRIVEN MOTIVATED BY FINANCIALS COMMS IS ABOUT MASS INFLUENCE	OUTCOME DRIVEN MOTIVATED BY CUSTOMER & SOCIETAL OUTCOMES COMMS IS DRIVEN BY ETHICS	
LEARNING	EXPERT TUITION IN PERSON LECTURES	GAMEPLAY REMOTE FIRST	
INFLUENCERS	MARKETING USED TO JUSTIFY DECISIONS *EXECUTIVES OVER EXTERNAL* PEERS OVER ALGORITHMS	MARKETING USED TO SEEK ALTERNATIVE VIEWS *EXECUTIVES & EXTERNAL* PEERS & ALGORITHMS	*STEP 4*
SUSTAINABILITY	COST TO OPERATIONS GREENWASHING FOCUSED ON THE PROJECT	HARVESTING WITHOUT DEPLETING CORE BELIEF FOCUSED ON THE COMMUNITY & THE PROJECT	
TECHNOLOGY	AI COMPLEMENTS & REPLACES HUMAN FUNCTION AI REPLACES JOBS & TASKS	AI COMPLEMENTS HUMAN FUNCTION AI REPLACES TASKS	

The table summarizes the changes of behaviour that we found in the 2021 population study and our recommended four-step approach to implementing them. The technological causes of these changes are social media, collaboration tools and visualization of/access to data. It is not an exhaustive list but it does comprise a minimum of next generation behaviours that modern firms should be either exhibiting or striving for.

The traditional company

The traditional company may talk of hybrid models of working but it is biased towards a return to the office. It is a procedurally driven organization whose executives see themselves in the role of heroic leaders (even if they don't openly say so). Symbols of power matter: the top floor office, the hierarchy, the stories of heroic leadership and top-down direction. Principles are ideas that are rarely stated or enforced. What motivates people in this environment is money. Sustainability is a cost to operations that is done for marketing reasons. Market research is used to justify executive decisions, not to question them. The focus of the company is always on the output; it might talk about 'community' but it is really all about the product or the current project. External comms is driven by mass influence – getting others to buy the product. Ethics are an add-on. Awareness of the market is considered a function of leadership and the company regards supply chains as a way of shifting responsibility onto others. As a consequence, it understands its own supply chains poorly. To train its people, the company uses expert tuition and favours face-to-face physical lectures. In terms of future technology, the company considers that AI will replace some jobs and functions currently undertaken by humans. It expects the future of the company to be currently one of decline with difficult times ahead.

The next generation organization

The next generation company is not seeking to return to the office but adapting to a more distributed world. This form of remote working — in many cases enforced by the isolation economy — is now seen as the new norm. The company is driven by guiding principles which are stated and enforced in both recruitment and promotion. Power is distributed to where it is needed. Teams will often swarm around problems; leadership is transient in nature and leaders will arise to fit the problem. In this world, hierarchy is unimportant and few care about the top-floor office or the status symbols of power. Outcome not output matters. What motivates people are customer and societal outcomes. The projects undertaken always consider the wider community and sustainability is not a buzz word but a core belief. In support of this, a deep understanding of supply chains is considered essential, therefore these tend to be modelled as the company holds itself responsible for its entire supply chain. Ethics matter a lot and drive external communication; they are not an add-on. Awareness of the market is systemic (throughout the organization) and not the function of a sole leader but of everyone. To train people, the company uses scenarios and gameplay, usually online. The idea of EVE online being a training tool for management is not an alien concept. The company expects that AI will complement humans, replacing some tasks and augmenting some functions. It considers the future of the company to be currently one of growth with positive times ahead.

Along with identifying the changes in organizational behaviours caused by the industrialization of technology and making recommendations for action to encourage them, this report covers the basic theory of industrialization, the hypothesis generated from it that multiple forms of organization can exist, how this hypothesis was tested with a population study, and the results in detail.

Recommendations for action

Unfortunately, we found contraindications in the study data. This means that some of the new behaviours (e.g. leaderless leadership) will be harmful to companies unless certain pre-conditions are met. Those pre-conditions include the use of guiding principles for orchestration and a focus on a remote-first working environment. With this in mind, we recommend the following steps:

1. Assess the state of guiding principles within your organization. To support this, in this report we provide a collection of universal principles (the **doctrine table**) along with a simple mechanism to test your own against it. Where you detect weaknesses in your principles, resolve these before embarking on any other major programme, whether technological, structural or methodological. Alongside this, continue your efforts to encourage remote working, recover costs from unused assets and resist the temptation to return to the office.
2. Provide time for your guiding principles to embed and to reflect on any outcome. Investment may be needed in removing legacy systems, adopting serverless and other areas designed to meet user needs. These investments should be guided by the principles.
3. Once you are satisfied that basic guiding principles are in place and remote working has become accepted as a norm, focus on orchestration, structure, increasing awareness, business model and learning. Re-evaluate sunk costs in past technology programmes including existing data lakes or private cloud environments. In many cases, attempts to create siloed data stores or home-grown efforts may well have been counterproductive and will need to be dismantled and costs recovered.
4. When those steps are completed, focus increasingly on issues of sustainability, how it influences and is influenced by others, and technology. Many of these questions relate to the security and resilience of the organization itself. At this point, investment in technology areas such as AI may provide valuable complements to human capability, depending upon your context.

A contraindication is a specific situation in which a procedure should not be used because it may be harmful to the person.

Common questions

Do you expect these next generation characteristics to become a new norm?

I expect these next generation behaviours to become accepted as the norm in a decade and for many companies to adopt them as a future aspiration.

Where can I find more details on those next generation practices & how to implement them?

They are emerging behaviours which means we are still learning about them. You are not going to be able to avoid experimentation and many experiments will fail.

To understand why it is so difficult to be precise, consider that our research found over 800 different word sets of the form 'X vs. Y' used to describe the differences between traditional and next generation behaviours. When discussing behaviours such as the orchestration of people and resources to resolve a problem, the traditional are described using words such as role-based, slow feedback, homogenous, directed, planned, synchronized, tyranny, accidental, reactionary, centralized command, executive war room, monolithic, over engineered, strategy, hierarchical co-ordination, powerful and charismatic leaders. The next generation are described with words such as adaptable, fast feedback, heterogenous, self-organizing, democratized, intentional, negotiated, collective intelligence, distributed cognition, cell-based, emergent, weak signals, non-hierarchical and leaderless leadership. (This last term often causes confusion: it does not mean that leaders do not exist but that they emerge depending upon the context.)

"Thy way of thinking is indeed pleasing to the Creator, but not thy way of acting."

Yehuda Halevi

This is vastly too many to test. We chose specific words based upon impact tests. For example, with 'orchestration' we tested top down, heroic leaders and unenforced or unstated principles against swarming of people, leaderless leadership and enforced principles. However, these words are describing emerging behaviours, so their meaning is changing. For example, we are still discovering what leaderless leadership means in practice and any attempt to define it is premature. Instead, we can point to examples like Masks4All, WallStreetBets and other forms of distributed autonomous organizations and provide a direction of travel (e.g. we should focus more on leaderless leadership than powerful and charismatic leaders).

What is the difference between behaviours & principles?

Principles are the simple ideas that lead to specific behaviours. The principles can be provided in many forms (e.g. lessons on things we need to think about; lessons on things we should avoid; described through conversational form; even embedded in parables and fables). Principles are not detailed steps to follow (such as procedures) nor are they hollow words to be ignored. They provide the mental scaffolding that guides how to look at a problem. For example, Amazon's leadership principle on customer obsession is *"Leaders start with the customer and work backwards. They work vigorously to earn and keep customer trust."* Although Amazon's leaders pay attention to competitors, they obsess over customers. The principles are not just words but are acted upon, measured, tested and challenged against throughout the entire organization. This report examines the emerging behaviours of the next generation.

The principles are not just words but are acted upon, measured, tested and challenged against throughout the entire organization."

What are the new principles?

I have an idea of the new principles that will enable the behaviours described in this study, but I am not satisfied or confident enough with them to update the doctrine table at the time of writing. The doctrine table is itself an accumulation of principles that enable behaviours that are considered universally useful. Since I am not confident about the new principles, I am providing the raw behaviours to at least make readers aware of the changes that are happening, the direction we are heading, and the areas being impacted. Notably, one of the emerging behaviours is the use of guiding principles. Some companies are better at this than others.

What are the most interesting companies to follow?

Haier, Amazon, Microsoft and others are cited in this report, but I would caution against simply copying. This is a common mistake. For example, companies try to copy Spotify's organizational model on the assumption that this will make them more effective. As Spotify itself made clear, it does not use the organizational model that many claim it does and what matters is not the organizational model but the guiding principles it follows.

It is vitally important to apply guiding principles to your context. Once you have a strong and stable base of guiding principles then explore next generation behaviours (e.g. setting up incentive programmes that drive behaviours towards more sustainable goals or implementing approaches such as RenDanHeYi to challenge hierarchies) as appropriate to your business. This is impossible to do unless you understand your context. This report can only point you in a direction; it cannot provide solutions to everyone's specific context.

Should I invest in this technology?

I caution against investment in large technology, structural or methodology programmes until you have put guiding principles in place. One of the problems with the 2011 report was that people assumed that by investing in data lakes they would become data driven, when they should have become data driven first. Of course, you cannot become data driven if you do not understand the environment that you are working in. This requires principles such as know your users, focus on user needs, understand the details (e.g. the value chain), understand what is being considered (e.g. how evolved components are), use a common language and challenge assumptions. All of these must be in place before you can become data driven, which should happen before you invest in technology.

What about cloud?

Use of cloud services and DevOps was next generation behaviour in 2011 and is now considered a given within companies where the focus has shifted towards serverless. I no longer consider cloud or DevOps as next generation practices as the industry has moved on. In many cases, if a company has not embarked on a cloud journey, then I recommend skipping this step and moving straight to serverless. Examples of good practice in that space can be found with Liberty Mutual and iRobot.

I no longer consider cloud or DevOps as next generation practices as the industry has moved on."

What is the most interesting emerging technology that you have seen?

That is mostly irrelevant. What matters are the emerging behaviours, which are mostly driven by existing technology such as social media, collaboration tools and visualization of data becoming more commodity-like. To work based on emerging technology would require cause-and-effect type predictions, which are notoriously poor. Even Google, which has access to most of the world's data, has a graveyard of failed emerging technology efforts.

You seem to be rather negative about data lakes?

The purpose is to be data driven; the technology will not make you that. In many cases, companies have heavily invested in building data lakes and are now retrospectively trying to find a ROI. This is completely the wrong way of approaching the problem. By pure coincidence, those past investments might realize value if raw disk prices continue to accelerate due to the impact of Chia coin, but that is by accident not design. The general trend is towards managing the flow of data rather than the storage of data. There are several reasons for this including questioning the value of data at rest, the realization that data shared can often create more value than data stored (especially in the field of sustainability), the increasing cost of storage, and awareness that in many cases it has become physically impossible to store the data generated. A case in point would be Swim.ai where the half-life of data (i.e. the time it takes to rapidly reduce in value) is considered to be around 50ms.

You do not mention crypto currency?

It did not feature heavily across all our research groups, but there are certainly interesting efforts around Ethereum to create distributed autonomous organizations. The absence of something does not mean it is irrelevant; it simply means it was not caught by this method or tested by it.

What do you mean by gameplay in learning?

There is an increasing use in the next generation of simulation environments, scenario planning and use of gameplay. Some of the best executive training courses can be found in environments like World of Warcraft (a massive online roleplaying game) and EVE Online.

I work for a company that looks traditional & is trying to get everyone back into the office.

There are a lot of executive power issues wrapped up in the back-to-office demands. Do not underestimate the importance of status symbols such as top-floor offices. And a company can quite happily survive in a more traditional form if it is competing against others that look just like it or the industry is somehow protected from outside competition. However, such protections are not permanent and encourage complacency. We recommend you discuss the behaviours outlined in this report at an executive level and challenge the reasons for returning to the office.

But I read a survey that most companies are looking towards returning to the office.

Generalized surveys of a population that consists of many different sub-populations will often hide the underlying trend or even give you the completely wrong answer. This is known as Simpson's paradox. For this reason, it is important to understand whether the survey population consists of multiple different populations. In our study, we tested the hypothesis that both traditional and next generation forms of company exist; if they did not, then generalized surveys would be fine. If we had conducted a general survey with a sampling bias such that more traditional companies responded then it would have been easy to conclude that companies should focus on output over outcome. However, when we examined the populations, it was quite clear that the next generation organizations focus on outcome over output. Be very careful with generalized surveys.

The next generation organizations focus on outcome over output."

Isn't this just your opinion about the future?

No. This is what the data shows is happening today. Opinions, anecdotes and past experience are not relevant. Even averages from wide samples are questionable when population differences are not considered.

I don't find this relevant to my company.

The changes of behaviour described are relevant to all companies, but the existence of contraindications means that you may not be able to implement them until you have resolved the underlying conditions through

the adoption of guiding principles and remote working where possible. However, these behaviours do present a significant challenge to assumptions about what leadership is. Whilst this may be uncomfortable, the change in communication structures through social media and collaboration tools means they will eventually be unavoidable.

I am not surprised that 'guiding principles' was highlighted as a contraindication in this study. If you do not focus on users, focus on user needs, understand the details, understand what is being considered and challenge assumptions (all of which are principles in the doctrine table) then it is difficult to imagine how you could possibly achieve the more complex behaviours described in this report.

Principles matter. To paraphrase Yehuda Halevi, they are a way of thinking which when acted upon will hopefully lead to pleasing behaviour. This is what this report is all about.

These behaviours do present a significant challenge to assumptions about what leadership is"

What does the report cover?

The report describes the problem space we examined, the basic theory of industrialization, the hypothesis generated from it that multiple forms of organization can exist, development of the research process, the creation of research groups, observation of change in multiple industries, testing that change, finding the characteristics that appeared to describe different organizations, development of prototype descriptions for traditional and next generation companies, development of the hypothesis to test, how the hypothesis was tested, the results in detail and the analysis from this.

Where do I start?

Start with step 1: use the doctrine table provided in the report to assess your own use of guiding principles.

ACKNOWLEDGEMENTS

Thank you

First, I would like to thank the estimated 1,400 people who responded to the survey or the various online tests that we have done. Without your input, none of this would have been possible.

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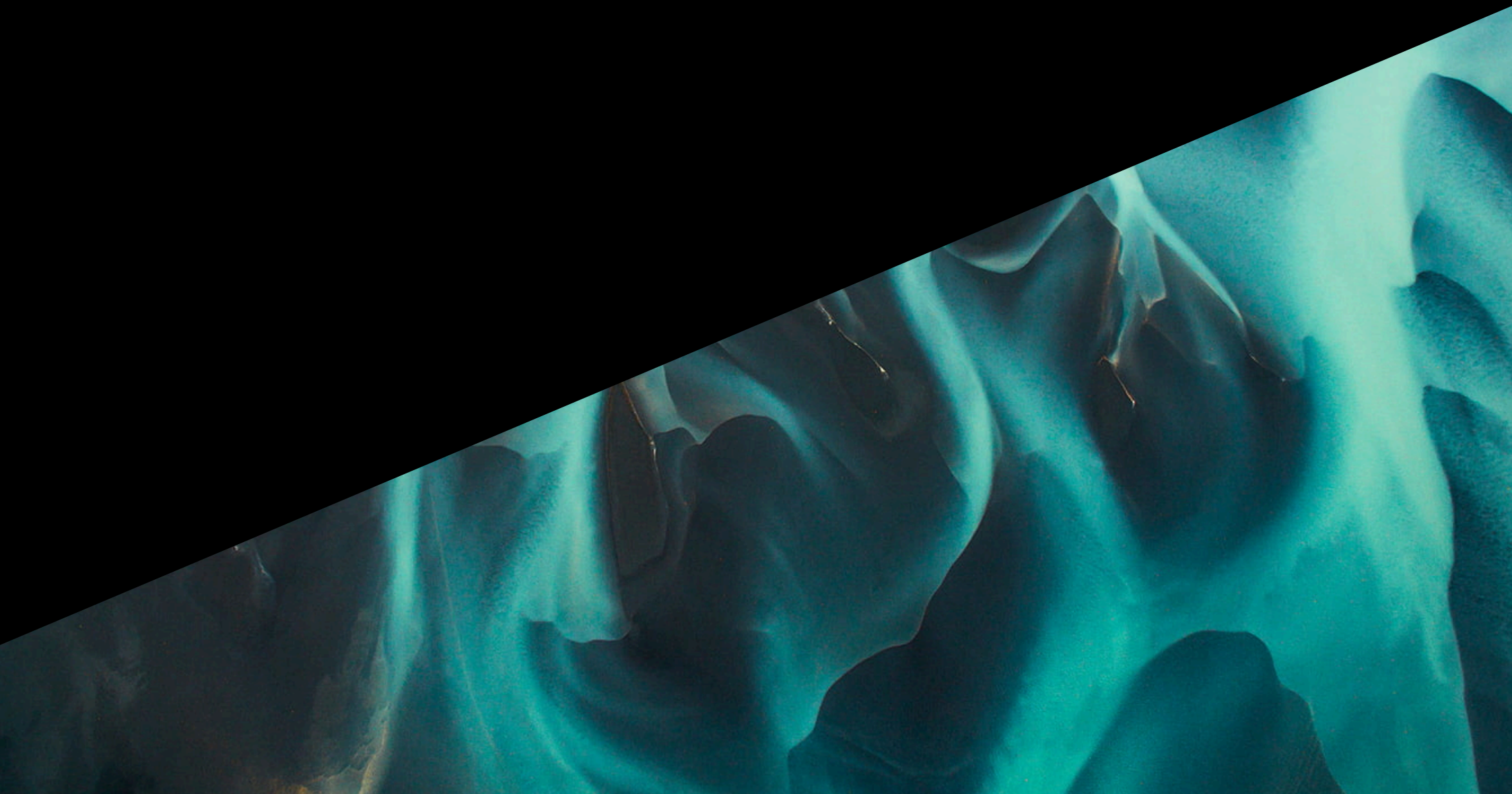
Third, I would like to thank the companies presenting in our study tour and electives (which were an integral part of this research) for their involvement and being so open to our questioning. Special thanks are given to Microsoft, Amazon, Sixense, BrainCo, Upekkha, Spatial, Virbela, Augumenta, Prehype, The Floow, Swim.ai, Planet, MakerBot, iRobot, WeRobotics, Synthesia, a16z and Rezilion.

Fourth, thank-you to the attendees of the study tour for being willing test subjects in our experimentation. Special thanks to Michael Conlin for the challenges given.

Finally, I would like to thank Jane Kingston and Sarah van der Burg whose tireless efforts and help in organizing the tour, the electives and research groups have made this all possible.

THE RESEARCH: THE PROBLEM WITH PREDICTION



In this 1940 science fiction thriller, Robert Heinlein predicted that in the future, all roads would be vast conveyor belts.

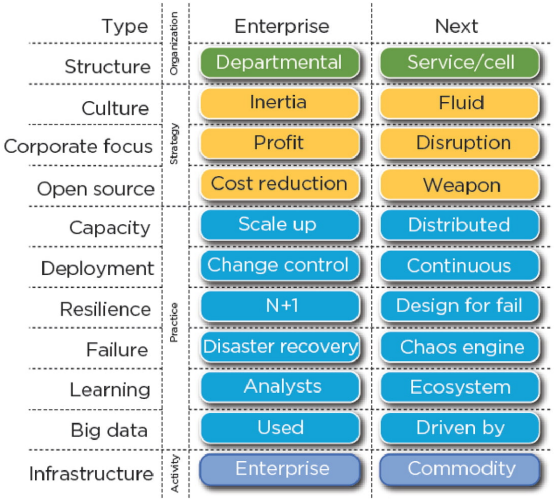
Most science fiction writers get it wrong, even Robert A. Heinlein. The roads did not roll; the future was not conveyor belts everywhere. But so much science fiction is published that by pure chance some of it turns out to be right. Our tendency to focus on that which is right creates a selection bias that leads us to think that we are better at forecasting than we really are. In truth, as political psychologist Conor Seyle stated: *"Humans are very bad at understanding statistical trends and long-term changes"*.

With that in mind, how could we go about identifying potential impacts on organizational behaviours caused by the industrialization of technology? Our tendency is to ask experts in the field what their thoughts are on the future. In December 2019, the top CIO predictions (according to CIO magazine) were: machine learning; unstructured and big data; drones; voice-based user interfaces; blockchain; 5G; Internet of Things (IoT); process automation; resilience planning; digital transformation; training; edge computing; cyberthreats; facial recognition; citizen developers; digital twins; data visualization; situational awareness; technology scaling; customer centricity; data lakes; DevOps; real-time analytics; blockchain; joint ventures; scenario planning; microservices; privacy; data flow; shifting to public cloud; and shifting away from public cloud. Ignoring that these predictions are a confusing mix of technologies (big data) and behaviours (situational awareness) then even by luck alone, some of this will be right – and they are the experts.

However, Philip E. Tetlock* collected forecasts from 284 highly experienced experts with more than 12 years' experience in their fields and examined a total of 82,361 predictions over 20 years. 15 percent of 'impossible' things happened; 25 percent of 'sure things' were false. Overall, experts tend to be horrific forecasters. So how do we know what, if any, of this word salad is right? Where should we focus? Maybe we should take an average of the many forecasts? Unfortunately, the average colour of the Mona Lisa painting is a dark olive, but a single blob of olive coloured paint hardly does justice to its rich tapestry or describe the key features of that enigmatic smile. Averages across an entire system are often a poor means of trying to determine patterns within it. So, what do we do instead?

*Philip E. Tetlock, *Expert Political Judgment: How Good Is It? How Can We Know?* Princeton University Press, 2005

A lesson from the past



Type		Enterprise	Next
Structure	Organization	Departmental	Service/cell
Culture	Strategy	Inertia	Fluid
Corporate focus		Profit	Disruption
Open source		Cost reduction	Weapon
Capacity	Practice	Scale up	Distributed
Deployment		Change control	Continuous
Resilience		N+1	Design for fail
Failure		Disaster recovery	Chaos engine
Learning		Analysts	Ecosystem
Big data		Used	Driven by
Infrastructure	Activity	Enterprise	Commodity

2011 LEF population study examining changes in organizational behaviours.

As an alternative we could use a population study. Almost a decade ago, I published this table to describe how organizations were shifting from a traditional form to a set of **next generation behaviours** driven by the industrialization of underlying technology (i.e. cloud). This was not a prediction but a population study, which simply showed that two groups of companies with very distinct characteristics existed at that time. Most companies were in between these two groups, on a transition from one to the other. The only prediction we made in our study was the future direction of travel away from traditional towards more next generation. A decade later, many of those next generation behaviours – DevOps (scale-out, continuous deployment, chaos engineering, design for failure); being driven by data; cell-based structures (Amazon's two pizza model) and learning from the ecosystem – have become more common or stated as future aspirations by many. Yesterday's next generation is increasingly becoming this generation.

The 2011 study was relatively easy to undertake because there was a common cause of change – the industrialization of computing from products to utility services (cloud). Such a pattern of industrializing technology leading to a co-evolution of practice and a difference in organizational behaviours has occurred throughout history: industrialization of electricity gave us Fordism; industrialization of mechanical components gave us the American System of Engineering.

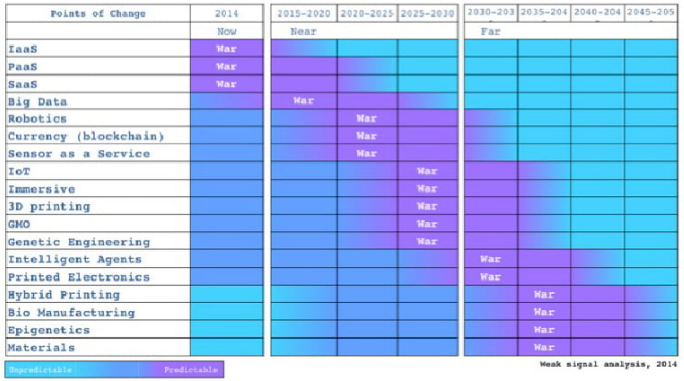
This provides three possible paths for us to try to determine the future:

Path 1 – Take averages from a group of experts in a survey. Whilst simple, it has extremely poor accuracy and often blurs out important changes.

Path 2 – Identify changes in industrialization and then apply some cause-and-effect method to determine what will happen. A favourite with science fiction authors but it tends to be inaccurate.

Path 3 – Conduct a new population study where we look for emerging patterns of behaviour based upon some industrializing technology.

A stumbling block



Heat map used in 2014 report to identify areas of industrialization within technology.

We can discount Path 1 (ask the experts) due to its poor accuracy. It is tempting then, to follow Path 2 (cause-and-effect). In 2014, I had even published the heat map in the table, which used text analysis to identify when specific technology areas were likely to see some form of industrialization in a shift from product to more commodity forms. This point of industrialization, associated with new entrants into the space and inertia barriers for existing incumbents, is a point of 'war' because the past rarely survives the encounter. The new entrants take over and the past collapses over time in a process that Joseph Schumpeter described as *"creative destruction"**.

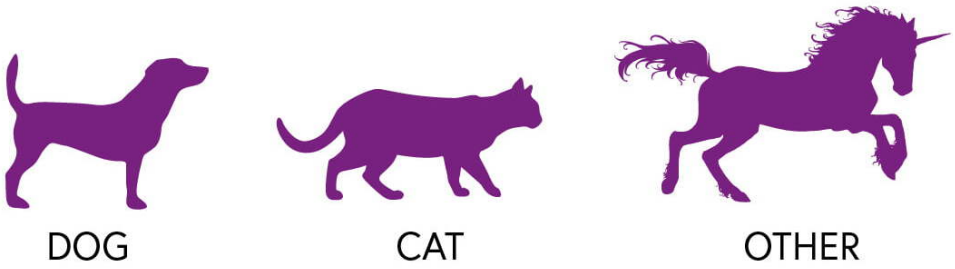
We could use this heatmap as a basis for any cause-and-effect discussion. In 2014 we had already been experiencing 'war' with infrastructure as service. The battle for the runtime (PaaS or what is now called **serverless**) had also kicked off with the introduction of AWS Lambda. Looking at the heat map, for the period of now (2020 -2030) we should have robotics, blockchain, Sensor as a Service, IoT, immersion, 3D printing and genetic engineering entering this stage of industrialization. Some validation for the heatmap is that seven years after it was created the topics of IoT, blockchain and robotics (i.e. drones) were indeed being mentioned in CIO surveys.

So, we could get together a group of companies in these spaces and try to work out what is going to happen through industrialization using cause-and-effect based on the heatmap. Unfortunately, this is exactly what experts in the field tend to do. We would be replicating the work of experts who themselves tend to create faulty predictions. A second problem is deciding where to start. In 2018, we had spent a year examining one aspect of this table – the rise of serverless – which was already happening and whose related practices had already appeared, and we would be looking at changes across seven different areas, many of which may not have started.

Path 2 did not seem either practical or likely to be fruitful.

*Joseph Schumpeter, *Capitalism, Socialism and Democracy*, Harper & Brothers, 1942

Of cats and dogs



The last path left to us was a new population study. This would be similar to the 2011 study and based upon the hypothesis that there exist two extreme forms of companies – traditional representing the past and next generation representing the future – caused by industrialization of some technology. Unfortunately we had no clear cause (unlike cloud in 2011). So, how would we find them?

We could simply ask them: Are you more next generation? But this suffers from subjective bias and the tendency for people in business to want to appear to be leading edge. Instead we needed to build some sort of test that identifies the next generation, demonstrates that it is different, shows that the traditional will evolve into it and identifies whatever technology is causing this. But how?

To illustrate the challenge, let us hypothesize that a population of 1,000 animals of various types includes cats and dogs, but we have no idea what a cat or a dog looks like. First we need to demonstrate that dogs and cats exist in that population and they are different. We could guess that dogs are taller than average and determine the average height of the entire population. But as we have seen ("the average colour of the Mona Lisa is olive") averages can be fairly meaningless. With 1,000 animals our averages would also be affected by samping bias. So, instead we need to test against relative characteristics – that dogs are taller than cats.

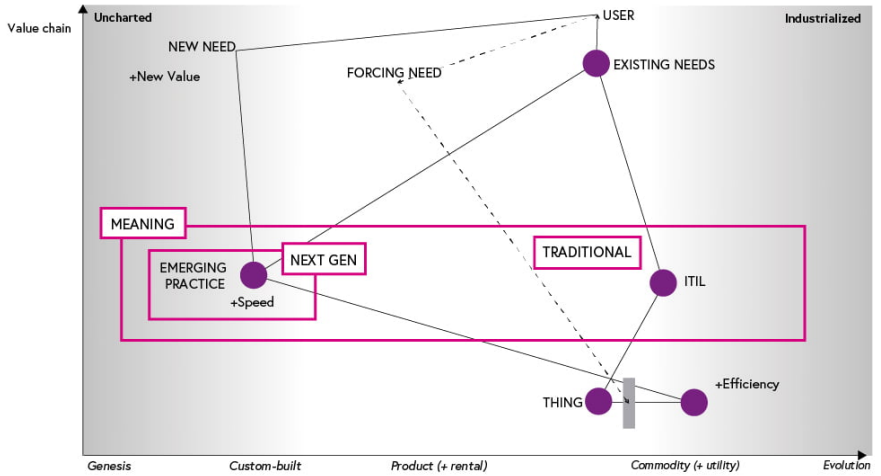
So we need to create **prototype** characteristics for what we think a cat and a dog are like (e.g. whether they bark). We need to test the separate cat and dog populations against those prototype characteristics and demonstrate statistical differences between the populations, plus **alignment** across them – that dogs look like dogs for all dog-like characteristics, and the same for cats.

This still leaves us with the problem of how to separate the population into dogs, cats and others. For this we need a set of separation questions. What should we ask? Do you have a tail? Do you treat humans badly? The quality of those separation questions will determine what sort of populations we might end up with – with the wrong questions our 'dogs' might contain all manner of beasts. But let us assume we find a set of questions that gives us populations of cats and dogs. We can then test our relative characteristics.

Our population study is about traditional and next generation companies, and is complicated by the issue of evolution. We need to demonstrate the **directional** element of our hypothesis with traditional companies becoming more next generation over time. The principles of the population study are the same as for dogs and cats. We must determine **prototype** characteristics for the next generation and build a survey using **separation** questions to test these characteristics including **alignment** and **direction**. But where do we start? How do we find what the next generation looks like? The problem with population studies is that so much can go wrong. We could mess up the separation question, look at the wrong characteristics, or be wrong about the hypothesis that there are separate populations.

For these reasons, we normally undertake such a population study when we believe there is a probable cause for the difference. In our case the probable cause was industrialization of some technology; we just didn't know which technology.

Exploring the probable cause



The basic pattern of co-evolution of practice with activities

From the heat map we had seven areas of potential industrialization, some of which may not have started, all of which were predictions and all of which could lead to multiple changing practices. This gave us some cause for undertaking a population study.

To start, I went back to the basic pattern of co-evolution that was used in the 2011 population study. The evolution of a thing across a state (custom built to product or product to utility) changes the characteristics of the thing. It has a different **material** state. Compute as a product (servers) is materially different from compute as a utility (cloud) and that difference is seen in its **properties**. An example of this for compute would be MTTR

(mean time to recovery): compute as a product had a high MTTR – it would take weeks to get a new server – but as a utility (cloud) it has a low MTTR since it now takes seconds to get a new machine.

This change of material allows for new **capabilities** which we call **practices**. For example, cloud led to novel practices such as design for failure, chaos engines, distributed systems, and continuous deployment under the banner of 'infrastructure as code' and later 'DevOps'. These practices will evolve, starting as novel and eventually becoming good or best practice for that material state. Thus DevOps will become best practice for the use of compute as a utility (cloud), whereas ITIL is best practice for compute as a product (servers).

The material change brings us efficiency, the change of practice brings us speed and the combination of both allows for new needs to be met and new value to be created. This is all summarized in the map. (Readers unfamiliar with mapping can find an introduction here.)

The first thing to note from the map is those practices (DevOps and ITIL) share a **label** or **meaning** (they are both about architectural practices). In the same manner, the materially different instances (servers and cloud) share the label or meaning of compute. But despite the label being the same, the meaning is in reality different.

- As technology evolves to a different material state it **causes** a change of practice
- This change also allows for new needs to be met and new value to be created
- Those practices are different competencies, but they do share a common **label**. So, whilst the **label** is the same, the **meaning** of the label has changed

There is also inertia to change caused by past success and pre-existing capital including pre-existing practices. Being good in the past turns makes adoption of the future that bit more difficult. When the COVID pandemic hit Europe, it became immediately clear that it would act as a forcing function for change. This was less about the creation of new technologies and more about overcoming existing inertia and adopting pre-existing technology — Zoom, telemedicine and virtual environments were all there, pre-COVID. Such events have happened throughout history. Mountains of horse manure and the outcry it caused in New York city at the turn of the 20th century had paved the way for the adoption of the automobile and the changes of practice it brought such as out of town shopping centres, malls and mass commuting to work.

Could we use this pattern of co-evolution to find and test changes in our populations of companies? Even if practices were changing, they still had the same label – compute was still compute even though it had evolved to

cloud. So, we need to find changes to meaning for labels that remained the same. If we could find these changes of meaning, we could find the practices in order to build our prototypes for traditional and next generation companies.

The process is almost like 'Derrida in reverse' (in deconstruction theory* , the central idea is that the meaning of words is tied to their context; there is no 'truth' to words, simply a reflection of their context.) As the context changes, so does our meaning though the labels remain the same. Change of meaning is our entry point into this problem.

Our first step would be to find meanings that seemed to be changing across many industries. From this we would build prototypes for traditional and next generation behaviour. We could then test them with a population study. However, we would need to dig further to find underlying technology causes because:

1. Whilst a survey might give us correlation, for validity we need to understand what technology is causing the change
2. The technology causes might help us determine where to target our survey (the **target space**)

*Jacques Derrida, *Writing and Difference*, Routledge, 1978

This is very different from the usual approach to examining future trends. It is common for forecasters to focus primarily on technology – the power of AI, the disruptive force of bitcoin, the digitization of organizations with cloud – and then to extrapolate from this 'perceived truth' using concepts of cause and effect to arrive at numerous possible futures – what impact will the autonomous car have? How will quantum computing change industries? However, it is not the technology itself that drives the future but the practices that develop from it. Cloud without DevOps is just a more efficient use of resources; cloud with DevOps is about speed, new sources of value, new ways of architecting along with more efficient use of resources.

So, we started with changes in meaning and worked back to practices and finally to technology causes.

It is not the technology itself that drives the future but the practices that develop from it."

Our research process

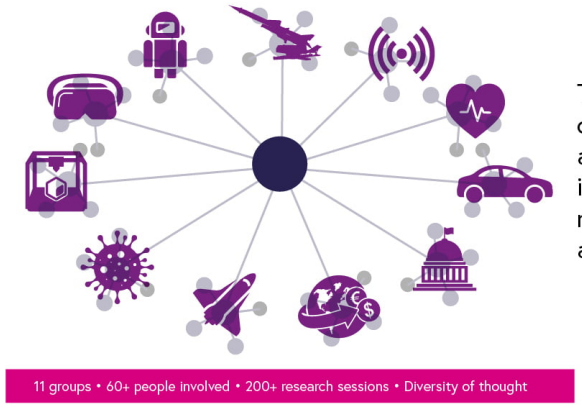
Our research process was now defined:

1. Find changes of **meanings** across multiple industries and test those changes of meaning with outside groups.
2. Use those meanings to determine a set of **prototypes** for traditional and next generation behaviours and practices.
3. Ground the next generation in today's reality by finding examples of the prototypes, hence avoiding the need to invoke cause-and-effect predictions of future states. We are looking for the future that is already here but not evenly distributed.
4. Map the changes to determine the underlying technology causes. Confirm with external groups that those technology **causes** are considered to be industrializing within the next decade.
5. Given that the change of meaning and technology causes could be significant in number, find a way of targeting the interconnection between the two to determine a **target space** of relevant change for us to test.
6. From that **target space** select a list of 20 or more **prototype** characteristics to test.
7. Our hypothesis is that two distinct populations of companies exist, one group representing the new next generation, one group representing the past traditional forms. To test this, we would need to identify:
   a. Key **separating** questions for the population.
   b. Questions that identify a sense of **direction** (will we all become more next generation over time?)
8. Run an online survey and test the data collected against the hypothesis:
   a. Do two distinct populations exist?
   b. Are the populations **aligned** (does one have next generation characteristics whilst the other has traditional?)
   c. Is there a sense of **direction**? Does the wider population (outside of the two distinct populations) fall in between the characteristics of both groups? Is there an indicator for future direction?
   d. Are there any contraindications?
9. Perform analysis and reach recommendations.

There are many paths to failure in this research process: the hypothesis could be wrong, we might fail to choose useful separating questions, the prototypes could be wrong, we could fail to discover any changes in meaning, the populations might not align, we might look in the wrong target space and any signals of difference could be too weak to distinguish. There are many more paths by which this process could fail than it could succeed.

However, purely from anecdote, we had a belief that something seemed to be happening in the industry even if we could not say what it was. This was a gamble – but then, all experiments are.

THE RESEARCH GROUPS

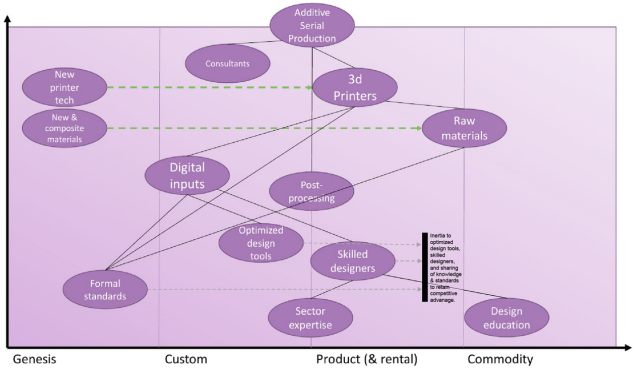


To sense changes of meaning across multiple industries we needed to create a sensor network.

To help find the changes of meaning, the prototypes for what the next generation and traditional looked like plus the target spaces that those next generation organizations might be operating in, I needed to create a human sensor network. In May 2020, I put together a team of 70 volunteers, organized into 11 different groups covering subjects such as defence, healthcare, robotics and immersion. Using regular Zoom calls, Slack, Miro boards and maps, they discussed the changes that they were seeing in those industries or fields. While the teams discussed the changes, I captured any changes in meaning that seemed to be highlighted across the groups.

The research groups covered over 200 hours of discussions, generating many hundreds of pages of notes and links. The topics were wide-ranging, from the use of sensors in underwater data centres to tracking satellites in space. What follows give a glimpse of those conversations.

Manufacturing



Many of the groups developed early maps whilst exploring changes in industries, covering topics from technology changes to policy & societal change.

The early parts of the discussion primarily focused on 3D printing, new materials in digital fabrication, mass personalization, the role of AI, automation with robotics, touchless workspaces, remote work, collaboration and the 'virtual shift'. As the discussion progressed, they began to focus on the comparative difference between additive manufacturing techniques and traditional approaches for price, sustainability, supply chain management, recycling and re-generation. The group then started to map out the spaces, which led to numerous conversations on the lack of skills, tools, standards and basic data which in turn expanded the conversation into logistics, lack of understanding in supply chains and the need for open data versus patent protection. This led rapidly into issues of nation state competition, use of swarming for robotics and even manufacturing in space.

What had started as a relatively simple look into manufacturing change due to industrialization of 3D printing technology had expanded to cover a myriad different forces. Out of this grew a recognition of different ways of organizing, in particular the concept of swarming of people, Haier's RenDanHeYi model and how communication mechanisms seemed to be disrupting hierarchies. That the structures we use reflect our communication mechanisms is critical. In the past, the cost of transmitting information to every point was prohibitive, which led to command and control structures. The absence of 'the office' (due to COVID isolation) had allowed us to discover that in the modern age we can manufacture with different structures.

Government

The Government group covered a mix of experience from G7 and national Government level to complete outsiders. The subject matter was so broad that at first the group wandered in multiple directions, from the role of digital transformation in Taiwan (Audrey Tan's interview on the use of collective intelligence and social media to counter COVID) to cyber attacks on critical power infrastructure and the use of robots in healthcare in Saskatchewan to the problems of misinformation. This was interspersed with discussions on the perceptions of trust, data journalism, impacts of autonomous vehicles, quantum computing and the idea of Government as a platform. This expansive early discussion was reminiscent of the CIO word salads but quickly the group narrowed in on discussions around sustainability, the rebalancing of the fossil fuel industry, misinformation, healthcare and education. Emphasis was placed on the impacts of remote working combined with deep dives on outcomes vs. output focus and the constant influx of manias: *"The media in the last four years has devolved into a succession of moral manias. We are told the most important thing ever is happening for days or weeks at a time, until subjects are abruptly dropped and forgotten but the tone of warlike emergency remains"*. This in turn led to an entire series of discussions based on maps that the group had created around values, guiding principles and the challenge of existing orthodoxy through social media. A particular focus was on healthcare systems and the role of groups such as Masks4All and Buurtzorg.

Healthcare

As with other groups, the healthcare team consisted of a mix of people involved in the industry and outside it. The early discussions started with technology and the use of AI, sensors, telehealth and robotics in healthcare but quickly shifted to the issue of baselines within medical data and our poor understanding of how the human body works. The conversation switched rapidly to radicalization of people online, the role of social media in challenging orthodoxy with Masks4All and the lack of transparency within many healthcare systems. This moved on into national comparisons where the issues of principles, intent and trust around the response to COVID were discussed. The unprecedented quarantine of 11 million people in Wuhan, the Chinese government orders on food supply and anti-profiteering combined with the use of the military to deliver medical supplies were seen as radically different. In the US, trust in federal government was low but local

government was high. In China, the reverse seems to hold but along with trust there seemed to be deeper cultural issues at play. As an MIT forum put it: *"In China, wearing masks during an epidemic is a readily accepted practice — unlike the situation in, say, the United States or some European countries, where the issue of mask-wearing is revealing civic and political fault lines."*

The group then started to map the interconnections between the parts and a constant recurring theme became the swarming of people, access to data, challenging orthodoxy, codes of practice, guiding principles and the role of social media.

Robotics

The group dived into the mechanics of robotics with concepts like swarms of robots used in farming including fruit picking, swarms within defence, robotic surgery, cleaning robots, components in the robotics supply chain including specialized cards to power the AI such as the NVIDIA Jetson Xavier NX, the use of virtual worlds to train robots and to combat COVID, drones in medical supply delivery, manufacturing and co-robotics.

This led into a discussion of physical robots, security, machine learning and the role of humans, which expanded into the concepts of robotic process automation and bot networks. In a surprising shift, the group then focused on the battle for human sentiment with the Pentagon's Office for Strategic Influence, the British Army's 77th Brigade and the Integrity Initiative before returning with the more everyday such as robotic lawn mowers, food preparation, Amazon Scout delivery bots, warehousing, marine robotics to tackle environmental pollution and chatbot platforms.

The constant switching between the physical and digital led to exploration of policy issues such as the need for a bot to identify itself, whether the use of humans to provide training data for future robotic replacements was ethical and the question of who works for whom. This led into discussions of human interaction and comfort, ethics and nation state competition including restrictions in communication mechanisms.

The group started mapping out the space and identified numerous constraints such as control systems, lack of standards and access to data such as satellite imagery.

Finance

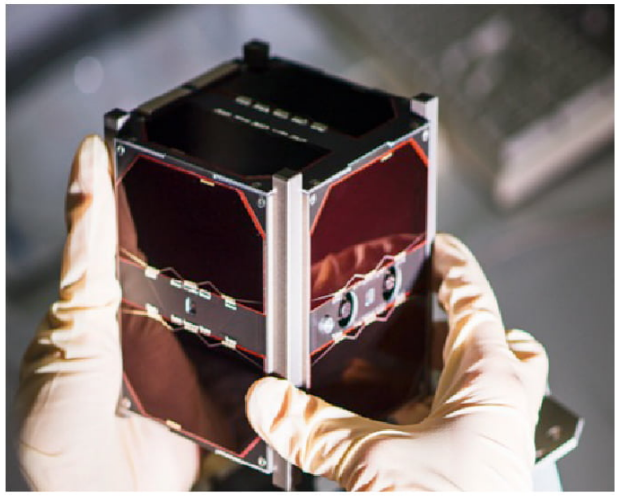
GameStop underwent a meteoric rise in market capitalization as share price rose from $4 to over $200 driven by the actions of the 10.5 million small investors on the WallStreetBet subreddit group.

The finance group included a mix of experience from retail, insurance and crypto to complete outsiders. Early discussions started with the mechanics of finance with references to how financial analysts were scraping job postings for early detection of downward estimates, to the definitions of commodity, the role of tech companies and the tech backlash to mortgage repayments and looming bank collapses.

Fairly rapidly the conversation expanded into managing uncertainty (citing Liberty Mutual and its use of serverless) to sustainability concepts such as Icebreaker One and the idea of purpose-driven investments with a focus on outcome. The role of cryptocurrency featured heavily along with the challenge to existing governments, the rise and fall of challenger banks, protectionism of the existing institutions, trust, cybersecurity, and the role of nation state actors in financial systems and in industry. There was a long and detailed discussion of mobilization impacts including radicalization of people online, combined with the pace of change and how the balance of power is shifting as millennials working at home become primary movers of the market.

Many of these ideas were then coalesced into early maps. Several of the conversations were also highly prescient. One conversation outlined the rapid rise, mobilization and impact of citizen investors in challenging existing orthodoxy which the group then got to watch in real time with the spectacular rise of WallStreetBets and GameStop (see image).

Space



In 2020, a total of 1,282 spacecraft were launched with the majority being CubeSats (small, industrialized satellites). SpaceX alone plans to launch 42,000 satellites for its Starlink service.

The group first focused on the economics of space (including low Earth orbit or LEO satellites) and how the price had reduced from $20K/kg to $2K/kg over the last decade, enabling LEO swarms for earth observation, remote sensing and communication. The number of spacecraft launched increased from 492 in 2019 to 1,282 in 2020. This discussion quickly expanded into manufacturing around CubeSats and then onto space manufacturing ('Made In Space') – a topic that gained traction after Jeff Bezos publicly discussed the idea for reasons of sustainability.

The group then moved into novel manufacturing techniques, monitoring of space debris, Kessler syndrome, removal of space debris, space recycling, increasing prevalence of reusable and modular components, satellite replenishment, new players in the field such as Amazon, industrialization of ground stations, nation state competition, failures in national investment, inertia in past satellite players, changes in financing of space operations, new venture funds, bankruptcies, defence (including the 'rods from god' kinetic based weapons), space terrorism, property rights and space law, use of digital twins in operations and control mechanisms ('humans on the loop' vs. humans in the loop).

As Ars Technica stated: *"There are insane amounts of cool space things happening in 2021."*

Defence

As with many other groups the initial discussions tended to focus on the changing technology landscape including automation, detecting future threats, advanced persistent threats, the use of AI with autonomous aircraft vs. human pilot anti-drone systems and the ethical issues arising from autonomous technology in warfare. The group then started to deep dive into the role of deepfakes, radicalization online, the oncoming clash over space and Will Roper's plan to change acquisition strategy for US fighters. At this point, there was a remarkable shift in the direction of the group prompted by General Sir Nick Carter's annual RUSI speech discussing the wider geopolitical and economic context of defence. This led the group to discuss values, the purpose of defence, the role of sustainability and the impact of ideological competition.

As this vast subject unfolded, the group created maps around purpose, what are we defending, soft power, sustainability, industrial strategy, and the changing nature of defence from kinetic to other forms with technology often reduced to a means and often considered misguided. Emphasis was placed on the prevention side of conflict and the UK Government announcements on reducing Foreign Aid were greeted with concern. To quote US Defense Secretary General Mattis' statement to the Senate Armed Service Committee in 2013: *"If you don't fund the State Department fully, then I need to buy more ammunition"*.

Automotive

The group initially focused on the impact of self-driving vehicles as new players such as Amazon enter the space. This quickly moved on to power sources with the German governments requiring all petrol stations to offer EV charging, alternatives such as hydrogen, the weaknesses of these alternative fuels and the role of inertia within existing industry players. This expanded into bidirectional charging (the car as a battery) and other transport-related concepts such as electric aircraft, autonomous delivery vans, drone delivery, networked vehicles, swarming of vehicles, smart roads, new modular designs and the role of LEO (low Earth orbit) satellites in communication. The importance of power became a primary focus for the group, with nation state comparisons of production rates and control of the supply chain.

In order to understand the issues the group started to map out the interconnection between components, which led to concepts such as the embodiment of societal values within AI simulation systems, potential control of populations through geofencing and unintended consequences such as increasing inequality within the transportation system. What started as a simple look into the automotive industry had become a highly political discussion around power, supply chains and control.

Immersion

Early discussions focused mainly on the use of virtual reality for gaming, travel, home design, training, logistics and meetings. This rapidly expanded into augmented technology including its use to reduce COVID infection in hospital wards, haptic alternatives to touchscreens, AR in social distancing, retrofitting elevators with voice control, AI in manufacturing operations, physiological impacts including damaged eyesight and a smorgasbord of corporate failures. Whilst many in the outside world claimed that VR was the future of retail, the group uncovered tales of infighting between groups (AR vs. VR) within companies, costly failed efforts, overhyped claims, physiological limits (in touch) and technology often looking for a problem to solve.

The exploration then focused on the increasing use of audio as the control medium for many devices and the increasingly programmable nature of video, which in turn led to security concerns such as deepfakes (including the now-infamous TikTok Fake Tom Cruise). Combined with sensors for measuring emotional states, the creation of 'artificial humans', the lack of consistent tool chains and content assurance within the supply chain, the

rise of more extreme political groups and individuals who can manipulate online with significant reach, the discussion quickly took on a darker note about the control of what you see and hear in both the digital and physical worlds – the ability to influence the recipient's perception of reality.

Fake Tom Cruise became an internet sensation for the power of deep fakes both in audio & video.

Sensors

The group started with a broad exploration of the use of sensors, from AI-backed sensors helping reduce wind turbines' threat to protected birds, in the construction industry for monitoring concrete hardening, in future workspaces and increasing productivity with digital twins, to wearable scanners, advances in bomb sniffing technology, optimization in automated vehicles, printed sensors and the connected home. Discussion quickly expanded into the lack of agreed standards in the IoT space, issues of security and demands for local power.

Topics covered further expanded into communication mechanisms (5G vs. satellite), ethical use and privacy of personal data, new forms of power distribution, material and political constraints within supply chains, sustainability, ecological impacts of sensors, how space was becoming crowded by sensors, the use of face recognition in controlling citizens and questions around autonomous systems and the role of humans on the loop or in the loop.

When the group started to map out the space, even the simplest of sensor-based services led to issues over power, lack of standards, lack of encryption and lack of defined interfaces.

Needs

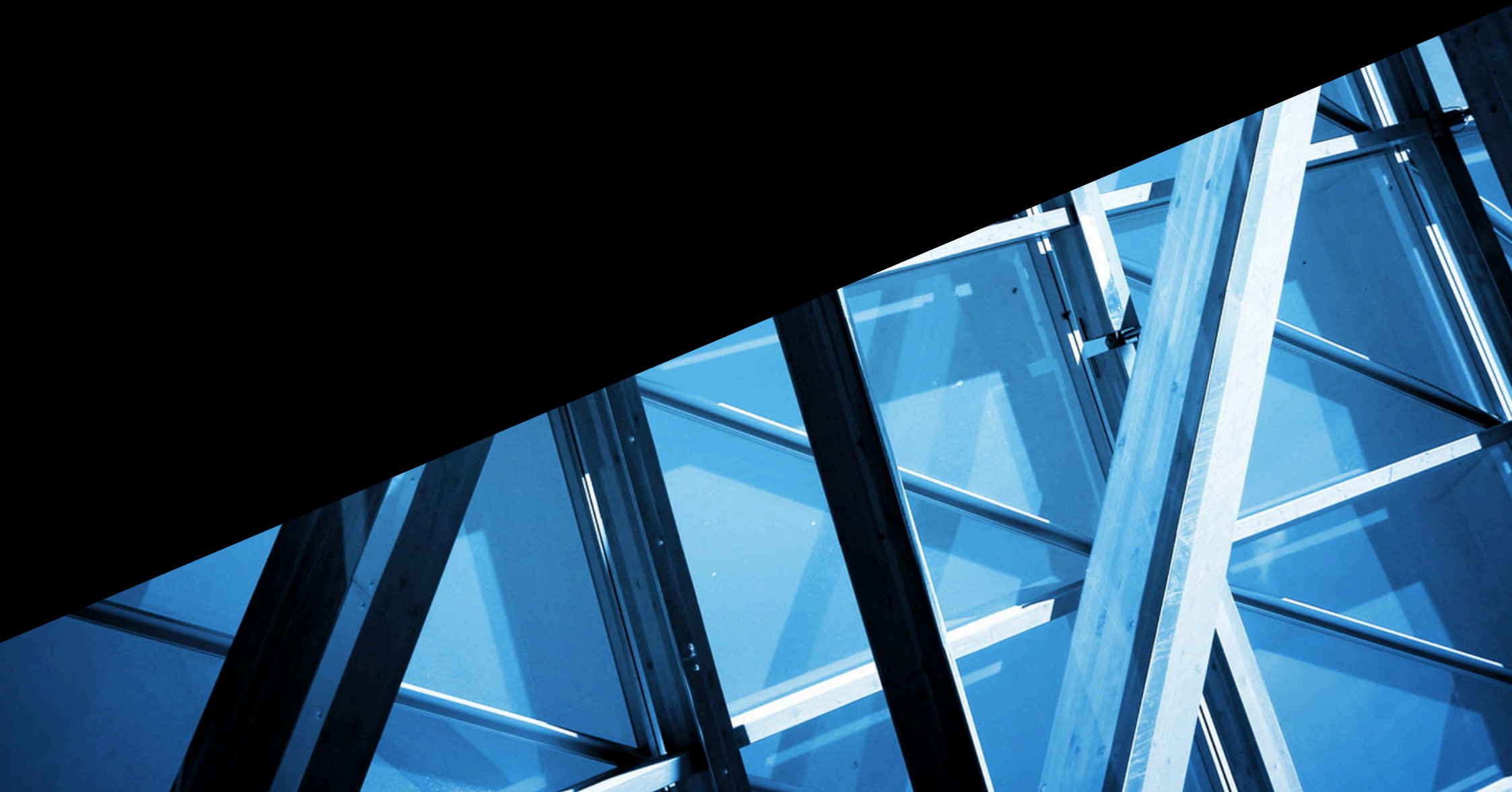
The final research group covered neither a technology space (immersion, sensors, robotics, manufacturing, space) nor broad industry (defence, healthcare, finance, government, automotive) but looked at the question of changing needs.

The group focused on areas connected to the COVID pandemic including remote learning, food safety, warehousing and distribution, travel, work from anywhere, mental health, wellbeing, online fatigue, new norms in business, comic failures, sustaining culture in remote environments, the role of AI in the pandemic and the need for ethics by design. It expanded into changing cities, changing mechanisms of collaboration, reactions against remote work, trust issues in remote environments, monitoring in the

workplace and at school, changes in commercial property portfolios, tech workers fleeing San Francisco, China's V-shaped recovery, the growth of online swarms of people, online radicalization and online manipulation.

Significant emphasis was placed on the changing balance of power between nation states and within the office due to loss of status symbols.

THE RESEARCH PROCESS



Changes of meaning

MEANING	ROBOTS	IMMERSION	SENSORS	SPACE
Networked swarms	X		X	X
Distributed learning	X	X	X	X
Distributed provision	X	X	X	
Acceptance of standards	X	X	X	X
Management of constraints	X	X	X	X
Focus on principles		X	X	X
Supply chain management	X	X	X	X
Immersion	X	X		X

The research focused on those meanings that appeared to be changing across all groups rather than focusing on industry-specific areas.

Potential changes of meaning were captured by simply noting that a discussion on that theme had occurred in most of the research groups (see matrix). In total, 41 potential changes of meaning were identified (see list).

This list represented areas of change, but it lacked the details of what was changing – the **prototype** characteristics for our next generation and traditional behaviours. However, before we could proceed, the meanings themselves needed to be tested.

MEANING		
ACCEPTANCE OF STANDARDS	EXPERIENTIAL MODELS	RADICALIZATION
ADAPTATION	FOCUS ON INTENT	REDUCTION OF WASTE
AMORPHOUS BOUNDARIES	FOCUS ON PRINCIPLES	RESILIENCE
ASSET OPTIMIZED BUSINESS MODELS	FORECASTING	RESOURCE MANAGEMENT
AUGMENTED INTELLIGENCE	IMMERSION	REUSABILITY
AUTOMATION	INCENTIVES & FUNDING MODELS	SAFETY
AUTONOMY	LOCATION	SECURITY
BASELINES	LOGISTICS	SIMULATION
BIOLOGICAL MIMICRY	MANAGE INERTIA	SITUATIONAL AWARENESS
CORPORATE SHARING	MANAGEMENT OF CONSTRAINTS	SOFT POWER
DISTRIBUTED & INDIRECT LEARNING	MANIPULATION	SUPPLY CHAIN MANAGEMENT
DISTRIBUTION OF PROVISION	MOBILIZATION	SUSTAINABILITY
DIVERSITY	PERCEPTION OF TRUST	SWARMING
ETHICS	PROTECTIONISM	

Testing the meanings

Change

	CHANGE?
SUSTAINABILITY (not just tick boxes in a CSR)	
DISTRIBUTION OF PROVISION (not power but provision)	
IMMERSION	
DISTRIBUTED & INDIRECT LEARNING	
SWARMING (of people)	
SIMULATION (including digital twins)	
LOGISTICS	
FOCUS ON INTENT (long term goals)	
FOCUS ON PRINCIPLES (over beliefs)	
AUGMENTED INTELLIGENCE	
SUPPLY CHAIN MANAGEMENT	
RESILIENCE (both engineering & ecological)	
MOBILIZATION (of people & resources)	
MANIPULATION (of perceptions & defence against)	
SITUATIONAL AWARENESS	
PROTECTIONISM (including conservation)	
ADAPTATION (anticipation of change & reacting to it)	
PERCEPTION OF TRUST (creation & maintenance)	
ETHICS	
SECURITY (in a virtual world including defence against deep fakes)	
SAFETY (including psychological)	
BIOLOGICAL MIMICRY (learning from nature)	
EXPERIENTIAL MODELS (mechanisms of learning)	

HIGH MODERATE LOW

We tested this list of meanings in two ways. The first was general surveys where we asked people to highlight any of the meanings for which they saw industry change. This was done by providing the list on a Miro board and asking invited people to add votes to each meaning. A summary of responses from 101 people (our main external group) is shown in the table. The strength of observation varied with the meaning. For example, more people added votes for 'sustainability' than 'biological mimicry' in this test. The results are subject to extensive bias and have no statistical value other than to say that a wider population has also observed changes occurring in these areas.

The second test was in elective sessions that were part of the 2021 study tour. The questions prepared were based upon our table of meanings, in order to discover whether a specific population (e.g. founders/CEOs of companies) also observed those changes. In these sessions the meanings principles, sustainability and intent were noted several times. At this point, we could reasonably say that the changes of meaning were an 'interesting' list and worth exploring more.

Finding the prototypes

SWARMING

GROUP	TRADITIONAL	NEXT GEN
HEALTHCARE	Directed	Collective intelligence
FINANCE	Strategy	Weak signals
FINANCE	Programmes	Responsive
FINANCE	Transformation	Consumer/activity led
FINANCE	Centralized command	Collective mind
FINANCE	Executive war room	Distributed cognition
FINANCE	Technical analysis	Common practice for autonomous teams
AUTOMOTIVE	Reactionary	Negotiated
AUTOMOTIVE	Unlearned	Learned
AUTOMOTIVE	Accidental	Intentional
GOVERNMENT	Emergency only	Collaborative
DEFENCE	Monolithic, 'over' engineered	Small, repeatable, cheap
NEEDS	Powerful & charismatic leaders	Leadership without leaders
NEEDS	Planned & synchronized	Self-organizing
NEEDS	Individual	Collective emergence
NEEDS	Tyranny	Democratized
MANUFACTURING	Directed	Self-organizing
MANUFACTURING	Individual knowledge & capability	Collective knowledge & capability
SENSORS	Homogenous	Heterogenous
SPACE	Fragile	Resilient
SPACE	Hierarchical coordination	Non-hierarchical coordination
SPACE	Role-based	Adaptable
SPACE	Specialized	Commodity
SPACE	Slow feedback	Fast feedback
ROBOTICS	Homogeneous	Heterogeneous, emergent behaviour
ROBOTICS	Vertically integrated	Horizontally interchangeable
IMMERSION	Prototype-test-learn	Adaptive/automated
IMMERSION	Sequential	Feedback loop
IMMERSION	In-person/co-located	Remote

Over 800 prototype descriptions of the form traditional vs. next generation characteristics were created for the identified meanings that were changing.

To turn the list of meanings into something more tangible that could eventually be tested, I asked each of the research groups to provide one or more prototypes for each meaning, in the form traditional vs. next

generation. To ground this in reality, the groups were asked to provide examples.

The figure illustrates the discussion on swarming across some of the groups. The traditional was described as hierarchical co-ordination, attempts to be homogenous, directed by powerful and charismatic leaders, emulating tyranny, planned and synchronized, swarming only in emergencies and often by accident, relying on centralized command but considered to be fragile; whereas the next generation was using collective intelligence, responding to weak signals, self-organizing, democratized, creating adaptable and resilient structures with fast feedback loops that were non-hierarchical and in which leadership was distributed.

Examples were often but not exclusively unique to one group. In the needs research group, the focus was firmly on the swarming of people and forms of organizational structure with examples such as Buurtzorg or Haier's RenDanHeYi. As CEO Zhang Ruimin explained: *"With the RenDanHeYi model we truly enter the network age. But the network aspect is not even the most important. What is more important is that we no longer try to delegate to, or 'empower', employees. It's now time for every employee to be his or her own boss."*

Meanwhile the sensors group cited swarms of sensors including Google traffic sensing via phones and sharing energy use data from sensors installed to monitor and control the activity of a retrofitted communal heating system in council properties. Other examples of swarming included grassroot projects to adapt various devices (e.g. snorkelling masks) for use against COVID; use of swarms of drones in defence; the ESA Darwin project and the use of constellations of spacecraft to find earth-like planets; and mob programming within organizations such as the UK's Government Digital Service (GDS).

Our prototype list

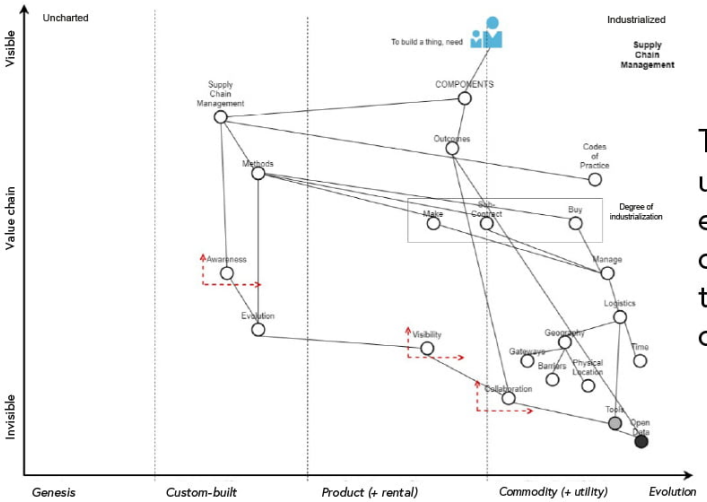
MEANING	TRADITIONAL	NEXT GEN
ACCEPTANCE OF STANDARDS	Mandated by committee	Led by community
ADAPTATION	Driven by business needs	Driven by user needs
AMORPHOUS BOUNDARIES	Strict silos linked to business.	collective responsibility
ASSET OPTIMIZED BUSINESS MODELS	Design, build, own & operate	Use of service
AUGMENTED INTELLIGENCE	Job replacement	Task replacement
AUTOMATION	Micro-optimzation	Digitization of entire system
AUTONOMY	Command & control	Towards the edge
BASELINES	Aggregated	Individual
BIOLOGICAL MIMICRY	Superficial	Learning from nature
CORPORATE SHARING	Knowledge stores	Knowledge flows
DISTRIBUTED & INDIRECT LEARNING	In person lectures	Remote first
DISTRIBUTION OF PROVISION	At the centre	At the edge
DIVERSITY	Quotas	Active inclusion
ETHICS	Code of compliance	Essential to purpose
EXPERIENTIAL MODELS	Expert led	Interactive gameplay
FOCUS ON INTENT	Focused on the project	Focused on community
FOCUS ON PRINCIPLES	Unenforced or unstated	Enforced
FORECASTING	Ordered systems	Complex systems (emergent)
IMMERSION	One-way process	Two-way process
INCENTIVES & FUNDING MODELS	Output driven	Outcome driven
LOCATION	Centralized	Localized
LOGISTICS	Competition	Collaboration
MANAGE INERTIA	Unaware	Actively identified
MANAGEMENT OF CONSTRAINTS	Restricting	Opportunity
MANIPULATION	Comms is about mass influence	Driven by ethics & morals
MOBILIZATION	Top down	Peer-to-peer, flash mob
PERCEPTION OF TRUST	Influenced by internal	Influenced by external (collective)
PROTECTIONISM	Focused on the status quo	Focused on the entire system
RADICALIZATION	Peer influence	Algorithmic
REDUCTION OF WASTE	Efficiency	Sustainability
RESILIENCE	Contingency planning	Requisite diversity
RESOURCE MANAGEMENT	Stocks	Orchestration of flows
REUSABILITY	Distributing responsibility	Ownership of the supply chain
SAFETY	Physical	Psychological
SECURITY	Liability focused	Mission-focused
SIMULATION	In vitro	In vivo
SITUATIONAL AWARENESS	Leadership activity	Systemic
SOFT POWER	Self interest	Altruistic
SUPPLY CHAIN MANAGEMENT	One up, one down	Model entire chain
SUSTAINABILITY	Cost of operating	Harvesting without depleting
SWARMING	Powerful & charismatic leaders	Leadership without leaders

Over 800 prototype definitions of characteristics in the form traditional vs. next generation were created for the 41 changes of meaning. The table shows the candidate prototypes I chose for each meaning as best fitted to

the conversations that had been held across all the research groups. Being part of all the discussions, I was in a unique position to do this.

These prototypes were to form the basis of our population study and are the characteristics that we would test. However, at the time we produced the table we still had no separating questions to divide the populations, nor the causes, nor even a target space to focus on.

Identifying the causes



The research groups used maps to help explore the changes of meaning in order to identify the core causes.

We had identified changes of meaning and created a list of prototypes to describe how those meanings were changing, but any population study could suffer from simply showing correlations unless we identified the causes of the changes. To do this, we returned to the research groups and asked them to map out the changes with a view to identifying the underlying technological causes. This produced a wealth of maps, from the concepts of supply chain management in the manufacturing industry, to digital engineering in the defence industry, hydrogen fuels for transport and wider impacts on healthcare. The example shown here was used in our discussions on supply chain management, which covered topics such as collaboration tools and access to data.

During these discussions specific areas of technology were found to repeat between the groups. These causes included social media, collaboration tools, video conferencing, virtual spaces, computing, networks, sensors, machine learning, object recognition, predictive modelling, data visualization, data access, additive manufacturing, satellite imagery, satellite networks, GPS, drones, robotics and AR/VR.

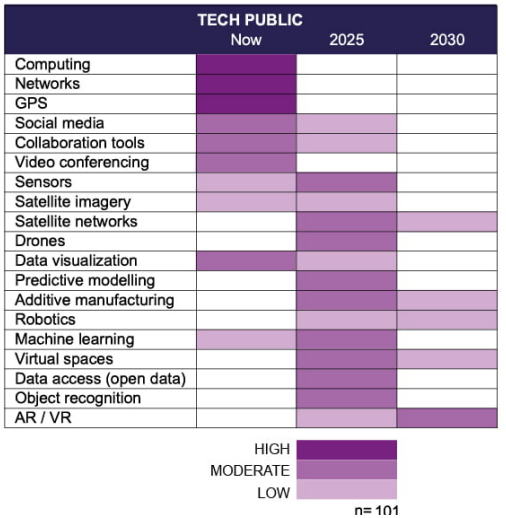
Any population study could suffer from simply showing correlations unless we identified the causes of the changes."

Recap of our research process

Using a network of human sensors we identified 41 **changes of meaning** that were happening across industries. We then created over 800 **prototype descriptions** of these changes (in the form traditional vs. next generation) which we grounded by use of examples and then consolidated to 41 candidates. Through **mapping** we identified 19 areas of technology that were the possible **causes** of these changes. Each of those technologies could be the primary cause of one or many of the changes we were seeing. This gave us a **target space** of over 750 interactions of technology and practice – any one of which, or possibly none, might be important.

We also had **timing issues** to consider.

Timing



In order to determine where we need to focus the survey, a mix of timing (i.e. is this thing relevant now?) and impact (i.e. what technology impacts what change) is needed.

The timing tests were conducted online with a simple scoring mechanism.

Throughout history, the most significant cause of change is the industrialization of technology. We had our candidate 19 technology areas, but we had to ask when each was likely to have an impact. Is this technology industrializing now, or is it likely to do so over the next decade, or will its potential impact be further in the future?

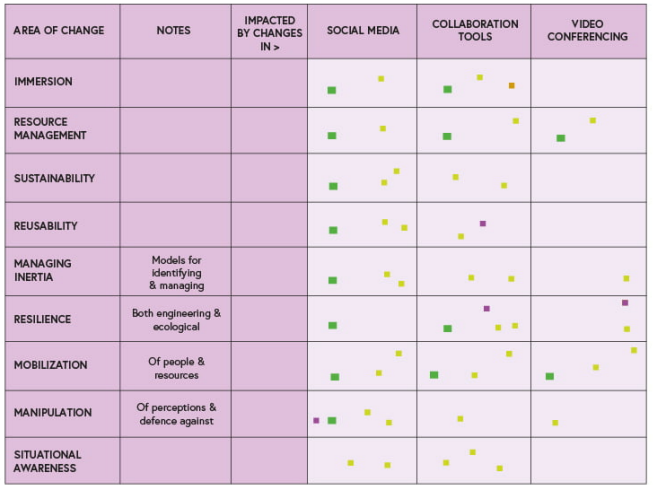
We returned to our external group and ran tests to determine when they considered each technology area was likely to industrialize. As with the meanings, the individuals were simply asked to vote on when they thought the change was likely to happen and basic scores developed from counting the votes.

As the chart shows, the group considers computing, networks, GPS, sensors and even satellite imagery to either be industrializing or already industrialized. However, augmented and virtual reality are seen to be further away – not by much, but by enough.

The results of these tests are not of value on their own but they do enable us to identify where we should target the survey. However, before we can do this we need to understand which technology impacts what meaning. We need to run some form of **impact test**.

Impact test

We knew that certain meanings appeared to be changing, we had our prototypes for the next generation, we had a list of potential technology causes and even an idea of timing. We had an underlying theory about causation, but it would take the population study to demonstrate whether this effect was real or not. There was a lot that could still go wrong. We could focus on the wrong space, select the wrong characteristics to test or even get the wrong separating questions for the populations. If it went wrong, we could still use the population study to look for correlations within the data, but we would have to create a new hypothesis from this and run the entire study again.



AREA OF CHANGE	NOTES	IMPACTED BY CHANGES IN >	SOCIAL MEDIA	COLLABORATION TOOLS	VIDEO CONFERENCING
IMMERSION					
RESOURCE MANAGEMENT					
SUSTAINABILITY					
REUSABILITY					
MANAGING INERTIA	Models for identifying & managing				
RESILIENCE	Both engineering & ecological				
MOBILIZATION	Of people & resources				
MANIPULATION	Of perceptions & defence against				
SITUATIONAL AWARENESS					

The impact test asks as simple question: does this technology impact this meaning?

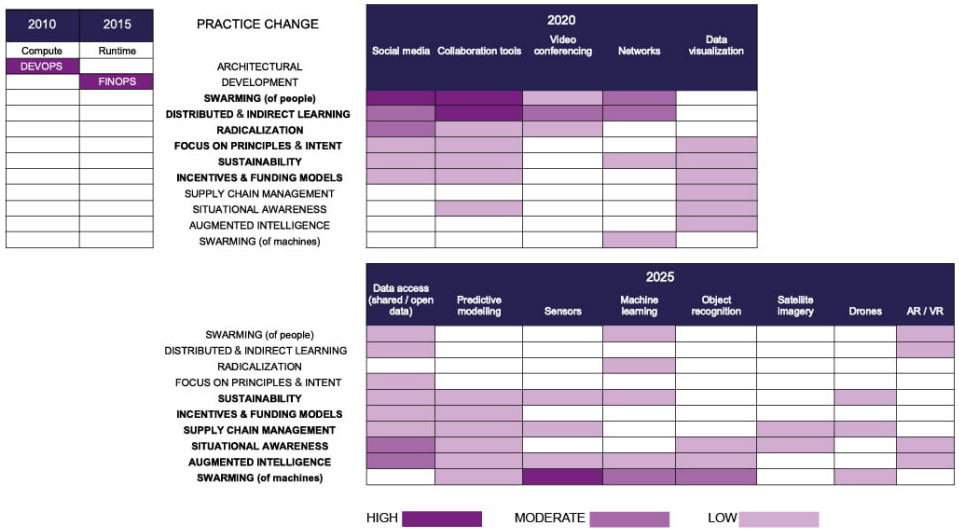
These were very large matrices in Miro (a section of which is shown) in which people voted by simply adding post-it notes.

The purpose of the test is to help guide us to where we needed to focus the survey.

The most likely area we would fail in was simply that the space was vast (an interaction of 41 meanings and 19 technology causes). We had to find a way to narrow this down.

To do that, I created several impact matrices where individuals could vote whether they believed that an area of technology was impacting this meaning (see the figure). The test itself has no statistical validity other than helping us try to find where we should concentrate the population study. In excess of 1,285 votes were cast and these we used as a guide to areas where should focus.

Target space



This figure summarizes the output from the impact matrices, overlaid with timing factors and past changes. This is our **target space**. (Note that this was only a guide to where we should focus the population study and is not meaningful in its own right. It is provided simply for illustration of the research process.)

From the diagram, the shift of computing (from product-based servers to utility-like clouds) with the introduction of a next generation of practice (known as DevOps) was known and had been seen in the 2011 population study. Furthermore, the shift of the runtime from product-based stacks (LAMP, .Net) to serverless (Lambda, Azure functions) and the rise of co-evolved practices called FinOps was another given.

From the impact matrices and using the timing for industrialization, several areas (highlighted in bold) seemed to be changing in the timeframe 2020–2025. These include swarming of people, and incentives and funding models driven by social media, collaboration tools and even data visualization. In the timeframe 2025–2030, the focus appeared to be on the list from sustainability to swarming of machines driven by access to data, predictive modelling and machine learning.

This target matrix would be used to help create the population study itself. However, we still had one final chance to refine where we would test: the Study Tour.

Input from the study tour

The study tour provided us not only with an opportunity to explore working in a virtual world & to examine interesting companies in this space, but also was a final test for the timing, meanings & impact tests prior to starting the survey.

Two companies that came up continually in the examples of traditional vs. next generation practices were Microsoft and Amazon. They were included as major pillars within the tour and both were given all 41 meanings that were changing and asked to speak to any of those. Microsoft focused on sustainability whereas Amazon gave a broad discussion ranging from sustainability to cloud to space. Both companies however made it clear that they could speak to all the topics. This gave some level of confidence that our list of changes of meaning were in roughly in the right direction. A selection of companies that had also appeared in the research were added to the agenda and grouped into dominant meanings. These were:

Immersion – Spatial, Virbela, Sixense, Augumenta
Situational awareness – Prehype, The Floow, Swim, Upekkha
Supply chains – Planet, MakerBot, iRobot, WeRobotics
Security – Synthesia, Rezilion, BrainCo

Finally, a group of wildcards were added from the stables of a16z (Andreeson Horowitz). By pure fortune, one of its recommended companies (Zipline) had also come up within the research group examples. The rest were selected as being representative of one or more of the meanings that were changing.

The study tour itself was also an example of changing practices as we were forced by the isolation economy of the COVID pandemic into a virtual world. For collaboration we used a mix of Zoom, Miro, Virbela and 6Connex to attempt to recreate that study tour feeling. However, more than this, the study tour was also an experiment. We were able to repeat the changes of meaning test, the technology industrialization test and even create the tour's own impact matrix. Whilst the sample sizes were very small (i.e. the attendees on the tour), and participation in the impact matrix was negligible, the results were at least comparable with external tests. This gave us some reassurance that that the targeting matrix was probably focused on an interesting space.

A detailed breakdown of the study tour has already been published.

Population study 2021

MEANING	TRADITIONAL	NEXT GEN	ORDER
AUGMENTED INTELLIGENCE	Job replacement	Task replacement	PRIMARY
DISTRIBUTED & INDIRECT LEARNING	In person lectures	Remote first	PRIMARY
FOCUS ON INTENT	Focused on the project	Focused on community	PRIMARY
FOCUS ON PRINCIPLES	Unenforced or unstated	Enforced	PRIMARY
INCENTIVES & FUNDING MODELS	Output driven	Outcome driven	PRIMARY
RADICALIZATION	Peer influence	Algorithmic	PRIMARY
SITUATIONAL AWARENESS	Leadership activity	Systemic	PRIMARY
SUPPLY CHAIN MANAGEMENT	One up, one down	Model entire chain	PRIMARY
SUSTAINABILITY	Cost of operating	Harvesting without depleting	PRIMARY
SWARMING	Powerful & charismatic leaders	Leadership without leaders	PRIMARY
EXPERIENTIAL MODELS	Expert led	Interactive gameplay	SECONDARY
MANIPULATION	Comms is about mass Influence	Driven by ethics & morals	SECONDARY
MOBILIZATION	Top-down	Peer-to-peer, flash mob	SECONDARY
REUSABILITY	Distributing responsibility	Ownership of the supply chain	SECONDARY
INCENTIVES & FUNDING MODELS	Sales & profit driven	Customer & societal outcomes	SECONDARY
AUGMENTED INTELLIGENCE	Replace human cognitive function	Complement human cognitive functions	SECONDARY
FOCUS ON PRINCIPLES	Greenwashing	Core belief	SECONDARY
SITUATIONAL AWARENESS	Self reinforcing [marketing used to justify decisions]	Seeking alternative views	SECONDARY
SWARMING	Hierarchical coordination	Non-hierarchical coordination	SECONDARY
FOCUS ON PRINCIPLES	Management by KPIs	Managment by principles	TERTIARY
MANIPULATION	Executive led PR	Online influencers create the market	TERTIARY

Our hypothesis was that the future is not evenly distributed and hence the future practices that matter are already here. If our targeting was correct, we should be able to identify two distinct populations within today's corporations: the two extremes of traditional and next generation.

"Our hypothesis was that the future is not evenly distributed and hence the future practices that matter are already here."

The targeting matrix suggested that our focus should initially be on swarming, distributed and indirect learning, radicalization, principles, intent, sustainability and incentives. So, we selected the next generation vs. tradition characteristics in those areas as **primary** characteristics (see table). The targeting matrix also suggested that we would see additional differences in supply chain management, situational awareness and augmented intelligence, so we expanded into those associated characteristics to add **secondary** and finally **tertiary** questions to test.

This was our 'best guess' as to what the traditional and next generation looked like. However, we were still missing those all-important **separating** questions to subdivide the populations in order to test them. We couldn't just ask "Are you more next generation?" because this invokes all kinds of bias. This problem was also compounded by the association of technology with practice. In the previous next generation table of 2011 we had identified how companies were shifting from using big data to be being driven by data. Unfortunately, many companies seemed to have assumed that ownership of the technology means that you are the practice – that they are data driven because they had spent vast sums on building big data lakes (a bit like assuming that you are a good driver because you have bought an expensive car.) We needed to find a way of separating out companies based upon what they were and not what they believed they were.

During this research process I had discussed these changes of meaning with numerous companies, the research groups and in online interviews. Two distinct defining characteristics had emerged which both had connections to our target space. The first was whether the company was driven by procedures or using guiding principles (such as Amazon and Haier). The second was a tendency towards believing the future of work was more remote first or office first. After testing this with several interviews, I formed the following hypothesis:

Companies that were strongly procedure-driven and showed a bias towards a future of office work would have significantly different characteristics from companies that were driven by guiding principles and showed a bias towards a future of remote work. The latter were our next generation.

We were now ready to build the survey.

Building the survey

We now had the hypothesis, the key questions, the target space, the traditional vs. next generation questions and the underlying pattern of co-evolution that explained it. We simply had to build the survey, test it and see whether the hypothesis held true or not.

Survey questions

The survey (listed in the Appendix) consisted of:

a) Two **separating** questions — procedure vs. principle, remote vs. office — which divided responders into three categories — traditional, next generation and 'in-between' others.

b) Twenty **prototype** questions that included a choice between next generation and traditional characteristics as defined by the research group. These were to be tested to see if phenotypic differences existed between the populations (i.e. the two populations do not look like each other). There were actually twenty-one questions but 'management by KPIs vs. management by principles' was considered too close to the separating question of 'procedure vs. guiding principles' and was left in only as a reaffirming question.

c) One **directional** question about views of the future. Whilst we have the traditional vs. next generation characteristics, we did not know which one truly represents the future. Hence we asked the question whether the respondents thought the future for their organization was more growth or decline.

d) Three questions on company size, use of mapping and industry, mostly to rule out other influences.

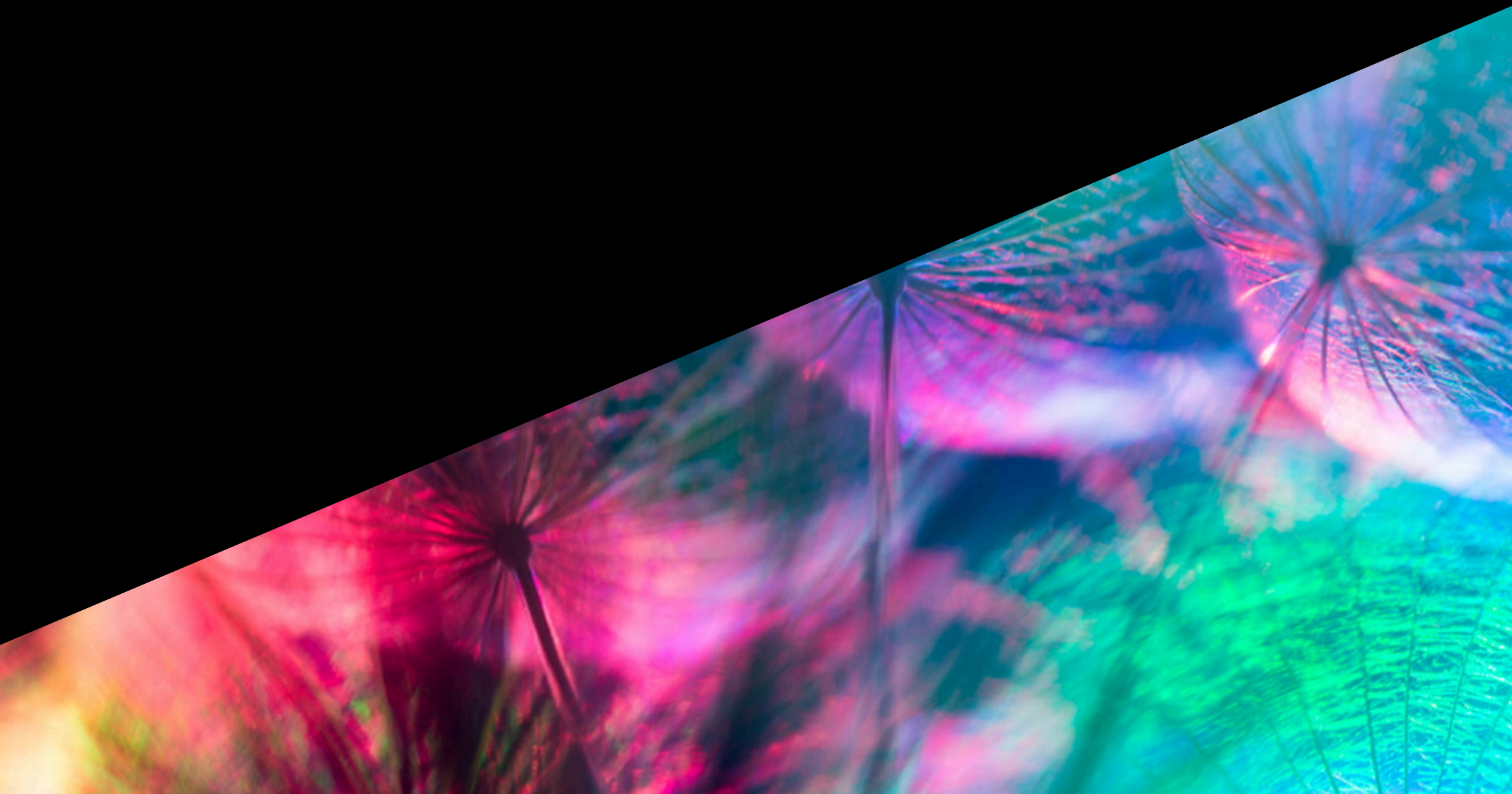
Survey bias

The survey would not be sent to a random population but to those connected to my Twitter steams. Whilst this would not affect the phenotypic characteristics of two different populations if they existed (dogs will still be dogs, cats will still be cats and next generation would still be next generation), it would certainly affect the volume of responses from each of those populations. Thus the survey can be used to identify if different populations exist, but the average results from the entire survey cannot be assumed to be representative of average of the wider population. In other words, our Mona Lisa has the same features of an enigmatic smile but may have a slightly darker or lighter olive average.

Survey tests

- Does the survey show two distinct populations, traditional and next generation?
- Do 'in between' companies exist between the average results of these two extremes?
- Can a direction of evolution be shown?

RESULTS & ANALYSIS



RANK	QUESTION	SCORE (1)	SCORE (7)	NEXT GEN	IN BETWEEN	TRADITIONAL	QUESTION #
1	When your organization needs to apply resources to a problem, is the approach best described by a top down direction that is given OR a spontaneous flash mob of peer to peer interaction?	Top down	Flash mob	4.66	3.24	1.45	6
2	How important is hierarchy in your organization for co-ordinating activities?	Critical	Not important	5.10	3.50	1.74	13
3	When it comes to understanding your competitive landscape, does your organization believe this should be a function of leadership OR systemic throughout the entire organization?	Leadership focused	Systemic	5.34	3.90	1.68	24
4	Does your organization believe that the future of leadership is about powerful and charismatic individuals OR a world without leaders where leadership is distributed?	Distributed leadership	Powerful individuals	2.85	4.17	6.35	4
5	Would you say your organization is more ...	Outcome driven	Output driven	2.10	3.84	6.06	11
6	Learning in the organization is most commonly achieved through expert led tuition with defined scenarios OR gameplay with evolving scenarios?	Expert led tuition	Gameplay	4.58	3.23	1.77	22
7	When your organization takes on a project, does it use market research to reinforce the justification for the project OR to seek alternative views on the viability of the project?	Seek alternative views	Reinforce justification	2.74	4.13	5.87	17
8	When your organization thinks about sustainability, is the main focus on the impacts to any cost of operations (including bad publicity) OR how to harvest resources without depleting the resources?	Cost of operations	Harvesting without depleting	5.11	3.74	2.23	7
9	What motivates people in your organization?	Customer and societal outcomes	Financials	2.54	3.90	5.71	23
10	When you hear sustainability in your organization, do you think ...	Core belief	Greenwashing	2.66	3.95	5.48	15
11	When building things in your organization, is the main focus on ...	The community	The project	4.01	4.98	6.26	14
12	Principles in the organization are ...	Unenforced or rarely stated	Essential & enforced	5.35	4.43	2.48	10
13	How aware is your organization of its own supply chain? Do you know who you bought from and who you sold to (known as one up, one down) OR do you model the entire supply chain including those of your customers and suppliers?	One up, one down	Model entire supply chain	4.47	3.78	2.23	18
14	Does your organization view artificial intelligence as a future replacement for human functions OR a complement to human functions?	Complement	Replacement	1.83	2.75	4.74	21
15	How would you describe external communication in your organization? Is it more set by internal executives OR directed by external influencers?	Influencer led	Executive led	4.47	5.14	6.29	20
16	Learning in the organization is an activity that is ...	Remote first	In person lectures	2.29	2.90	4.68	8
17	Does your organization think that supply chains are a way of shifting responsibility to others OR that the entire supply chain is the responsibility of the organisation?	Distributing responsibility	Maintain responsibility	5.71	4.55	3.19	12
18	In your organization, artificial intelligence will ...	Replace jobs	Replace tasks	6.17	5.49	3.97	16
19	To your organization, what matters most with advertising ...	Mass influence & reach	Ethics & morals	4.82	4.21	3.10	10
20	When your organization thinks about the future, what influences its choices most ...	Algorithms	Peers	4.24	4.99	5.52	3

1,000 responses were collected and separated into populations based upon the separating questions of 'procedure vs. principle' and 'remote vs. office'. There were 31 in traditional, 92 in next generation and 867 in the wider 'other' population.

The two populations of next generation and traditional showed significant differences across all 20 characteristics, with those selected as next generation showing stronger affinity with all next generation characteristics (highlighted in purple in the chart) and the same for the traditional (highlighted in pink). The remaining 'other' population fell in between these populations. The population study confirmed the hypothesis with an extremely high degree of statistical significance.

"The population study confirmed the hypothesis with an extremely high degree of statistical significance."

We can conclude from the data that:

1. These populations are distinct.
2. These populations align with the hypothesis (i.e. the next generation are next generation across all characteristics and the traditional are traditional across all characteristics).
3. There is a sense of direction (i.e. the 'other' population are in between the scores for traditional and next generation for all 20 characteristics and the next generation population have a more positive growth attitude to the future).
4. There is no size effect (i.e. it is not 'a startup thing').

Average scores for each of the populations are shown in the table, with the prototype behaviours ranked according to statistical significance. The most important characteristics turned out to be ones that I had guessed were secondary – top-down direction and hierarchical structure vs. flash mob and non-hierarchical. In other words, we were a bit lucky with our questions. The targeting matrix had found the right areas, but not the right order of importance.

Our data confirms that the two following types of organizations exist in the wild. Most companies will exist in between these two states, becoming more next generation.

The traditional company

The traditional company may talk of hybrid models of working but it is biased towards a return to the office. It is a procedurally driven organization whose executives see themselves in the role of heroic leaders (even if they don't openly say so). Symbols of power matter: the top floor office, the hierarchy, the stories of heroic leadership and top-down direction. Principles are ideas that are rarely stated or enforced. What motivates people in this environment is money. Sustainability is a cost to operations that is done for marketing reasons. Market research is used to justify executive decisions, not to question them. The focus of the company is always on the output; it might talk about 'community' but it is really all about the product or the current project. External comms is driven by mass influence – getting others to buy the product. Ethics are an add-on. Awareness of the market is considered a function of leadership and the company regards supply chains as a way of shifting responsibility onto others. As a consequence, it understands its own supply chains poorly. To train its people, the company uses expert tuition and favours face-to-face physical lectures. In terms of future technology, the company considers that AI will replace some jobs and functions currently undertaken by humans. It expects the future of the company to be currently one of decline with difficult times ahead.

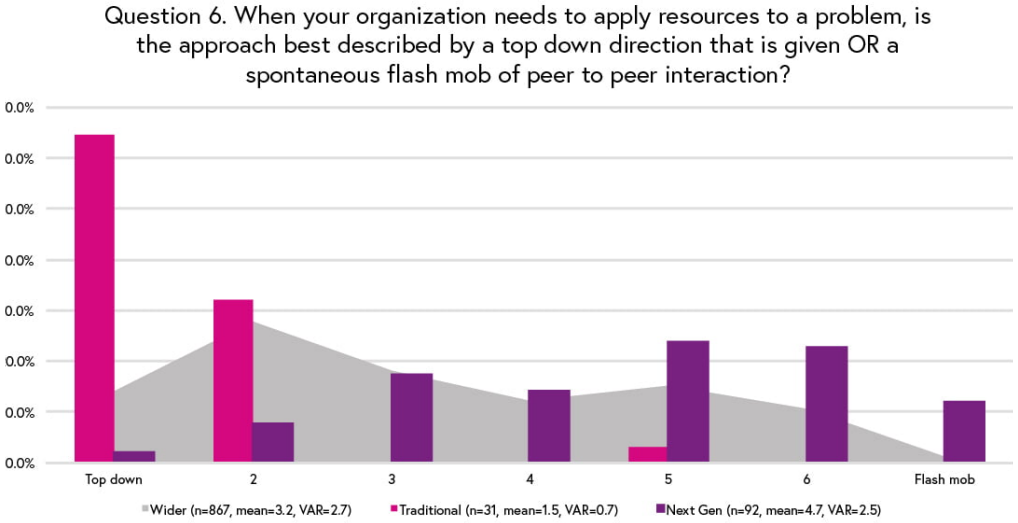
The next generation organization

The next generation organization is not seeking to return to the office but adapting to a more distributed world. This form of remote working — in many cases enforced by the isolation economy — is seen as the new norm. The company is driven by guiding principles which are stated and enforced in both recruitment and promotion. Power is distributed to where it is needed. Teams will often swarm around problems; leadership is transient in nature and leaders will arise to fit the problem. In this world, hierarchy is unimportant and few care about the top-floor office or the status symbols of power. Outcome not output matters. What motivates people are customer and societal outcomes. The projects undertaken always consider the wider community and sustainability is not a buzz word but a core belief. In support of this, a deep understanding of supply chains is considered essential, therefore these tend to be modelled as the company holds itself responsible for its entire supply chain. Ethics also matter a lot and drive external communication; they are not an add-on. Awareness of the market is systemic (throughout the organization) and not the function of a sole leader but of everyone. To train people, the company uses scenarios and gameplay, usually online. The idea of EVE online being a training tool for management is not an alien concept. The company expects that AI will complement humans, replacing some tasks and augmenting some functions. It also considers the future of the company to be currently one of growth with positive times ahead.

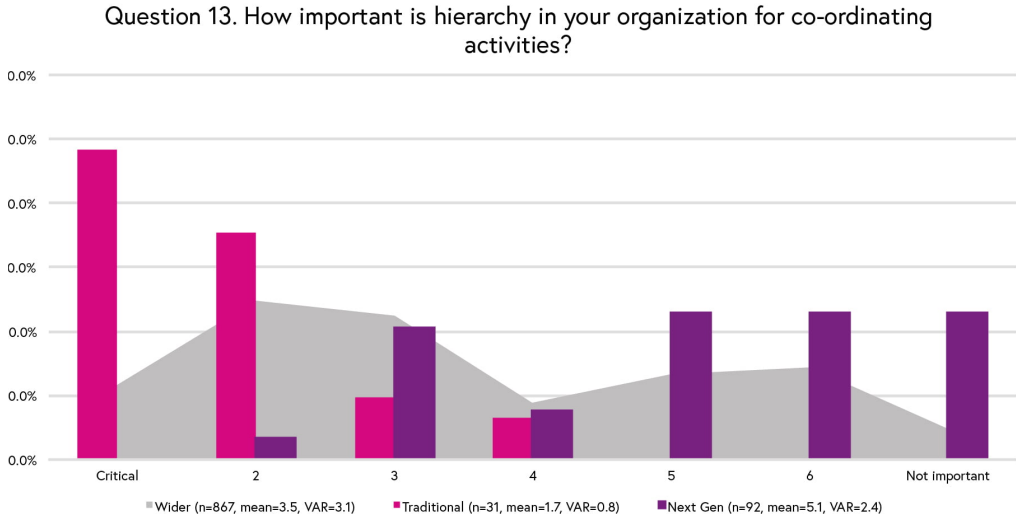
Survey results: Graphs

The graphs are ranked in order of statistical significance. Each graph shows the responses for traditional (pink) and next generation (purple) organizations against a background of wider population responses (grey) from all those companies not selected as either traditional or next generation.

Rank #1 – ORCHESTRATION

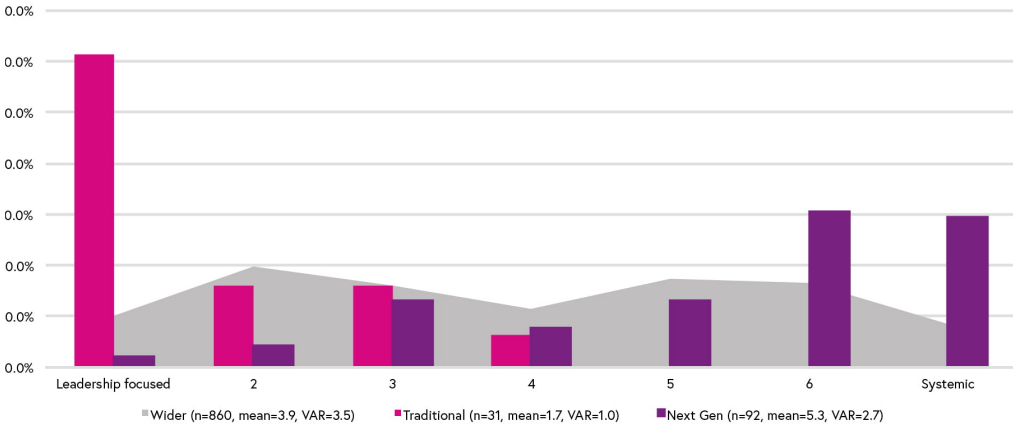


Rank #2 – STRUCTURE



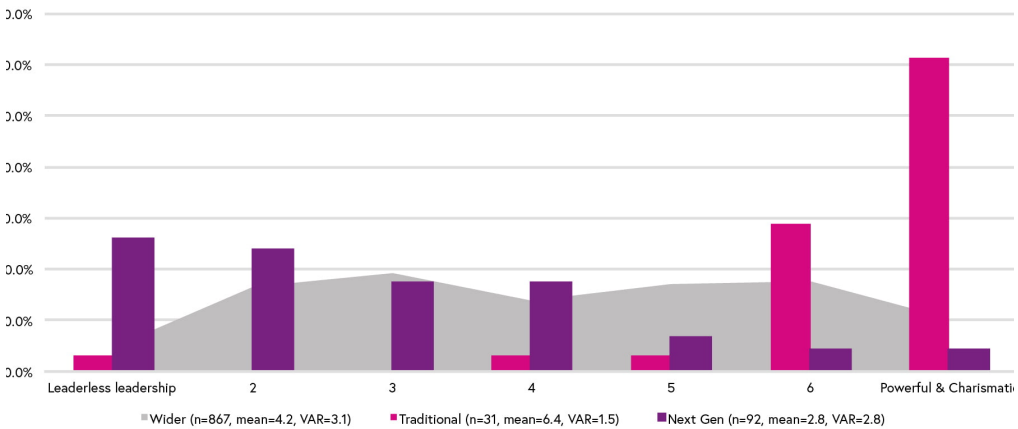
Rank #3 – SITUATIONAL AWARENESS

Question 24. When it comes to understanding your competitive landscape, does your organization believe this should be a function of leadership OR systemic throughout the entire organization?

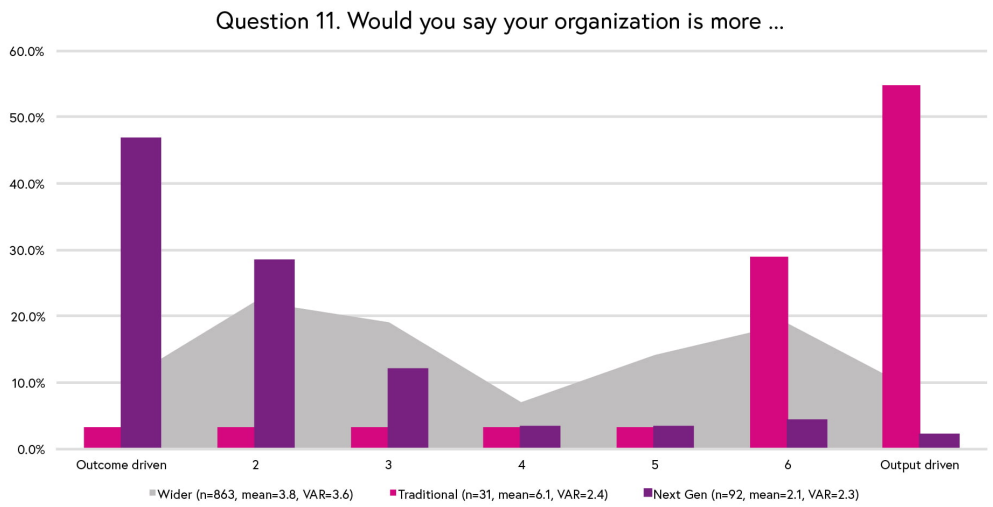


Rank #4 – ORCHESTRATION

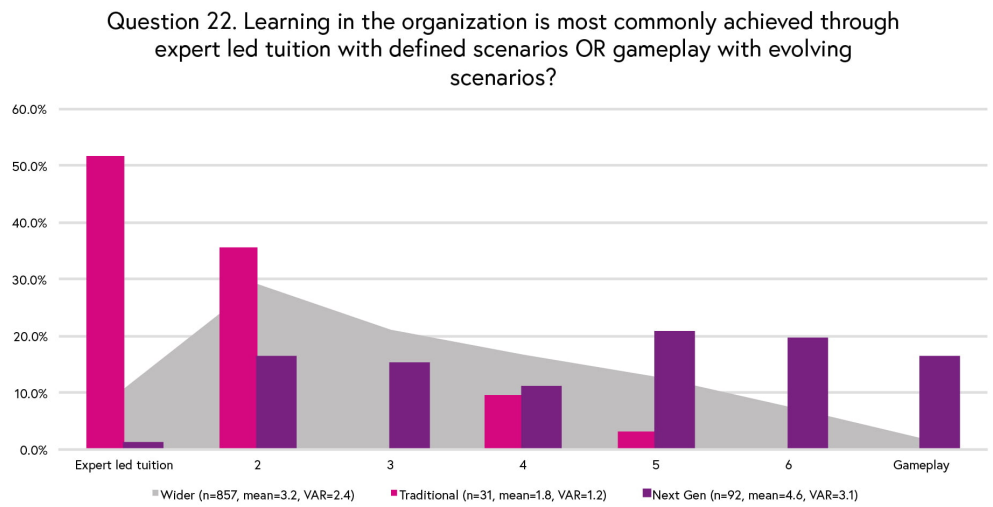
Question 4. Does your organization believe that the future of leadership is about powerful & charismatic individuals OR a world without leaders where leadership is distributed?



Rank #5 – BUSINESS MODEL

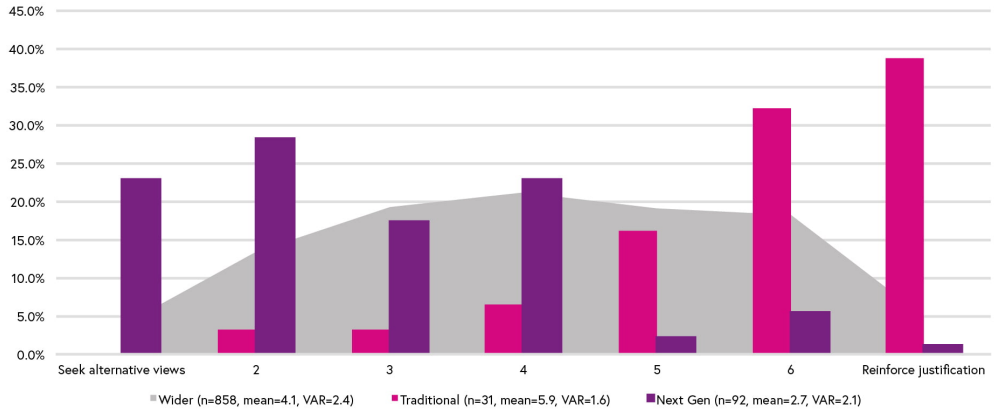


Rank #6 – LEARNING



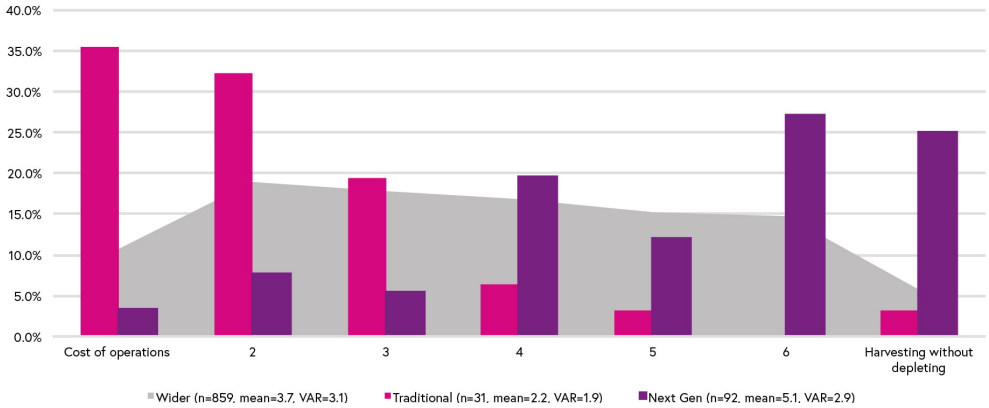
Rank #7 – INFLUENCERS

Question 17. When your organization takes on a project, does it use market research to reinforce the justification for the project OR to seek alternative views on the viability of the project?

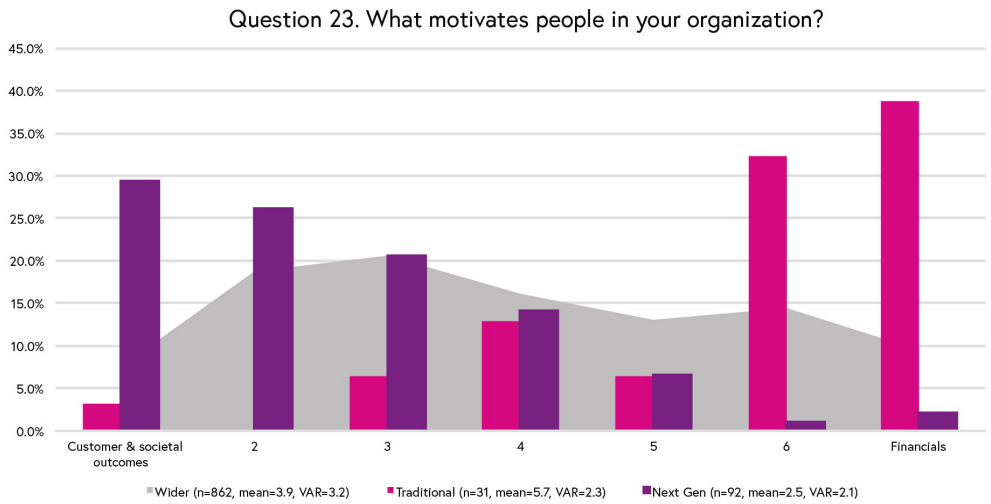


Rank #8 – SUSTAINABILITY

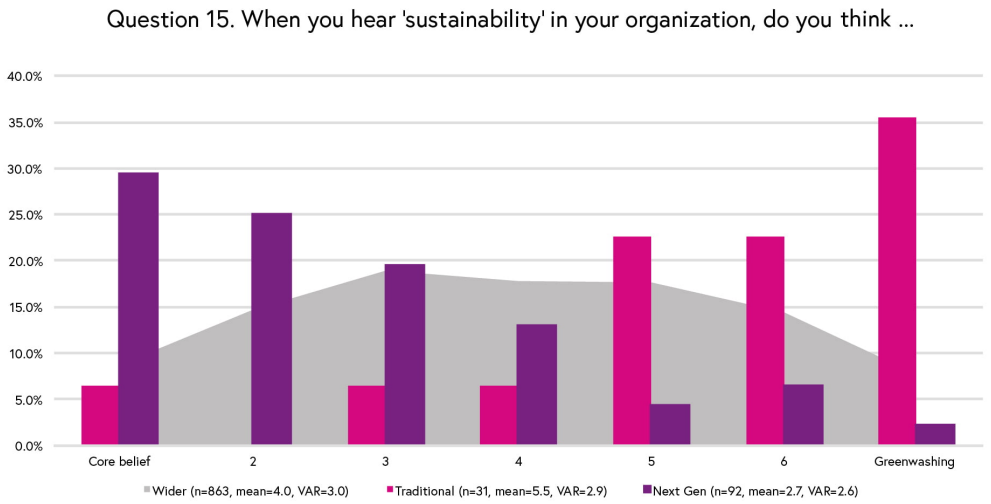
Question 7. When your organization thinks about sustainability, is the main focus on the impacts to any cost of operations (including bad publicity) OR how to harvest resources without depleting the resources?



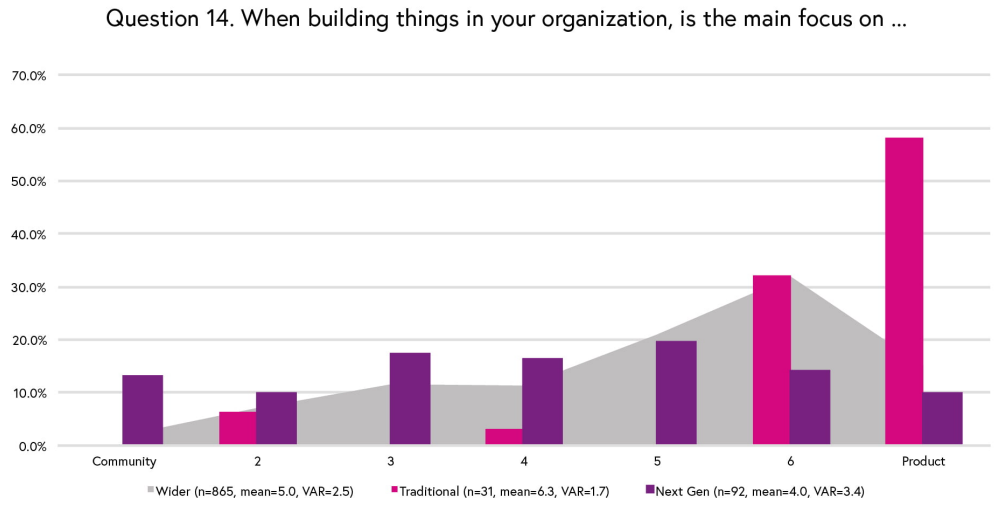
Rank #9 – BUSINESS MODEL



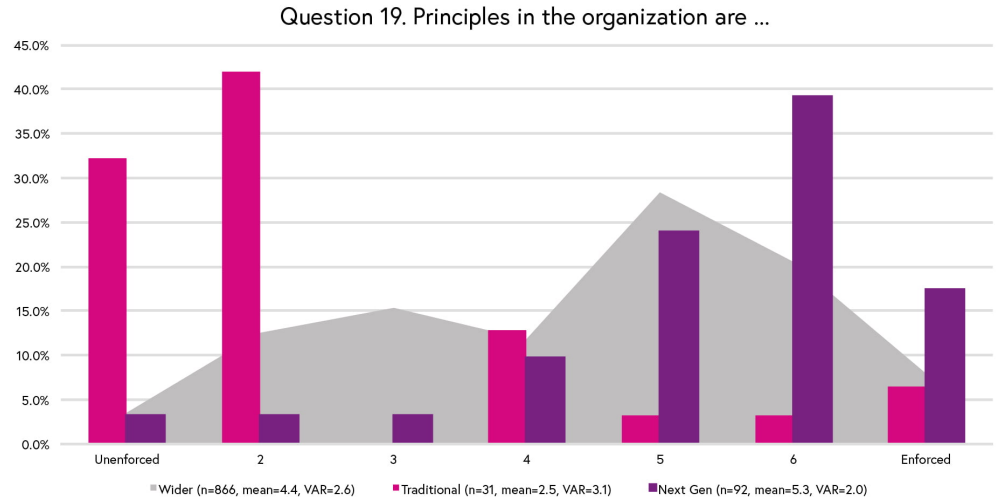
Rank #10 – SUSTAINABILITY



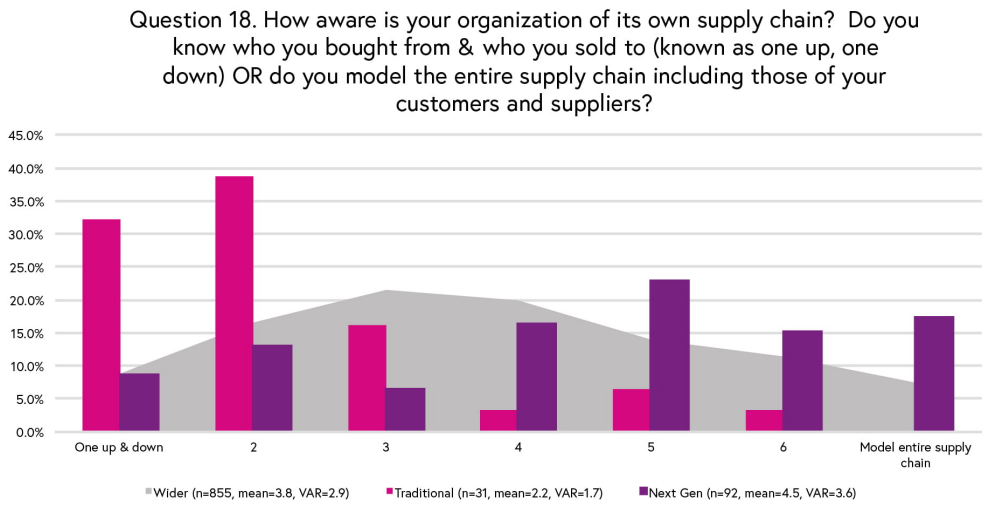
Rank #11 – SUSTAINABILITY



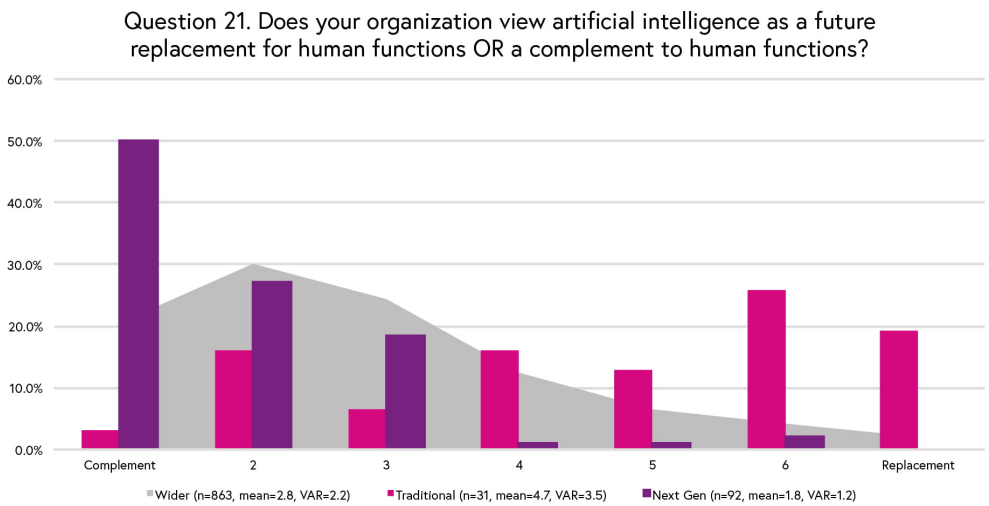
Rank #12 – ORCHESTRATION



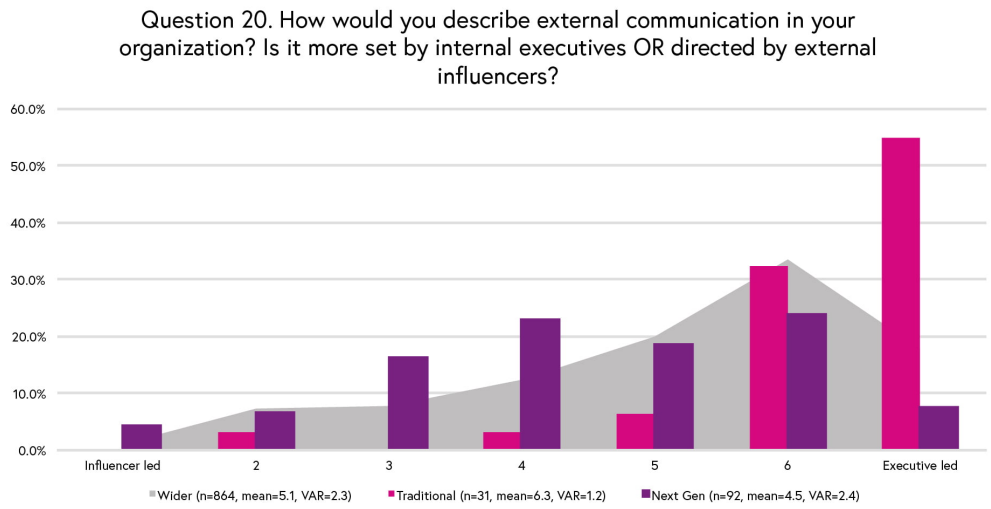
Rank #13 – SUPPLY CHAIN



Rank #14 – ARTIFICIAL INTELLIGENCE (TECHNOLOGY)



Rank #15 – INFLUENCERS



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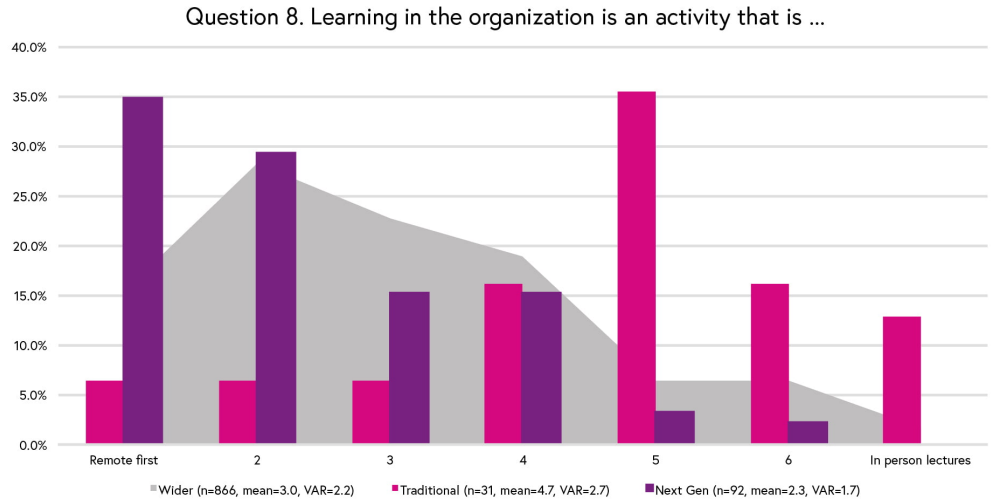

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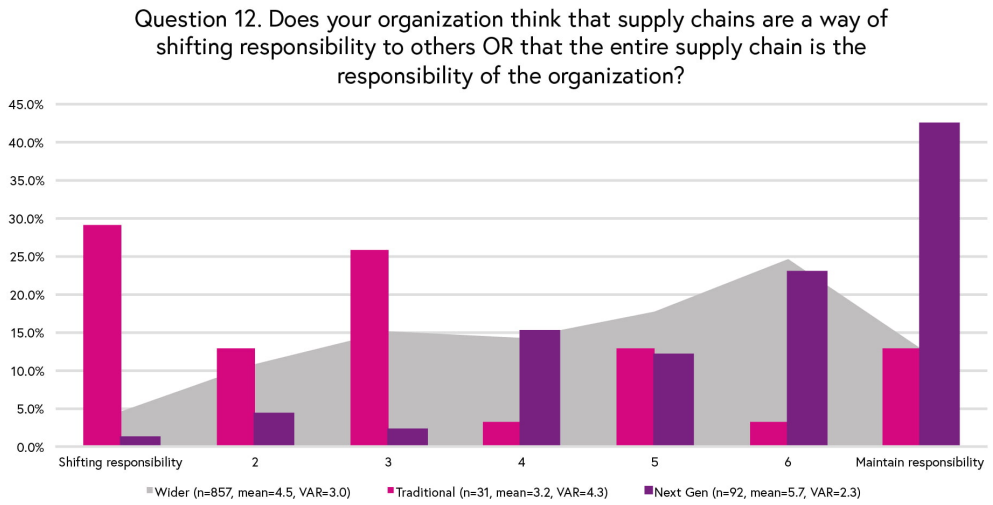
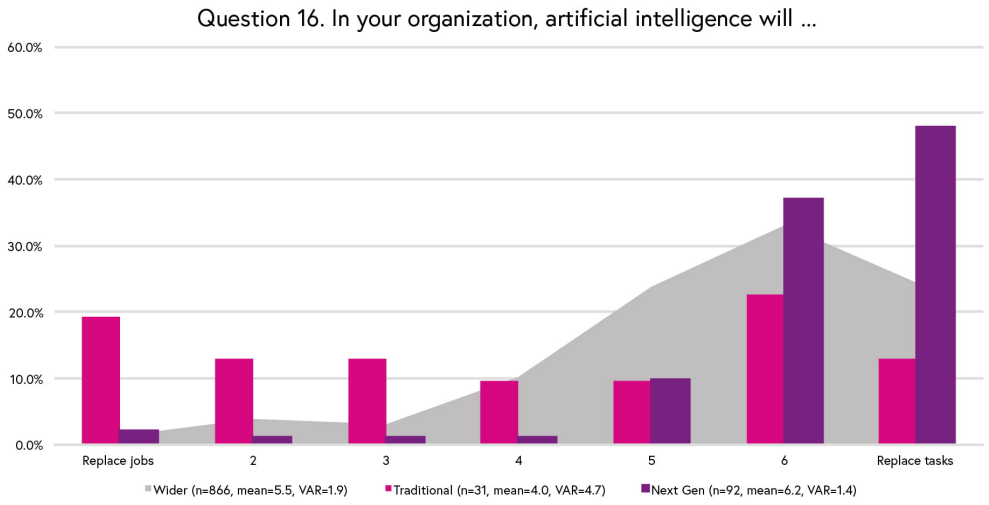
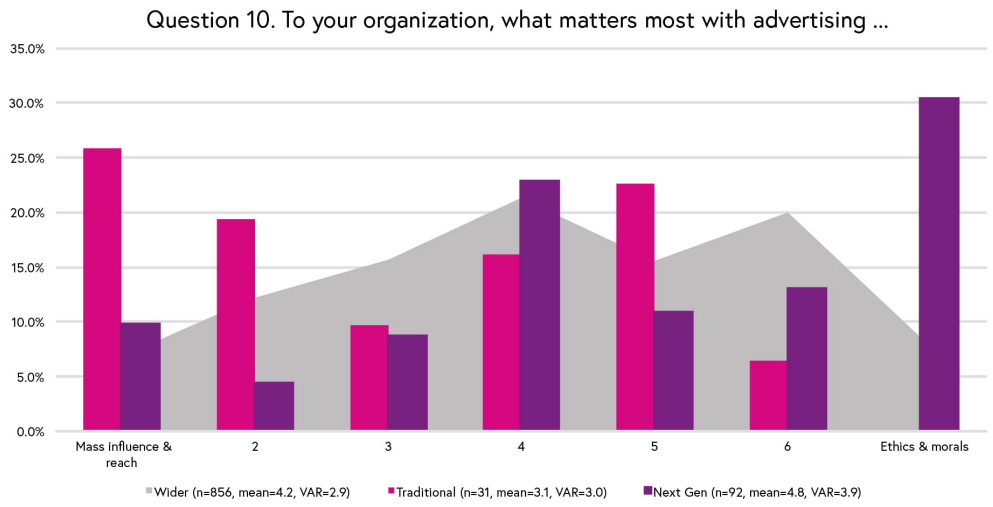


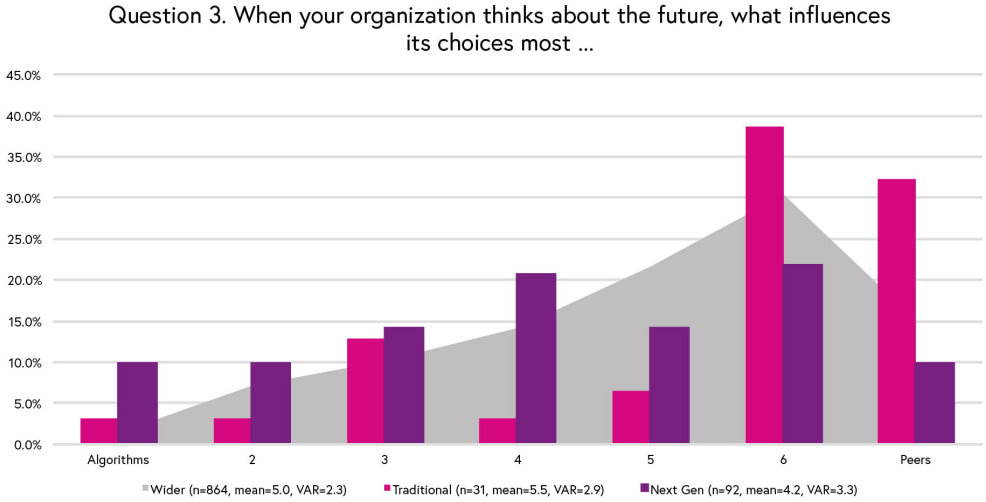
Rank #18 – ARTIFICIAL INTELLIGENCE (TECHNOLOGY)



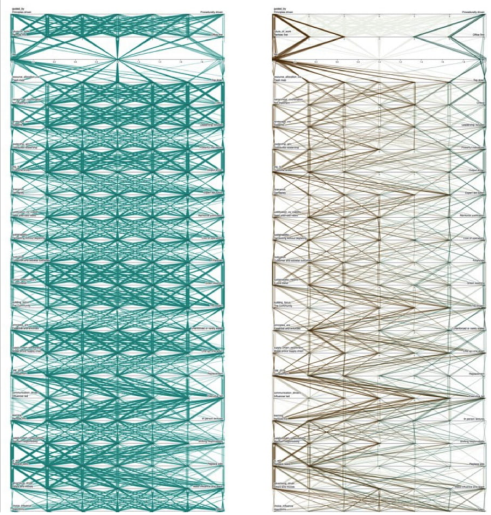
Rank #19 – BUSINESS MODEL



Rank #20 – INFLUENCERS



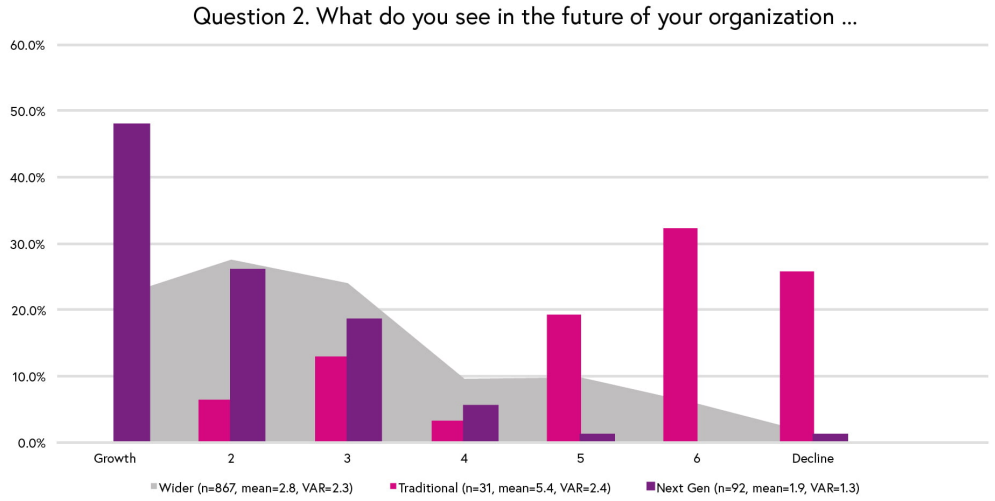
Separation of populations



Whilst the survey showed statistically different populations, this is not always easy to see from the numbers alone. The graphs above attempt to represent this difference. The first graph has all 1000 responses with the same weighting (i.e. all survey responses using a single colour). The responses are aligned with those indicating next generation on the left of the graph and traditional on the right, and questions are ordered in the significance ranking determined from the survey. From this first graph, it is difficult to distinguish any pattern in the general population, which is what you would expect. At best you could take average responses, which would suffer from sampling bias and the olive colour problem with the Mona Lisa. There are certainly some responses that the general population favours, but mostly the spread of responses is even.

In the second graph on the right, responses from companies that emerged as next generation are shown in brown and as traditional in green, with others made more transparent. There are now clearly two distinct populations of brown and green. Whilst there is some crossover in responses, the populations mostly keep to themselves with the next generation (brown) on the left of the graph and traditional (green) on the right, though this diminishes as the questions become less significant.

Direction, inertia & large companies



The populations aligned to the characteristics created by the research group (i.e. next generation showed next generation characteristics and the same for traditional) and the 'other' population fell in between these two

extremes. Though the research group viewed next generation as representing the future, question 2 was added to provide evidence to support that direction of travel. The wider 'in-between' population were fairly positive about the future, viewing it more as growth than decline. However, the next generation were extremely positive about their prospects and the traditional organizations mostly saw decline. On the assumption that these companies are best placed to determine their own fates, we can reasonably postulate that traditional approaches will disappear over time and be replaced by next generation.

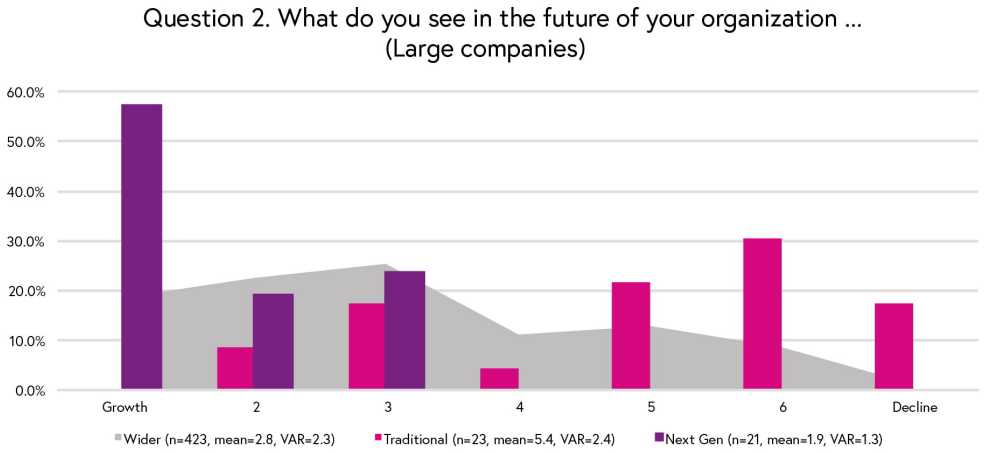
Inertia

Several controversial ideas seem to have been highlighted by the data, including the concept of distributed or leaderless leadership. That is not to say there are no leaders, but that leaders emerge as needed. In the words of Haier's CEO Zhang Ruimin: *"It's now time for every employee to be his or her own boss"*. This is counter to many Western practices and is likely to face significant resistance in much the same way that some executives have resisted a shift to more virtual practices due to loss of status and power symbols. To compound this problem, all these next generation practices are emerging – so we are still learning about them. That means there are no guidebooks, no clear examples to follow, no list of steps to take, and there are likely to be several high-profile failures and rocky roads as companies learn and evolve (e.g. Zappos and Holocracy).

Our inertia to change is no different from the resistance to cloud and DevOps practices in 2010. By the time practices become clearly defined, any advantage is long gone. However, before embarking on exploring any of these practices, the organization needs to consider its risk appetite and the inertia it will face.

Large company test

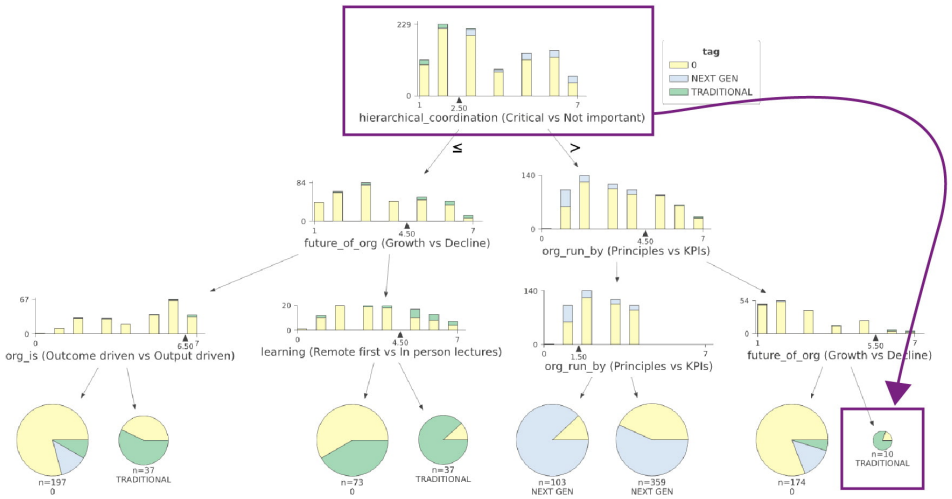
Our 2011 survey was often dismissed as being 'just startups' so in this population study I added a question on company size. The same differences and views about the future were found in larger companies.



If anything, the data showed that large organizations that exhibited next generation characteristics tended to be even more positive about their future than the startups in the same population group. Larger organizations that exhibited traditional characteristics also tended to be less negative

about the future than startups in their population group but not by any significant difference. Beyond a general statement that there exists some weak evidence that large organizations tend to be slightly more positive and less negative, there were no significant differences from their population groups related to company size. In other words, this is not 'a startup thing'.

Contraindications



AI was trained on the data by running it through modules from Explained AI to develop a decision tree. Whilst the details are not relevant, one thing should be noted: as the diagram shows (in purple), if a company that is traditional (uses procedures and offices) decides to pursue the approach of using non-hierarchical structures then the future outcome is likely to be decline. This is a contraindication, much as certain drugs have adverse reactions in patients with certain conditions. We can assert that the condition in this case is that companies must be run by guiding principles before embarking on such a journey. The same contraindication appeared in our report on Pioneers, Settlers and Town Planners where companies that had embarked on that structure without basic guiding principles in place had failed.

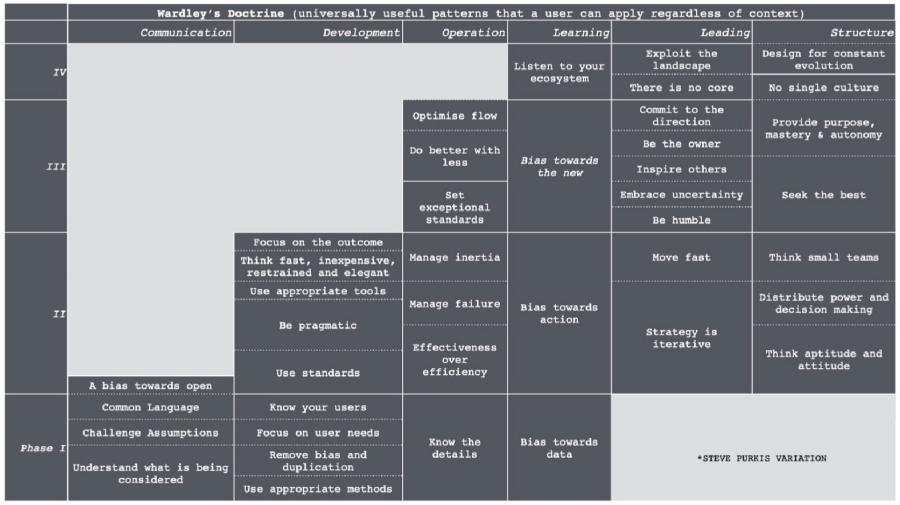
Companies must be run by guiding principles before embarking on such a journey."

Our advice in that previous report was to sort out the guiding principles of the company before any organizational change. However, that runs counter to popular business mantras of 'becoming bimodal' or 'adopting the Spotify structure'. (Note that Spotify itself has clearly stated that it does not follow the organizational structures that many management consultants claim it does and the key to its success is not its organizational structure but its guiding principles.) Given this contraindication has once again appeared in this set of data, it is incumbent on us to provide a health warning:

Whilst the emerging next generation practices are associated with speed, including the ability to quickly mobilize and extract value from a market, they are likely to cause harm if the company does not have strong enough guiding principles in place.

Whilst structural led efforts such as adoption of the Spotify model or technology-led efforts such as digitization or methodology-led efforts such as agile are seductive, it is strongly advised that all companies refrain from such efforts and withhold from exploring these next generation behaviours until they have strengthened their guiding principles.

Guiding principles



Examination of next generation vs. traditional characteristics provides a list of behaviours exhibited by companies that we should seek to emulate. However, behaviours themselves are a function of values (i.e. beliefs), underlying principles and the context we operate in. The universally useful principles (known as doctrine) that we are aware of are summarized here in the **doctrine table**. These principles should be used to challenge the organization, for example, asking the question: do we 'focus on user needs'?

Underneath the next generation behaviours that this study has highlighted will be principles that will need to be added to our doctrine table over time. I am not yet satisfied that we can conclusively state what those are. The principles in the doctrine table are connected, and have been mapped themselves in order to create the phases seen in the table. Hence any new principles are likely to be higher order phases which depend upon these underlying principles being in place. If this is the case (which seems likely) then it would explain the contraindication: if these basic principles don't exist, then you are unlikely to be able to succeed in following those next generation behaviours.

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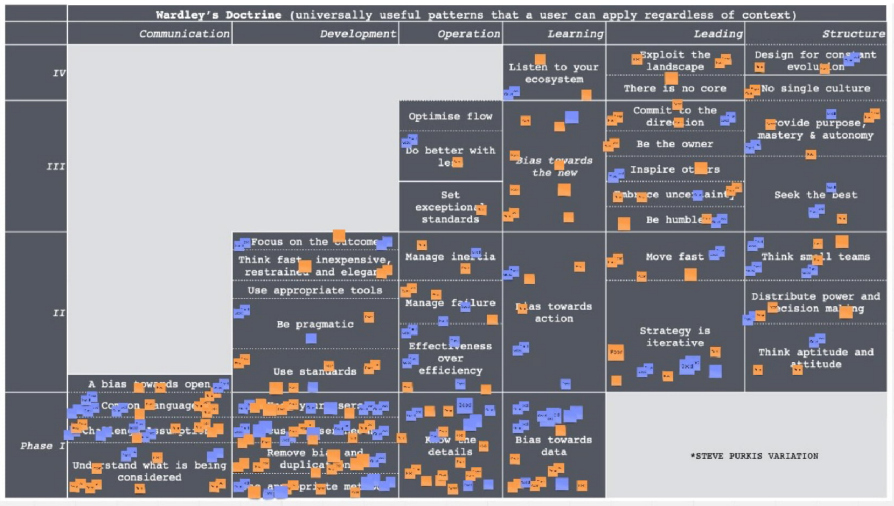
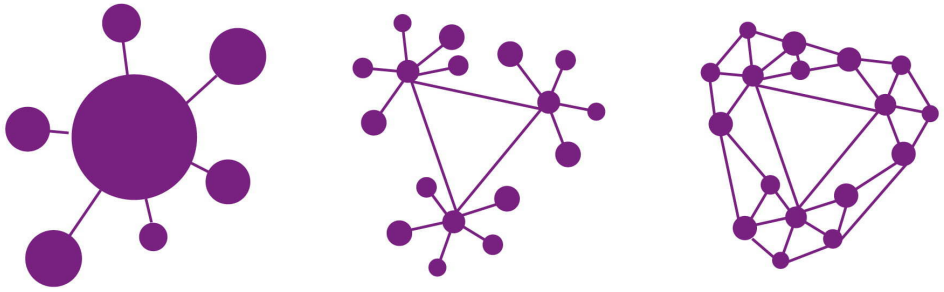


A simple way of testing the state of guiding principles in your organization is to create a Miro board, add the doctrine table to it and ask people to add post-it notes on whether they believe the company is good at this (blue) or poor at this (orange). You should then focus on the lowest order principles that the company is poor at. In the example shown here that would mean knowing your users, focus on user needs, removing bias and duplication, understand what is being considered, a bias towards using data and understanding the details. This should be done before any large scale technological, structural or methodology transformation or any attempt to emulate the next generation.

Alternative examples of guiding principles include Amazon's Leadership Principles, Microsoft and Haier.

The role of communication



Another contraindication is to do with communication mechanisms. Conway's law states: "Any organization that designs a system (defined broadly) will produce a design whose structure is a copy of the organization's communication structure."

Our organizations are systems and their design will reflect our communication systems. In a world where communication between individuals is relatively cheap because groups are small and localized (e.g. hunter gatherer societies) then human society has tended towards more decentralized and contextual forms of leadership – leaders arise where necessary and to meet the given situation. There is no overall leader, no hierarchy, no headquarters; and when leaders do need to emerge, they have little authority over others beyond

influence. There are norms of behaviours (including leading by example) but not procedures. An example is the Apache nation as described in the book *The Starfish and the Spider**. We tend to describe these as 'starfish' organizations, where leadership is not only decentralized but distributed across the whole.

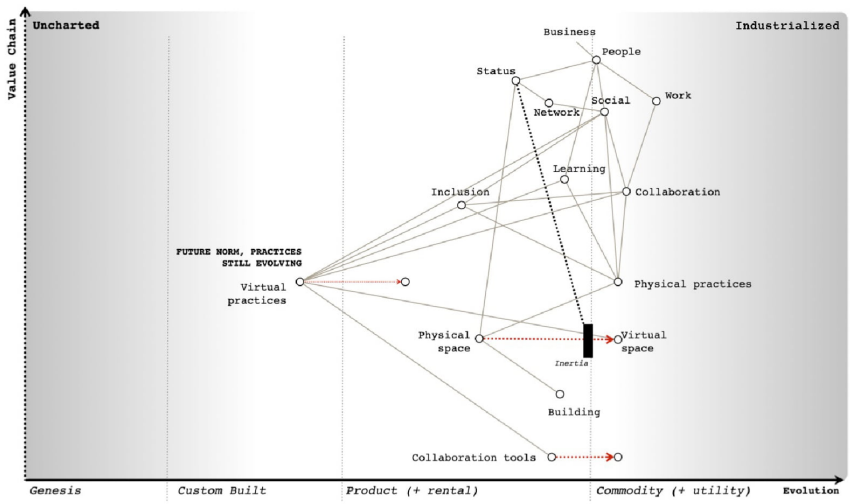
When communication between individuals becomes more costly (e.g. sending messages by courier through large, connected groups) then centralized structures that collect information and disseminate it can arise. These structures are more like the spider at the centre of a web. The hubs become centres of power and leadership becomes a permanent role often associated with a small group of people. For example, the Spanish Army defeated both the Aztecs (a spider) and the Incas (a spider) but despite its clear technological advantages for many centuries failed and ultimately lost to the Apache nation (a starfish).

In today's world, where point-to-point communication is cheap (through the internet), then other more contextual structures become possible. This has long been an area of discussion in the open source world, within online gaming and a few organizations that have tended towards more starfish-like structures where decisions and power are distributed.

*Ori Brafman & Rod Beckstrom. *The Starfish and The Spider: The Unstoppable Power of Leaderless Organizations*, Penguin, 2006

However, just because communication mechanisms are cheap and allow for new contextual structures, this does not mean that organizations will encourage these new structures to arise. The reason is that those past structures are tied to concepts like power and status, which are both major sources of inertia to change. The 'office' or 'headquarters' can be considered as the last bastion of the centralized mentality. Whilst it is likely that our structures would have changed naturally over time, the isolation economy caused by COVID has forced us to quickly adopt new communication mechanisms that directly threaten those past structures – consider the democratizing effect of a Zoom room rather than the status-laden symbol of the top floor office. This effect is shown in the following map, which shows the isolation economy forcing us into a world of the virtual, where new practices have emerged for collaboration, learning and inclusion (often borrowed from the online gaming world) based upon collaboration tools that have industrialized.

The isolation economy caused by COVID has forced us to quickly adopt new communication mechanisms that directly threaten those past structures."



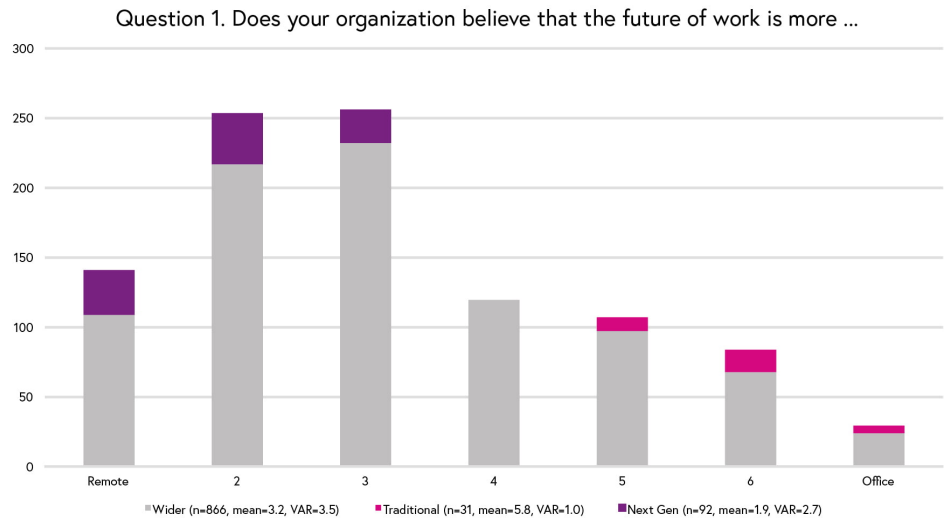
It is therefore not entirely surprising that so many next generation characteristics are related to orchestration (concepts like leaderless leadership), structure (non-hierarchical) and the underlying communication mechanisms (social media and collaboration tools such as Miro, Slack, etc.). Nor is it surprising that Microsoft swooped on GitHub ($7.5bn), attempted to buy Slack (bought by Salesforce for $27bn) and Discord ($10bn) and Amazon has acquired Wickr. This is why focus on remote working ended up being part of the separation questions for the survey.

It was equally predictable that there has been a significant push by executives to return to offices despite any actual outcome . Whilst some counter examples exist and questions arise around trust and close proximity, there is little to suggest that this push back to the office is being done for the organization's benefit but instead raises questions over personal power and status. It is also not surprising that so many employees wish to resist a return.

As one engineering manager in multi-billion-dollar global organization explained to me, *"We are not returning to the office because it makes the staff happier, or that we've suffered from productivity loss or for reasons of collaboration. The brutal truth is the CEO and some of the team feel powerless, can't adapt and won't admit it. We are losing so many good people and we are struggling to recruit. I thought COVID would be the problem. I'm not sure how we will survive this return to the office."*

However, this is just one anecdote. Looking at the wider population in the survey (excluding the traditional and next generation) then for the average company the future appears a hybrid of remote and office work with a tendency towards more remote. It would be easy to argue that the future is hybrid but this is our equivalent of saying that the Mona Lisa is olive. As the graph shows, depending upon your sampling, a survey that consisted of a very high proportion of traditional organizations could even push this 'average' towards an office-based future. This is why surveys that are not mindful of population differences, suffer from sampling bias and create generic averages across distinct populations can be so dangerous.

However, when the differences and the direction of those populations are factored in, the future is quite clearly remote first. Whether we like it or not, all the evidence points to the future being next generation and that next generation is more remote.



The future is quite clearly remote first."

Summary of findings

	TRADITIONAL	NEXT GENERATION
SELECTING QUESTIONS *Work is achieved through* *Future of work is ...*	PROCEDURES OFFICE FIRST	GUIDING PRINCIPLES REMOTE FIRST
ORCHESTRATION	TOP DOWN DIRECTION 'HEROIC' LEADERS UNENFORCED OR UNSTATED PRINCIPLES	SWARMING OF PEOPLE LEADERLESS LEADERSHIP ENFORCED PRINCIPLES
STRUCTURE	HIERARCHICAL	NON HIERARCHICAL
AWARENESS	FOCUS FOR LEADERS KNOW WHO WE SOLD TO & BOUGHT FROM SHIFTING RESPONSIBILITY	SYSTEMIC MODEL ENTIRE SUPPLY CHAIN MAINTAINING RESPONSIBILITY
BUSINESS MODEL	OUTPUT DRIVEN MOTIVATED BY FINANCIALS COMMS IS ABOUT MASS INFLUENCE	OUTCOME DRIVEN MOTIVATED BY CUSTOMER & SOCIETAL OUTCOMES COMMS IS DRIVEN BY ETHICS
LEARNING	EXPERT TUITION IN PERSON LECTURES	GAMEPLAY REMOTE FIRST
INFLUENCERS	MARKETING USED TO JUSTIFY DECISIONS *EXECUTIVES OVER EXTERNAL* PEERS OVER ALGORITHMS	MARKETING USED TO SEEK ALTERNATIVE VIEWS *EXECUTIVES & EXTERNAL* PEERS & ALGORITHMS
SUSTAINABILITY	COST TO OPERATIONS GREENWASHING FOCUSED ON THE PROJECT	HARVESTING WITHOUT DEPLETING CORE BELIEF FOCUSED ON THE COMMUNITY & THE PROJECT
TECHNOLOGY	AI COMPLEMENTS & REPLACES HUMAN FUNCTION AI REPLACES JOBS & TASKS	AI COMPLEMENTS HUMAN FUNCTION AI REPLACES TASKS
VIEW OF THE FUTURE *For the company*	DECLINE	GROWTH

The chart provides a summary of all the graphs and data, organized into categories that are placed as far as possible in order of significance, and so summarizes traditional vs. next generation behaviours. We have shown that these entities do exist in the wild and companies are migrating from traditional towards more next generation behaviours over time.

Whilst those next generation practices are emerging, they are exhibited to different degrees by both small and large companies.

RECOMMENDATIONS & FUTURE RESEARCH

Recommendations

Step 1. Due to the existence of contraindications, first assess the state of guiding principles within your organization using the doctrine table. Where you detect weaknesses in your principles, resolve these before embarking on any other major programme, whether technological, structural or methodological. Alongside this, continue your efforts to encourage remote working, recover costs from unused assets and resist the temptation to return to the office. Be aware that there will be pressure to return, often associated with inertia to change and loss of status symbols.

Step 2. Provide time for your guiding principles to embed and to reflect on any outcome. Investment may be needed in removing legacy systems, adopting serverless and other areas designed to meet user needs. These investments should be guided by the principles.

Step 3. Once you are satisfied that basic guiding principles are in place and remote working has become accepted as normal, with collaboration tools (Slack, Miro), conferencing capabilities (Zoom, Virbela, Teams) and social media in common use and increasing access to data (both internally and externally), then you can examine next generation behaviours. Focus first on orchestration, structure, increasing awareness throughout the entire organization, the business model itself (shifting towards becoming outcome-driven, with comms driven by ethics, and motivation and rewards based upon customer and societal outcomes) and learning. These behaviours are emerging (and changing) so consider the context in which they are being applied. This is why it is so important that guiding principles are in place, including a focus on situational awareness throughout the organization. Re-evaluate sunk costs in past technology programmes including existing data lakes or private cloud environments. In many cases, attempts to create siloed data stores or home-grown efforts may well have been counterproductive and will need to be dismantled and costs recovered. There will be inertia, often due to political and financial capital spent.

Step 4. Focus increasingly on issues of sustainability, how it influences and is influenced by others, and technology. Many of these questions relate to the security and resilience of the organization itself. At this point investment in technology areas such as AI may provide valuable complements to human capability, depending upon your context. To assess this, you will need to have increased your organization's situational awareness and to be guided by those at the coal face, hence the importance of leaderless leadership.

Future research

	TRADITIONAL	NEXT GENERATION
ORCHESTRATION	DEPARTMENTAL 'HEROIC' LEADERS PROCEDURES OFFICE FIRST TOP DOWN DIRECTION HIERARCHICAL UNENFORCED OR UNSTATED PRINCIPLES	SERVICE / CELL BASED LEADERLESS LEADERSHIP GUIDING PRINCIPLES REMOTE FIRST SWARMING OF PEOPLE NON HIERARCHICAL ENFORCED PRINCIPLES
BUSINESS	PROFIT FOCUS OUTPUT DRIVEN COMMS IS ABOUT MASS INFLUENCE MOTIVATED BY FINANCIALS CULTURE IS A SOURCE OF INERTIA	DISRUPTION FOCUS OUTCOME DRIVEN COMMS IS DRIVEN BY ETHICS MOTIVATED BY CUSTOMER & SOCIETAL OUTCOMES CULTURE IS FLUID / GAMEABLE
LEARNING	ANALYSTS IN PERSON LECTURES EXPERT TUITION	ECOSYSTEM REMOTE FIRST GAMEPLAY
AWARENESS	USES 'BIG DATA' FOCUS FOR LEADERS SUPPLY CHAINS SHIFT RESPONSIBILITY KNOW WHO WE SOLD TO & BOUGHT FROM	DRIVEN BY DATA SYSTEMIC MAINTAINING RESPONSIBILITY FOR SUPPLY CHAIN MODEL ENTIRE SUPPLY CHAIN
INFLUENCERS	EXECUTIVES OVER EXTERNAL *PEERS OVER ALGORITHMS* MARKETING USED TO JUSTIFY DECISIONS	EXECUTIVES AND EXTERNAL *PEERS & ALGORITHMS* MARKETING USED TO SEEK ALTERNATIVE VIEWS
SUSTAINABILITY	COST TO OPERATIONS GREENWASHING FOCUSED ON THE PROJECT	HARVESTING WITHOUT DEPLETING CORE BELIEF FOCUSED ON THE COMMUNITY & THE PROJECT
ARCHITECTURE	CHANGE CONTROL DISASTER RECOVERY N+1 OPEN SOURCE IS COST REDUCTION SINGLE PROJECT METHODOLOGIES SCALE UP	CONTINUOUS DEPLOYMENT CHAOS ENGINES DESIGN FOR FAILURE OPEN SOURCE IS A WEAPON USES MIXED METHODS SCALE OUT
TECHNOLOGY	AI COMPLEMENTS & REPLACES HUMAN FUNCTION AI REPLACES JOBS & TASKS ENTERPRISE CLASS	AI COMPLEMENTS HUMAN FUNCTION AI REPLACES TASKS USES COMMODITY

This amalgamated table shows the full list of next generation behaviours that your firm should ideally exhibit. It includes behaviours from our 2011 (grey) and 2021 (blue) research. This is purely for completeness as the 2011 behaviours have already been turned into principles within the doctrine table, which itself represents an accumulation of accepted behaviours described through principles.

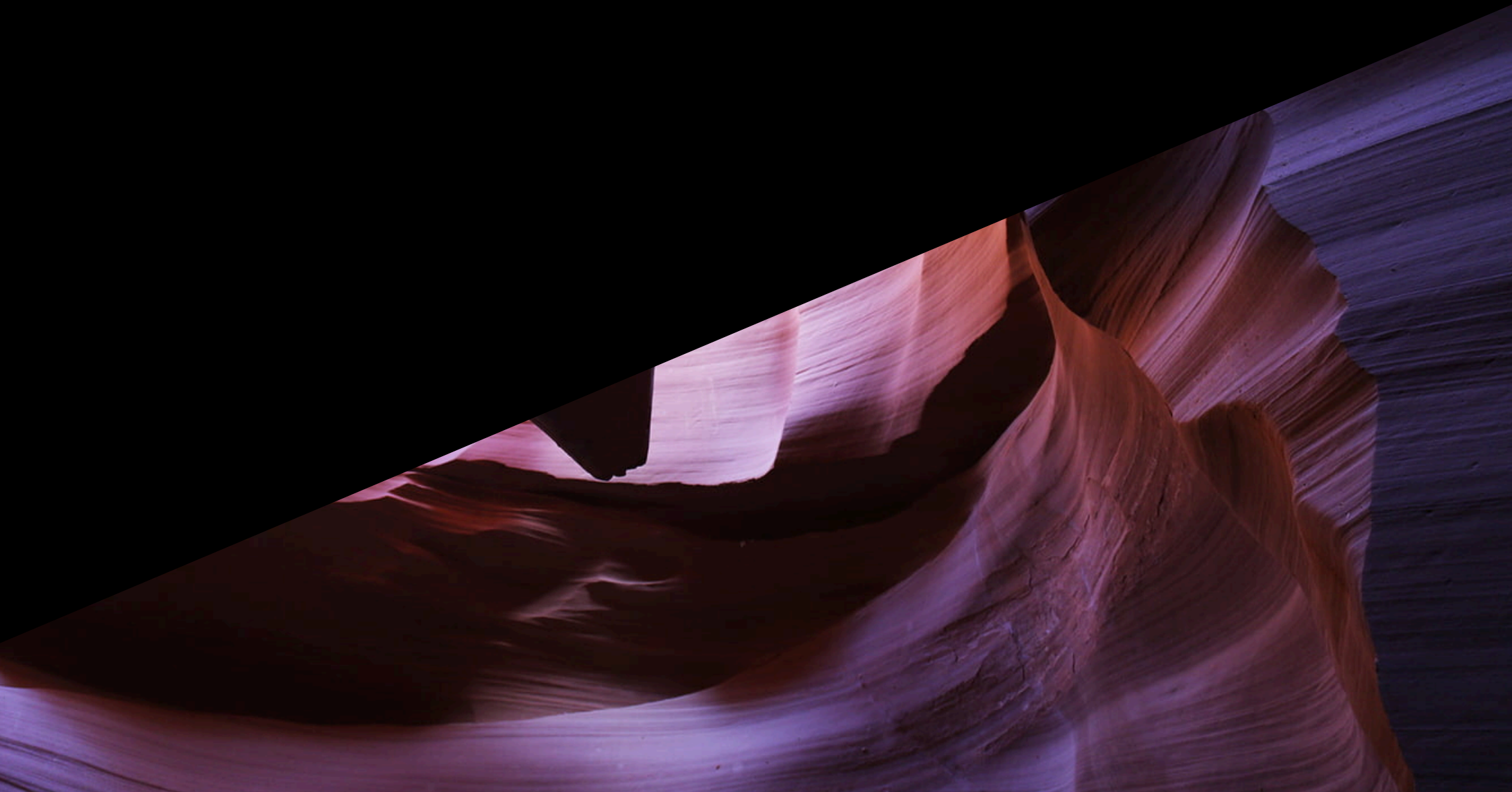
We are aware that some companies have not yet fully implemented (and sometimes not even started) the behavioural changes from 2011. Some are just starting their journey into DevOps and cloud today. Others do not even have earlier behaviours that are now covered by the most basic of principles, such as a focus on user needs or understanding the details. So how do they survive?

Van Valen's Red Queen effect means that an organization has to evolve to simply to keep up with a surrounding competitive ecosystem. However, in protected spaces (e.g. by regulation, barriers to entry or constraints) or in an environment with similar competitors, then there is no effective competition. Those protective barriers may create a false sense of security and once they are overcome those companies may struggle to adapt or even to survive against new competitors that have been hardened by competitive forces. Many apparently unassailable giants have fallen to the likes of Amazon.

Each of these new behaviours is individually worthy of further research as they are emerging concepts, including remote work, leaderless leadership, modelling supply chains and outcome over output. Whilst we have not normally written industry-specific reports but instead looked for general impacts, given that each of the markets examined (including healthcare, space and defence) are undergoing significant change, we need to consider commissioning groups of experts in those fields to describe examples of these changing behaviours and emergent practices.

Finally, the entire exercise itself should be repeated in 2031 to both re-assess the current state of behaviours at that future time and to see if we can find a new 'next generation'.

APPENDIX



Question 1. Does your organization believe that the future of work is more ...

Scoring: Remote first [1] to Office first [7]

*Note: Used as a **SEPARATING** question for populations. Next Generation would score 3 or less, Traditional would score 5 or more.*

Question 2. What do you see in the future of your organization ...

Scoring: Growth [1] to Decline [7]

*Note: Used as a **DIRECTIONAL** question to help determine whether Next Generation or Traditional have a more positive view of the future.*

Question 3. When your organization thinks about the future, what influences its choices most ...

Scoring: Algorithms [1] to Peers [7]

Question 4. Does your organization believe that the future of leadership is about powerful and charismatic individuals OR a world without leaders where leadership is distributed?

Scoring: Distributed leadership [1] to Powerful individuals [7]

Question 5. When work needs to be done, is it normally achieved through defined procedures OR through a set of guiding principles?

Scoring: Principles driven [1] to Procedurally driven [7]

*Note: Used as a **SEPARATING** question for populations. Next Generation would score 1, Traditional would score 7.*

Question 6. When your organization needs to apply resources to a problem, is the approach best described by a top-down direction that is given OR a spontaneous flash mob of peer-to-peer interaction?

Scoring: Top down [1] to Flash mob [7]

Question 7. When your organization thinks about sustainability, is the main focus on the impacts to any cost of operations (including bad publicity) OR how to harvest resources without depleting the resources?

Scoring: Cost of operations [1] to Harvesting without depleting [7]

Question 8. Learning in the organization is an activity that is ...

Scoring: Remote first [1] to In-person lectures [7]

Question 9. Is your organization run by ...

Scoring: Principles [1] to KPIs [7]

Note: Though chosen for the survey it was considered too close to the separating question of procedure versus principle and was discarded from any analysis.

Question 10. To your organization, what matters most with advertising ...

Scoring: Mass influence and reach [1] to Ethics and morals [7]

Question 11. Would you say your organization is more ...

Scoring: Outcome driven [1] to Output driven [7]

Question 12. Does your organization think that supply chains are a way of shifting responsibility to others OR that the entire supply chain is the responsibility of the organization?

Scoring: Shifting responsibility [1] to Maintain responsibility [7]

Question 13. How important is hierarchy in your organization for co-ordinating activities?

Scoring: Critical [1] to Not important [7]

Question 14. When building things in your organization, is the main focus on ...

Scoring: The Community [1] to The Project [1]

Question 15. When you hear sustainability in your organization, do you think ...

Scoring: A core belief [1] to Greenwashing [7]

Question 16. In your organization, artificial intelligence will ...

Scoring: Replace jobs [1] to Replace tasks [7]

Question 17. When your organization takes on a project, does it use market research to reinforce the justification for the project OR to seek alternative views on the viability of the project?

Scoring: Seek alternative views [1] to Reinforce justification [7]

Question 18. How aware is your organization of its own supply chain? Do you know who you bought from and who you sold to (known as one up, one down) OR do you model the entire supply chain including those of your customers and suppliers?

Scoring: One up, one down [1] to Model entire supply chain [7]

Question 19. Principles in the organization are ...

Scoring: Unenforced or rarely stated [1] to Essential and enforced [7]

Question 20. How would you describe external communication in your organization? Is it more set by internal executives OR directed by external influencers?

Scoring: Influencer led [1] to Executive led [7]

Question 21. Does your organization view artificial intelligence as a future replacement for human functions OR a complement to human functions?

Scoring: Complement [1] to Replacement [7]

Question 22. Learning in the organization is most commonly achieved through expert-led tuition with defined scenarios OR gameplay with evolving scenarios?

Scoring: Expert-led tuition [1] to Gameplay [7]

Question 23. What motivates people in your organization?

Scoring: Customer and societal outcomes [1] to Financials [7]

Question 24. When it comes to understanding your competitive landscape, does your organization believe this should be a function of leadership OR systemic throughout the entire organization?

Scoring: Leadership focused [1] to Systemic [7]

Question 25. How many people does your organization employ?

Scoring: Selection of ranges.

Note: *To test whether the changes were purely start-up related.*

Question 26. Does your organization use Wardley maps?

Note: *Exploration question for future hypothesis and survey.*

Question 27. What industry does your organization work in?

Note: *To test for any industry-specific effects.*

Thank you for reading

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