

# Systematic Innovation

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**e-zine**

Issue 273 December 2024

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# A History Of Creativity, 50,000BC to 2050

## Abstract

There are many definitions of creativity, but none, this article argues, that are useful. 'Useful' is also a troublesome word. Here it is used to help guide thinking about the meaning and purpose(s) of creativity. Particularly in the context of its integral role in enabling progress. A meaningful definition of the word creativity enables two things. The first is to a detailed examination of the evolution of human creativity from the first arrival of Homo sapiens to the present day. The second, building on the first, allows a meaningful projection into what the future evolution journey is likely to be. Unravelling the creativity evolution mystery has also required a critical examination of how historians work. Here, the article demonstrates that most historical analyses are flawed, and that the flaws arise as a result of a widespread failure on the part of historians to understand complex systems theory in general and non-linear dynamics in particular. Having then, in effect redefined creativity and history, a final section of the article suggests that the coming decade will be pivotal in the future of humanity. Deal with the emerging threats badly and society could easily find itself back in the Dark Ages; deal with them well and a breakthrough to a golden new post-capitalism age is possible. Whether society ends up going backwards or forwards is centrally dependent on the creativity evolution story, and in particular how creative problem-finding and solving capabilities are embedded into emerging and soon to be ubiquitous AI technologies.

**Keywords:** TRIZ, complex systems, nonlinear dynamics, s-curve, contradiction, discontinuity

## Introduction

There are times in history where scientists, engineers and other pioneers spread to the four winds in search of the new. And then there are other times when the pendulum shifts and the imperative becomes consolidation of the scattered discoveries. Hunters and farmers. Generalists and specialists. Divergence and convergence.

The Renaissance – the last big convergence – happened in the 15th and 16th Century. The next one is likely just around the corner. Signs of its arrival have been gathering – usually in the form of noble but ultimately partial 'Theory Of Everything' consolidation attempts (Wilber, 2000; Hawking, 2002; Kaku, 2021; Muthukrishna, 2023) – for the last two decades. Signs of the need for consolidation of the myriad disconnected breakthroughs that have happened since the start of the Industrial Revolution, particularly in the surge triggered by the arrival of the internet, can be seen in the growing portfolio of apparently unsolvable problems in society. Or rather problems that, thanks to dominance of ultra-specialists that are no longer able to meaningfully communicate with one another, fall between the cracks and become the simultaneous responsibility of everyone and no-one. The world is complex and increasingly entangled and interdependent. Well-intentioned problem-solving specialists increasingly fall foul of the Law Of Unintended Consequences and end up solving one problem only to create a dozen new ones. Never has the world needed more creative thinking, and never has the world of the creative been more dysfunctional. With this contradiction in mind, now feels like the right time to look back through the history of human creativity to explore how we got to where we are, what has gone right, what has gone wrong, and, more importantly, where it needs to evolve in the coming decades if humanity is to successfully prevail through some of the unprecedented existential challenges we now collectively face.

There are some, meanwhile, that have begun to claim that there is no such thing as creativity, no such thing, even, as free-will, and that 'AI' will somehow replace humans as the dominant driving force that will take us into the future. To test at least the latter of those three notions, what better place to begin an investigation into the history of creativity by asking ChatGPT. In theory at least, the fact that ChatGPT and the growing flood of similar Artificial General Intelligences have been 'trained' on something approaching the sum total of mankind's knowledge, the results should provide some measure of the 'state of the art'. Here is what ChatGPT has to say in response to a question regarding the various different stages in the evolution of creativity:

*The history of creativity is a vast and multifaceted journey that spans across various disciplines and cultural shifts. While it's challenging to encapsulate the entirety of this history, we can identify major stages and developments that have shaped our understanding and appreciation of creativity:*

- 1. Early Philosophical Ideas (Ancient Greece to Renaissance): Ancient Greek philosophers, such as Plato and Aristotle, explored the concept of inspiration and the divine origins of creativity. During the Renaissance, the idea of the individual artist as a creative genius gained prominence.*
- 2. The Enlightenment and Industrial Revolution (17th to 18th centuries): The Enlightenment emphasized reason and logic, but also the importance of creativity and individual expression. The Industrial Revolution marked a shift toward mechanization but also sparked innovations and creative problem-solving.*
- 3. Romantic Movement (Late 18th to 19th centuries): Romantic thinkers celebrated emotion, imagination, and individualism. Artists and writers like William Wordsworth and Lord Byron emphasized the importance of creative expression and the unique role of the artist.*
- 4. Psychological Perspectives (Late 19th to Early 20th centuries): The late 19th century saw the emergence of psychological perspectives on creativity. Psychologists like William James and Alfred Binet explored the cognitive processes underlying creative thinking.*
- 5. The Birth of Modern Psychology (20th century): Gestalt psychology, psychoanalysis, and behaviourism all contributed to our understanding of creativity. Pioneering thinkers like Max Wertheimer, Sigmund Freud, and B.F. Skinner offered diverse insights into the creative process.*
- 6. Creativity Research (Mid-20th century): Psychologists such as J.P. Guilford and E. Paul Torrance developed influential theories and tests to measure and understand creativity. This era marked a more systematic and empirical approach to studying creative thinking.*
- 7. The Creative Industries (Late 20th century): The latter half of the 20th century witnessed the rise of creative industries, including advertising, design, and entertainment. Creativity became recognized not only as an individual trait but also as a key driver of economic and cultural growth.*
- 8. Cognitive Revolution (1960s-1970s): The cognitive revolution in psychology brought a renewed focus on mental processes. Creativity was studied as a cognitive ability, and researchers like Howard Gardner proposed theories of multiple intelligences, acknowledging various forms of creativity.*
- 9. Interdisciplinary Approaches (Late 20th century to Present): As the 20th century progressed, interdisciplinary approaches to creativity gained traction. Fields like neuroscience, cognitive science, and artificial intelligence contributed new perspectives on the nature of creativity.*
- 10. Digital Age and Technological Creativity (Late 20th century to Present): The digital age has transformed the landscape of creativity. Advances in technology have not only provided new tools for creative expression but have also raised questions about the impact of automation on certain creative tasks.*
- 11. Globalization and Cultural Exchange (Late 20th century to Present): Increased globalization has facilitated the exchange of ideas and cultural influences, enriching the*

*creative landscape. Diverse perspectives and voices contribute to a more inclusive understanding of creativity.*

*Throughout these stages, the history of creativity reflects a dynamic interplay between cultural, psychological, and technological factors. It is a story of how human beings have sought to understand, nurture, and harness the power of creative thinking across different eras and contexts.*

One of the most immediate problems with AGIs is the apparent plausibility of the responses it provides. The list of stages are certainly recognisable, and, one suspects, readers will be more inclined to believe what ChatGPT has produced than what is to follow in this article, since a lot of it will not be recognisable. Starting with the polite suggestion that what ChatGPT has regurgitated here is meaningless nonsense. There are several reasons for making such a bold assertion, but they may conveniently be bundled into two main clusters: the first relating to AGIs inability to contextualise either the questions it receives or the responses it offers; the second relates to the inability of the original human knowledge creators to make meaningful sense of history. Put more succinctly, the two problems we need to explore before there is even a chance of establishing where we need to be heading in the future are a) we don't have a meaningful definition of 'creativity' and b) the historical records are predominantly dysfunctional and therefore not fit for purpose. The next two sections seek to deal with both issues.

## **What Is Creativity?**

ChatGPT is only able to identify what it thinks are the main stages in the evolution of creativity because the mass of training data on which it has been taught has implicitly or explicitly made assumptions about what creativity is. Here's what ChatGPT has to say when asked for a definition of creativity:

*Creativity is a multifaceted and complex phenomenon, often defined in various ways across different disciplines. Generally, creativity refers to the ability to generate novel and valuable ideas, solutions, or expressions that go beyond conventional thinking. Here are some key aspects of creativity:*

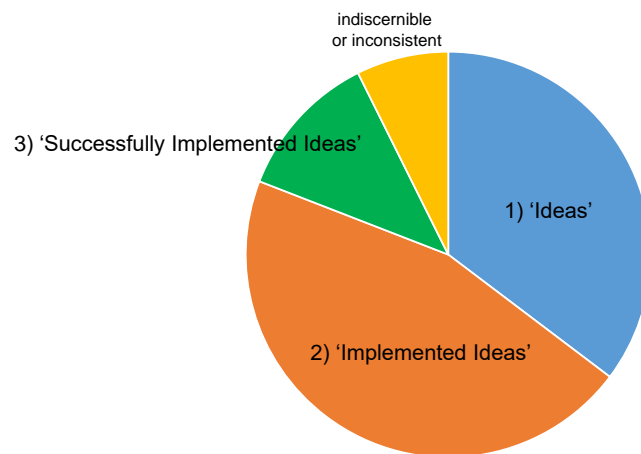
- 1. Novelty: Creativity involves producing ideas or outcomes that are original and not merely a replication of existing concepts or solutions. It introduces something new to the existing body of knowledge or experience.*
- 2. Value: Creative ideas or expressions are not only novel but also possess value or significance. They contribute positively to a particular domain, whether it's in the arts, sciences, business, or everyday life.*
- 3. Problem Solving: Creativity often manifests in the ability to solve problems in innovative ways. It involves thinking beyond traditional solutions and adapting to new challenges with imaginative and effective approaches.*
- 4. Divergent Thinking: Creative thinking often involves divergent thinking, which is the ability to generate a variety of ideas or solutions in response to a stimulus. This contrasts with convergent thinking, which seeks to find the single best solution.*
- 5. Originality: Originality is a key component of creativity, emphasizing the unique and distinctive nature of creative ideas or expressions. It involves breaking away from established patterns and exploring new possibilities.*
- 6. Adaptability: Creative individuals are often adaptable and open to new experiences. They can embrace uncertainty, navigate ambiguity, and make connections across seemingly unrelated domains.*
- 7. Expression: Creativity extends beyond problem-solving to self-expression in the arts and other forms. It involves the ability to communicate ideas, emotions, or perspectives in unique and compelling ways.*
- 8. Process and Product: Creativity can be viewed both as a process (the way ideas are generated) and a product (the outcome or result of creative thinking). The creative process often involves stages like preparation, incubation, illumination, and verification.*

9. *Collaboration: Creativity can thrive in collaborative environments where individuals with diverse perspectives and skills contribute to the generation of ideas. Collaboration can enhance the creative process by combining different insights and approaches.*
10. *Cultural and Contextual Influence: Creativity is influenced by cultural, social, and historical contexts. What is considered creative may vary across different cultures and time periods.*
11. *Cognitive and Neural Processes: Cognitive psychology and neuroscience research explore the cognitive processes underlying creative thinking. These processes involve memory, pattern recognition, associative thinking, and the ability to shift between focused and diffuse modes of thought.*

*Understanding and fostering creativity is crucial in various fields, including education, business, science, and the arts. Encouraging an environment that values diverse perspectives, encourages exploration, and embraces risk-taking can enhance creative thinking and innovation.*

We submit that this cluster of definitions is as meaningless as the earlier description of the creativity evolution story. It is archetypal ‘garbage in, garbage out’. What it tells us is that the world has no clear definition of what creativity is. Which, if that is the reality, puts us into the Lewis Carroll world of ‘If you don't know where you are going, any road will get you there’, and hence, by rather large extrapolation, into a world analogous to Alice’s Wonderland. If we don’t know what something is, what hope do we have of making it better? Or indeed how it got to where it is.

Here there exists an opportunity to tap into an earlier piece of research. An investigation into definitions of the word, ‘innovation’ (SIEZ, 2020). The principal findings of this research are that there are three main definitions in use across the academic and business literature:



**Figure 1.** Alternative ‘Innovation’ Definition Families.

There is as yet no kind of consensus that any of these definitions is better or worse than any other one. The one incorporating the word ‘success’, however, is the only one that has – accidentally – revealed much about the underpinning ‘DNA’ of why 98% of innovation attempts fail and only 2% are successful. This research perhaps further opens up the question, ‘what is ‘success?’ In which case the interested reader is invited to explore (Mann, 2023a). The 98% number, meanwhile is based on the biggest study of innovation ever conducted. Currently over 11.5 million case study examples have been reverse-engineered by dedicated researchers, the first generation of which began their work in the 1940s (Altshuller, 1984) and, the latest, in this Century, have been able to apply AI technologies to assist in the search for the fundamental underlying principles of success (Mann, 2007). What this research now tells us, to paraphrase Leo Tolstoy, is all successful innovation attempts are alike, and that each unsuccessful attempt is unhappy in its own

way. There are very few ways of creating breakthrough solutions well, millions of ways of doing the job badly. By including 'success' into the definition of innovation, the research job is made more difficult, but the benefits, we now clearly see, are that much of the noise is removed and the underlying 'success' signal thus becomes much clearer.

The hypothesis here, creativity being the essential precursor to any eventual innovation, is that by incorporating a 'success' element into the definition of the word creativity will pay similar dividends in terms of eliminating the noise and revealing the signal... the actionable aspects of creativity that can be meaningfully taught and applied.

It is conceivable that the remainder of the space available in this article be devoted to studying what happens when the fuzzy world of creativity is examined through a success lens. Far better, based on the findings from the equivalent innovation investigation, is that an initial hypothesis is made and then iterated once the results of that hypothesis are tested. Provided there is an appropriate level of *via negativa* thinking in the approach – i.e. the job is to constantly look for data that *doesn't* fit the models rather than data that does – there is an opportunity to make meaningful progress in a much shorter period of research. That assumption is something that will be returned to in the final sections of the article. So, what does 'success' mean in the context of a creative act? A question that can only sensibly answered, this author proposes, with an 'it depends' response. Success, in other words, is a dynamic term. What defined success among our homo sapiens ancestors of three hundred thousand years ago, may have little in common with how, say, the CEO of a multi-national corporation might utilise the word today. The dynamic nature of success is something that we will incorporate into the revised history of creativity found in the next section but one.

To get there, it is necessary to start from first principles that define creativity as some form of violation of a norm. Doing this, it quickly becomes apparent that the vast majority of such 'violations' – whether it be a painter experimenting with a new technique, a musician in search of a previously unused chord progression, or an architect making their first sketches for an 'iconic' building – are going to produce bad ideas. The vast majority of creative ideas, in other words, make things worse. The more evolved society becomes, and hence the more 'good' solutions that have already been created, the more likely that a new 'novel' idea is going to fall into the category of worse. Occasionally, however, one (or more likely a combination of those novel violations – 'ideas') is going to result in something that is deemed good enough to progress into an innovation attempt. And, if history repeats, 2% of those attempts will end up in a value-adding 'successful' solution that ultimately becomes the new normal. As we look around our homes and offices, or the built landscape around us, every man-made thing we see was once an innovation. One that, most likely, we now take for granted. Millions of norm violations distil down to a tiny few that change the world. Mostly, hopefully, for the better, although that also brings us back to the need for dynamic definitions of 'success'. For the time being, the working definition of creativity to be used for the remainder of this article is 'productive violation of a norm'.

### **What Is History?**

So, now back to the question of history, and how to justify the Introduction statement that ChatGPT's distilled history of creativity was meaningless. Or, to state the problem of history more boldly, why is nearly all of it wrong?

Here is another topic worthy of a article of its own. Niall Ferguson (2017) – one of the few historians who get it – would be a good place to start. Meanwhile, from what the author believes to be myriad interacting reasons, the following six are intended to provoke

readers to reflect on whatever histories they may have been exposed to in the past. In no particular order:

- Historians – like the anonymous masses that ChatGPT drew from in the creativity history in the Introduction – are taught to focus on events and people. The one sure thing in life is that humans die. In the sociology of scientific knowledge, Planck's principle tells us that change rarely happens because individuals (leaders, scientists, 'influencers') change their mind, but rather that successive generations of individuals have different views. Ideas and knowledge, in other words, often evolve according to generation-driven cycles. Historians notice these shifts, but have no way of identifying whether such a shift made life better or worse. That they were 'successful' or not.
- Historical events happen at random, but society's reaction to those events is conditioned by the times they happen. Creativity-wise, an individual might make an extraordinary breakthrough in thinking, but if no-one is listening, the breakthrough will in all probability be lost. Or, more likely in the post-Renaissance world of written communication, temporarily forgotten, only to be re-discovered at some point long into the future – in the next section, we propose, for example, that one of the key step-change advances in the world of creativity that may be seen to have happened only in the last forty years was first hypothesised over two-hundred years ago.
- "There are decades where nothing happens; and there are weeks where decades happen." So said Vladimir Ilyich Lenin, perhaps one of the first thinkers to recognise that the world evolves in a very non-linear fashion. Distil the workings of the world down to first principles, and at the top of the small heap of such principles is the realisation that the world is s-curve shaped. S-curves are everywhere. There are societal meta-level s-curves – human population, for example – and there are micro-level s-curves governing the performance of, to take a trivial example, athletes trying to jump higher than other athletes. The fundamental dynamics of the s-curve tell us that, when something new appears, there is a period of 'struggle' to get better. Then, on the assumption that the entity enduring the struggle eventually prevails, it becomes progressively easier to get better. That quest for 'better' however, cannot go on forever. Eventually, the laws of physics tell us, something comes along to prevent things 'better' from happening. Progressively more effort is required to deliver less benefit, until eventually things become 'stuck' and it is not possible to improve them anymore. Unless historians understand the dynamic of the s-curve and, more importantly, the inevitable hierarchical and network effect interactions between s-curves, they have no chance of accurately explaining what happened in the past.
- Human history is also fundamentally about complex adaptive systems. Historians are not taught about complex systems. They are taught that by tracing back through history, they will find 'root causes' explaining why things happened the way they did. But there are no such things as root causes in any kind of complex system, so they are being taught to look for something that doesn't exist. The relationships between cause and effect in any complex system are often tenuous, and almost always highly entangled. Everything has the potential to affect everything else. The flapping of butterfly wings in Dark-Age Britain has the potential to result in a 21st Century hurricane in Asia. Complex systems produce emergent behaviour.
- Humans, including historians have not evolved to uncover truth, but rather to survive. Survival has traditionally meant fitting in with the rest of the tribe, and we all quickly discover that the best way to fit in with the tribe is to say things that everyone else agrees with. Uncomfortable truths have a tendency to get people cast out of the tribe. When we hear cliched statements like, 'history is written by the winners' we're experiencing the culmination of our myriad truth-avoiding biases. Confirmation bias being the biggest and most dangerous of all: once we have made a hypothesis about something,

there is a strong tendency to look for evidence that confirms said tendency, and to reject evidence that contradicts it.

- The same kind of bias also applies to journalists, reporters and others tasked with communicating ‘the news’ to the rest of us. It has been said that the level of truth found in newspapers is at its lowest on the front page and highest on the back page. It is easy to factually relay the results of a football game; rather more difficult to remove the politics from the front-page headlines.
- Contradictions. Another of the innate human biases. Life conditions us to expect a zero-sum world of winners and losers. And further, that we all have to make trade-offs and compromises. Indeed, much of history can be seen as an enormous catalogue of pendulum-swings from one side of a trade-off to the other. Left wing governments eventually get replaced by right wing ones; sometimes the world is dominated by specialists, sometimes by generalists; some generations over-protect their offspring, others under-protect them; business leaders oscillate between being domineering and collaborative. Whenever these pendulums swing, we can be certain of only one thing: progress is not happening. Progress, our 11.5 million innovation case studies tell us, only happens when we stop making trade-offs and compromises and start transcending them. Progress-wise, pendulum swings are noise; contradiction solving is signal. Hence, history-of-creativity hypothesis number two, if creativity is ‘productive violation of a norm’, a meaningful search through history tells us that ‘productive’ is when creative individuals recognise contradictions and work out how to solve them. This is not quite the same as ‘being successful’ – the creative person still has to convince others of the merits of their contradiction-solving violations – but, finally, it does offer up a more useful lens through which to examine the history of creativity...

## **A (Contradiction-Oriented) History Of Creativity**

### ***Primordial Soup***

To begin sometime after the beginning, life on Earth first appeared around 3.7 billion years ago, and with it, slowly at first, came the first ‘norm violations’. One might go so far as to say that the first appearance of life was in itself a norm variation, but without wishing to stretch the point too far, the norm violation mechanism of the day was genetic mutation. Random genetic mutation. And ‘productive’ became the tiny percentage of those random mutations that produced a ‘better’ life-form. Where ‘better’ first meant ‘survived’, and then ‘survived long enough to reproduce’ to become fitter than the few other life-forms in existence. Progress through this randomly mutating primordial soup took a few billion years before we reach the first Hominins around 6 million years ago. For convenience sake, let’s call this random genetic mutation phase of life, Creativity 0.0.

### ***Creativity 1.0***

The arrival of Homo sapiens happened somewhere between 200,000 and 300,000 years ago. Thought of in generational terms, that’s around 10,000 generations. We had bigger brains by this point in our evolutionary journey, mainly for social reasons, but also to help survive in a world full of predators far better equipped to survive than us. Genetic mutation wasn’t a fast enough survival mechanism and so ‘norm variation’ had evolved up the first s-curve to include the ability to conduct trial and error experiments, a tiny percentage of which – tool usage, fire, cave-painting – were norm violations that proved themselves to be productive, and therefore became part of the new norm.

As is predominantly the case, real change only happens during periods of crisis. For Homo sapiens that crisis happened around 2000 generations ago. It arrived in the form of an Ice Age that made life pretty much uninhabitable in what we now know as Europe. If the cold didn’t kill you, it killed the food you needed to survive. Some estimates tell us that



the human population dipped as low as 4000 individuals. Most humans died. Not good, but nevertheless better than the Neanderthals, who had become extinct by around 1800 generations ago. The comparison between the few surviving humans and the Neanderthals is telling. Also, at first inspection, somewhat counter-intuitive because the Neanderthal brain was larger than the human equivalent. In theory, Neanderthal's stood a better chance of being able to innovate their way through the crisis. We will never know for certain what the difference was, but the most convincing time-tested hypothesis (Childs, 2019) is that what the human brain had that the Neanderthal brain didn't have was the ability to imagine. And moreover to imagine futures that didn't currently exist. Homo sapiens had become homo narrans. The story-telling ape. And there's the productive norm variation that gives us what might be viewed as the next creativity s-curve. Or Creativity 1.0. What Homo narrans developed, for the first time in evolutionary history was a sense of direction. Which in turn meant that we had a way – primitive at first – to be able to test whether a norm variation was likely to be useful without having to go through much of the previous trial and error, and the strong likelihood that one of the trials would result in our demise. Death is a harsh but potent means of weeding out bad ideas. Especially if those with the good ideas survive long enough to pass them onto others.

### ***Creativity 2.0 – Beyond Brainstorming (1947-today)***

As time passed and humans first slowly and then quickly (post Industrial Revolution) climbed the Creativity 1.0 s-curve until eventually the law of diminishing returns began to take hold. The contradictions behind this flattening of the curve were essentially two-fold. First was the inevitable problem arising because we had invented lots of productive norm-violating solutions and thus created an exponentially greater number of possible combinations of those solutions. This can be thought of as the 'too many opportunities' challenge, or 'how do we prioritise what we're going to do next?' At its peak, the top of the Creativity 1.0 s-curve is observable today in the form of the brainstorming session. A group of subject matter experts gathered together to fill office walls full of Post-It notes that will end up leaving everyone feeling simultaneously drained and overwhelmed with predominantly bad choices. Brainstorming was created by the advertising agency as a means of maximising idea generation efficiency. To some extent it did that, but in so doing, it made very visible the contradiction that needed to be solved. The second contradiction discovery came a little later than the arrival of brainstorming, in the form of lateral thinking. Edward deBono's discovery that our 'norm violation' capability was essentially our brain's uncanny ability to make connections (deBono, 1969). Select a random word from a dictionary, DeBono was able to advise, force yourself to connect that word to a problem you're trying to solve, or thing you're trying to improve, and one or two of those connections will provide the 'Eureka' moment you seek. This ends up being a more extreme version of the 'too many opportunities' contradiction: there are too many random words in the dictionary.

Necessity being the mother of invention, those that had spent the most time thinking about brainstorming began to realise that it wasn't necessary to possess a whole dictionary full of random words to connect to. Some words were far more productive than others. This realisation then enabled the shift to a new s-curve. Creativity 2.0. Beyond brainstorming. Or 'forced' brainstorming. Or SCAMPER, brainstorming pioneer, Alex Osborn's acronym describing the seven most productive connection-making words. SCAMPER first appeared in 1953 (Osborn, 1953), and evolved through various variants through the 1960s and early 1970s, culminating, post tipping point, to some degree with the Creative Problem-Solving Institute and the company, Syntectics, in the US. CPSI still exists today, but it is also worth saying that the creativity capability in most organisations is still on the previous, Creativity 1.0, s-curve. The full suite of reasons for that are again largely beyond the scope of this

article. Suffice to say that what enters the world of work at around the same time as SCAMPER was the first seeds of what became the Japanese Quality Revolution and the idea of continuous improvement. While there was no inherent conflict between continuous improvement and productive norm-violation, in reality, the former places considerable emphasis on many small, incremental optimising improvements, most of which will be generated using quantified mathematical models (statistical process control, Taguchi methods, etc). While none of this was explicitly anti-creative, the reality has been that the better organisations are at continuous improvement, the worse they are going to be at innovation. When a continuous improvement process reaches the 'now generate some ideas' phase, because the focus is incremental, Creativity 1.0 level brainstorming is usually more than good enough to produce the required mathematically more optimal results.

Meanwhile again, as if to demonstrate some of the innate complexities of s-curve timing and trajectories, a group of maverick engineers in the Soviet Union started their own version of Creativity 2.0 in 1946. The first results of this research, today gathered under the label, TRIZ ('Theory Of Inventive Problem Solving'), emerged by accident. The research started with an accidentally potent question: what makes a good patent? The only way to begin answering the question was to read through hundreds of thousands of patents. The TRIZ researchers, on the other side of the Iron Curtain and therefore out of view of the rest of the world, were likely the first ones to find the start of the Creativity 2.0 s-curve. Their first paper was published in 1947. Much of the research story is still shrouded in myth and mystery, but what is clear is that the TRIZ leader, Genrich Altshuller was able to construct a new creativity big-picture and publish the tellingly titled book, *Creativity As An Exact Science* (Altshuller, 1984). Some time before then, the TRIZ world had discovered the so-called 40 Inventive Principles. These Principles are effectively a comprehensive version of SCAMPER that in effect tells problem solvers that there are millions of ways of solving problems badly, but only 40 ways of doing it well. The Principle list still stands at 40 today, despite, now the analysis of over 11.5 million case study evaluations of 'successful' productive norm-variations and a keen *via negativa* focus to identify solutions that didn't fit the model. The 40 Principle list in all probability represents the peak of the Creativity 2.0 s-curve. Even though most organisations and creative teams are still operating in the Creativity 1.0 paradigm, there were sufficient Creativity 2.0 users – including Genrich Altshuller – that, long before the 40 Principle list had hit 40, the next set of limitations began to emerge. The TRIZ research focus shifted to the new creativity-related contradictions that needed to be solved...

### ***Creativity 3.0 – Directed (~1956 – today)***

At some point, probably during the 1970s, Altshuller and his team of TRIZ researchers began to realise that powerful as the Theory Of Inventive Problem-Solving was, the bigger problem to be solved required something more like a theory of inventive problem-*finding*. Because their research had accidentally started with a question that forced researchers to build a measure of 'success' into their search for 'good' solutions, they had automatically helped to remove much of the randomness that had previously made it difficult to make any kind of sense of either innovation or what 'productive' norm violation looked like. Removing the noise revealed some very clear patterns of success. The first of which was that success is determined by a 'customer'. The second of which is that what customers are looking to do are get jobs done ('benefits'), and to do them with the minimum of downside (costs and anything else that is 'harmful'). Enter the Value Equation:  $\text{Ideality} = \frac{\text{Benefits}}{\text{Cost} + \text{Harm}}$  and the concept of Ideal Final Result (IFR): all successful solutions evolve to deliver all the customer required benefits with zero cost and zero harm. The innovation world had received its first formative version of a North Star.

By 1956, the TRIZ researchers had seen enough of the patterns that pointed towards the IFR to recognise that the biggest pattern of all was a journey of discontinuous jumps from one s-curve to another, and that the primary jump mechanism was the emergence and resolution of contradictions. Productive norm violation had a new definition of 'productive': contradiction solving. Creativity 3.0, which might be thought of as 'Directed Creativity' is thus formed from the realisation there is a long-term success direction and destination (albeit a theoretical one that, rather like sailing towards the horizon, often seems to recede into the distance any time we appear to get close to it), and a road-map for navigating to the destination that is all about revealing and resolving contradictions.

The TRIZ researchers began connecting the various different kinds of contradiction (measurable in the hundreds – again, their research showed that, irrespective of domain, we're all working on the same basic problems) to the Inventive Principles that were deployed the most frequently to resolve them. The first 'Contradiction Matrix' was produced in 1964 and matured in 1971 (Souchkov, 2015).

There was a decision, some time during the early 1970s that, because the list of Inventive Principles was no longer growing, there were other places to devote the creativity research efforts that would deliver a better return on investment than manually analysing patents to reverse engineer contradictions. Altshuller didn't have the advantage of AI or NLP software algorithms that could be trained to automatically find contradictions and reveal the inventive strategies used by inventors to resolve them, but now we do, the first Contradiction Matrix has now grown into a family of tools and strategies that allow creative problem solvers to systematically access the breakthrough solutions of literally millions of previous solvers of their contradiction (Mann, 2008; 2010; 2018).

As of the time of writing, while this Creativity 3.0 s-curve may be seen to have succeeded past its tipping point, the majority of engineers, scientist and other domains requiring creative solutions, have still either never heard of it, or been convinced that the concept of Ideal Final Results and solving contradictions don't fit what the large majority of (Western) academic best practices teach. Most enterprises don't use Contradiction Matrices or the Inventive Principles, but those that do – Samsung, POSCO, Hyundai, to name a few notable examples - have performed extraordinarily well relative to competitors that don't. For a while some of these pioneers started to tell the world what they were doing, then, for some reason (why show your competitors the secrets of your success, being one of them), the doors closed.

This is something of a pity for those that earn a living through helping organisations to innovate in a more systematic way, but on the other hand, it has allowed time to start thinking about the next round of creativity-related contradictions and what the next s-curve is going to look like...

#### ***Creativity 4.0 – Contextual (~2015 – today)***

The moment contradiction-finding AI algorithms are deployed to look at data beyond the patent databases and academic literature of the world, the faster the new contradictions to be solved become visible. So, what happens when these algorithms are applied to the world of creativity itself? Is it possible to identify what the limiting contradictions of Creativity 3.0 are before most of the world has recognised its existence? The emerging answer seems to be a clear 'yes'.

Add to that story other narrative-scraping algorithms that reveal and measure the frustrations of a target customer-base and the state-of-the-art innovator now also has a method for prioritising the found contradictions.

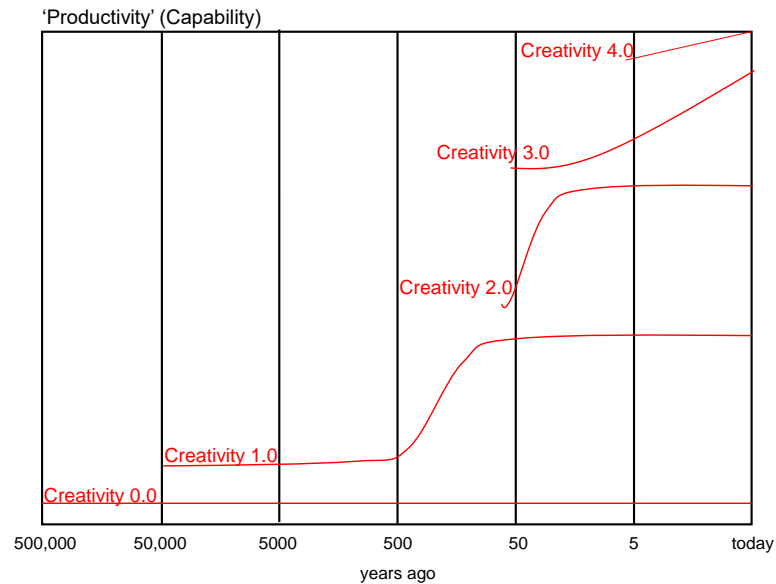
Then add the possibility to connect the contradiction finding and prioritising algorithms to the Contradiction Matrix tools and the ranked list of Inventive Principle solutions they are able to present to problem-solvers (Mann, 2021). So-called AI-assisted creativity in effect sits on the problem solver's shoulder whispering sage advice into their ear: 'here's the most important contradiction to be working on right now, and here's the Inventive Principle most likely to help you solve it'. Beyond that, the virtual contradiction-solving avatar can connect the generic Principle suggestions back to their source and further prompt the problem-solver with additional, more specific suggestions like, 'go look at patent US11,222,333 for a ready-made solution'. It could also suggest strategies for designing around said patent.

While it remains far from clear that engineers and scientists want such a capability (why, they say, would I want to out-source the best part – the creative part – of my job?), it is much clearer that the managers responsible for those creatives can see the value. Creativity without the annoying, rule-breaking, tangent-following, even-better-answer-tomorrow creatives. These are the people that see the top of the Creativity 3.0 s-curve first, and hence the next set of contradictions that need to be solved. Those contradictions, we clearly see, relate to context. Various different aspects of context relevant to determining whether a suggested norm violation might be productive to you or not:

- A solution idea might be the best idea in the world, but if its successful execution demands capabilities that an enterprise doesn't possess, or can't acquire in a timely manner, then it cannot be the 'right' idea.
- Customers love solutions that remove their frustrations, especially when the cost and collateral harms are also moving in the right direction, but it is very definitely possible to propose solutions that are 'too far ahead of the parade'. So far ahead that the customer doesn't recognise they are in the same parade. Customers love new, but they also love familiar. Getting the right balance of familiar-and-new to suit any given individual customer is necessary if they are to consider adopting a new way of achieving the jobs they need doing.
- In the busy, interdependent world of business that exists today, almost every innovation disturbs an established ecosystem. The rules of ecosystem innovation are still at a relatively formative stage (Adner, 2012; 2021), but they are already clear enough to see that the rules are different to innovating in the blank canvas of a Blue Ocean (Kim et al, 2005) where no competitors exist. Innovation in an ecosystem demands that every player in that ecosystem perceives a win from the new solution we are planning to inject into it. If any one player says no, the innovation attempt will fail. Winning in this kind of world goes somewhat beyond the established rules of capitalism, where competition is king. The good news is that achieving win-win outcomes in an ecosystem is merely about solving multiple contradictions. The bad news is that the AI assistant isn't yet good enough to find all the right ones and to suggest solutions that will solve them all.

No doubt each of these context-related challenges will be solved by the time Creativity 4.0 passes its tipping point and hence sustainable market penetration. We probably know how to solve the context problems with existing capabilities. What we don't know is whether the world is ready for them yet. We will explore those issues in the final Section of the article, the place where we will speculate on the future of creativity up to somewhere around 2050. Including why we've selected 2050 and not an earlier or later date. Before we reach that topic, it is necessary to make what might feel like a diversion to plot the history of creativity through another lens – one pertaining to systems theory. Or an evolved version

thereof. But before heading there, it is useful to close out this section with an s-curved based summary of the creativity evolution story so far:



**Figure 2:** Creativity Paradigms 50,000BC To Today

Taken half a step further still, what is also possible to estimate from the various different creativity capability paradigms is an approximation of the percentage of creativity workers – i.e. those tasked with productively violating norms in order to create new products, services, processes and other kinds of solution – operating within each:



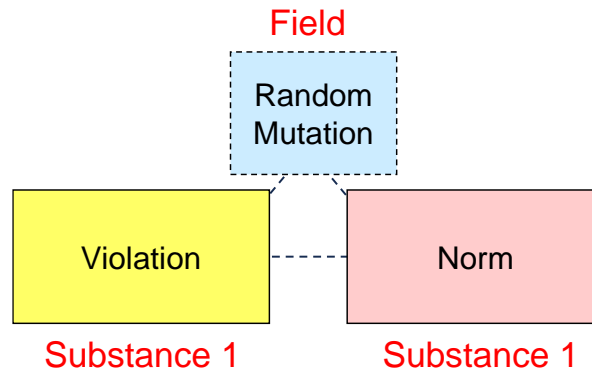
**Figure 3:** Relative Number Of Creatives Working Within Each Paradigm (SIEZ, 2024)  
(The potential significance of this data will be discussed in the final section of the article.)

### Creativity ('Productive Norm Violation') As A System

'System' is almost as troublesome a word as creativity or innovation, with at least a dozen widely used definitions in circulation. The debate about what the 'right' definition is will be curtailed here by heading back into the world of TRIZ, and another of the original researcher team's accidental discoveries. Or rather two of them.

The first is that the most useful definition of a system describes a requisite collection of entities that, together, deliver a function. Where 'function' equates to some kind of outcome ('benefit'). Sometimes, if humans are designing the system, these outcomes will be useful, but even when negative outcomes are produced, they happen because a

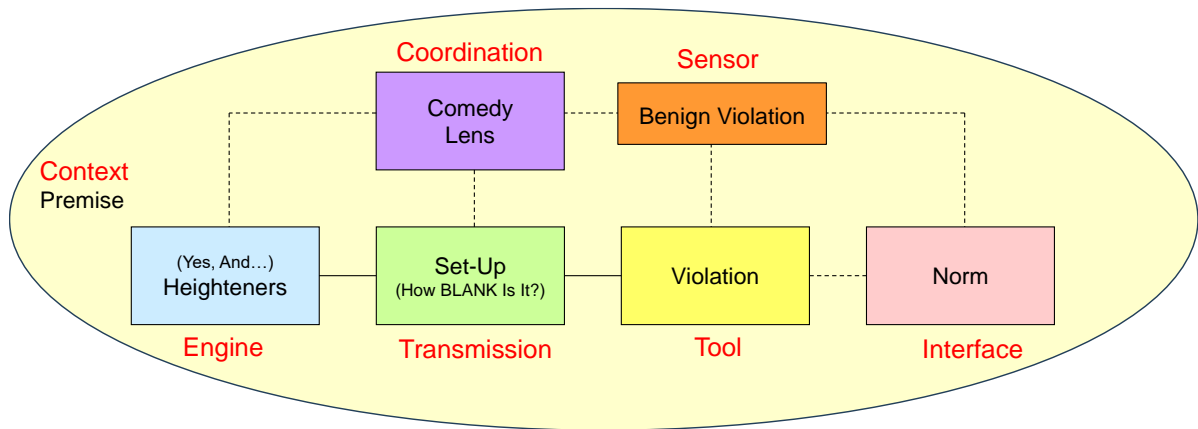
system exists to deliver them. This latter realisation can be useful in troubleshooting – if an unexpected bad thing is happening, look for the system that is producing it and then alter or remove it. The minimum number of entities required to produce an outcome – good or bad – is three. In TRIZ language, ‘two substances and a field’. In lay-person terms, this equates to two ‘things’ and an ‘engine’ or source of energy. Thus, if we head back to the primordial soup and think about a norm violation as the desired evolution-driving outcome, the two required things are: a norm, a violation of that norm and ‘genetic mutation’ as the engine that drives the creation of the violation:



**Figure 4:** Norm Violation As A Minimum System – Creativity 0.0

The problem with this three-element version of a system is that there is little if any ability to control or direct the outcomes it produces. In the days of primordial soup, the vast majority of norm violations – i.e. ‘mutations’ – as discussed earlier, were non-viable as lifeforms. They did not pass the ‘productive’ test. But then, even the tiny proportion of mutations that produced viable lifeforms were only viable in the short-term. They were viable but not ‘fitter’ than the norm lifeforms, and therefore they were unable to out-compete the norm in order to become the new norm. Only a very tiny proportion of norm violations managed that feat. And so, for the first few billion years of life, evolution occurred very slowly.

Now let’s jump through time to the modern day to examine the second accidental TRIZ discovery concerning systems, the so-called, Law Of System Completeness. A minimum system, the TRIZ research showed, contained three elements, a complete system (one that was directed and controllable) required six elements. Seven if we bring the story right up to date and integrate the TRIZ findings with those emerging from the Viable System Model research of Stafford Beer (Beer, 1972). Here it becomes beneficial to examine a specific system, one designed to produce a specific type of creative output, humour. Not that this is necessarily the most advanced type of creativity system, but, in much the same way that biologists use fruit-flies in genetic experiments because they have a short reproductive cycle and it is easy to breed lots of new fruit-flies, jokes are a ubiquitous part of modern-day life. Plus, like biologists, there has been a large body of research aimed at understanding humour. Putting aside the awkward side effect of studying humour that has the strong likelihood of killing the fun, one of the most frequently cited text-books on the first-principle fundamentals of jokes is ‘Finding Your Comedy Muscle by comedian, Mike Lukas (Lukas, 2023). Lukas has no apparent knowledge of either TRIZ or Stafford Beer, but has nevertheless managed to discover for himself precisely what they discovered. Here’s what Lukas’ joke-producing system re-drawn in the format of the TRIZ Law Of System Completeness:



**Figure 5:** Productive Norm Violation As A Complete System – Creativity 4.0

Let's now zoom-in and examine the seven elements within this system, starting with the elements found in the minimum system from the Creativity 0.0 world:

First, there needs to be a Norm. In TRIZ language, this is the 'Interface' element of the system. It is the element that the element delivering the useful function acts upon. A joke, in this context, can only be funny (a positive norm violation) because the joke teller sets up an expectation – norm – that the funny bit then violates.

The part of the system doing the violation job is the 'Tool'. The violation, in this case, acts on the norm, in the same way that a hammer acts on a rock. The violation creates a laugh; the hammer creates a broken rock.

The third element of the minimum system is the 'Engine'. From the humour system perspective, rather than random genetic mutation, the engine now becomes, what Lukas describes as 'Heighteners', but what TRIZ would call the 40 Inventive Principles, or Alex Osborn would call SCAMPER. They are the strategies used to solve contradictions, and, of course, this now also allows us to see that the foundation of a joke is a contradiction that is set up and then resolved. (As an aside, Lukas' book includes a section on the Heighteners he uses. When compared to the 40 Inventive Principles, he in effect uses around 27 of the 40 (SIEZ 2023a).)

Okay, now to the four complete system elements not found in the minimum system:

*Coordination* – as the name suggests, here is the element that guides the direction of the system. In general creativity terms, this is the element that determines what 'productive' means. In the specifics of Lukas' joke system it is the Comedy Lens – the thing that every comedian brings to their performance: an overarching perspective on life. This might take the form of an overt character (Al Murray's 'Pub Landlord' for example) or a less visible ethos. Jerry Seinfeld, for example, is an everyman type character that makes a big deal out of nothing; Chris Rock is a racial satirist who's 'half rapper, half preacher'; Stewart Lee adopts an arrogant persona, knowing he is the 'best comedian in the world'. And so on. Whatever Lens a comedian sees the world through needs to be at least subliminally communicated to the audience. If an audience is seeing a comedian for the first time, this communication needs to happen very quickly. The fastest way is usually through physical appearance – the clothes being worn (Harry Hill's oversized shirt collars), the facial expression (Jack Dee's world-weary grumpiness) – or tone of voice (Rhod Gilbert always close to exploding with rage at the most trivial of provocations).

*Transmission* – in mechanical terms is the element that connects the Engine to the Tool. In general creativity terms, it is the element connecting the Inventive Principles to the

violation. It is in effect the contradiction-solving process. For a comedian it is the Set-Up – the process of establishing the norm and then establishing the route the violation will take.

*Sensor* – this element of the system provides the feedback loop required to establish whether the desired change has been successful or not, and, if it hasn't, to adjust the other elements within the system accordingly so that it will be more likely to be successful next time around. As far as the comedy system is concerned, Lukas calls this feedback loop, 'benign violation', which basically means that the comedian telling a joke, if they are to obtain the audience laughter they seek, needs to be able to gauge how far to violate the established norm – don't violate enough and the joke is obvious (rather like re-hearing a joke we already know); violate the norm too far and the only likely outcome is that the comedian causes offence. A good comedian is able to consistently achieve a violation 'sweet-spot'. A really good comedian is able to tune the level of violation to suit the specific audience they're performing to.

*Context* – strictly speaking not a part of the system, but nevertheless, something that is always present because no system operates within a vacuum. There is always a surrounding context, whether it be the Primordial soup or the premise a comedian establishes at the beginning of a routine – Brexit, for example, Covid, or some other in-the-news topic deemed worthy of humour. Context and the feedback loop Sensor are often closely connected in any kind of controlled, directed system.

In case there is a degree of confusion regarding this description of systems, the overall relationship between the Law Of System Completeness and the history of creativity is summarised in Figure 6. The objective in the figure is to add a further level of credence to the earlier idea that each evolutionary stage in the history of creativity in the progression represents a genuine – contradiction-solving, s-curve-jumping - paradigm shift:

*Creativity 0.0* – the three-element minimum system driven by random mutation.

*Creativity 1.0* – the evolution of imagination and the consequent ability to think about 'better'

*Creativity 2.0* – acquisition of sufficient trial-and-error experience to recognise that there aren't an infinite number of ways of creating 'better' solutions, there is a very finite (40 so far) set.

*Creativity 3.0* – recognition that the fundamental mechanism driving evolution towards 'better' is revealing and resolving contradictions, and that there is a (theoretical) ultimate 'Ideal Final Result' destination.

*Creativity 4.0* – (automated) ability to contextualise problem and opportunity situations in a complex/chaotic world to identify the 'right' next creative step.



| Creativity Paradigm | System Configuration | Contradiction/Resolution  |
|---------------------|----------------------|---|
| 0.0                 |                      | (minimum system)  |
| 1.0                 |                      | random/directionless: evolution of 'imagination' permits improved ability to deal with change and move towards 'better' |
| 2.0                 |                      | too many solution direction possibilities: identification of finite set of solution strategies that deliver 'better'    |
| 3.0                 |                      | need to identify 'good' problems and then connection to solutions: repeatable contradiction finding/ solving process    |
| 4.0                 |                      | inability to close-the-loop to identify 'right' solution: (automated) context-sensitive feedback-loop capabilities      |

Figure 6: System Evolution – Creativity 0.0 To Creativity 4.0

## Today – 2050 ?

The wise person recognises the merits of the Danish parliamentarian howler from 1937-8, 'It is difficult to make predictions, especially about the future', and avoids speculating about the world to be. No-one is able to predict the future beyond the next 400 days (Heffernan, 2020) and even that limited horizon is ambitious in the context of the global turbulence triggered by the 2020 Covid-19 pandemic. But just because we can't predict *all* of the future doesn't mean that we can't predict *any* of it. All of the noise-eliminating TRIZ research findings provide clear roadmaps to show us where solutions will evolve in the future. A small number of brave pioneers have begun using those roadmaps to inform thoughts about the still emerging Creativity 4.0 paradigm. The really difficult part of the future prediction story is knowing *when* the jumps and shifts will occur. TRIZ can't help us with that aspect of the story, but other pieces of research can.

One school of the complex-systems domain argues that in a complex and occasionally chaotic world, nothing is predictable and therefore the only appropriate means of ensuring long-term survival is to achieve a requisite level of adaptability. Such that as the surrounding environment changes, we're capable of changing faster and more effectively.

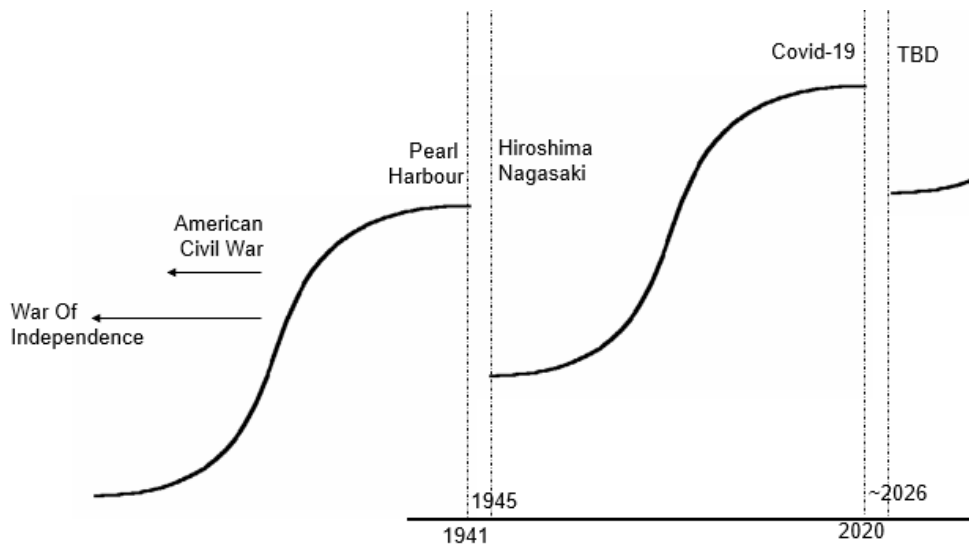
Other schools argue, consistent with the Mark Twain quote, 'history doesn't repeat itself, but it often rhymes.' The smart money, now we understand the importance of contradiction and contradiction solving is that the only meaningful answer to any kind of either/or question is 'both'. Resilience-seeking futurologists, in other words, should be targeting requisite adaptability *and* listening for the things that rhyme. Multiple independently evolved versions of the 'rhyming' perspective on history (Howe, 2023; Turchin, 2023; Xenakis, 2020; Duffy, 2021) explain the existence of repeating patterns as the result of a set of universal core principles:

- a) As stated earlier, events happen at random, but society's reaction to those events is not.
- b) How the future emerges is determined not so much by market of societal trend directions, but rather the *interactions between* those trends. In particular, situations where one trend conflicts with another. In other words, the emergence and resolution of contradictions is the primary determinant of how society evolves and shifts.
- c) When these society-level contradictions are resolved, society makes a discontinuous shift from one paradigm (s-curve) to the next.
- d) When society fails to solve contradictions, and instead follows a pendulum swing from one extreme to another (under- and over-nurture of offspring for example), these swings create oscillatory, repeating patterns – i.e. unsolved contradictions create the societal 'rhymes'.
- e) The fundamental pace of societal evolution is driven by the human life-cycle, and in particular the fertile, adult years. This generational cycle length is thus around 20-25 years.

The consistently observed result of the combined effect of these core principles is that society makes contradiction-driven paradigm shifts every 80-100 years. This equates to a four-generation cycle.

At the top of each s-curve – where the various contradictions become increasingly visible – society enters a Crisis period. As this Crisis builds, a (random) trigger event can easily push society off its current s-curve into a chaotic 'special world' where many of the previous rules, behaviours and conventions no longer work and there is a need to find new contradiction-solving rules and behaviours. Eventually, one or more of these contradictions will be solved – traditionally (for the past six cycles at least) through some form of armed conflict – and the new paradigm becomes clear.

In case of doubt, society – Figure 7 – is currently in the peak period of one of these s-curve-shifting Crisis periods. Covid-19 was the (random) event that pushed society off the current s-curve, and, as of the end of 2024, most parts of the world are still trying to find what the new s-curve will be. Predictions as to when this will happen suggest somewhere between 2025 and 2033, with the bulk of evidence pointing towards the former rather than the latter. The precise end date of the Crisis is largely unpredictably as a result of principle a) above: from 2025, society's reaction to a major crisis event (the US dropping the atom bomb on Hiroshima and Nagasaki being the events that ended the previous s-curve crisis period) will be such that, random as the event might be, it will trigger a widespread realisation that it was 'enough'.



**Figure 7:** Societal Crisis Period S-Curve Shift (Mann, Ford, 2020)

The importance of this Crisis period from a creativity perspective is that it has historically proved to give rise to enormous surges in the need for innovation – per the Rahm Emanuel epigram, ‘don’t let a good crisis go to waste’.

On the one hand, an examination of the global patent database (Mann, Dewulf, 2015) clearly indicates, despite a rising *rate* of invention since the start of the current Crisis period (9/11/2001), there is also a marked reduction in the *quality* and size of the breakthroughs being achieved by their inventors. This pattern is consistent with all system behaviour during the top half of the s-curve – optimisation of the existing is more valued over its disruption and displacement.

On the other hand, it is also very clear that much of the innovation that is happening is happening beyond the creativity found in the patent database. Only the US allows software algorithms to be patented, and hence the vast majority of innovation in the digital world – from the emergence of social media, through digitalisation of almost every industry, to the latest surge of AGIs – is happening invisibly. And, moreover, at the speed of light.

The rapid rise of AI, although still not clear that it will create the dominant societal contradiction that will trigger the end of the Crisis period, certainly makes visible a pair of interdependent contradictions that are causing multiple authors to conclude that AI could unwittingly destroy society if the technology continues along its current trajectory (Suleyman, 2023). The combination of Space-Age technology and our (predominantly Creativity 1.0 level thinking) Stone-Age brains forms the first part of the contradictions, the Dark-Age institutions that sit between the two forms the second part.

Looked at through this lens, creativity sits right at the heart of determining whether the current Crisis period ends badly or well. More specifically, once the Space-Age technology part of the story acquires Creativity 4.0 paradigm capabilities – probably within the next two years, and almost certainly by the end of the decade – from a business perspective at least it will make the large majority of Creativity 1.0 and 2.0 workers essentially redundant. It will also likely – unless Government institutions intervene appropriately – make the Creativity 3.0 and especially 4.0 pioneers into a new elite. To a high degree, through the rapid growth of organisations like Google, Amazon, Meta, X, Baidu and Tencent we can already see clear signs that this trajectory is already well established.

The evidence from 2009 (Mann, Özözer, 2009) – when we first published our findings that the period 2020-2025 would see the peak of a societal-level Crisis period – was that most people (principally managers inside corporate and government institutions) didn't want to listen. This despite the message being framed in the context that every crisis has winners and losers, and that if we know there's a crisis coming, there is an opportunity to do things that make it more likely to being one of the winners.

At the close of 2024, although probably still not a majority of managers and politicians, there is a growing acceptance of the possibility that there is bigger trouble ahead. It is still not clear what the culminating contradiction (or contradiction-combinations) will be. The AI threat, according to the ongoing analysis of this author's research team, is currently top of the list (Mann, 2023b). Here, in descending order are some of the other contenders:

- 'elite over-production' – one of the key drivers of previous crisis periods is a societal propensity to educate too many intelligent (IQ rather than EQ) individuals that then find themselves unable to climb the pyramid-shaped hierarchies of society. Too many educated people for too few positions leads to frustration. Frustration then leads to anger. Too many angry smart people then leads to the overthrow of those in power (Turchin, 2023; SIEZ, 2023b)
- Increasing gap between haves and have-nots. Different to the elite-production problem (the 'haves' are more likely to be the lucky people rather than the smart ones), but when 1% of society owes over half of the collective wealth, and those in the bottom 25% live in poverty, and increasingly rely in food banks and charity to survive, the closer society comes to the "civilization is twenty-four hours and two meals away from barbarism" problem. This again has been a primary driving contradiction in previous Crisis cycles, especially looking at the Depression in the one before the current one.
- Religious ideology-clash. One of the unintended consequence side-effects of pervasive social media is the creation of an increasingly divided society made up of 'echo-chambers'. Isolation of different communities creates an 'othering' that in turn exaggerates differences rather than similarities, and in turn means that the contradictions not only become more stark, they also prevent the dialogue necessary to manage or resolve them. As can be seen in several regions right now, it then becomes easier to resort to armed conflict.
- (US) Debt Default. None of the economic problems that triggered the 2008 GFC have been solved in the wake of the crisis. Rather, governments sought to allay full economic collapse by bailing out the banks and printing unprecedented amounts of money. The underlying contradictions were thus not solved, and the world – the US in particular – has merely 'kicked the can down the road' for the past sixteen years. The longer these kicked-can contradictions go unsolved, the worse the aftermath when the inevitable next financial crash occurs.
- US political divide. In a political system that increasingly prevents communication between Republican and Democrat advocates, society becomes progressively more divided – in much the same way that caused the ideological clash of the 19<sup>th</sup> Century resulting in the American Civil War (the last but one 80-100 year Crisis cycle) – the result is one of two things. Either another civil war, or instigation of an external war that re-unites the population against a common enemy (as happened in WW2). Whichever becomes the reality, the ripple effect triggered when the world's biggest economy takes a step-change fall, will affect everywhere else.
- Climate Change. Probably one of the most contentious issues in global politics at the moment. Tackling climate change demands a united global response, but this has thus far not proved possible. Largely due to an inability to determine whether

the changes in the climate are man-made or part of a natural cycle. Vested interests in either direction are thus far seemingly unprepared to work together to solve this contradiction. Irrespective of which side is ultimately 'right', what is already observable is that as some parts of the planet become less habitable, migration to those parts that are creates a rising cause of international tensions. The inability to manage these tensions thus becomes the most significant short-term threat.

- **Pandemic.** Covid-19 demonstrated that our interdependent world was vulnerable to even quite small perturbations. It wasn't so much the pandemic itself that caused the ensuing breakdown of global supply chains, as the excessive interdependence. Herein lies the pernicious contradiction between the need to think globally to meaningfully tackle climate change versus the need to act locally in order to protect and maintain supply of food, potable water and life's other essentials. The problem is further exacerbated by societal shifts towards (excessive) hygiene protocols – which in turn make the human immune system more vulnerable to attack – and the increasing capability of biologists to engineer new pathogens operating out of kilter with their ability to understand the unintended side-effects of their discoveries. Whether 'lab-leak', random genetic mutation or by deliberate action, the message from Covid-19 is that once a new pathogen is exposed to any region of the world it will quickly spread to them all.
- **Nuclear War.** With a rising tide of populist leaders in place across the planet, the gap between the promises they make and reality grows. Couple this growing tension with regions of armed conflict (Ukraine) or conflict potential (Middle East, Taiwan) and as it becomes clear to populist leaders that an unacceptable defeat is approaching, it becomes increasingly tempting for them to press the nuclear button.

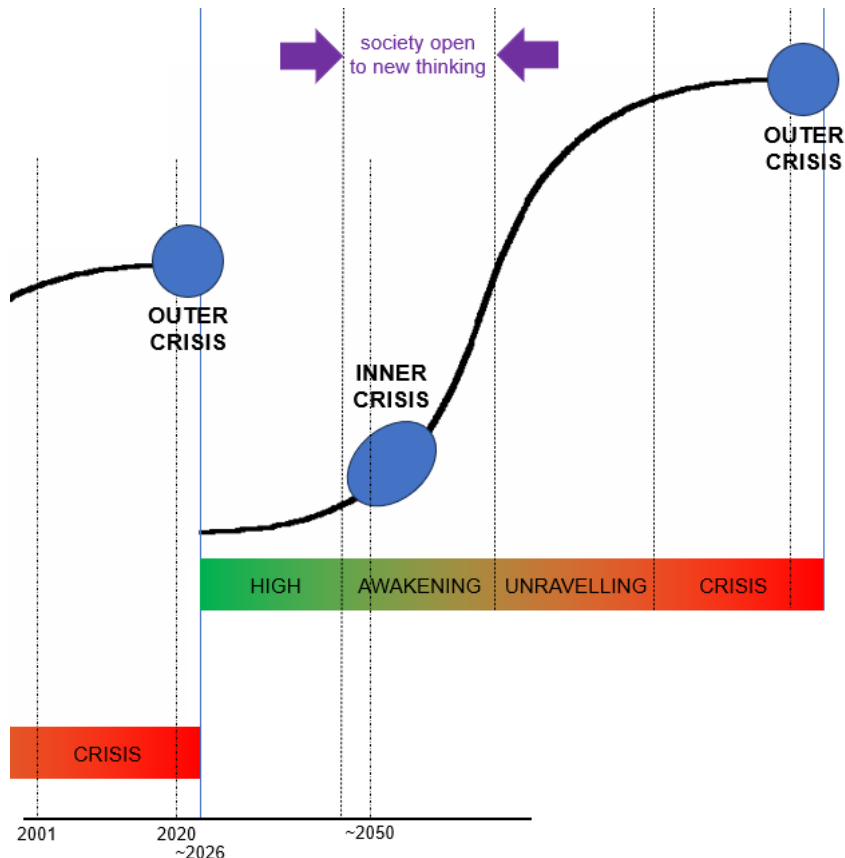
Coupling these problems with the fact that we now inhabit a society in which increasingly small numbers of individuals can create exponentially large amounts of harm, and the overall prognosis for the peak of this current Crisis looks overwhelmingly bleak. Three flavours of totalitarianism versus one small opportunity to 'break through' to a better, more ideal, version of society (Mann, 2023c). If the latter option is the least likely, it is the one that – again – only becomes possible provided a critical mass of creative individuals are able to combine to point people towards the right problems and the right ways to solve them. They will, in other words, be Creativity 3.0 and, preferably, 4.0 thinkers. Individuals that recognise the overriding importance of contradictions and contradiction-solving.

### **2050?**

If Society and those in power deal with the ongoing omni-Crisis badly, it is not inconceivable that society regresses back to something like the Dark Ages. In which case, from a creativity perspective, all the hard work being done to create the third and fourth generations will in all likelihood be lost. In a manner akin to the Maya, Khmer Empire, Indus, Easter Island, Çatalhöyük or other previous lost civilisations. With a following wind, however, those same creative skills will be allowed their due and society will end the current crisis in a better state than before. In which case, the new cycle will have the opportunity to build beyond the fourth generation.

Another rhyming trait of previous societal s-curve cycles is that each can be divided into four 'turnings'. The fourth turning, as described in the previous description, is where we hit the top of the s-curve and enter an external crisis. The second turning is a period of 'Awakening'. This period is a time of internal crisis. A crisis borne of the limitations around how we collectively see the world. The last Awakening period happened during the period from the late 1950s and particularly through the 1960s. A time when a post-Crisis

generation – Baby Boomers in this last instance – grew up to re-imagine how the world could be. The so-called consciousness revolution. Woodstock. Dylan. The Beatles. Rachel Carson’s Silent Spring. The Female Eunuch and Women’s Liberation. Going to the moon. A time when a new generation is receptive – nay, actively seeking – new ways of thinking. A time when, perhaps, the world will be more receptive to third and fourth generation creativity capabilities. Maybe even to be able to work out – no doubt assisted by the matured fourth-generation solutions – what the fifth generation will look like. A time starting, assuming the established pattern continues, around 2050:



**Figure 8:** The Next Societal Cycle 'Awakening'

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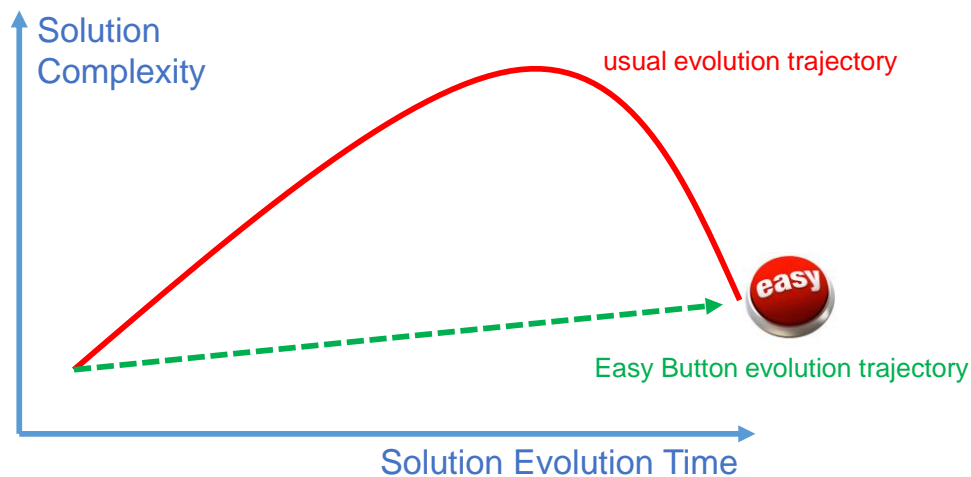
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# The Easy Button?



King Midas, granted a wish by the gods, asked for everything he touched to turn to gold. Delighted at first, he soon realised the curse: food, drink, and even his beloved daughter transformed into lifeless gold. Desperate, he begged the gods to reverse the gift, learning that unchecked greed brings ruin, not joy. Midas, like a lot of us, was looking for an Easy Button solution. Once he received it, also like a lot of us, he realised the consequences of using that Easy Button were anything but easy.

I first started hearing client requests for Easy Button solutions probably ten years ago. One short-lived client went as far as saying that, 'if we didn't make life easy' for them, 'they wouldn't use it'. For a while we played along with the Easy Button game. In some ways it is not a bad ambition. TRIZ tells us that solutions go through phases of increasing complexity followed by decreasing complexity, and in that regard, seeking a simple solution could legitimately be interpreted as shortcutting the curve:



The most typical client response when you get to deliver this kind of Easy Button solution is 'why did it take you so long to produce something so simple?' Which, when you hear the words kind of feels like a kick in the guts and the thought that, maybe we'd have been better off delivering a much more complicated solution. It is very definitely possible in this

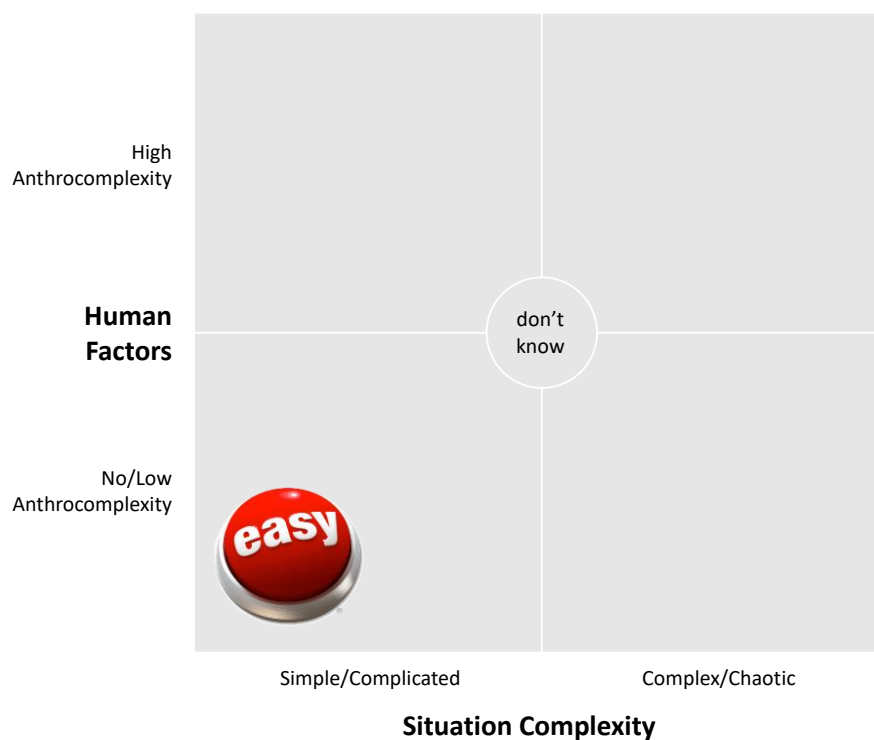


context to deliver solutions that are so far ahead of the parade, no-one knows that you're in the parade anymore. Nevertheless, metaphorical kicks in the guts are a comparatively easy contradiction to solve, so these kinds of complexity-bypassing solutions should always feature somewhere on the innovator's radar.

We might call this kind of Easy Button solution the 'right' kind of Easy Button. As opposed to the wrong kind. King Midas was given a terrifically simple way of creating more gold than he could ever hope to spend, but the downsides not only made his life worse, but had a fairly bad impact, too, on those around him. The bad kind of Easy Button, in other words, is the one prone to delivering negative unintended consequences.

The not immediately obvious reason why Easy Button seeking problem solvers too often find themselves in the land of unintended consequences is that, as discussed in last month's Government As A System article, even the simplest solution is a system and therefore has to comply with the Law of System Completeness: there needs to be an Engine, Transmission, Tool, Interface, Coordinator and Sensor. True, some of these elements may be combined and therefore hidden from view (like Midas' Golden Touch), but they all need to be there.

If the problem-solver gets lucky they may find themselves in a situation where a previously working solution is no longer working because one of the six necessary elements has developed a problem. The ABS warning light appears on the driver's dashboard because there's a problem with the sensor (thanks, VW, twice this year!) rather than anything wrong with the overall ABS system. These are what we might think of as 'simple' problems where an Easy Button ('replace the sensor') solution makes the problem disappear without any adverse unintended consequences. In Troubleshooter 'Realm' terms (Reference 1) these 'simple' problems occur in the bottom-left hand quadrant where the problem itself is simple and there are no messy human problems to have to deal with:



In each of the other three quadrants, there is no such thing as an Easy Button solution despite our or the problem owners desires for there to be one. Guaranteed, if you think you've identified a 'simple' solution in any of these quadrants, you've just tipped yourself

into the Unintended Consequences domain. For every complex problem, there is a simple, wrong answer. Moreover, you may have heard me say, for every complex problem there are thousands of simple wrong answers. I usually say that sentence before I add the second sentence, 'for every complex problem, there is a potential simple, right answer... provided you understand the core principles from which the complex system is operating'. It's a bit of a mouthful, I know. Top of the list of those core principles, of course, is the Law of System Completeness: if I'm going to find the simple, right solution, I need to be acutely aware of not just that Law, but also how it applies on multiple nested levels. Such that apparently solving a problem at the system level doesn't preclude me from creating an unexpected new problem at the super-system level. Linear-thinking humans are notoriously terrible at this kind of multi-level thinking – as evidenced in the Definitely Not Funny article following this one.

Delivering 'the right' Easy Button solution in this multi-layered system world demands a higher level of dot-connecting thinking than most methodologies acknowledge or incorporate. Probably the closest is Panarchy (Reference 2). Thus far, I've met less than a dozen people who understand even half the content of that book. Even fewer who also understand its more recent follow-up. Which is in effect to say that, as soon as a problem enters either the complex or anthrocomplex domains, there is in effect no Easy Button solution.

And, moreover, any client that continues to insist on receiving one is probably not the client you want or need.

They don't understand systems and don't want you to teach them.

They definitely don't understand hierarchies of systems and really don't want you to teach them.

Easy Buttons beget slippery slopes to fragility and a likely catastrophic end.

Warn Easy Button clients of the dangers as much as you can, but then your best bet is to politely step out of the way. Who knows, maybe, once the catastrophe unfolds, you might get asked back again to help remove all the previous Easy Button un-solutions and help build some that are, to paraphrase Einstein's point, as easy as possible, but no easier.

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## Definitely Not Funny – Perverse Incentives



Regular readers will no doubt be (over-) familiar with our use of the expression, ‘what gets measured gets done’. That’s because, picking up the Easy Button article immediately before this one, one of the simplest ways of changing complex systems is to change the (Sensor) incentives that motivate the behaviours of the other parts of the system. I say ‘simplest’ with a fair degree of scepticism. Humans – bless us all – spend most of our lives on Mount Stupid, allowing our hubristic, ‘we-know-better-than-Nature’ good intentions to turn into some rather not-good outcomes. Here are a few of our favourites, starting with the all-time classic that gives its name to the whole family of perverse incentives:

### Historical Examples

The Cobra Effect (British India)

Policy: Bounty offered for dead cobras to reduce their numbers.

Outcome: People bred cobras to collect the bounty, and when the policy ended, they released the cobras, increasing the population.

The Hanoi Rat Bounty (French Colonial Vietnam)

Policy: Payment for rat tails to control rodent infestations.

Outcome: Entrepreneurs began breeding rats and cutting off their tails while leaving the rats alive to breed further.

Window Tax (England, 1696)

Policy: Tax based on the number of windows in a house.

Outcome: Homeowners bricked up their windows, leading to darker and poorly ventilated homes and the phrase “daylight robbery.”

### Corporate and Economic Examples

Wells Fargo Sales Scandal (2010s)

Policy: Incentives for opening new customer accounts.

Outcome: Employees created millions of fake accounts to meet quotas, resulting in massive fines and reputational damage.

### Ford Pinto Fires (1970s)

Policy: Cost-benefit analysis concluded that compensating victims of crashes was cheaper than fixing the car design.

Outcome: A public relations disaster when the decision came to light, costing far more in reputation than anticipated.

### Enron Broadband Division (1990s)

Policy: Bonuses tied to reporting profits.

Outcome: Employees falsified data to inflate profitability, contributing to Enron's collapse.  
Government and Public Policy

### Soviet Nail Factories

Policy: Quotas for production based on the number or weight of nails.

Outcome: Factories either produced tiny, useless nails (to hit numbers) or oversized, impractical ones (to meet weight).

### Bogota's Traffic Law (1990s)

Policy: Cars banned on certain days based on license plate numbers to reduce traffic.

Outcome: Wealthy citizens purchased second cars with different plates, increasing pollution and congestion.

### Orphanage Donations in Developing Countries

Policy: Donations tied to the number of orphans cared for.

Outcome: Some orphanages began recruiting children from families to increase their numbers.

## Environment and Conservation

### China's Sparrow Campaign (1950s)

Policy: Citizens encouraged to kill sparrows to protect crops.

Outcome: Ecological imbalance led to an explosion in locust populations, contributing to the Great Chinese Famine.

### Recycling Contamination (Modern Times)

Policy: Fines for not recycling specific materials.

Outcome: People began adding non-recyclable items into recycling bins to avoid penalties, contaminating entire batches.

## Education

### Standardized Testing Incentives (U.S.)

Policy: Schools rewarded for improved test scores.

Outcome: Teachers focused exclusively on "teaching to the test," neglecting broader education, and, in some cases, altered student answers.

### Attendance-Based Funding (Various Countries)

Policy: Schools funded based on daily attendance.

Outcome: Schools discouraged sick children from staying home to maintain funding.

## Health and Medicine

### Surgical Success Metrics

Policy: Hospitals rewarded for higher surgical success rates.

Outcome: Some hospitals avoided treating high-risk patients to preserve their statistics.

## India's Sterilization Campaign (1970s)

Policy: Cash payments for sterilizations to reduce population growth.

Outcome: Coerced sterilizations and incentivized fraud, leading to public backlash.

## Sports and Gaming

### Olympic Medal Bonuses

Policy: Cash rewards for winning medals.

Outcome: Reports of athletes engaging in doping and extreme measures to enhance performance.

### Arcade Game Exploits

Policy: Early games like Asteroids offered extra lives for high scores.

Outcome: Players exploited glitches to rack up infinite lives and monopolize machines.

## Everyday Examples

### Hotel Towels

Policy: Signs asking guests to reuse towels to save the environment.

Outcome: Guests assumed hotels were cutting costs rather than genuinely saving the planet and ignored the signs.

### Parking Fines for Parents (Israel)

Policy: Fines for late pickups at daycare.

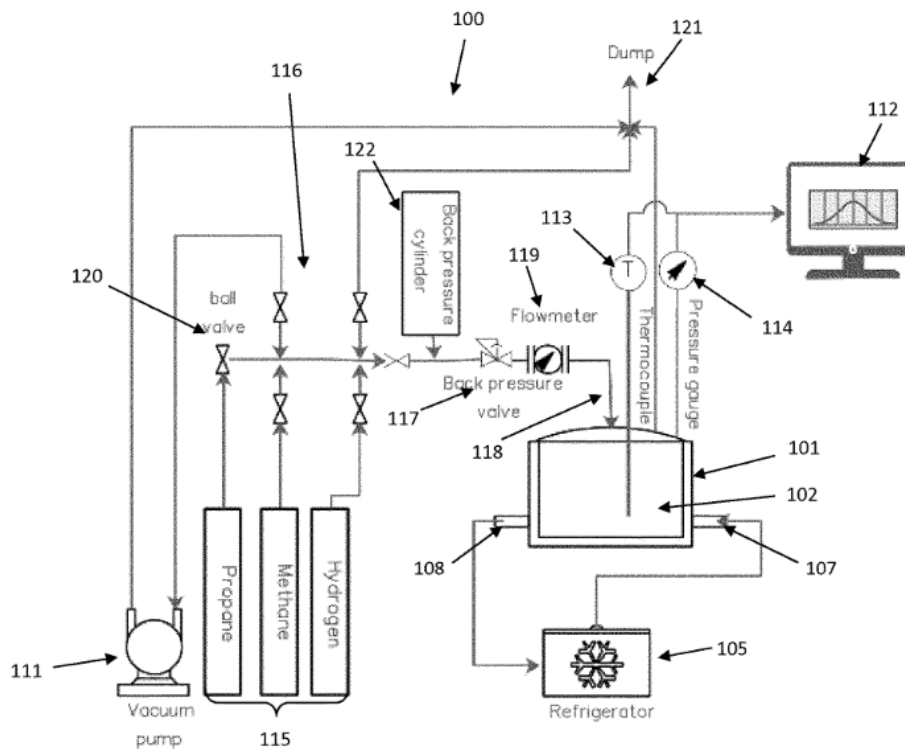
Outcome: Parents treated the fine as a fee, leading to more late pickups.

Finally, shaping up to be a world-record breaking example of Mount Stupid are all of the incentives pinned to the 17 UNESCO Strategic Development Goals. The core problem here is that sooner or later all of the goals – laudable as they might be individually – conflict with one another. Meaning that an incentive to reward movement in the right direction along one of the goals will also serve to make one or more of the other goals start moving in the wrong direction:



The main lessons being that people respond to incentives. If a loophole exists, someone will exploit it. What gets measured gets corrupted. The only doubt is how long will it take to work out how.

## Patent of the Month – Nanobubble Generator



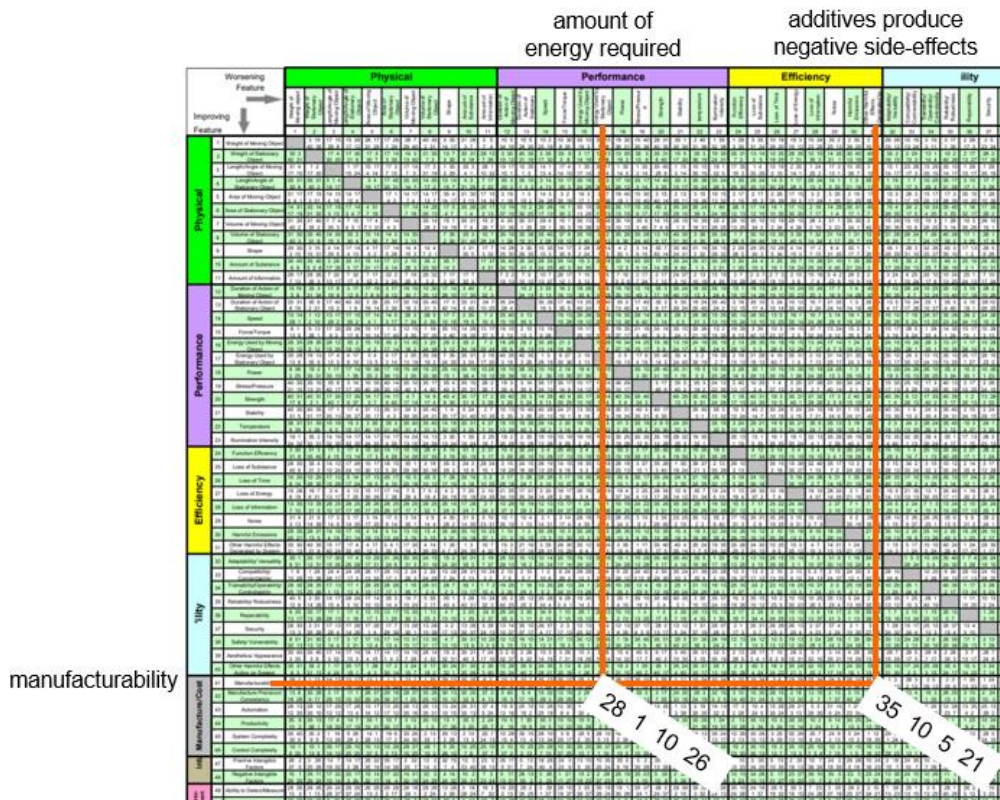
If my memory serves me correctly, we make a first trip to Ireland for this month's Patent of the month winner. Specifically, to University College Dublin, where a pair of inventors had US12,161,982 granted to them on December 10. Here's what the background description has to say about the problem the team has solved:

*The value of nanobubbles to industry can be seen clearly in the great multiplicity of applications they have found therein. Their high metastability in liquids has found nanobubbles a popular application in gas storage on the scale of months. Moreover, their high surface area:volume ratio has meant that they are useful in surface cleaning applications as they are able to cling to insoluble dirt on surfaces. Nanobubbles have also found wide usage in waste-water treatment by flotation, and furthermore in bio-gas applications including controlling methane emissions from agriculture.*

*Such applications have motivated significant amounts of research in to the various physical properties of nanobubbles and means of producing them. The cavitation effect for example, in which a sudden change in pressure in a liquid causes the formation of low-pressure cavities, has been used to produce nanobubbles.*

*These methods have been found to be costly in terms of energy requirements and the physical apparatus required. Moreover, some methods require additives in the process which contaminate the liquid, whilst also producing relatively low gas solubility.*

Per the third paragraph, the conflicts needing to be solved concern the fight between manufacturability of the nanobubbles, the amount of energy required to do it, and the likelihood of adverse side-effects resulting from the usual need for additives to facilitate the process. Here's what those two conflicts look like when mapped onto the Contradiction Matrix:



And here's how the invention solves them, as described in the main Claim of the patent document:

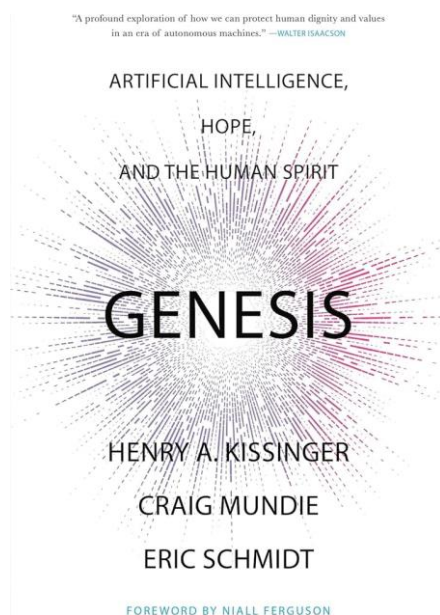
*A method of producing nanobubbles or nanodroplets; the method comprising: providing a volume for accommodating a liquid; distributing a medium within the liquid; generating a [Principle 28] static electric field using an electrode in the proximity of the volume, wherein the nanobubbles or nanodroplets are generated as a result of the static electric field being applied to the liquid and the medium; wherein the electrode and the liquid are [Principle 1] not in direct electrical contact to prevent electrolysis occurring within the volume.*

In a separately published article outlining the discovery, Professor Niall English, UCD School of Chemical and Bioprocess Engineering said, "Our new fundamental discovery involves the application of electric fields, which cause transient negative-pressure regions at gas-liquid interfaces, thereby resulting in gas incorporation in liquids in nanoscale-bubble form. It is very energy-efficient, additive-free, and works for a wide range of gases and the greatly enhanced gas solubility in water is highly metastable, lasting at least for many months."

Fellow-inventor, Dr Mohammad Reza Ghaani, UCD School of Chemical and Bioprocess Engineering, said, "Our new method of nanobubble generation has multiple commercial applications and has the potential to boost the ability to store gas directly in aqueous solutions over months. In addition it has the potential to boost by several-fold dissolved-gas levels, resulting in greater capacities to treat wastewater and also enhance mass transfer in oxygen-limited biochemical and biopharma reactions, such as fermentation processes in the food and brewing industries."

Read more: <https://www.ucd.ie/innovation/news-and-events/latest-news/ucd-researchers-new-nanobubbles-generation/name,490167,en.html>

## Best of the Month – Genesis



*“The top policy maker has so much information at his disposal that in crisis situations he finds it impossible to cope with it.”*

Henry Kissinger, 1968 paper.

*“With sufficient democratic input as well as legal and technical expertise, and with extraordinary caution, and mindful always of the misuses and malfunctions we have here described, we believe it will be possible to inculcate a moral baseline into artificially intelligent machines, and crucially, to do so in lockstep with our fellow humans. Thereby we may cross the threshold to a new age with, if not utter confidence, at least informed and solemn hope... With sober optimism, may we meet its genesis.”*

Henry Kissinger, 2024.

Boy, this book has everything. Henry Kissinger’s final message to mankind; two stellar co-authors; a foreword by (Kissinger’s biographer), Niall Ferguson; testimonials from anyone that’s anyone in or around the emerging world of AI – Mustafa Suleyman, Sam Altman, Satya Nadella, Larry Summers, Graham Allison, Ian Bremmer and Condoleezza Rice; not to mention a round of TV and online interviews on global-phenomena podcasts like Steven Bartlett’s ‘Diary Of A CEO’.

And now, most impressive of all, it gets to win our prestigious Best of the Month award. I say that with my tongue pressed somewhat firmly into my cheek. That’s because this might just be – said with kindness – the worst Best of the Month book in SIEZ history.

Why might that be? The root of the problem, I think, is that, much as I admire a person in their late 90s deciding to start learning about AI and then connecting that knowledge to a lifetime’s perspective on global politics, most of the arguments and prophecies contained within the book are somewhat half-baked. Where Kissinger starts to hit the edge of his knowledge, his AI-soaked co-authors, fail to fill the gaps – I don’t know whether that was out of respect for a man at the end of his life, or because they also didn’t know how to fill the gaps either – I don’t think I’ve ever read a book with as many uses of words like ‘if’, ‘perhaps’, ‘maybe’, ‘possible’, ‘may’, ‘hopefully’, ‘might’ or ‘could’. It was like there were a dozen ‘get out of jail free’ qualifiers on every page. So, what we end up with is AI might be



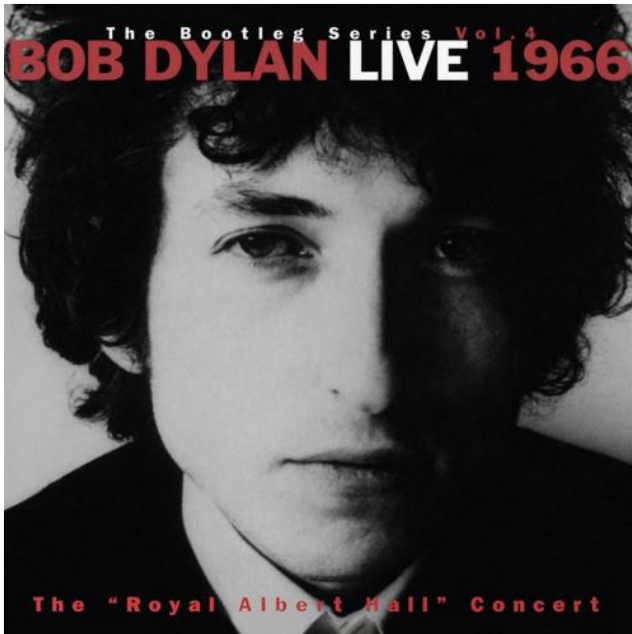
dangerous or not. The political world might understand the importance of taking hold of the legislative reins or not. The world might unite to tackle the problem or not. You get the idea. Regular readers will know that I've often been guilty of similar obtuse proclamations myself ('never make predictions... especially about the future'), but never so universally as happens in Genesis.

Maybe (!) this ultimately means that, the reason this is still the best book of the month, is that it presents a stake in the ground defining humanity's collective understanding – or lack thereof – of AI's future place in the world. Right now, the insight is that there is no insight. If we're all, Kissonger included, on Mount Stupid, then so be it. At least we know where we are and what we need to do to continue the final ascent and then descent down into the valley of despair and the rise to enlightenment that lies on the other side.

One of my main reasons for my criticism is that, in something of a cruel irony, one of the other clusters of frequently used words through the book centre around paradoxes and contradictions. The irony being that, although the words get used a lot, they're never used in a context that suggests any of them can be overcome. Which means, ultimately, this is yet another of those books where anyone familiar with TRIZ/SI finds themselves pulling their hair out with frustration: 'why didn't you solve it?' As ever, those contradictions are at least the first half of an insight. And maybe that will be the ultimate legacy of the book: it was the place where the contradiction-solvers took their initial inspiration.

Fingers-crossed. For all of our sakes.

## Wow In Music – Visions Of Johanna



'Visions of Johanna' is a song written and performed by Bob Dylan on his 1966 album *Blonde on Blonde*. Several critics have acclaimed "Visions of Johanna" as one of Dylan's highest achievements in writing, praising the allusiveness and subtlety of the language. *Rolling Stone* included "Visions of Johanna" on their list of the 500 Greatest Songs of All Time. In 1999, Sir Andrew Motion, Poet Laureate of the United Kingdom, listed it as the greatest song lyric ever written.

Dylan first recorded the song in New York City in November 1965, under the working title of "Freeze Out", but was dissatisfied with the results. When the *Blonde on Blonde* recording sessions moved to Nashville in February 1966, Dylan attempted the composition again with different musicians, and decided to release this performance. All of the alternate versions of the song have been officially released, many of them are November 1965 or later 1966 studio outtakes, and two others are live performances from his 1966 world tour. On the latter front, I always thought that the Dylan-alone-on-stage version from the 'Royal Albert Hall' (ask your Dad about the inverted commas!) concert was the perfect version of the song. More on that front shortly.

Before we get there, it is worth noting some of the contradiction-based lyrical 'wow' moments in the song, and why it remains high in Dylan's best-of list among hardcore Dylanophiles. Critic, Andy Gill suggests it is the enigmatic quality of the song that is responsible for its popularity – "forever teetering on the brink of lucidity, yet remaining impervious to strict decipherment". Gill writes that the song begins by (Principle 4) contrasting two lovers, the carnal Louise, and "the more spiritual but unattainable" Johanna. Ultimately, for Gill, the song seeks to convey how the artist is compelled to keep striving to pursue some elusive vision of perfection.

Clinton Heylin has described what he construes as the strange circumstances surrounding the song. Written around the time of Dylan's marriage to Sara Lownds, Heylin describes it as "one of the oddest songs ever written by a man who has just tied the knot and is enjoying a brief honeymoon in the city". Noting that the song is an elegy for (Principle 2) a past lover, Heylin speculates that "it is awfully tempting to see Johanna as his muse," who,

in the song, is "not here". For Heylin, the triumph of the song lies in "the way Dylan manages to write about the most inchoate feelings in such a vivid, immediate way". Renowned Dylan critic, Michael Gray also praises the subtlety of the song. Gray acknowledges that it is difficult to say what this song is "about", since it is at once (Principle 37) indefinable and precise. For Gray, its principal achievement lies in the way it confuses categories, using language to be simultaneously serious and flippant, delicate and coarse, and mixing up "abstract neo-philosophy and figurative phraseology".

Robert Shelton called "Visions of Johanna" one of Dylan's major works. He writes that Dylan's technique of throwing out "skittering images" evokes "a mind floating downstream"; these "non-sequential visions" are the record of a (Principle 1) fractured consciousness. Shelton argues that the song explores a hopeless quest to reach an ideal, the visions of Johanna, and yet without this quest life becomes meaningless. He suggests that the same paradox is explored by Keats in his "Ode on a Grecian Urn".

Mike Marqusee situates the song in New York City, "a flickering, electric, ghostly, cityscape". Dylan describes himself stranded in a fog of detachment which provides a haven, and at the same time is pained by a piercing clarity: an unmediated response that is "too concise and too clear". For Marqusee, Dylan describes his predicament, suspended between freedom and slavery, yet hungry for an authentic experience. Johanna and Louise are objects of desire and yearning. "It is their elusiveness and unreality that's the point."

Guitarist and critic Bill Janovitz also emphasizes the urban, unreal quality of the song, calling it a "sprawling epic". "The journey takes Dylan through lofts, the D train, a museum, empty lots, and through snippets of overheard conversation, as well as a discussion with some 'little boy lost', who 'takes himself so seriously', and who is 'so useless and all/muttering small talk at the wall'." For Janovitz, this could "possibly be a swipe at a critic".

Literary critic, Christopher Ricks, in his study of Dylan's work, pinpoints the emotional effect of these same lines:

*He's sure got a lotta gall to be so useless and all  
Muttering small talk at the wall while I'm in the hall*

Ricks writes that the phrase "and all" turns a mood of helplessness into a sense of "aggression and baffled anger".

Finally – seemingly every Dylan critic has written about the song, so we could've stretched this section a lot further - trying to unravel the mystery of the song, Greil Marcus writes that the song is concerned with internal questions, rather than external ones: "Line by line, 'Blowin' in the Wind' is pious, or falsely innocent— isn't it obvious that whoever wrote "Yes, 'n' how many seas must a white dove sail / Before she sleeps in the sand?" already knows the answer, assuming he, or anyone, can actually bring themselves to care about such a precious question? But 'Visions of Johanna' is asking different sorts of questions. Such as: Where are you? Who are you? What are you doing here?" Evoking the drugged, urban milieu of the song, Marcus writes of "People wandering from one corner of a loft to another, doped, drunk, half-awake, fast asleep, no point to the next breath, let alone the next step." For Marcus, "'Visions of Johanna' makes a narrative (Principle 34) solely out of atmosphere.

Okay, so much for analysing Dylan. None of the critics to my knowledge ever talked about any of the musical wow's within the song. On nearly every level it's a classic 'three chords

and the truth' song. Except sometimes the E chord is played as a major chord and sometimes its played as a (Principle 16) E7, and it's the unpredictability of which gets played that helps maintain interest in the music.

I've always loved the song. But that love was lifted to a whole new level when I saw Cat Power perform it as part of her 'Sings Dylan, The 'Royal Albert Hall' Concert' tour at the end of August this year. Power is in any event one of those rare artists capable of getting so far into someone else's song that she makes it her own. And now I have a copy of the live album of the tour, safe to say, Visions of Johanna is now her song in my mind. When I need to hear it, in other words, its her version I'll be reaching for.

Part of the ownership takeover happens because of the common (Principle 13) trick of having a woman singing a man's lyric (or vice-versa). Then, of course, Cat Power is a much more characterful singer than Dylan, so she's able to squeeze several extra ounces of feeling out of the lyrics. The clincher, however, is slightly odd. An apparently simple (Principle 16) adjustment in the pronunciation of 'Johanna' so that the 'ha' syllable becomes dominant. No-one pronounces Johanna like that. And maybe that's the simple but oh so effective point of the way in which Cat Power decided to sing it. A tiny shift that turns into something quite transformational. Re-pronunciation magic. One that literally sent shivers down my spine when I first heard her do it at the concert.

No surprise, therefore, these moments being kind of rare these days, that Cat Power in Copenhagen was high up my Top Ten list of concerts in 2024. Just in case you're interested, here are the other nine (out of – new record - 134):

- 1) Cara Dillon, Stroud
- 2) Glen Hansard, Bristol
- 3) Cat Power, Copenhagen
- 4) Leif Vollebekk, Bristol
- 5) Big Big Train, Newport
- 6) Fat Freddy's Drop, Bristol
- 7) Black Crowes, Wolverhampton
- 8) Bonny Light Horseman, Birmingham
- 9) Jason Isbell, Bristol
- 10) Marisa & The Moths, Swindon
- 11) Unthanks, Exeter/Nick Cave, Leeds

For those readers living in the UK, the Cat Power Sings Dylan tour is heading in our direction in 2025. Be there or be a regular four-sided figure.

## Investments – Early Cancer Detection



A new screening method that combines laser analysis with a type of AI is the first of its kind to identify patients in the earliest stage of breast cancer, a study suggests.

The fast, non-invasive technique reveals subtle changes in the bloodstream that occur during the initial phases of the disease, known as stage 1a, which are not detectable with existing tests, the team says.

Researchers at the University of Edinburgh say their new method could improve early detection and monitoring of the disease and pave the way for a screening test for multiple forms of cancer.

Standard tests for breast cancer can include a physical examination, x-ray or ultrasound scans or analysis of a sample of breast tissue, known as a biopsy. Existing early detection strategies rely upon screening people based on their age or if they are in at-risk groups.

Using the new method, researchers were able to spot breast cancer at the earliest stage by optimising a laser analysis technique – known as Raman spectroscopy – and combining it with machine learning, a form of AI.

Similar approaches have been trialled to screen for other types of cancer, but the earliest they could detect disease was at stage two, the team says.

The new technique works by first shining a laser beam into blood plasma taken from patients. The properties of the light after it interacts with the blood are then analysed using a device called a spectrometer to reveal tiny changes in the chemical make-up of cells and tissues, which are early indicators of disease.

A machine learning algorithm is then used to interpret the results, identifying similar features and helping to classify samples.

In the pilot study involving 12 samples from breast cancer patients and 12 healthy controls, the technique was 98 per cent effective at identifying breast cancer at stage 1a.

The test could also distinguish between each of the four main subtypes of breast cancer with an accuracy of more than 90 per cent, which could enable patients to receive more effective, personalised treatment, the team says.

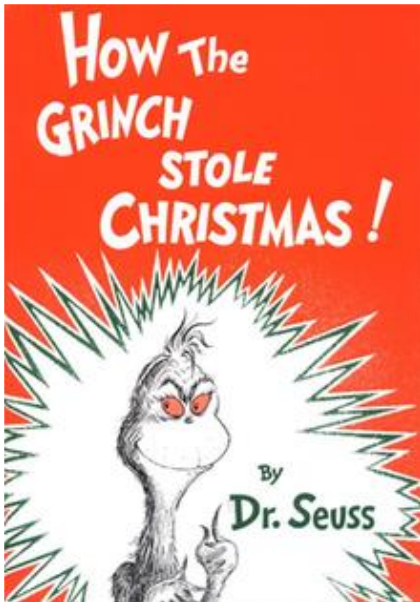
Implementing this as a screening test would help identify more people in the earliest stages of breast cancer and improve the chances of treatment being successful, the team says. They aim to expand the work to involve more participants and include tests for early forms of other cancer types.

The study is published in the *Journal of Biophotonics*. Blood samples used in the study were provided by the Northern Ireland Biobank and Breast Cancer Now Tissue Bank. It also involved researchers from the University of Aberdeen, the Rhine-Waal University of Applied Sciences and the Graduate School for Applied Research in North Rhine-Westphalia.

Dr Andy Downes, of the University of Edinburgh's School of Engineering, who led the study, said: "Most deaths from cancer occur following a late-stage diagnosis after symptoms become apparent, so a future screening test for multiple cancer types could find these at a stage where they can be far more easily treated. Early diagnosis is key to long-term survival, and we finally have the technology required. We just need to apply it to other cancer types and build up a database, before this can be used as a multi-cancer test."

Read more: Kevin Saruni Tipatet, Katie Hanna, Liam Davison-Gates, Mario Kerst, Andrew Downes. Subtype-Specific Detection in Stage Ia Breast Cancer: Integrating Raman Spectroscopy, Machine Learning, and Liquid Biopsy for Personalised Diagnostics. *Journal of Biophotonics*, 2024; DOI: 10.1002/jbio.202400427

## Generational Cycles – Grinch



This year, we set ourselves the challenge of uncovering a generational Christmas connection. Do different generations – in the US/UK parts of the world at least – view the holiday season differently?

These kinds of challenge are always more difficult than you initially think. That's because if we find a generational difference that is predictable or will be perceived to be obvious there's no point in writing about it because there's no insight (a trait, incidentally, that ChatGPT hasn't yet understood). Falling into this obvious category comes the not-surprising 'discovery' that anticipation and build-up to Christmas becomes longer during Crisis periods. In the economically-stalled UK this year, for example, the shops started promoting Christmas products before the end of September. Perhaps they do that because, also observable during Crisis periods, people have less money to spend on Christmas goodies.

Beyond that, the prospects for a story were beginning to look bleak. Until, that is, we decided to visit one of our favourite cafés for a spot of pre-Christmas lunch. The café is on two floors. Downstairs was where we usually sit. Per tradition, the walls were decked with holly and there was tinsel everywhere. It was the tinsel motherlode. I started to get twitchy. Fortunately, there weren't any available seats. So we went upstairs. Where not only were there were a couple of free tables, there was also a distinct absence of tinsel and holly. It had been replaced by assorted Grinch decorations:



This felt far better.

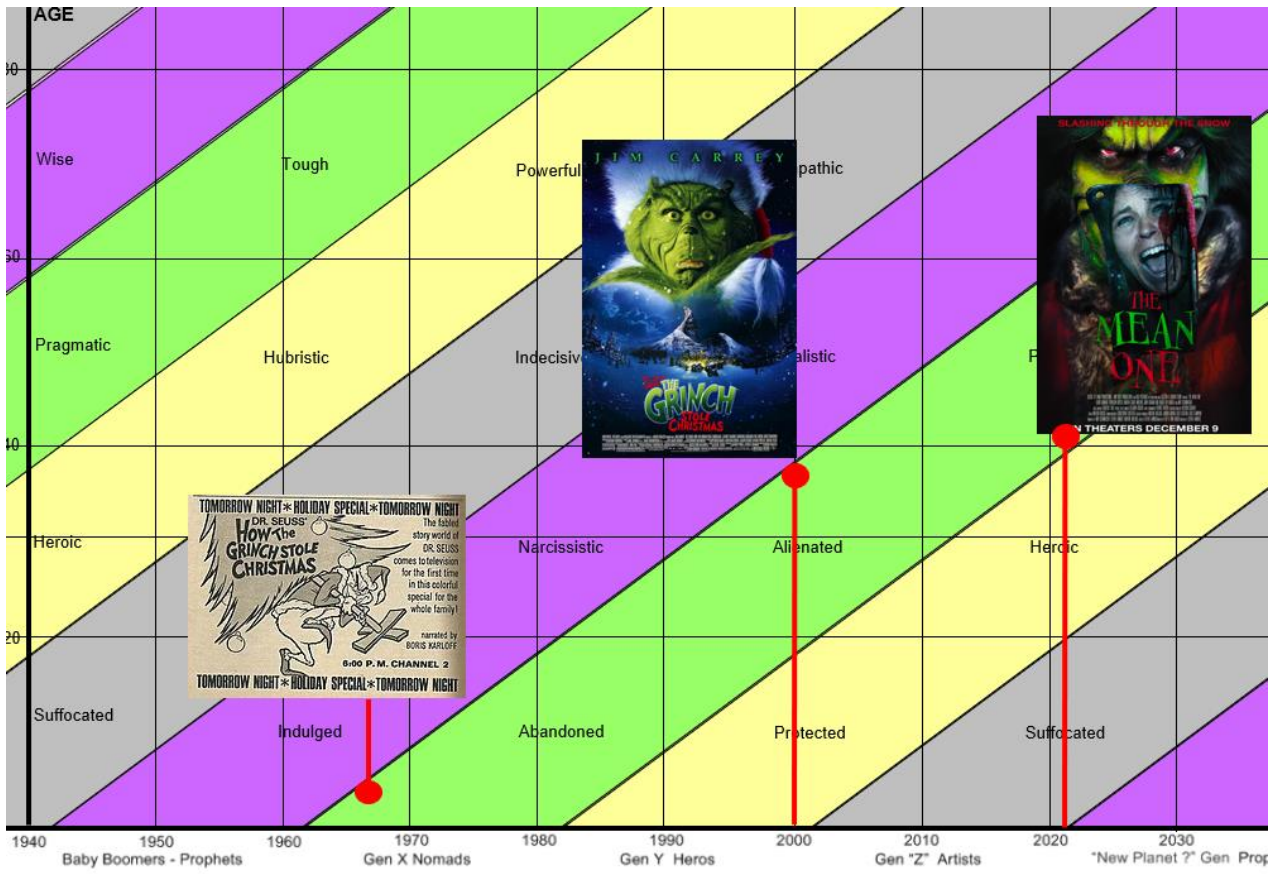
Not only was it much more depressing, it had given me a generation-related clue. As I looked around the other upstairs tables, each and every one was occupied by grinch-like GenXers like me. No kids, no ironic Christmas sweaters, no Santa-hats, nothing.

For those that might not know, 'How the Grinch Stole Christmas!' is a Christmas children's book by Theodor "Dr. Seuss" Geisel. Per Dr Seuss convention, the book is written in rhymed verse with illustrations by the author. It follows the Grinch, a cranky, solitary creature who attempts to thwart the public's Christmas plans by stealing Christmas gifts and decorations from the homes of the nearby town of Whoville on Christmas Eve. The story was published as a book by Random House in 1957. In effect, the book criticises the commercialisation of Christmas and the holiday season. By the late 1950s, all Dr Seuss books were popular with American kids, but it took a few years for The Grinch to really take off. The first big uplift happened in 1966 with an animated TV film narrated by Boris Karloff. The significance of 1966 is that there had been a generational shift in the audience. The young kids exposed to Boris Karloff were the first ('Abandoned') GenX Nomads.

A generation that, once they'd grown into 'Alienated' young adults grumbling about all of the world's annoyances, had Grinch DNA. Christmas was indeed over-commercialised and horrible. But then again, these Nomads now increasingly had a new conflict to deal with: As they aged a little more, they were becoming 'Protective' parents. Now it was necessary to hate Christmas and also to love it. Or at least pretend to love it for the benefit of their impressionable, 'you-can-have-whatever-you-desire' young offspring. Now the time was perfect for the 2000 live-action feature film starring (GenXer) Jim Carrey. A film to make everyone happy. The kids loved it because the Grinch learned the error of his ways and was quite funny. The parents 'loved it' because now they could 'pretend' to be the Christmas Grinch and still be seen to be partaking in the celebrations.

Then, finally, bringing the story up to date, 2022 brought a slasher horror Grinch parody film starring (surprise, surprise, also GenXer) David Howard Thornton. The Mean One (slashing through the snow') probably now represents the top of the Grinch s-curve. A film that, if the over-protected, anxious, GenZ's get to see it will no doubt send the franchise into temporary decline. Being a 'Christmas Grinch' is still a badge of honour for most Nomads. For GenY and GenZ, the character is about as far away from being aspirational as is possible to be. When a Millennial is told by a fellow Millennial that they're being 'Grinch'y, it's a not so subtle way of saying, 'stop being so miserable, pin on a happy smile and get out there. There's a world to go save'. Or, to quote another Nomad-centred literary character, Bah! Humbug... which makes me wonder whether there might be some kind of Nomad Ghosts of Christmases Past, Present and Future going on here...



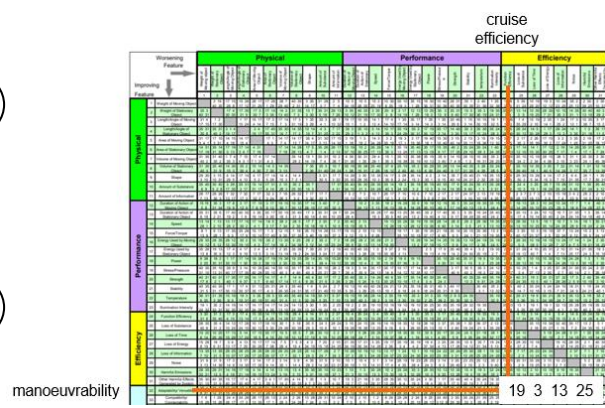
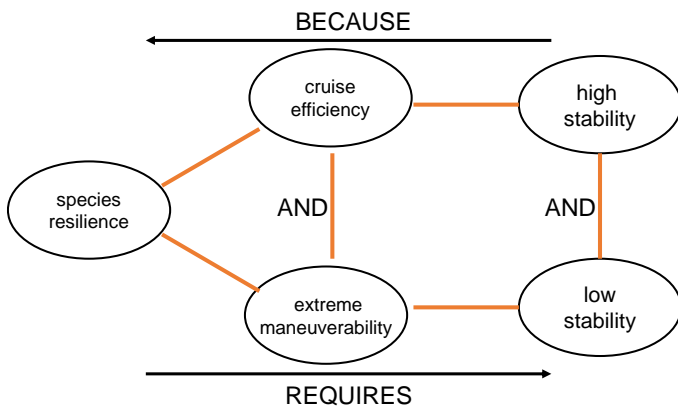


# Biology – (Whiffling) Goose



This viral image captured by photographer Vincent Cornelissen shows a goose flying with its body upside down, with its neck twisted so that the head is the right way up. Many people were wondering why the bird would do such a thing. Or whether it is even possible.

While it looks painful, such a manoeuvre is indeed possible and is a tried and tested way of braking, called whiffling. By turning the body upside down, the aerodynamics which usually give a bird lift during flying are inverted causing the bird to plummet towards the ground. Whiffling allows the bird to rapidly lose speed and height either for a fast landing or to throw off avian predators or when having to land in turbulent conditions. From a contradiction perspective, the problem looks something like this:

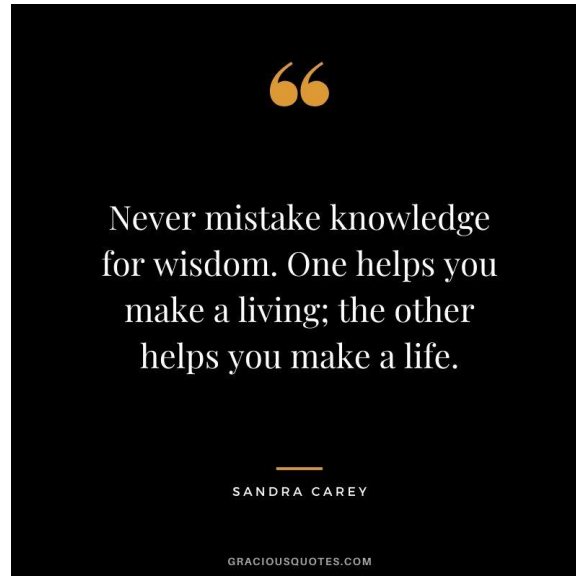


Principle 13, turn the system upside down. Or rather – Principle 3 – most of the system: turn the lift-generation system upside down, and leave the visual and control system the right way up. Simple when you know how. Which is probably why the behaviour is seen in several species aside from geese including lesser yellowlegs, the black-tailed godwit, the northern lapwing, three species of scoter, and other members of the family Anatidae.



## Short Thort

*“Wisdom cannot be imparted.  
Wisdom that a wise man attempts to impart  
always sounds like foolishness to someone else ...  
Knowledge can be communicated, but not wisdom.  
One can find it, live it, do wonders through it,  
but one cannot communicate and teach it.”*  
Hermann Hesse



*“The saddest aspect of life right now is that  
science gathers knowledge faster than society gathers wisdom.”*  
Isaac Asimov

## News

### Troubleshooting and SI/AI Online Workshops

Following multiple enquiries from people that weren't able to attend the 2024 dates, we are proposing to re-run both workshops. The new dates are:

Troubleshooting (16 hours) – 18-19 & 25-26 February

SI/AI (8 hours) – 6 & 13 March

More details and booking at: <https://si-shop.org.uk/workshops-and-training/>

### R&D Management Conference

Our recent re-interest in Panarchy (see this month's second article), we set about looking for a conference on the subject. There isn't one. But the R&D Management conference seems to have featured several Panarchy-related papers over the years, so we figured that might be an event to go present at. The fact that the 2025 conference is taking place in Pisa had nothing to do with the decision. And shouldn't affect yours either. Deadline for abstracts is the end of January, and the conference takes place from 30 June to 2 July. Italy in July, hmm. More details: <https://www.rndtoday.co.uk/event/rd-management-conference-2025/>

## **New Projects**

This month's new projects from around the Network:

- Services – SI/Design-Thinking Workshops
- Government – Scenario Planning Project
- Consulting – SI Workshops
- Energy – Business Development Project
- Finance – PanSensic Dashboards
- Consulting – SI Workshops
- Conglomerate – SI/Design-Thinking Workshops
- Services – SI Workshops
- FMCG – TrenDNA Project

## **Merry Christmas & Happy New Year**

Finally, as the speed-of-light year that was 2024 comes to a close, please allow us to thank readers for their support, feedback and intriguing questions again this year. We quite simply couldn't do it without you. To those of you celebrating the Christmas holiday, please allow us to wish you a restful break (perfect for reading the History of Creativity article at the top of this month's ezine!), and to everyone celebrating the New Year, we hope you and yours enjoy a prosperous and inspiring 2025.

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