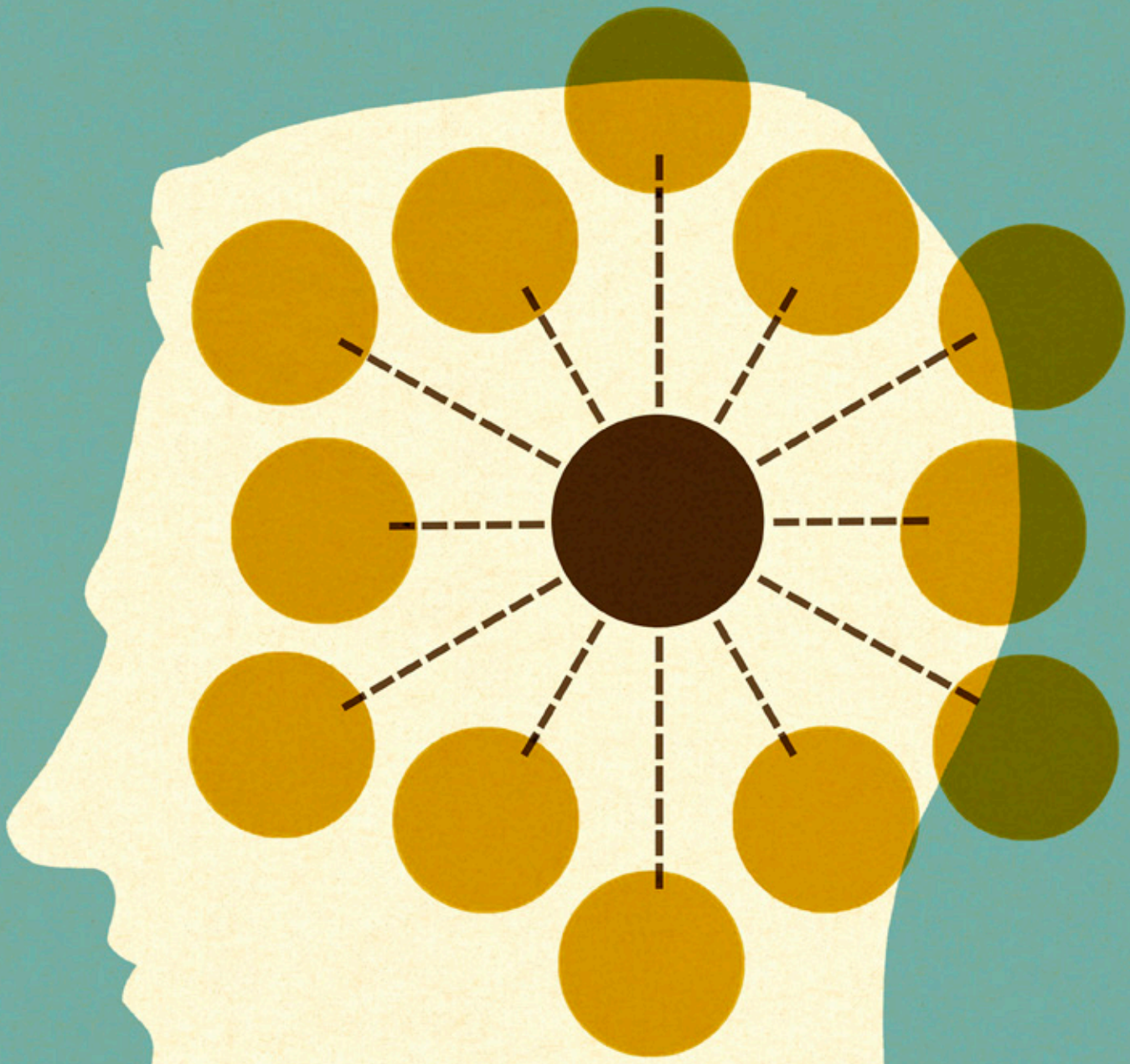
The Theory of Fragmented Strategies

The role of creativity and imagination in a technology led world

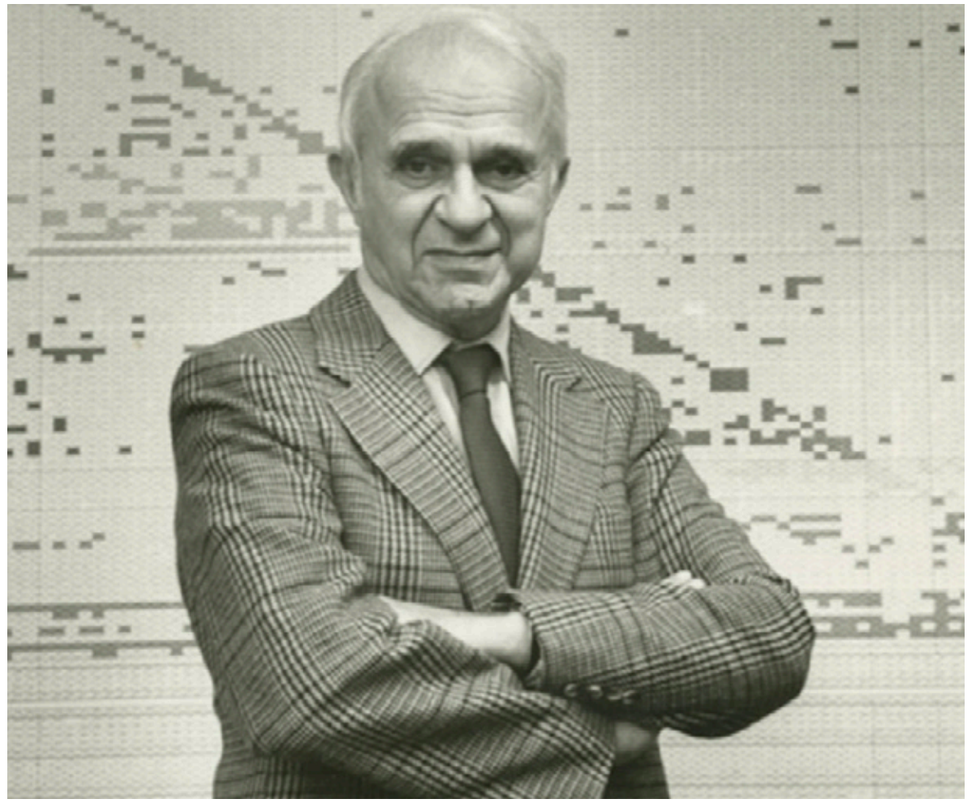


BY
KARY BHEEMAIAH

Fahrenheit212
Part of Capgemini Invent

"If you fail to transcend conventional thinking at a time when conventional thinking is losing touch with reality, then you are more likely to fall prey to an epidemic of disorientation that lies ahead"

- *The Sovereign Individual, 2008*



"The Human Worker will go the way of the horse"

- *Wassily Leontief, Nobel Prize in Economics, 1973*

“By 2017, a 15-hour work week will suffice...”,

John Maynard Keyes, 1930

In light of such polarising viewpoints, it’s hard to arrive at a consensus that offers guidance on how to adapt to technology. But if one were to analyse the past effects of technology on society, a repeating pattern appears that could be used as a compass of adaptation – Every time a new technology enters a society, it fragments existing hierarchies and value chains, creating new occupations and flatter social structures.

We can test this theory by looking at the Printing Press, and its transformative effect on society.

Consider the following scenario – It’s 1455, and you find yourself on the streets of Mainz, where the printing press has just been invented by Johannes Gutenberg. If you were to ask a proud citizen of Mainz that within the next 30 years, this invention would:

- Undermine the authority of the Catholic Church,

- Trigger and fuel the Protestant Reformation,

- Create something called Modern Science,

- Lead to the creation of undreamed and unprecedented occupations, professions and industries,

- Change our conception of childhood, social order and prosperity....

...What do you think they would have said?

Irrespective of their answer, this is exactly what happened, and it’s a phenomenon that continues to unfold.

[1] Thomas Samuel Kuhn was an American physicist, historian and philosopher of science whose 1962 book 'The Structure of Scientific Revolutions' was highly influential and introduced the term paradigm shift.

[2] Carlota Perez is a scholar who specialises on technology and socio-economic development? Her work has further developed Schumpeter's work on Kondratieff waves.

[3] Stephen Wolfram is a computer scientist, physicist, and businessman. He is known for his work in computer science, mathematics, theoretical physics and for building Wolfram|Alpha, a computational knowledge engine or 'answer' engine.

[4] E.O. Wilson is an American biologist, theorist, naturalist and author. He is a two-time winner of the Pulitzer Prize and has been nominated in the past for the Nobel Prize.

[5] Kevin Kelly is the founding executive editor of Wired magazine, and a former editor/publisher of the Whole Earth Review.

[6] Invention as a Combinatorial Process: Evidence from U.S. Patents

TECH-LED FRAGMENTATION AND ITS SOCIO-ECONOMIC EFFECTS

Whether we use the Printing Press or any other proxy of technology, when we study the historical effects of technology on a society, a familiar pattern emerges. Technology leads to the dilution of the existing hierarchies and value-chains, followed by the creation of new, fragmented, flatter, network-based higher order systems.

This pattern is not a new one, but a repetitive one, which has been documented by scientists and innovators such as Thomas Kuhn[1] in 'The Structure of Scientific Revolutions', Carlota Perez[2] in 'Technological Revolutions and Financial Capital', Stephen Wolfram[3] in 'Idea Makers', E.O. Wilson[4] in 'Consilience' and most recently by Kevin Kelly[5], the founder of WIRED magazine.

In his popular TED Talk, 'How Technology Evolves', Kelly stated that every technology goes through 5 phases: It starts off by being something very specialised, gets adopted by different users and increases in diversity, gets mixed up with other technologies to become increasingly ubiquitous, and as it reaches a threshold point of utilisation it becomes commoditized and social before intermixing with human interactions to become complex. After this point, it becomes a utility and leads to the creation of higher-order systems as it mixes with other technologies which are each in their own phases of technological evolution. This combination of technologies to create new technologies and higher-order systems has been documented and defined in academic literature as The Combinatorial Theory of Technological Evolution[6].

"Pioneers such as Alan Turing designed and built automated machines that could decrypt these camouflaged communiqués."

As computing is the protagonist of contemporary tech-conversations, let's analyse how this combinatorial evolution of technology occurs via the proxy of computing technology:

Initially computers were made for very specific or specialised operations. For example, early computers such as the Differential Analyser[7], were analog computation machines created to solve differential equations to help calculate the trajectories of ordnance shells.

As WWII broke out, various militaries integrated techniques of cryptography to these computing advances in order to communicate sensitive information. Pioneers such as Alan Turing designed and built automated machines (Turing Machines) that could decrypt these camouflaged communiqués. These applications effectively changed the use of the computer and increased the diversity of the computing machines.

After the war, advances by John Mauchly, Presper Eckert and John von Neumann, led to the creation of the EDVAC[8], the first binary computer. With binary computers coming of age, there was an increasing need to develop software to give instructions to computers. Punch cards were soon replaced by logic gates[9] and languages such as COBOL and FORTRAN[10] helped in the creation of early operating systems. As software design began to evolve so did the functionality of computers. Programming languages such as BASIC, LISP, SIMULA, C, C++, UML, Unix, Linux, etc., helped in the construction of distributed communication networks, the internet and ultimately the worldwide web.

As the cost of transistors began to drop (Moore's Law), more tasks got computerized leading to the ubiquity of computers in almost all functions of business and life.

This ubiquitous-ness gradually entered the sector of trade, communication, and finance. As trade is fundamentally based on interactions, the socialization of computers for communication and value exchange was a natural evolutionary technological development.

Increased socialization via digital technologies and multiple social channels over the past two decades has led to more interconnections between different 'nodes and agents', which has created a complex interwoven structure where there is no central point that holds the entire edifice in place.

As any technology evolves from specialization to complexity, an underlying pattern of Fragmentation repeats itself - Rigidity in terms of a technology's mono-function, is combated by mixing it with technologies with complementary functions. As fragmented pieces of technologies intertwine, the value chains of each technology mix and common processes are streamlined, redundant processes are eliminated, and repetitive processes are automated.

[7] Invented by Vannevar Bush in the mid 1930's

[8] Electronic Discrete Variable Automatic Computer

[9] from Boolean algebra

[10] FORTRAN: FORmula TRANslation

“Technology is, after all, ‘the carrier bag of culture’.”

As automation and streamlining spreads, marginal costs are reduced via economies of scale. This lowers the entry barrier to new entrants who develop novel uses of the tech, or actors who provide optimised solutions to specific parts of the value chain. As new entrants increase the competition in a space, new solutions and services are created to gain market share. Increased competition and new functionalities mean that technological functions move from being a productised commodity to an easily available utility (E.g.: From Hard drives to Storage on the cloud).

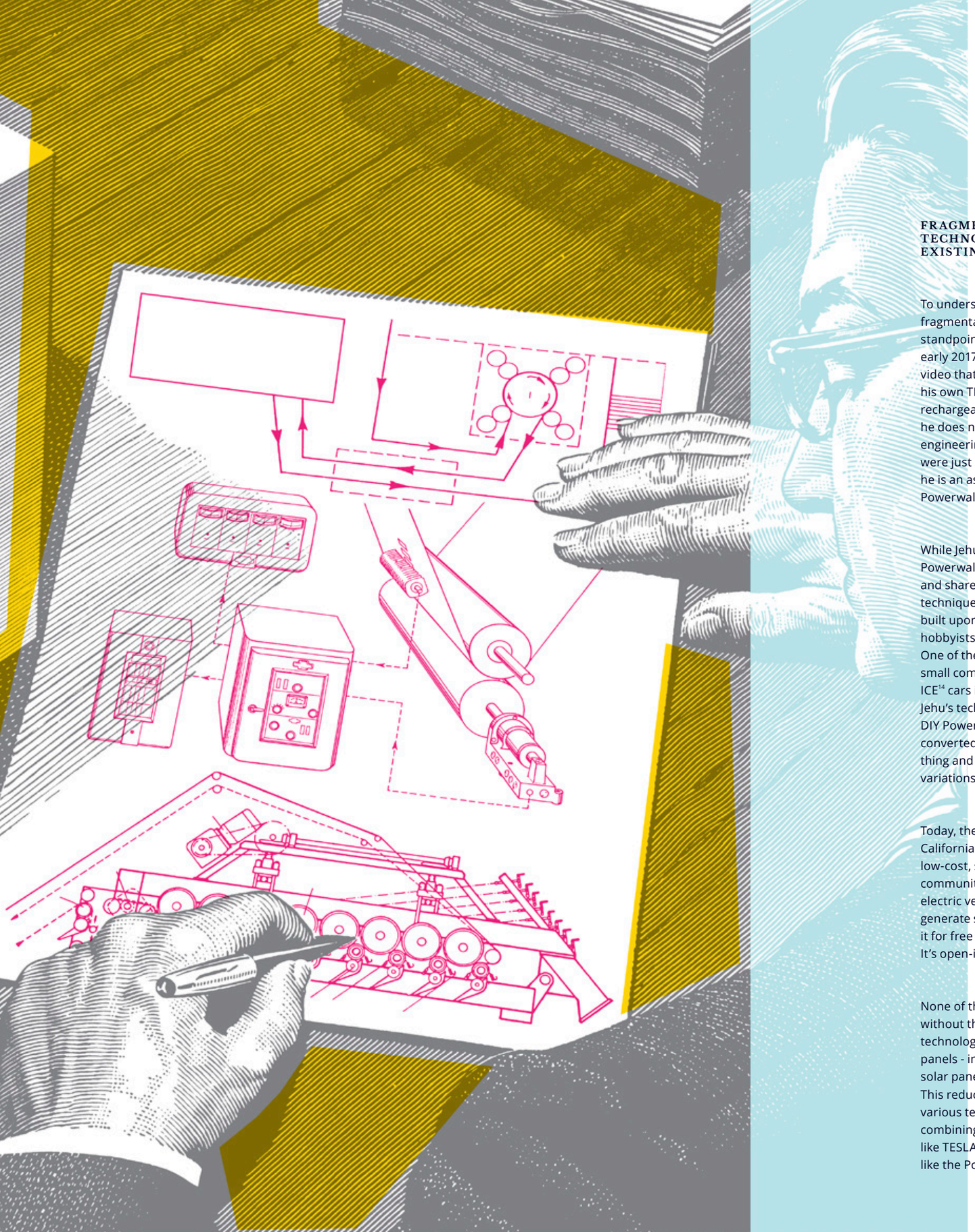
When a technology becomes a utility, it becomes cheap enough to be used by a wide population. New actors now combine this easily available technology in novel and unique ways with other technologies[11], leading to the creation of new mono-functional technologies, and the cycle of fragmentation repeats itself.

This self-fulfilling fragmentation pattern of technological evolution is our compass of adaptation. It helps us determine the slope and the tempo of a technology’s evolutionary curve, as well as the socio-cultural changes that emerge as a consequence. Technology after all is the ‘carrier bag of culture’ [12]. Selection, diversity, incremental variation and temporal progression are the hallmarks of tomorrow’s technology and, by extension, capitalism[13].

[11] Refer the Combinatorial Theory of Technological Evolution

[12] Quote by Ursula Le Guin

[13] K. Bheemaiah, ‘The Blockchain Alternative’, 2017



FRAGMENTATION 2.0: HOW TECHNOLOGY FRAGMENTS EXISTING SOCIAL HIERARCHIES

To understand the effect of fragmentation from a socio-cultural standpoint, let's look at Jehu Garcia. In early 2017, VICE magazine published a video that showed how Jehu constructed his own TESLA Powerwall, using cheap rechargeable batteries. Jehu states that he does not possess an electrical engineering degree and that his activities were just a hobby. By his own admission, he is an aspiring filmmaker, not a Powerwall builder.

While Jehu was building his DIY Powerwall's, he recorded his experiences and shared them on YouTube. His techniques and ideas were copied and built upon by a large number of related hobbyists, but also by other businesses. One of these businesses was EV West, a small company that converted existing ICE[14] cars into Electric cars. They adopted Jehu's techniques and started installing DIY Powerwall-esque units into their converted cars. Others saw the same thing and began making their own variations.

Today, there are neighbourhoods from California to Utrecht, that are creating low-cost, solar-powered decentralised community grids and powering their electric vehicles. In fact, they sometimes generate so much power that they share it for free with their adjacent neighbours. It's open-innovation on steroids.

None of this would have been possible without the fragmenting effect of technology. Firstly, let's look at solar panels - in the past decade, the cost of solar panel modules has fallen by 99%[15]. This reduction in cost (brought about by various technological mechanisms combining together[16], allowed companies like TESLA to create specialised products like the Powerwall and sell them on the market, thus mixing two fundamentally different technologies (electricity generation and storage) to create a combined set of products with interoperable processes.

Meanwhile, the fragmenting effect seen in computing technology led to the creation of channels such as YouTube. By combining these three individual technologies together, Jehu managed to not only create a new line of business (turning ICE cars into EVs) in a completely different sector (the automotive industry), but he also converted two products – solar powered electricity generation and the Powerwall – into locally sharable utilities, thus opening the door for the creation of higher order systems.

From an individualistic standpoint, Jehu has become a contender in the EV, Solar and Energy storage markets simultaneously[17]. In other words, as technology fragmented and diluted existing mechanistic hierarchies in specific markets, it has also led to the fragmentation of his own identity as a consequence.

At this juncture, we see the interplay between technology's evolution and its broader social context. In the scenario above, how does one identify Jehu? Is he:

- An autodidact with the ability to simplify the complex?

- A renegade entrepreneur who made the decision to publicly show how he hacked a Powerwall?

- An electrical engineer who saw the higher order system that could be built with EV West to change mobility and energy sourcing in a community,

- A creative film-maker who knew how to show this higher order system in a way that would inspire others to create their own higher order systems and thus accelerate the tech-led fragmentation phenomenon?

- A hero-hacker that is the embodiment of 'Shanzhai' culture?

He is all of these, as his identity is an integration of all his context-relevant identities. While he is making his DIY Powerwall, Jehu is an electrical engineer. While he is uploading the video of his DIY Powerwall, he is the film-maker. While he is talking to the owner of EV West to scale his invention for more cars and communities, he is an entrepreneur.

It is the culmination of all these identities that makes up the individual today. Technology and Culture, after all, are two sides of the same coin, as they have been from the days of Gutenberg. As one evolves, so does the other.

Whether a person is an academic, a consultant or a UberEATS delivery person, the same rule applies. Increasingly we are entering a world where tech-led fragmentation is diluting existing hierarchies, allowing people to create multiple, context-relevant identities and augmenting the role of creativity and imagination in innovative value-generation. It is leading to what some experts now call 'The Full-Stack Free-Lancer', which is individuals who use different tech platforms to create multiple persona's and interact with different communities, whilst retaining a singular existence.

[14] Internal Combustion Engines (ICE)

[15] 'Why PV Costs Have Fallen So Far—and Will Fall Further', Green Tech Media, 2018

[16] 'Evaluating the causes of cost reduction in photovoltaic modules', Kavlak et al, 2018

[17] Combined, Jehu Garcia and EV West have a million followers on social media who are making similar innovative ecosystems in their own communities.

TASKS AND SKILLS IN AN INCREASINGLY FRAGMENTED ECONOMY

The dual effect of fragmentation is not simply liberating individuals to create new higher order systems, but is also changing the architecture of how we organise to make teams and create companies of value. No man is an island after all, and while an individual can perceive things uniquely, being able to scale their perception and build something worthwhile with it, requires multiple perspectives.

The Russian psychologist L.S. Vygotsky who was one of the founders of cognitive psychology, defined perception as a process of triangulation between the subject (the individual in the world), the object or experience encountered, and the mediation of that relationship thorough cultural frames and behaviours.

Mental images we form are not the same as one-to-one representations of a sensed world. They are socio-cultural-biological constructs from the very beginning. What one sees, be it object or experience, is perceived through the lenses that work to make sense of that object or experience in terms known to the individual as a culturally embedded entity. Imagination then, is the "process of resolving and connecting the fragmented, poorly coordinated experience of the world so as to bring about a stable image of the world and a feeling of oneself in relation to the world."[18]

This means that different people will perceive the same event or even the same objects differently. They will create unique triangulations between themselves in the world, and the way in which their imaginations engage in making sense of the world to "create a stable image". This is why eye witness reports of a single even can vary widely and even contradict each other.

To fight fragmentation, we must use fragmentation. While technology fragments value chains and creates new higher order systems, cognitive diversity fragments perceptions and helps us understand the nuances of a novel proposal by offering multiple reasonings to the same issue. It is for this reason that the role of cognitive diversity is key in adapting to tech change and creating new products and services from it.

"To fight fragmentation, we must use fragmentation."

[18] Design Unbound, Pendleton-Jullian and Brown, 2018

Imagination and creativity is becoming increasingly important in a tech fragmented world. It is not only about producing novelty, which in turn fuels creativity, nor is it simply the undisciplined counter-faculty to reasoning. It is an entire spectrum of activity associated with diverse, cognitive processes, that turbocharge perception from reasoning to novelty to help us open new opportunities and create the higher order systems that technology allows us to achieve.

Be it an individual, a team or a community, the same principles apply. We use technology to see new opportunities, use our imagination to see alternative realities, get different people together to see which realities stand the test of reasoning and act together to create this new reality. It is the same forces that allow communities to transform their identities (e.g.: Rwanda is now a pioneer of drone technology) and companies to diversify into completely different sectors (Shell, the oil company is inching into the retail industry). It is therefore no surprise that Marc Andreessen said;

“There are more net jobs in the world today than ever before, after hundreds of years of technological innovation and hundreds of years of people predicting the death of work”

Andreessen, 2016

It is because of this cultural connotation that imagination and creativity will have a greater role to play in the story of technology’s evolution.

PUTTING IT ALL TOGETHER

In our new era of tech-led capitalism, we increasingly see the rise of an Autonomous-as-a-Service (AaaS)[19] economy. In almost every sector, we have greater and greater amounts of Autonomy and increasing specialization related to the kind of task being automated. MIT economist David Autor, was one of the first to identify this trend and in his seminal paper, “The Changing Task Composition of the US Labor Market” (2013), he states two key points that have since been built upon by other economists.

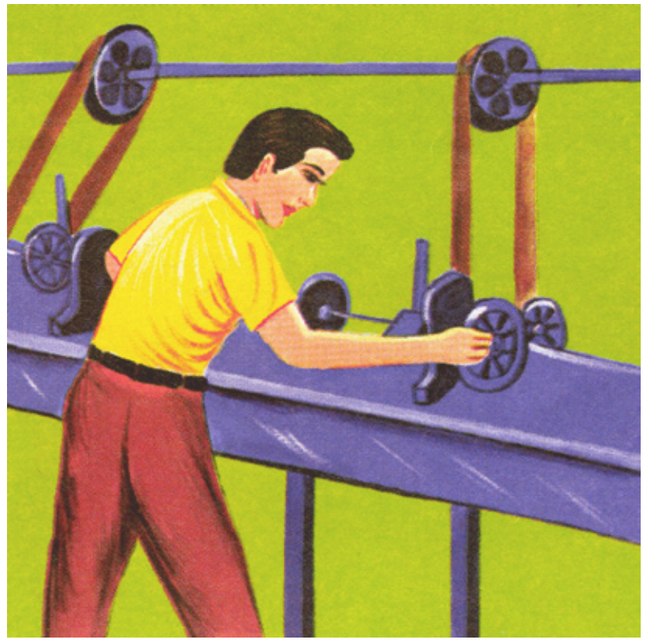
The first, is that every job is composed of a collection of ‘tasks’ and that all jobs can be grouped based on the level of repetition these tasks entail. As per his analysis, there are 4 kinds of jobs:

[19] We will be exploring this new trend of Automation-as-a-Service (AaaS) in a forthcoming article with the same title.

1

NON-ROUTINE MANUAL JOBS

- these are manual jobs that involve doing something different or new everyday i.e.: they cannot be encoded as there are too many scenarios (e.g.: a nurse working in a ward needs to deal with different situations everyday).



2

ROUTINE MANUAL JOBS

– these include jobs that are repetitive, and which can be easily taught to a robot (e.g.: worker in an assembly line/factory).

3

ROUTINE COGNITIVE JOBS

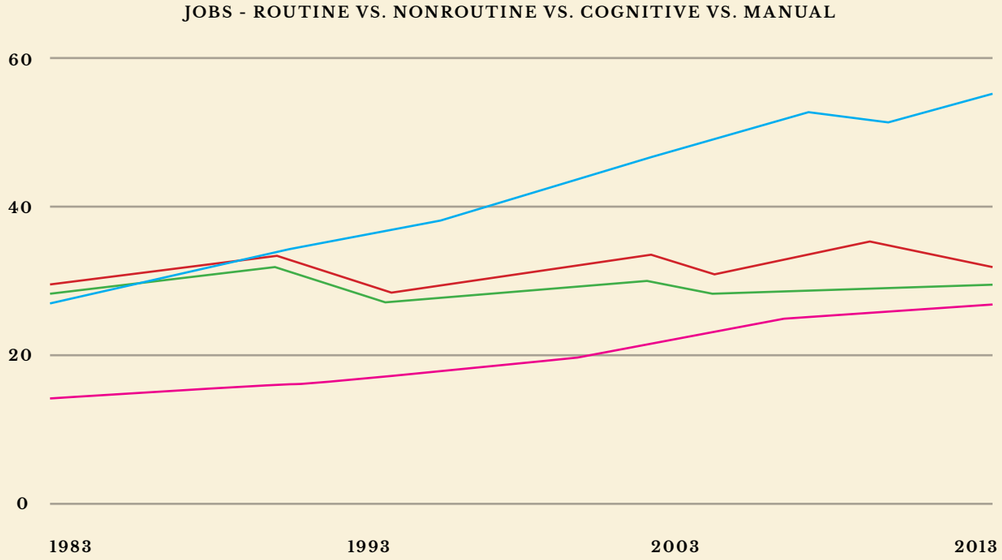
- these are ‘white collar’ jobs that require a certain amount of education and involve repetitive tasks that can be encoded and taught to a computer (e.g.: an accountant).

4

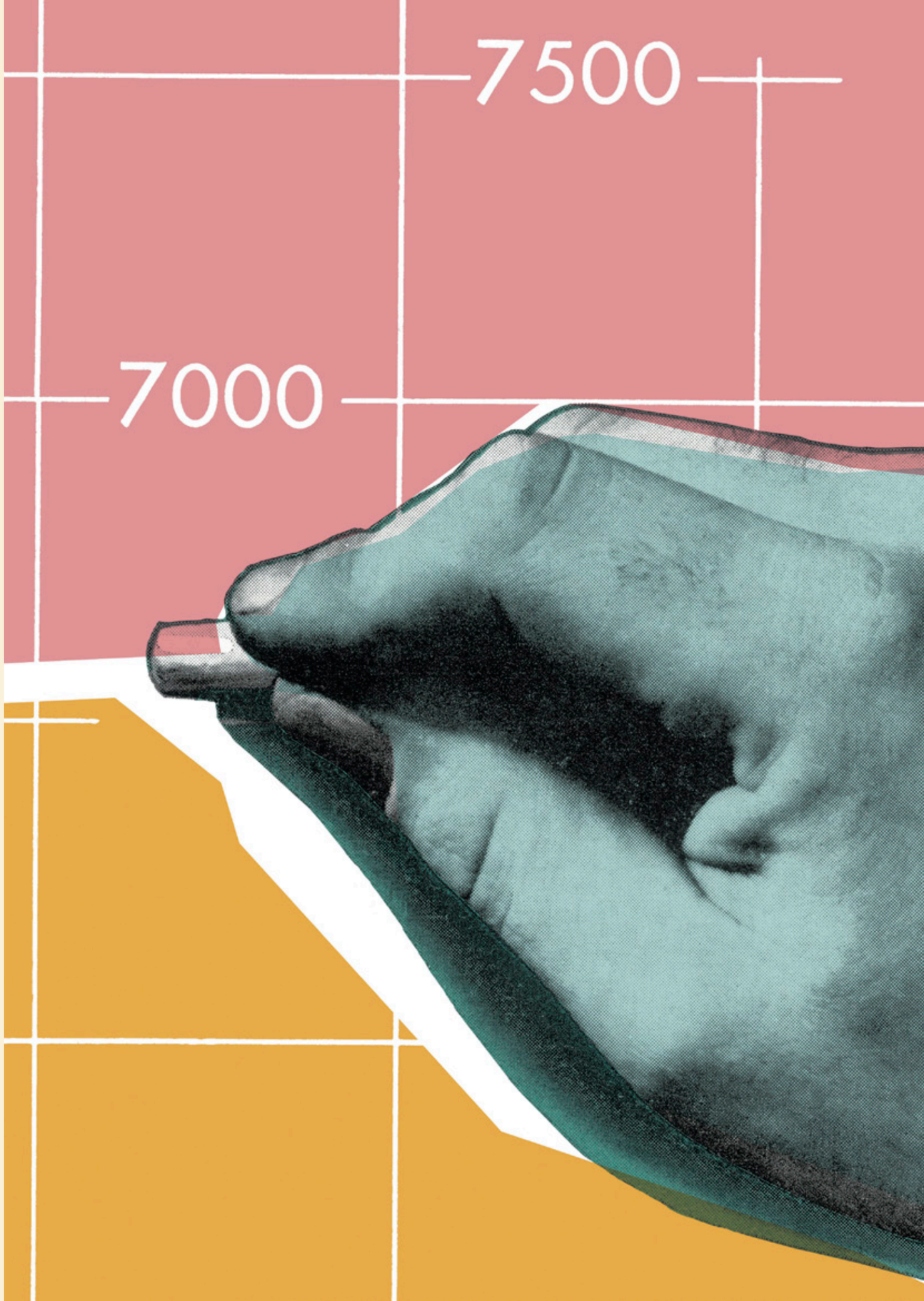
ROUTINE NON-COGNITIVE JOBS

– jobs that need a high level of education and/or involves the use of specific skills to execute responsibilities that change very frequently (e.g.: a researcher in NLP, or even a high-level consultant).

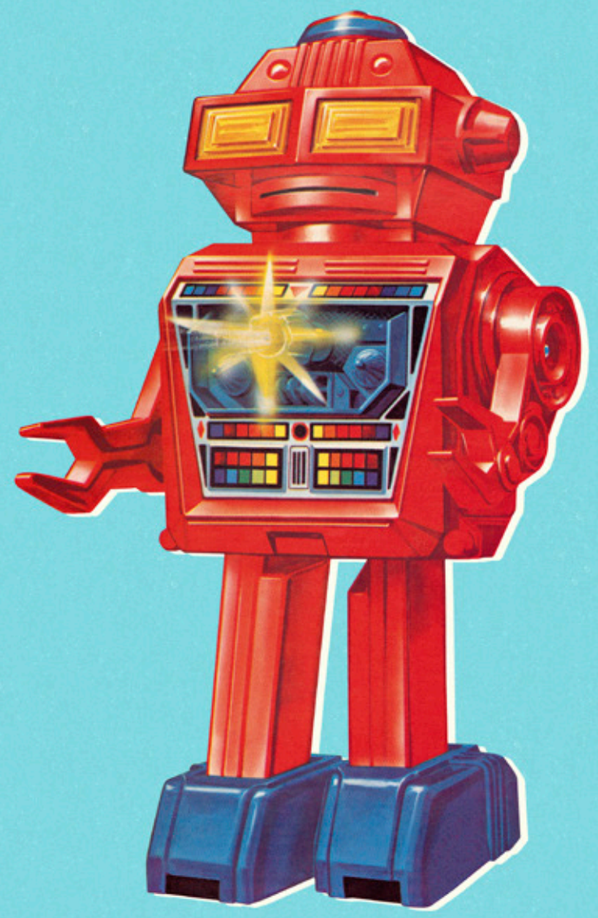
The second is that there is an increasing demand for ‘non-routine’ tasks and that this demand will continue to grow in the face of increasing automation. His analysis, which has since been built upon by other researchers can be graphically summarized and seen below:

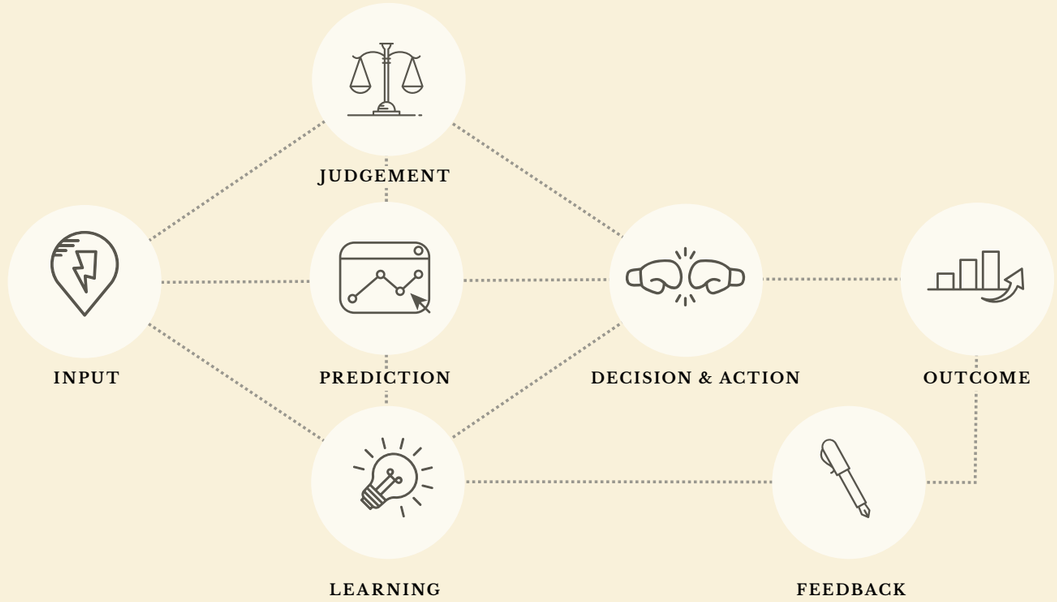


Further work from researchers from the University of Oxford, the IZA institute of labour economics, the University of Uppsala, and the American National Bureau of Economic Research (NBER), confirm that firstly, there is a growing amount of return from the non-repetitive skills, and secondly, in the face of increasing automation, the value of Soft Skills in the labour market is poised to increase as most of these non-routine skills involve human talents such as creativity, imagination and trans-disciplinary dot connection.



"As technology continues to automate tasks, fragment value chains and create higher order systems, the skill of being able to imagine what the higher order system will be, requires imagination and creativity."





What the image above shows us, is that most components of a task already are, or are getting, automated. Data capture or Input is now done with scraping algorithms. We use neural nets and machine learning to predict what can be done with the data we have amassed. Once the data is analysed, it is converted into intelligence and an action is taken based on our objective. This results in an outcome, which we can analyse to see if the previous actions have led us to reach the objectives we set, and coupled with feedback, which is also increasingly automated with tools from Affective Computing[20], we create a learning curve that is fed back to the prediction algorithms so that they may learn and improve.

In all these task components, there are only two components which involve humanistic skills – Judgment and Decision-making. As technology continues to automate tasks, fragment value chains and create higher order systems, the skill of being able to imagine what the higher order system will be, requires imagination and creativity.

Although creativity and imagination are both used to define novelty, the truth is they are two sides of the same coin[21]. Creative activity aims to do something purposeful. The imagination is something that emerges. While creativity works toward products that exist in the real world and have real world purposes, the product of imagination is the "imagined object" … it is the image itself. That image comes with meaning, but it is precisely because the imagination is given permission to play without pragmatic intent that it finds connections between things that are not obvious or easy.

[20] Affective computing is the study and development of systems and devices that can recognize, interpret, process, and simulate human affects. It is an interdisciplinary field spanning computer science, psychology, and cognitive science – i.e.: a higher-order system.

[21] We will be exploring this concept in greater detail in our forthcoming article, "Principles to Design an Innovation Space".

“It is only by understanding the cultural effect of technological change, that one can use creativity and imagination as levers of adaptation and change.”

HOW TO USE THIS MOVING FORWARD

Today the pace of combining imagination and creativity to achieve a sound judgment and make sensible decisions is accelerating thanks to technology. We see this fragmentation as a fountain of opportunity that leverages our talents and begets the need for continuous understanding of emergent trends. As technology liberates individuals and communities, it also illuminates constraints and challenges, especially for large companies that operate with an older organisational template.

The reason that these constraints exist is often due to a time-lag. Historically, when information was not as freely available as it is today, companies were organised in pyramidal, mechanistic hierarchies for a singular purpose – information came from the bottom and/or via markets, was passed up the chain, and executives made top-down decisions which were acted upon by employees.

This model of simplification was very useful until the early 2000’s. But as the volume of information grew thanks to the exponential rise of computing, the number of decisions that could be made, could not keep up with it. In other words, the throughput of decision-making was out of kilter with the amount of information that needed to be processed. It was this impetus that made automation a priority to be acted upon, rather than being a random act as is often described in popular fear-mongering media.

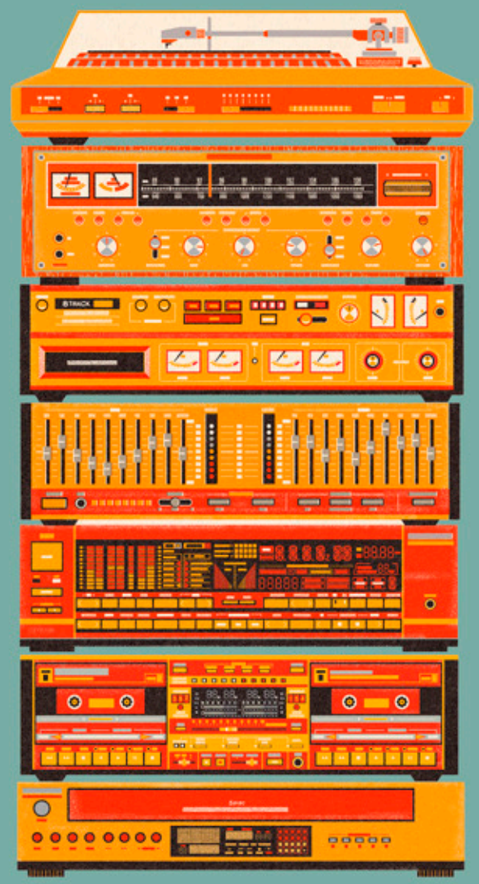
This shift is one of the primary reasons why change management and digital transformation has gained such popularity in recent years. But the mis-understanding of the root cause, i.e.: the effect of fragmentation, is also why a high percentage (70%-80% by some industry experts) of such initiatives result in failure.

It is only by understanding which elements of the value chain are being affected by fragmentation, that one can turn constraints into opportunities.

It is only by understanding the cultural effect of technological change, that one can use creativity and imagination as levers of adaptation and change.

It is only by the simultaneous application of deductive, inductive and abductive reasoning to a complex adaptive economy, that one can use constraints and creativity to create emergent, pragmatic solutions that are innovative by nature, whilst remaining traditional in identity.

Our role today is to understand the tempo of change and design new worlds which help our clients reach better judgments and execute smarter and faster decisions. In such a world, technological evolution is not a societal quagmire, but an evolutionary stampede. A stampede that F212 looks towards with earnest, as human imagination and creativity become the new currency of identity, opportunity, transformation, and adaptation.



About the author: Kary is an Engagement Manager at Fahrenheit 212 Paris where he leverages his extensive experience to provide clients with novel solutions that bear the signature of pragmatic imagination. He is also an author, speaker, an Associate Research Scientist with Cambridge, a Senior Fellow at Ecole des Ponts and a visiting lecturer at a few European business schools.

Fahrenheit 212 is the Innovation arm of Capgemini Invent: an innovation consultancy creating new products, services and business models that deliver sustainable, profitable growth for the world's most ambitious companies.
fahrenheit-212.com