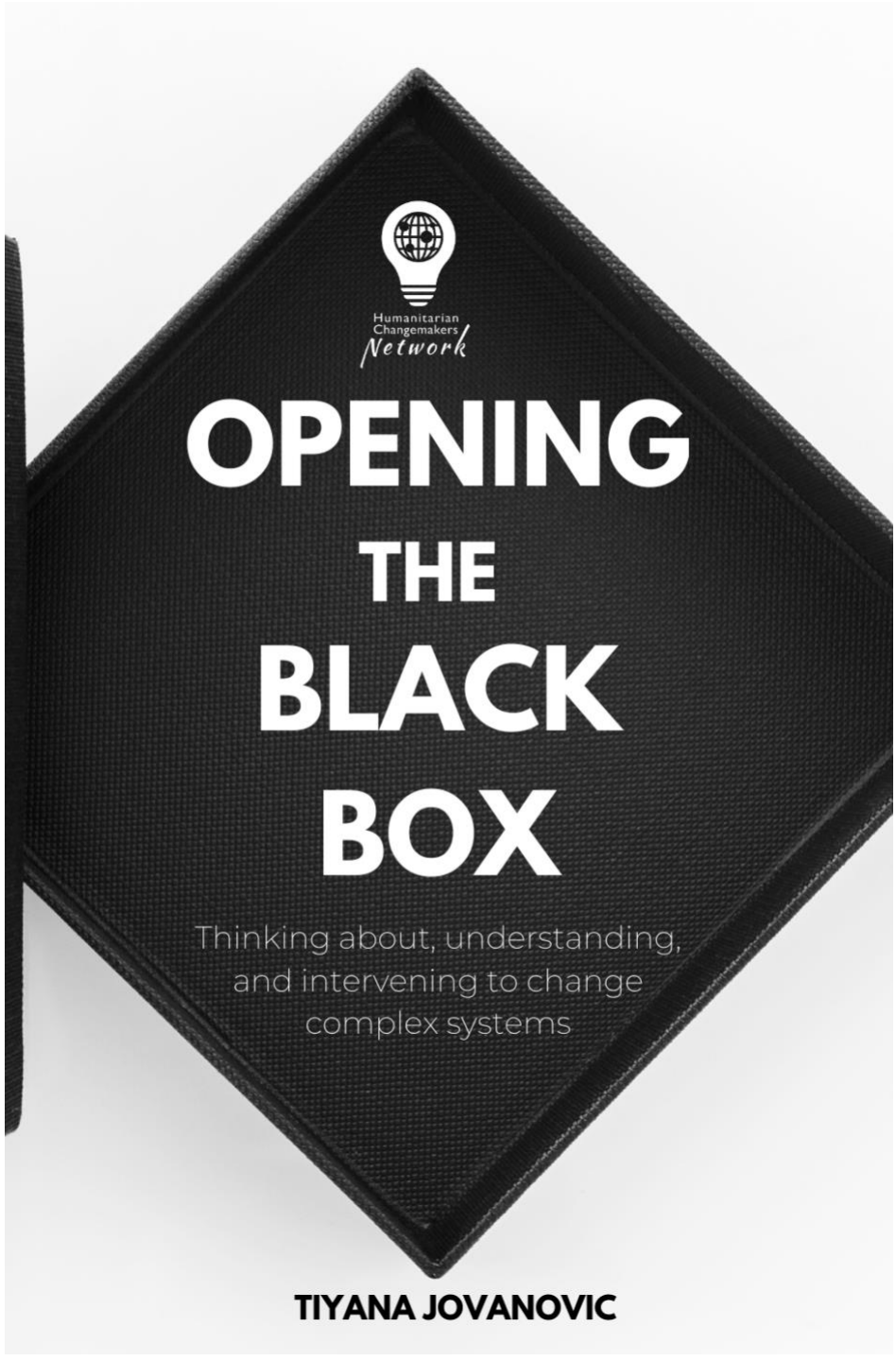
Humanitarian
Changemakers
Network
OPENING
THE
BLACK
BOX
Thinking about, understanding,
and intervening to change
complex systems
TIYANA JOVANOVIC

Opening the Black Box:

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PREFACE

Several years ago, the Australian dairy industry began to change and decline after the government's complete deregulation of the milk industry, which led to increases in overseas milk exports, locational shifts in dairy farms and milk production, and a decline in dairy farm profit margins alongside increases in the concentration of milk production. For several years, questions persisted amongst resident of Queensland and New South Wales about whether dairy farmers were receiving fair prices for their milk. These questions intensified in 2011, after supermarkets reduced the retail price of their milk to $1/litre. A 2017 report from Dairy Australia revealed that the drought was making things worse for farmers across Queensland and New South Wales, and one in five dairy farmers intended to leave the industry. Significant public discourse about the structure and practices of the Australian dairy industry deepened. The Federal Agriculture Minister, David Littleproud, jumped on board a campaign calling for a $0.10/litre levy on all milk sold at supermarkets, because the $1/litre retail price of milk has long been perceived to be a major consequence of deregulation. But adding a levy to the retail price of milk was actually a distraction from the real impacts of a complex, global food system on the Australian Dairy Industry.

Then-Treasurer Scott Morrison issued a notice requiring the Australian Competition and Consumer Commission (ACCC) to

hold an inquiry into the competitiveness of prices, trading practices and the supply chain in the Australian dairy industry (Australian Competition and Consumer Commission, 2017). What the ACCC's Dairy Inquiry found was incredibly indicative of how much of an impact globalisation has on the dairy industry in Australia. Contrary to public discourse during the milk crisis in Australia from 2016-2018, $1/litre supermarket milk was not to blame for the crisis. Whether farmer's milk is sold in an expensive bottle, or a cheaper supermarket brand, Dairy farmers are paid the same amount of money. This is because processors, not supermarkets, pay farmers. Processors act as the "middle-man" between the farmers and retailers, and farmers get paid on a milk-solids basis, based on the fat and protein composition of their milk. The processors then produce the milk solids into milk or other dairy products to be sold in Australia, or overseas, and the global market determines the prices that processors pay farmers. In 2014, after Malaysian Airlines flight MH17 was gunned down by Russian-backed soldiers, Australia, amongst other nations, placed sanctions on Russia. In retaliation, Russian President Vladimir Putin halted dairy imports into Russia from Australia and the EU, which lead to a significant decrease in global milk prices. Countries in the EU then started selling dairy products in countries that Australia was previously selling in, and this was a key root cause of Australia's milk crisis.

The dairy crisis is just one example of how our conventional ways of thinking can lead humans to oversimplify our understanding of complex systems, which in turn, makes it harder to truly address the root causes of the issues that we see emerge as symptoms of their complexity.

1
WHY SYSTEMS CHANGE

We are living in an era of unprecedented change. Globalisation, interconnectedness, and complexity are transforming the way we live and work. As a result, we are facing a range of new challenges, from climate change to global pandemics, known as ‘wicked problems.’ Wicked problems are social, economic, political, or cultural problems that are difficult to solve because of their complex, interconnected nature, they typically involve a large number of stakeholders with conflicting values, and they often involve long-term and structural issues. Wicked problems are often contrasted with "tame" problems, which are easier to solve because they have a clear cause-and-effect relationship. Some examples of wicked problems include poverty, biodiversity loss, food insecurity, and healthcare.

Because wicked problems are so complex, they often require creative and interdisciplinary solutions. For example, they might require a combination of economic policies, educational initiatives, social welfare programs, environmental regulations, technological innovation, and lifestyle changes. Wicked problems are challenging, but addressing them is essential for building a better world.

Systems change is about addressing the root causes of problems and their intractable and embedded networks of cause and effect. It is an intentional process designed to fundamentally alter the components and structures that cause the system to behave in a

certain way. The terms, systems innovation and systems change have arisen in parallel to the idea of wicked problems.

Systems change is an intentional process designed to address the root causes of social problems. It is a long-term, multi-faceted approach that involves all stakeholders in a problem-solving process. Wicked problems often require systems change because traditional methods are not effective in addressing the root causes of these problems. The emergence of systems innovation and systems change has been in response to the realisation that many social problems are actually wicked problems. Not all social change is systems change—and not all social change should necessarily seek to change entire systems—because sometimes it's important to focus on addressing immediate problems and people's immediate needs. However, if we aren't also seeking to change the systems that create these persistent problems, we will find ourselves on a proverbial hamster wheel, which is why our social change efforts should also include systems innovation.

Systems innovation is an approach that seeks to fundamentally alter the components and structures that cause a system to behave in a certain way. It is an approach to solving problems that acknowledges the interconnectedness of all elements in a system and seeks to create lasting change by addressing the root causes of social problems.

Unfortunately, our science and much of our thinking has left us in a situation where we are far from complex problems and the new set of issues they present. Our experience, which has been developed from exposure to simpler systems, tells us that if we work hard enough on the problem, we will find the answer. The complicating factor is that these systems are in a constant state of change and evolution. What was the cause of a problem in the past may not be the cause now or in the future. We are further challenged by the fact that these systems are often tightly coupled. A change in one part of the system can result in impacts elsewhere that may be difficult to predict. This reality makes both short-term management and long-term planning more difficult. The upshot is that we need to become much better at understanding complex systems if we are to effectively manage them. Only then will we be able to make the necessary changes to keep them healthy and productive.

But it's not all doom and gloom. In my last book, The Changemaker In You, I highlighted how we currently live in a time where it's not only revolutionaries, inventors, geniuses, and the powerful that have the power to change the world, we all do. The framework laid out in that book, presents a theory of change for how we can holistically create formal and informal change at both the individual/collective and systemic levels. This same approach also offers us opportunities to solve these wicked problems, if we are willing to shift from conventional ways of thinking about the issues we are tackling and fill our changemaking toolkit with one of the most powerful tools a 21st century changemaker can have: a systems approach.

Before moving ahead, it's important to make a clear distinction between systematic change, systemic change, and systems change.

Systematic change is an adjective– it's a way of describing how we 'do' change– typically referring to using a step-by step plan or fixed method. Usually, it refers to large-scale change that happens over time, such as the Industrial Revolution or the civil rights movement. Systematic change often happens as a result of people working together to bring about change. For example, during the Industrial Revolution, workers banded together to demand better working conditions and higher wages. In the civil rights movement, activists worked together to challenge segregation and ensure that all people had equal rights. Often, something like an activism campaign will be carried out systematically, because there is a clear strategy and a plan to carry out individual tactics. Systematic change describes a particular approach taken to change.

Systemic change is a term that is often used in the field of sociology. It refers to a process of transformation that takes place at the level of systems or institutions, rather than individual people. If you think of the Humanitarian Changemakers Networks' framework, it's the bottom two quarters of the quadrant. In other words, it is about changing aspects of a social system to improve outcomes for individuals and society as a whole. There are many different approaches to systemic change, like political activism or policy change, and some of the challenges involved in systems change include identifying the root causes of problems, engaging key stakeholders, and developing sustainable solutions. Typically,

systemic change describes changes to formal aspects of a social system.

This brings us to systems change; When we consider that systems thinking and systems dynamics evolved from general systems theory all the way back in the 1950s and 60s, the term 'systems change' is a relatively new one, coming to prominence within just the last decade, and it is safe to say that it is still in its formative stage with many different perspectives on what it is exactly.

Ashoka defines systems change in terms of tackling root causes: "Systems change is an approach to tackling the root causes of a problem by identifying and creating shifts in the systems that are responsible for the problem."

Charlie Leadbeater talks about it in terms of transformation and new rules: "Innovations which are transformative and generative; which change the rules of the game, create new relationships and create, with that, new flows and resources through society."

John Kania, who developed the systems change practices at New Profit, talks about it in terms of shifting the system conditions when he says: "We're thinking about systems change not as an issue or a person that needs to be fixed… it's the set of conditions that surround that individual. We need to work on shifting the conditions that hold the problem in place."

Personally, I would define systems change as: "a way of thinking about, understanding the dynamics of, and intervening to change, the structure or functioning of, a complex system." Perhaps not as pretty as the others, but this definition encompasses the three key aspects that we will cover in this book that are essential to a systems approach to change; systems thinking, systems dynamics, and systems intervention. Taking a systems approach should ultimately encompass each of these, and the reality is that there is no one-size-fits-all approach to systems change, so it may look vastly different for different issues. There are however a few key features of systems change:

Disruptive

Systems change is a term that is used to describe a shift in the way that a system functions. This can be a change to the structure of the system, the way that it operates, or the way that it interacts with its environment. Systems change can be large-scale, such as a change to the political system of a country, or it can be small-scale, such as a change to the way that a company manages its supply chain.

Whatever the size or scope of the change, it will usually involve some degree of disruption to the way that things are currently done. However, systems change can also bring about new opportunities and ways of doing things that were not possible before, and this process of making something new or different, and it is an essential part of creating a better future.

As anyone who has ever experienced a major change knows, disrupting the status quo can be difficult and messy. But, as we all also know, sometimes change is necessary. Systems change is no different. In order to create lasting, positive change within a system, it is often necessary to disrupt the way things have been done in the past. This can be difficult and uncomfortable, but it is often the only way to bring about true transformation.

Of course, not all change is bad. Sometimes, a little disruption can be just what a system needs to jolt it out of complacency and into action. So, the next time you're feeling frustrated by a seemingly intractable problem, remember that systems change is inherently disruptive in nature - and that's not necessarily a bad thing.

Complexity

Complexity is a term that can be used to describe both the simplicity and the chaos of the world around us. In its simplest form, complexity is the study of how parts of a system interact with each other to create patterns of behaviour. This can be applied to anything from the atoms in a molecule to the neurons in a brain. However, complexity also arises from the fact that our world is constantly changing. Every decision we make affects the future in ways that we may not be able to predict. As a result, social challenges are often

considered complex because they involve many different factors that must be taken into account.

Complexity also refers to the number of interconnected parts in a system. The more parts there are, and the more interdependent they are, the more complex the system is. Many social challenges, such as poverty, homelessness, and crime, are considered complex because they involve many different factors that all interact with each other.

For example, poverty is not just about a lack of money – it is also about a lack of access to education, healthcare, and other opportunities. When you add all of these different factors together, it becomes clear why these challenges are so difficult to solve. However, understanding complexity can also help us to develop more effective solutions. By breaking down a problem into its component parts, we can better understand how it works and identify potential areas for intervention.

It's useful to contrast complex with complicated, because the two terms are used to describe two very different types of systems. The word 'complicated' can describe something that is difficult or convoluted, but complex systems are more difficult to understand and manage than complicated systems.

A complicated system is any system that has a lot of parts that interact with each other in a non-trivial way. The word 'complicated' comes from the Latin word *complicatus*, which means 'folded together.' And that's a good way to think about it: a complicated system is like a bunch of different parts all folded up together. Something like a car, which is full of lots of different individual parts that all work together to move it from A to B. It can be hard to understand how everything fits together, but they nevertheless do all fit together in a specific way. That's also what makes complicated systems different to complex systems– a complicated system could, at least hypothetically, be broken down into its component parts, then reassembled together and it would still work.

In a complicated system, there is typically a clear way of knowing exactly what goes into the system for it to work. When you're trying to figure out how a system works, it can be helpful to think about whether it's more complex or more complicated. If it's complicated, you can focus on one part at a time and piece together

how the whole system works. If it's complex, even if you could consider all of the different parts within the system, it's incredibly challenging to work out how all of the different ways that the parts interact with each other.

We can see the rise of systems change as a response to the growing complexity of the challenges faced by societies around the world. As a function of this complexity, we are moving from a world where one single actor could drive changes to a world where that is no longer possible because of the scale, interconnectivity, and complexity of the issues today.

Complex challenges require comprehensive solutions. A traditional, linear approach to problem-solving typically fails to address the inherent complexity of chronic community level challenges. Placed-based initiatives and community revitalization efforts are often designed for incremental improvements to discrete problems. However, this approach fails to take into account the interconnected nature of social, economic, and environmental issues.

A more holistic, systems-thinking approach is needed to address chronic community level challenges, that considers the relationships between different sectors and stakeholders and seeks to create synergies across programs. It is only through a comprehensive, systems-thinking approach that we can hope to effectively address chronic community level challenges.

For those who are really committed to dealing with wicked problems, we need to understand that systems are complex. They are made up of many different parts, all of which interact with each other. This means that when one part of a system changes, it can have an impact on other parts of the system. This can make it difficult to predict how a system will respond to change. We also need to accept that we can never fully understand or control a complex system. We can only influence it. We need to be open to learning from mistakes and continually adapt our approaches. If we can embrace these principles, then we stand a chance of creating lasting change in the world around us.

A Holistic Approach

A key to tackling wicked problems is to embrace this complexity rather than trying to reduce it. Problems seldom exist in isolation. To get a handle on complex issues, we must step back and look at the bigger picture with a systems thinking approach. This means examining problems within the context of the larger system they're a part of, and taking into account all of the different factors involved.

It can be difficult to do this, since we're often trained to focus narrowly on one thing at a time. But by expanding our perspective and looking at the world holistically, we can develop creative solutions that address underlying causes instead of just treating symptoms.

Systems change is more than a one-time event or a linear process. It's multidimensional, meaning it involves multiple people and organizations working together to create lasting, positive change. It's human nature to look for simple solutions to complex problems. We want a silver bullet that will fix everything. However, the reality is that often the way we approach a problem makes it worse in the long run. We need to be open and flexible, not stubborn or narrow-minded about what can solve our issues.

A complex world means there is no ‘silver bullet.’ By being inflexible, we limit our ability to find new and innovative solutions. We need to be willing to experiment and try new things if we want to make progress. Otherwise, we'll just end up going in circles. Approach each problem with an open mind and be willing to think outside the box. That's the only way we'll make progress in solving the challenges we face. Trying to fix a problem the same way over and over, even though it's not working, is like being a dog chasing its tail. We just keep going around in circles, getting nowhere. And the more complex the problem is, the less likely a single approach will work.

Take climate change, for example. We can't just plant more trees, or switch to electric cars, reduce meat consumption, or recycle more plastic and assume that will solve everything. We need to look at the issue from all angles and be open to new ideas if we want to make progress. That's not to say that trees and electric cars and reducing meat and recycling aren't important. They are! But we need

to remember that there is no silver bullet when it comes to complex problems. The only way to make headway is to keep our minds open and keep trying new things until we find a series of solutions that work. This takes time, commitment, and collaboration.

The dominant, mechanistic paradigm we live with today views change as something that can be “managed” through centralized, top-down design processes that produce clear, predictable outcomes. This type of linear cause-and-effect thinking has influenced the design and development of our Industrial Age institutional arrangements that contribute to many of the global wicked problems we face today.

This way of thinking has led to the development of bureaucratic organizations that are inflexible and resistant to change. It has also contributed to the overuse of natural resources and the pollution of our environment. The good news is that this paradigm is gradually shifting. We are beginning to see the emergence of a more decentralised, bottom-up approach to change that emphasises local action and flexibility. This new paradigm offers hope for a more sustainable future.

Systems change is a big, messy endeavour. You're never quite sure what's going to happen when you start messing with systems - they're complex and interconnected, and small changes can have unintended consequences. That's why it's important to be patient when pursuing systems change; you may not see the results you want right away, but with time and effort, you can make a real difference. So don't be discouraged if your first attempts don't produce the results you were hoping for - keep at it, and eventually you'll see your efforts pay off.

Collaborative Action

We live in a complex world, and it's getting more complex all the time. The challenges we face—from climate change to economic instability to terrorism— are too big for any one person or organization to solve. We need to find new ways of working together if we're going to make a real difference, by building ecosystems of actors. These are groups of people who share a common understanding of the system they're operating in and are capable of collective action. To build these ecosystems, we need to

develop shared system diagrams and a shared language. This is about building the collective intelligence of the group so that we can collectively identify and address problems. When we work together like this, we can be much more effective than any one person or organization working alone.

The idea behind collaboration and collective action is that by working together, people can achieve goals much faster than if they were trying to do everything on their own. This means building an ecosystem where all actors have a shared understanding of the system and are capable enough with language in order for them to be able take steps towards making changes happen within society as well at large levels too! In other words, when people come together and share their skills, experiences and resources, they can create something much bigger and more impactful than anything they could have accomplished on their own. Collective action allows us to pool our resources and our knowledge in order to achieve common goals. It is a powerful tool for social change, and it has the potential to transform the world.

Systems thinking is a deep and theoretical way of understanding the world. Systems change is certainly not a theoretical exercise, it aims at actually changing the complex systems that make our economies and societies work (or not work as the case may be.)

For example, if you're trying to make a change in your family or your workplace, you need to understand how the system works before you can make a meaningful change. Otherwise, you might end up just making things worse. The same is true for larger systems, like the economy or the environment. If we want to make positive changes in the world, we need to start with a good understanding of how systems work.

Imagine a big, black box. Inside this box are all the factors that contribute to how our society functions - everything from our economy and politics to our culture and social interactions. Now, imagine trying to understand how this box works without being able to open it up and take a look inside. You might be able to see the inputs going into the box, and the outputs it’s creating, but you have no idea what’s actually happening inside.

Avoiding a systems approach is what it's like to study complex issues without ‘opening the black box’. Sociologists use

this analogy to explain that, in order to truly understand society, we need to be able to examine all of its complex parts.

By “opening the black box,’ we can begin to see how all the different pieces fit together and impact one another. In other words, we can start to see the bigger picture. Systems thinking helps us to open the black box and understand what’s really causing the problems we see in the world, better understand the complexities of our world to avoid unintended consequences, and use innovation to create new solutions to the challenges we face.

So don’t be afraid, let's embrace the black box analogy and be willing to open them to build a better future for all of us!

2
THE SYSTEMS PARADIGM

The first step to being able to take a systems approach in our change-making is to first understand some foundational concepts from general systems theory, and what we call the systems thinking paradigm. Systems thinking is largely based on the body of work known as systems theory, in which it's argued that the only way to fully understand something is to understand its parts in relation to the whole.

Systems thinking, in a nutshell, concerns an understanding of a system by examining the linkages and interactions between the elements that compose the entire system by taking the overall system, as well as its parts into account. In this way, systems theorists believe that it's possible to get a more accurate understanding of how a system behaves and why it behaves in the ways that it does. The additional benefit of this approach, particularly useful for us changemakers, is that systems thinking sets the foundations for us to begin understanding how a system behaves and can be used to help predict how it may behave in the future, based on our understanding of how it has behaved in the past. Ultimately, the systems thinking paradigm provides a powerful tool for understanding complex phenomena.

A paradigm is a sort of model or example used for comparison, or to conceptualise and explain a set of observations. The word paradigm comes from the Greek *paradeigma*, which

means pattern or example. In the scientific community, paradigms are very important. They help scientists to understand the world around them and make predictions about what they will observe in future experiments. Paradigms can also be useful in everyday life. For example, when you are trying to decide what to wear to a party, you might use a paradigm such as ‘formal’ or ‘casual.’ This will help you to narrow down your choices and find the perfect outfit for the occasion.

Most of us don't think about the paradigms that shape our lives - we just live them. But if you step back and look at the world around you, you'll start to see the paradigms at work. For example, consider the way we think about time. In Western cultures, time is linear - it moves in a straight line from past to present to future. But in some cultures, time is cyclical - it repeats itself over and over again. This difference in how we see time leads to different ways of living - Westerners tend to focus on planning for the future, while those in cyclical cultures may place more emphasis on living in the present moment.

Of course, paradigms don't just shape our view of the world - they also influence the way we interact with it. Consider our education system. The way we learn is based on a linear paradigm - we advance from one grade to the next, building on what we've learned before. But what if we started to see education as a more cyclical process? Perhaps students would move through subjects multiple times, reinforced by different teachers and different methods each time around. This could lead to a more holistic view of learning, where students are constantly growing and expanding their understanding of the world around them.

There's not necessarily a right or wrong paradigm - it's simply a matter of what works best for the specific context. The important thing is to be aware of the paradigms that shape our lives.

As I’ve moved through my PhD and engaged with researchers working across different fields, I’ve become aware of two key and fundamentally different paradigms within research. In the past, scientists primarily used what we call the analytical method of reasoning when conducting experiments and researching topics. This paradigm involves breaking things down into their component parts in order to better understand them. However, in recent years, there has been a shift towards the use of synthesis. This method

focuses on putting things together in order to create new, innovative solutions. While both paradigms have their merits, synthesis is often more effective for complex problems that cannot be easily solved through analysis. As we continue to face ever-more complex challenges, it is likely that synthesis will become increasingly important within research.

Understanding the difference between analysis and synthesis, and when each should be used, is an important tool for a systems thinker. When we analyse something, we are breaking it down into smaller pieces in order to better understand it. This is called reductionism, and it's a process that can be applied to any system. For example, let's say we want to understand how a car works. We could start by looking at the engine, then the transmission, the wheels, etc. Or, we could look at the car as a whole and see how all of the parts work together. The latter approach is what we call synthesis.

Analysis is based on the idea that our basic unit of interest should be the individual parts of a system. The whole is then studied in relation to its component parts. This type of analysis works well when there is a low level of interconnectivity and interdependencies within the system, and particularly for complicated systems. A system with a high degree of interconnectivity and interdependence is complex and dynamic, making it more difficult to analyse using this method. In these cases, other approaches, such as synthesis, may be more appropriate.

Many of the systems we are interested in as changemakers are complex ones with a high level of interconnectivity and interdependency. Examples being ecosystems, computer networks, and many types of social systems. In an ecosystem, for example, there is a complex web of relationships between the many different organisms that make up the system. These relationships can be cooperative or competitive, and they can have a big impact on the health of the ecosystem as a whole. Social systems also rely on a high degree of connectivity and interdependence in order to function properly.

For example, families, communities, and businesses are all social systems that are made up of individuals who must cooperate in order to achieve collective goals. When people work together towards common objectives, it helps to create a strong sense of

community and belonging. However, when there is little or no connection between people, it can lead to isolation and division. Therefore, it is clear that connectivity and interdependence are important factors to consider when studying any type of system.

Synthesis, by contrast, says that we should look at the interactions between components in order to understand how a system works. As we know, complex systems are composed of many different elements that work together to achieve a common goal. However, these elements are not static; they are constantly interacting with each other. As a result, the relations between the elements are more important than the individual properties of each element. This is why we need to change our basic paradigm from one that focuses on the components of a system to one that focuses on the relations between the elements. Synthesis will allow us to better understand and manage complex systems.

The systems-thinking paradigm evolved from general systems theory throughout the mid twentieth century, as a response to the mechanism and reductionism in analysis, or what we might call conventional thinking, on the basis that this might not be the most effective way of understanding and responding to complex phenomena. As an early proponent and thought leader on systems theory, von Bertalanffy asserted that, "…it is necessary to study not only isolated parts in the process; but the essential problems are the organising relations that result from dynamic interaction and make the behaviour of parts different when studied in isolation or within the whole."

Early systems theorists observed that systems in the natural sciences like biology, can either be a closed system, which does not interact with its surrounding environment, or it can be an open system, which receives inputs from its surrounding environment, transforms them, and returns them to the surrounding environment as outputs. In his renowned work, *General System Theory* (1968), von Bertalanffy purported that this same concept could be applied to other types of systems, including social systems. Since then, systems thinking has continued to evolve in three distinct 'waves,' each of which build upon, respond to, or are adapted from the previous.

The first wave of systems thinking was 'hard systems thinking,' that relied on quantitative data, and assumed that systems

that exist in the world could be modelled to represent their reality to make predictions about the system.

In the 1960s to 1980s, the second wave, or 'soft systems thinking' emerged, where systems were viewed as a way of thinking about complex issues, not as a model for representing real entities. The third wave of systems thinking, or 'critical systems thinking' emerged during the 1980s to 1990s. Born out of the larger body of research in hard and soft systems thinking, this third wave sought to promote participatory problem solving, consider injustice and marginalisation, and broaden the toolkit of systems thinking practitioners to meet the needs of contemporary social challenges.

Critical systems thinking is popular when dealing with development and social change, as the method can provide a holistic view using transdisciplinary methods to describe and analyse the complexities of a system with an understanding of how individual components and surrounding processes affect the larger systems, while dealing with diverse groups of stakeholders and cultures. Critical systems thinking and the tools associated with it, were largely shaped by critical theory, the branch of philosophy that critiques the social, historical, and ideological forces that both produce and constrain power structures. Early critical theorists like Hegel who argued that the progress of humanity was achieved through self-determination, and Marx who critiqued societal progress driven by exploitation from those in positions of power within capitalist socio-economic systems, were influential in shaping critical systems thinking.

As a way of understanding the world, critical systems thinking, which is most likely the branch of systems thinking we would use as changemakers, embraces three fundamental commitments. First is a commitment to critical awareness, which involves examining and re-examining any taken-for-granted assumptions, along with the conditions which give rise to them. The second commitment is emancipation, which demands we focus on improvements in our field by taking into account issues of power. Thirdly, is a commitment to methodological pluralism, by using a variety of research methods in a theoretically coherent manner, becoming aware of their strengths and weaknesses, to address a corresponding variety of issues.

Systems thinking is not just for academics or researchers; it is a tool that anyone can use to improve their understanding of the world. Systems thinking is a way of looking at the world that emphasises our subjectivity and the limited nature of our understanding. It emphasises the need to constantly question how we see the world, and to be aware of the potential for biases in our interpretations. This way of thinking can be applied to any situation, from personal relationships to world events. It can help us to better understand the complexities of the world around us, and to make more informed decisions.

When we say that something is subjective, what we mean is that it is a matter of opinion, not fact. In other words, it's up to the individual to decide what they believe. This is the case with systems thinking. How we see the world around us depends on the conceptual systems that we use to make sense of it. These systems are made up of the beliefs, values, and assumptions that we hold about how the world works. Systems thinking recognises that there is no one right way to see the world. Instead, it acknowledges that different people will see things differently, and that this is okay. The key is to be aware of our own subjectivity, and to understand that others may see things differently than we do. By recognising the subjectivity of our systems thinking, we can open ourselves up to new ways of seeing the world and solving problems.

Sometimes, as humans we want to believe that we are being as objective as possible when thinking about complex issues. The enlightenment period gave us the conception of the ‘rational individual,’ that humans are endowed with the capacity for abstract thought, and that modern humans are rational and calculating that we use our intellectual capabilities to act in a purposeful way. However, over the past 30 years or so, this idea of the rational individual has come under scrutiny within economics and the social sciences. Social scientists have pointed to a number of biases and heuristics that people employ when making decisions which lead them to behave in apparently irrational ways. These include biases such as confirmation bias, where people give more weight to evidence that supports their existing beliefs, and anchoring, where people's judgements are unduly influenced by irrelevant information. Despite these challenges to the idea of the rational individual, it remains a useful concept as it captures an important

aspect of human behaviour. We do tend to use our intellect to make purposeful decisions, even if those decisions are sometimes based on flawed premises. Understanding this helps us to better understand ourselves, and can help us to think better, through methods like abstract reasoning.

Abstract reasoning is a fundamental human ability, but it's not something that people do regularly because it's often demanding and not particularly enjoyable. Instead, we rely on automatic processes that make assumptions based on our prior experiences. This allows us to avoid having to reason through every situation, which would be incredibly time-consuming.

As humans, we might like to think of ourselves as the masters of our own thoughts - that we are the active agents who choose what we believe, and how we reason. However, the reality is that we are often guided by a set of assumptions that we may not even be aware of. These assumptions can range from simple beliefs about how the world works, to complex systems of thought that shape our entire worldview. To be an effective systems thinker, it is essential to be aware of our assumptions and understand the paradigms that we are using. Only then can we adjust our thinking when necessary and truly understand the world around us and begin to model complex systems.

In systems thinking, modelling is essential in order to understand complex systems. However, it is not enough to simply create a model - the model must be accurate and representative of the system it is meant to represent. One way to ensure accuracy is to use multiple models, each representing a different aspect of the system. This approach, known as multimodal modelling, helps to avoid oversimplification and ensures that the model is comprehensive.

Additionally, pluralism - the idea that there is not one correct answer but many possible interpretations - must also be taken into account. By recognising that there are different ways of understanding a system, we can create models that are more accurate and representative of reality. Ultimately, by using multimodal and pluralistic approaches, we can create more accurate models that are better able to capture the complexity of real-world systems.

When discussing systems thinking, it is important to remember that modelling must be both qualitative and quantitative.

This is because data triangulation (or the gathering of data from multiple sources) is essential in order to get an accurate picture of what is happening in a system. By using both qualitative and quantitative data, we can build a more complete model that captures the nuances of the system. Additionally, by using data triangulation, we can reduce the risk of error by cross-checking our data from different sources. Ultimately, using both qualitative and quantitative modelling methods helps us to build a more accurate and comprehensive picture of a system, which is essential for making sound decisions about how to improve the system.

We know that while there is an objective reality out there, our individual perspectives shape our understanding of that reality. When we model reality, it is important to keep this in mind. If we are too focused on one perspective or the other, our models will be inaccurate. For example, if we only consider 'objective data' when building a model of how a system works, we may miss important subjective factors that are influencing the system. On the other hand, if we only consider subjective data, our model may be based on faulty assumptions. The key is to find a balance between objectivity and subjectivity when modelling reality. By doing so, we can build more accurate models that better reflect the complex reality of the systems we are studying.

TASK: Think of a wicked problem that you're interested in. How aware are you about what you think of it? What assumptions do you hold about the system? What are the values and beliefs underlying these assumptions? How much of your understanding is objective, and how much is subjective (consider not only your own subjective opinions, but those of people who might be stakeholders in the system?)

3
MODELING SYSTEMS

We use models all the time without really thinking about it. For example, when we tell a story, we are using a model to communicate our understanding of events that happened in the past. When we give someone directions, we are using a model of the geographic area to help them understand how to get from one place to another. And when we make a plan for the future, we are using a model to predict what might happen and to develop a course of action. In each of these cases, the model is an abstraction - a simplified representation of reality that enables us to understand and communicate complex ideas.

The ability to create and use models is one of the most important things that sets humans apart from other animals. It is this capacity for abstract modelling that forms the foundation of our advanced civilisation and has extended the human ability to much better understand the world, communicate that understanding between each other and to collaborate around these shared models.

To understand why all models are simplified, it helps to think about how our brains work. Our brain is constantly taking in information from the world around us and trying to make sense of it. However, there is simply too much information for our brain to process all of it consciously. Instead, our brain uses a process of simplification to reduce the amount of information that we need to focus on at any given time. This allows us to grasp the overall

picture without getting bogged down in the details. When we create models, we are essentially using the same process. We simplify complex systems so that we can better understand them as a whole. In many cases, this simplified understanding can be just as useful as a more detailed one. In the world of finance, for example, models are used to predict stock prices, interest rates, and currency exchange rates, without overwhelming people with unnecessary information needed to understand the gist of what is happening.

The goal of modelling is not to perfectly replicate reality, but to provide a useful tool for understanding and making decisions about the system being modelled. Imagine you are trying to explain the concept of wealth to a child. You could show them a picture of a person counting a stack of bills, or you could give them a more abstract representation, such as a pie chart showing the distribution of wealth in the country. In either case, you are using encapsulation to convey only the most essential information about wealth. Encapsulation is a key part of modelling because it allows us to focus on only the most essential information about a system. By encapsulating the details of a system into a simplified model, we can more easily understand how that system works and make predictions about how it will behave in the future.

There's always room for improvement, especially when it comes to models. The effectiveness of a model can be judged along a number of different parameters. For example, how solid are its foundations? That is to say, the assumptions it's based upon. Are they truly self-evident assumptions or are they contingent upon certain conditions that may not always hold? Additionally, how well does the model allow us to grasp the whole system and identify its core attributes? These are important questions to consider when evaluating the utility of a model. After all, a model is only as good as its ability to help us understand the phenomenon it represents. If it falls short in this regard, then it's not doing its job properly. Fortunately, there are always ways to improve existing models so that they can better meet our needs.

Any good model should be able to do two things: explain past observations and predict future observations. That's why, when our standard economic and financial models seem to fall short in times of crisis, it's cause for concern. After all, if these models can't help us make sense of what's happening in the present, how can we

hope to use them to plan for the future? However, it's important to remember that even during ‘normal’ economic conditions, these models aren't perfect either. They're still just models, which means they're simplifications of reality that are designed to help us understand complex systems. In other words, they're never going to be 100% accurate. But that doesn't mean they're not useful. As long as we keep their limitations in mind, we can still use them to make better decisions and navigate through uncertain times.

When building a model of something, there's always a trade-off between how simple and accurate you want it to be. You could build a very simple model that captures the basics of what you're looking at, or a very complicated model that captures all the details. The problem is, if you make your model too simple, you might leave out some important data that could change your results. But if you make it too complicated, your model might be difficult to understand and use. So, an effective model is usually a balance between simplicity and accuracy. It should be simple enough to be understandable, but accurate enough to give good results. When choosing how simple or complex to make your model, it's important to consider the purpose of the model and who will be using it. If the model is for your own personal use, you can afford to make it more complicated than if you're trying to explain your results to someone else. Ultimately, the goal is to find a balance between simplicity and accuracy that works for you and achieves your objectives.

So, how can we effectively model systems? This chapter will outline some of the key components and tools we can use for modelling a system.

Drawing the Boundary

In systems thinking, a system boundary is the line that defines what is included in the system and what is outside of it. The system boundary can be physical, such as a fence or wall, or it can be conceptual, such as the boundaries of a company or organisation. The system boundary can also be dynamic, meaning that it can change over time as the system itself changes. The concept of a system boundary is important in systems thinking because it helps us to understand how a system works and how it is affected by things that are outside of it. By understanding the system boundary, we can

design better systems and make more informed decisions about how to manage them.

When we think of systems, we often think of closed systems, like those in nature, which operate independently and are not impacted by outside forces. However, there are also open systems, which interact with their external environment. In an open system, inputs are the ways in which the environment affects the system, and outputs are the specific changes resulting from these inputs. For example, a human body is an open system. The food we eat (an input) affects our energy levels (an output), which then has an impact on how active we are or how we feel mentally (more outputs). Our activity level or mood can then have an effect on other people (our environment), completing the loop. It's important to remember that all systems are connected, and what happens in one system can have an effect on another.

Where we draw a boundary is not arbitrary, because the boundary can affect the scale of the system, which influences exactly what and how we understand the system. This is why in the context of soft systems thinking, or critical systems thinking, we consider systems to be open— regardless of where we draw the boundary or the scale of the system— because it will inevitably interact in some way with the broader environment.

Subsystems and Components

Once we have our system boundary defined, we can then define its subsystems, and draw conceptual boundaries around them. In systems thinking, a subsystem is a part of a larger system that interacts with other parts of the system. The concept of a subsystem is often used in the fields of engineering and biology. In engineering, for example, a car can be thought of as a system with subsystems such as the engine, transmission, brakes, and suspension. Each of these subsystems has a specific function and interacts with the other subsystems to keep the car running smoothly. In biology, an ecosystem can be thought of as a system with subsystems such as the abiotic environment, plants, and animals. Each subsystem plays a role in maintaining the balance of the ecosystem. Systems thinking allows us to see how the various parts of a system interact with each

other and how changes in one part of the system can impact other parts of the system.

By grouping elements into subsystems, we can make sure that each subsystem is designed to be strong enough to support the entire system. For example, consider a car. The engine is a subsystem, and it needs to be able to generate enough power to move the car. The transmission is another subsystem, and it needs to be able to transfer that power to the wheels. The suspension is yet another subsystem, and it needs to be able to keep the wheels in contact with the ground. If any one of these subsystems fails, the car will not be able to function properly.

Each subsystem can then be broken down into its basic components or elements that work together to perform a function or functions. For example, cars have subsystems for the engine, transmission, suspension, and brakes. Each subsystem has different parts that work together to make the whole car work. The engine subsystem has the engine, spark plugs, fuel injectors, and exhaust manifold. The transmission subsystem has the clutch, gearbox, and driveshaft. The suspension system has the shocks, struts, and springs. Finally, the braking subsystem has brake pads, callipers, discs, and shoes. Together, these subsystems make the system of a car work. Similarly, our bodies have subsystems for respiration, circulation, digestion, excretion, and reproduction, each with their own individual component parts that have relations and connections to one another.

Relations and Connections

In systems thinking, relationships and connections are key concepts. A system is made up of interconnected parts, and the relationships between those parts are what determine how the system behaves. When we say that a system is “connected,” we mean that there is a flow of information or energy between its parts. This flow can be physical, like water flowing through a pipe, or it can be abstract, like the flow of data between computer systems. Connections can be direct, like the connection between two pieces of metal, or they can be indirect, like the connection between two people who share a common interest. Whatever form they take,

connections are what give a system its shape and make it possible for it to function as a whole.

An important part of these relations and connections is causality. In systems thinking, causality is the relationship between cause and effect. A cause is something that leads to an effect, while an effect is the result of a cause. The concept of causality is often used to explain how different parts of a system interact with each other. The study of causality can help us to understand how systems work and how they can be changed. We will go into relations and causality in later chapters, but because complex systems are defined by the complexity of their relations and connections, these are an important aspect of any model of a system.

System Map

Once we've drawn a boundary, identified the subsystems and their components, and begun to understand the connections between these parts, we can draw a system map. A system map is a formal model of an abstraction of a system. In other words, it's a way to visualise how a system works. System maps can be used for any type of system, from simple mechanical systems to complex socio-technical systems. When creating a system map, it's important to start with the big picture and then break down the system into smaller and smaller pieces. Once you have a good understanding of the individual pieces, you can begin to see how they fit together to form the bigger picture. Creating a system map is an iterative process, so don't be afraid to go back and make changes as you learn more about the system. Ultimately, the goal is to create a model that accurately reflects reality and helps you improve the system.

The process of system mapping involves understanding the components of the system, the relationships between the components, and the behaviour of the system as a whole. The product of system mapping is a map of the system. This map can be used to understand the system and allows us to really tap in and start applying systems thinking. We will explore some common types of systems maps in later chapters.

TASK: Draw a simple map of a system that you would like to understand better. Here are some things to consider:

- Where will you draw the boundary (is it a geographic boundary, a demographic boundary)?
- What are the subsystems within the larger system?
- What are the components or elements that make up each subsystem?
- How are these components connected?

4
THINKING IN SYSTEMS

In order to apply a systems approach, we need to train ourselves to think about complex phenomena a bit differently to how we might think about them with conventional thinking. General systems theory, on which systems thinking is based, provides us with a number of principles or 'tools' for thinking about a model of a system. In this chapter, we will cover the main principles of systems thinking, and how they contrast to the conventional thinking approaches we might be more familiar with.

Reductionism and Holism

In the world of science, there are two dominant paradigms or world views that provide fundamentally different accounts as to how to best view, interpret and reason about the world around us. These paradigms are called holism and reductionism. Both holism and reductionism have their strengths and weaknesses, and it is important to understand the difference between them in order to best make use of both approaches. Reductionism emphasises the constituent parts of a system and is often used as an analytical approach to understanding phenomena. Holism, by contrast, emphasises the whole system, and is often used in synthesis.

The aim of reductionism is to find the simplest explanation for how a system works. Often, this means focusing on the lower-level components that make up the system, rather than higher level

features. Reductionism can be applied to many different areas, including biology, physics, and psychology. For example, in biology, reductionism can be used to understand how a complex organism function. By studying the individual cells and organs that make up the organism, scientists can gain insights into how the entire system works. In physics, reductionism is often used to explain the behaviour of particles and waves. By understanding the behaviour of individual particles, physicists can develop an understanding of how larger systems like galaxies or solar systems behave. Similarly, in psychology, reductionism can be used to understand human behaviour. By studying individual brain cells or chemicals, psychologists can gain insights into how the mind works and how human behaviour is generated. Reductionism is a powerful tool that can help us to understand complex systems. However, it is important to remember that reductionism also has limitations. For example, focusing on lower-level components may give us a simplified view of a system that fails to capture its true complexity. Additionally, reductionism may lead us to overlook important higher-level phenomena that emerge from the interaction of different parts at different levels. Despite these limitations, reductionism remains an important tool for understanding complex systems.

Holistic approaches mean that the whole has priority over its parts. This means that instead of looking at an entity as a collection of separate parts, we look at it as part of a larger system. And instead of trying to explain the properties of an entity by looking at its parts, we try to understand how it functions within the broader system. This can be a very powerful way of understanding complex phenomena, and it can also help us to see connections that we might otherwise miss.

This can be applied to anything, from individuals to organisations to societies. If you want to gain a fuller understanding of someone or something, take a step back and look at the big picture. It's only by considering the system as a whole that you can begin to piece together a comprehensive understanding.

This means taking into account all of the elements that make up the system, including their interactions and relationships. By doing so, it is possible to get a more holistic understanding of how the system works. In some cases, this can lead to unexpected insights that

would not be apparent from a reductionist approach. For example, consider the behaviour of a school of fish. If we only looked at the individual fish, it would be difficult to understand why they swim in groups. However, by taking into account the interactions between the fish, we can see that schools provide safety in numbers and make it easier to find food. As a result, fish are able to take advantage of opportunities that they would not be able to find on their own.

When contrasted, reductionism and holism lead to a number of fundamentally different perspectives on basic questions about causality, objectivity, structure and dynamics. While holism puts forward a top-down view of causality and a dynamic process-oriented view of the world that is subjective in nature, reductionism provides a more static, bottom-up and objective perspective. Neither approach is right or wrong; they just represent different ways of thinking about phenomena and might require different approaches. It is by considering both we can gain a deeper understanding of the world around us.

Analysis is the approach we would typically use for reductionism. For example, when you see a painting, you might analyse it by looking at the brushstrokes and colours used. Or, you might take it apart even further by looking at the historical context in which it was created. Analysis may be contrasted with the opposite process of reasoning called synthesis, which comes from the Greek word meaning putting together. Synthesis is a process of reasoning whereby we put disparate parts together to gain an understanding of the whole system. In contrast, when you synthesise the painting, you might step back and look at it as a whole, considering how the various elements work together to create a meaning or message. You might also consider how the painting makes you feel, what it might represent on a personal level, or even it’s political implications. The process of synthesis is essential for critical thinking and problem-solving, as it allows us to see beyond the individual parts and understand how they work together to create a greater whole. When we want to understand something, we tend to break it down into its component parts. We analyse it. But synthesis is another way of understanding things that requires us to do the opposite; it's a powerful tool for problem-solving and creative thinking.

Synthesis is typically the approach we would use in holism, and it's all about bringing together information and data from multiple sources in order to see the big picture. Synthesis is an important tool for understanding complex systems, because it gives us a very different understanding of how different factors can lead to a particular outcome. For example, if we want to know why a particular species of plant is going extinct, we might look at data on population size, habitat loss, and predation rates. By synthesising this information, we can develop a clearer understanding of the underlying causes of the extinction. In this way, synthesis can help us to build a better understanding of the world around us and the ways in which different factors can interact.

Causality

Causality is the relationship between cause and effect. In other words, it's what happens when one event leads to another. For example, if you drop a glass on the floor, the glass will break. The dropping of the glass is the cause, and the breaking of the glass is the effect. Causality can be a difficult concept to understand, but there are some simple ways to think about it. If you put a pot of water on the stove and apply enough heat, the water will eventually boil. The cause of this effect (boiling water) is that at 100°, there is enough heat energy to move the water molecules to the point where they experience a phase transition, from liquid to gas. Causality is an important part of many everyday situations.

In the study of cause and effect, one of the most important distinctions is between linear and non-linear causation. Linear causation is predicated on being able to isolate a single or small amount of variables causing a given effect. In contrast, non-linear causation acknowledges that there may be a multitude of factors influencing a given outcome. This can make non-linear causation notoriously difficult to study, as it can be difficult to isolate all of the relevant variables. We will go into non-linearity in more detail later.

Causation can be tricky. In most cases, we think of causation flowing from the bottom up. That is, an event is caused by something prior to it. However, there are cases where causation appears to flow in both directions. For instance, consider the stock

market. Stock prices are largely determined by investor confidence. If investors believe that a company is doing well, they will buy its stock, driving up the price. However, a high stock price can also give the impression that a company is doing well, leading to even more investment. In this case, causation appears to flow both from the bottom up and from the top down. This type of non-linear causation is known as emergence. Emergence occurs when the whole is greater than the sum of its parts. That is, the behaviour of a system cannot be predicted from its individual components. Instead, it must be considered as a whole. While linear causality focuses on isolated events, emergence emphasises the interconnectedness of all things. Understanding emergence is essential for understanding complex systems like weather patterns, economies, and ecosystems. Non-linear causality and emergence help us to see the world in a new way, revealing hidden patterns and connections that would otherwise remain invisible.

Relations

When we focus on relations, the main principle is a shift from seeing a fixed world made up of things and their properties to seeing a world that is primarily made of relations and connections between those parts. This shift also entails a move from seeing things as static and unchanging to recognising them as dynamic and ever-changing. In other words, the relational paradigm provides a way of understanding the world that is far richer and more complex than the traditional object-based approach.

Throughout many disciplines, relational theories in general are frameworks for understanding physical or social systems in such a way that the elements of interest are only meaningful in relation to other entities. This focus on relationships has proven to be fruitful in many different areas of inquiry. For example, in history, relational approaches have been used to study networks of trade routes or patterns of migration; in sociology, they have been used to study social networks or patterns of interaction; in anthropology, they have been used to study kinship relations or patterns of exchange; in economics, they have been used to study market relations or patterns of production; and in biology, they have been used to study ecological relations or food webs. All of these examples show how

a focus on relationships can yield new and interesting insights into familiar phenomena. In recent years, there has been a growing interest in applying relational approaches to digital data. For example, researchers have used relational approaches to study networks of websites or patterns of online activity.

When observing any phenomenon, it is important to take into account the various relationships and contexts that surround it. By taking this perspective, we can gain a more complete understanding of the phenomenon in question. For example, let's say you are trying to understand why a particular plant is not blooming. If you only focus on the plant itself, you may never discover the answer. But if you take into account the surrounding environment, you may find that the plant isn't getting enough sunlight or water. In other words, the plant's relationship to its surroundings is key to understanding its behaviour.

In the relational paradigm, relations are what define how entities act and react: in other words, their cause-and-effect patterns. This means that rather than thinking of things as independent parts, we think of them as being connected to one another. Relationships are what give shape and meaning to our world. If we think about the world in terms of relationships, we can start to see new ways of connecting with others and with the environment.

Integration

Once we realise the importance of relations in complex systems, we find that a system is only as strong as its weakest link. This is because a system is only as strong as the connections between its parts. When we think of a system, we often imagine a complex web of interconnected parts. However, what really defines a system is the degree of exchange and interdependence between the parts. At a low level of connectivity, an entity is simply a collection of elements. But as the degree of connectivity is increased, it is the connections between the parts that come to define the whole as an integrated system. Thus, what ultimately defines a system is not its complexity, but rather the extent to which its parts are working together. When thinking about systems, it is important to remember that even the simplest of entities can be considered a system if there is enough exchange and interdependence between its parts.

A system can be defined as a group of interacting or interdependent parts that work together to achieve a common goal. When discussing systems, it is important to consider the degree of integration and connectivity between the parts. At a low level of integration, the parts of the system are relatively independent and define the relations between the parts and the whole. However, when the system is highly integrated, the parts are shaped by the dense network of connections within the system. This inverted relationship is due to the fact that highly integrated systems rely on a high degree of communication and coordination between the parts. As a result, the parts of a highly integrated system are more interdependent and work together to achieve a common goal. The degree of integration and connectivity within a system is important because it defines how unified that system is. A low level of integration results in a system that is less unified, while a high degree of integration results in a system that is more unified.

Take the number of connections within a community. A strong community is an integrated network of connections along which resources flow and which enables the community to experience itself and operate as a whole. It is the strength of the relationships between people, and the value that is generated by those relationships that connects people and allows them to share resources, knowledge, and skills, and to work together to solve problems. A community with high integration is a tight-knit group that looks out for one another and works together for the common good. By contrast, a community with low integration is fragmented and individualistic, with each person looking out for themselves.

High integration in social systems is referred to as ‘social capital,’ and it has been used to explain why some communities are more prosperous and cohesive than others. Communities with high levels of social capital tend to be more stable and efficient, because there is more trust and cooperation among members. In addition, social capital makes it easier for individuals to start businesses and to find jobs, because they have a built-in network of support. They’re also more resilient to changes from unexpected external factors, like natural disasters or economic crises. For these reasons, communities that invest in building social capital are likely to see long-term benefits in terms of economic growth and social stability.

Every new connection made within a system allows some resources to flow more efficiently. Through telecommunications networks or resources within ecosystems, through the exchange between the creatures, the more the connections, the greater the integration and the more efficiently organised it will become. In order for a system to function properly, all of its parts must work together seamlessly. When one part of the system is not working correctly, it can throw off the whole system and reduce its overall functionality. Additionally, if the different parts of the system are not able to interoperate with each other, it can also lead to reduced functionality and even disintegration. In order for a system to emerge, it must be integrated so that processes can take place through its connections, making connectivity essential for both proper functioning and emergence within a system.

While closed systems are considered to be isolated from their external environment, systems we are dealing with in a world that is increasingly connected are open systems that are affected by, and have an effect on, the external environment beyond their boundary. Integration is a key factor in the autonomy of an open system. When systems are integrated, they are able to share resources and information, which allows them to function more efficiently and effectively, adapting and responding to changes in their environment. As a result, integration is essential for the autonomy of a system, and without autonomy, systems would be limited in their ability to function properly.

Differentiation

Integration is the process whereby diverse elements become highly connected or synthesised into a whole. Differentiation by contrast, is the process whereby an integrated system becomes divided up into more specialised well-defined parts. In other words, differentiation is the process of taking something that is whole and making it into more distinct parts, while integration is the process of taking more distinct parts and making them into a whole. Differentiation allows for greater specialisation and efficiency, but at the cost of flexibility and adaptability. Integration, on the other hand, allows for greater flexibility and adaptability, but at the cost

of specialisation and efficiency. Both processes are vital for the evolution of systems, and both involve trade-offs.

The process of evolution in a system involves a dynamic interplay between systems differentiation, where new different elements are created, and systems integration where these elements that are best suited to the whole system are selected by the environment as the system becomes reintegrated. In other words, it's a two-step process: first, new things come into existence; and second, the best of those new things become integrated into the existing system. This process is always going on, at every level of reality, from molecules to ecosystems. It's what drives novelty and creativity in the universe, and it's responsible for the ever-changing landscape of life on Earth.

Through the specialisation that is enabled through differentiation, subsystems are formed, which can focus more intensely on a particular function or activity. This allows them to become more specialised in their activity than if they had to perform a large number of diverse activities. Differentiation occurs in all areas of life, from the formation of cells to the development of entire ecosystems. It is an essential part of the way that living things grow and change over time.

Integration and differentiation are thus two processes that work together to drive change and development. Integration is the process of bringing different things together to form a whole, while differentiation is the process of distinguishing between different parts. These two processes work together in a dialectical fashion, with each driving the other in a cycle of change. Differentiation leads to integration, which in turn leads to further differentiation, and so on. This dialectical process is what drives the evolutionary development of systems, as they gradually become more complex over time. In short, the differentiation of parts is essential for the development of complex systems. Without it, there would be no progress or change, and the world would be a very static place.

Process Thinking

Process thinking is a way of interpreting events in terms of the processes of change that create them. It focuses on the non-linear dynamics of change over time that create certain patterns out of

which events emerge, and process thinking involves considering phenomena dynamically. That is to say concerning their movement activity, events change in temporal evolution. By understanding how these processes work, we can start to see the interconnections between different events and how they might unfold over time. This can be a useful way of understanding complex systems and predicting future trends.

To understand the world, it is essential to think in terms of processes. Processes are events that change over time and are seen as the key drivers of change within systems. In systems thinking, the world is perceived as a series of interconnected systems, and each system is in turn composed of smaller subsystems. By understanding the processes that occur within and between systems, we can gain a much deeper understanding of the world around us.

Our traditional way of thinking sees events as generated by linear cause and effect relations between a system's component parts. But instead, processes are seen to have internal patterns that generate and condition individual events. This is an inversion of our traditional conception that sees objects as having precedence over processes of change. And thus, process thinking can be contrasted with our more static way of thinking that sees events as generated by linear cause and effect relations between a system's component parts. Processes are always happening, and they provide the conditions for individual events to occur. So, when we think about an event, we should also think about the processes that made it possible. By understanding the processes at work, we can move beyond simply describing the event, and better explain the process that led to the event.

TASK: Think of the model of the system you created for a wicked problem you are passionate about solving.

How might reductionism and holism be applied to give different perspectives and understandings of the system?

What are some of the key relations between components or elements of the system? Can you identify and linear or non-linear cause and effect patterns that these relations lead to?

Can you identify any examples of integration or differentiation in the system?

What are some of the key processes that allow the system to function as it currently does?

5
COMPLEXITY

Thinking in systems allows us to recognise the complexity that is a fundamental feature of our world. While conventional thinking isn't well-suited for studying complex systems, researchers have developed new models and approaches, by taking an interdisciplinary approach, researchers have been able to make significant advances in our understanding of complex systems. This work has led to new insights into a wide range of phenomena, from the spread of disease to the behaviour of financial markets. And as we continue to learn more about complexity, we may find even more ways to apply this knowledge to the world around us.

Complexity theory provides a set of tools for modelling and understanding complex systems that has its roots in mathematics, but it has been applied to many different disciplines including physics, biology, management, computer science, and engineering. The key idea is that complex systems are composed of many different parts that are highly interconnected and interdependent. This makes them difficult to understand using traditional methods. Whenever we are dealing with systems that are composed of many parts that are highly interconnected and interdependent, having a good grasp of complexity can be a helpful tool.

A complex system is a system composed of many parts that interact with each other. The global climate, the human body, and

even a beehive are all examples of complex systems. In order to study complex systems, scientists often use computer simulations.

A complex system is a special class of system. A system can be ordered or unordered. An unordered system is simply a set of things because there is no specific structure or order. In contrast, ordered systems have some kind of structure or order. The elements in an ordered system are arranged in some way so that they can interact with each other to achieve some purpose. Complex systems are ordered systems that are made up of many elements that interact with each other in a non-linear way. This means that the behaviour of the whole system cannot be predicted from the behaviour of the individual elements. Many natural systems are complex, such as ecosystems and the climate. Man-made complex systems include financial markets, social networks and transportation systems.

A key feature of complex systems is that they are typically composed of sets of things that are distributed and lack centralised control. The organisation of a complex system often emerges out of the local interactions between its parts. This process of self-organisation can give rise to the formation of new levels of organisation. In addition, complex systems are often characterised by their ability to adapt and change in response to their environment. For example, an ant colony is able to adapt its behaviour in order to find food or avoid predators. Similarly, a human society can adapt its customs and beliefs in response to changes in the external world.

There are many examples of this principle at work in our world. For instance, think about the human body. It is made up of cells, which form tissues, which in turn form organs, which work together to keep us alive and functioning. Each level affects the others – if you don't have enough oxygen, your cells can't function properly, and if your cells don't function properly, your tissues and organs won't either. Similarly, weather patterns on Earth are affected by a complex system of elements on different scales, from the small-scale movement of air molecules to the large-scale effect of the sun's energy. Understanding how these different levels interact is essential for making accurate predictions about weather patterns. This principle can also be seen in social systems like families, schools, and businesses. Families are made up of individuals, who form relationships with each other. These relationships are what give a family its unique character. School systems are made up of

classrooms, which are made up of students, who learn from teachers. Each level affects the others – if there is conflict within a family, it will affect the individual members; if there is conflict within a classroom, it will affect the students' ability to learn. The same is true for businesses – a company is made up of departments, which are made up of employees, who produce products or services. If there is conflict between departments or between employees, it will affect the company's bottom line. Understanding how these different levels interact is essential for creating successful organisations.

This principle can also be applied to understanding the universe as a whole. The universe is made up of galaxies, which are made up of stars, which are made up of planets. Each level affects the others – if a star explodes, it will affect the planets orbiting it; if a planet collides with another planet, it will affect the galaxies they are part of. Understanding how these different levels interact is essential for understanding the universe as a whole. So next time you look at something complex, like a human body or a weather system or a social system, remember that it is composed of many elements on many different scales all affecting each other. And understanding how different levels interact is essential for understanding complexity

One of the things that makes complex systems so fascinating is that they often exhibit a high degree of autonomy and adaptation. This means that, instead of being centrally controlled, each element in the system has a certain degree of freedom to act and adapt according to its own set of instructions. This can be seen in a flock of birds, where each bird is able to make its own decisions about where to fly and how to avoid obstacles, without any central coordination. Similarly, the internet is made up of billions of devices that are all able to communicate with each other without any centralised control. And our global economy is made up of countless individuals and businesses that are constantly interacting with each other in a way that no one person or organisation could ever hope to coordinate. Autonomy and adaptation are essential characteristics of complex systems, and they are what make them so fascinating and dynamic.

The capacity for autonomy and adaptation gives complex systems a great deal of flexibility and makes them much more resilient than simpler systems. This makes them better able to cope

with change and respond effectively to various phenomena. For example, an ecosystem with a high level of biodiversity is more likely to recover from a disturbance than a less diverse ecosystem.

The study of complexity as a phenomenon of our world focuses on a range of different principles. Understanding these key principles can give us a better idea at how we can identify and make sense of complexity in the systems we are dealing with.

Patterns

The study of the processes that emergence from complex systems can be understood as the study of pattern formation. A pattern, as we shall use the term here, is a recognisable, repeating motif. It is an arrangement of things, subject to general rules, which is repeated over and over. The study of patterns, then, is the study of how these arrangements come about. In particular, it is the study of how simple arrangements can give rise to more complex ones. This process of emergence is one of the most fascinating and yet least understood areas of science. In recent years, there have been major breakthroughs in our understanding of how patterns form, and this has led to a rapid growth in the field of emergence studies. However, there is still much to learn about this complex and exciting subject.

There are two key points to note about patterns. The first is that they are highly abstract concepts. This means that they can be difficult to define precisely. However, this does not mean that we cannot discuss them in an informed and meaningful way. The second point to note about patterns is that all systems exhibit some form of a pattern. This is because all systems are made up of elements that interact with each other in some way. These interactions give rise to patterns of behaviour that we can observe and study. By understanding the patterns that exist within a system, we can gain insights into the underlying structure and function of the system as a whole.

Identifying patterns is key in uncover potential correlation, simply refers to the degree to which two variables are related. In other words, a correlation is a measure of how similar or dissimilar two things are. When two variables are perfectly correlated, it means that they always move in the same direction. For example, when the

temperature outside rises, so does the number of ice cream sales. However, perfect correlation is rare; more often, two variables will be only partially correlated. This means that they usually move in the same direction but not always. Two variables can also be negatively correlated. This means that they tend to move in opposite directions. For example, there is a negative correlation between the number of hours of daylight and the number of electric lights sold. This makes sense because when it's light out people don't need to use as many electric lights. Correlations can be helpful in predicting behaviour because they allow us to see patterns in data.

However, it's important to remember that correlation does not necessarily imply causation. Just because two variables are correlated does not mean that one causes the other. For example, there is a strong correlation between ice cream sales and shark attacks. Does this mean that eating ice cream causes shark attacks? Of course not! In reality, both ice cream sales and shark attacks go up in the summer because that's when people are more likely to eat ice cream and go swimming in the ocean where sharks live. So, while correlations can be interesting and helpful, we need to be careful not to jump to conclusions about cause and effect.

To figure out whether two things are correlated, scientists use statistics. They look at how often one thing happens when the other thing happens. If the two things happen together more often than you would expect by chance, then they're probably correlated. If they don't happen together more often than you would expect by chance, then they're probably not correlated.

Randomness is often thought of as the opposite of patterns, but in fact, all patterns have an underlying mathematical structure. In other words, maths is the science of patterns. This means that randomness, while it may appear to be chaotic, actually has a hidden order. For example, consider a deck of cards. A deck of cards is a collection of 52 individual objects (the cards). If we shuffle the deck, the order of the cards will be random. However, if we look at the entire deck as a single object, we can see that there are certain patterns that emerge. There are four suits (clubs, diamonds, hearts, and spades), and each suit has 13 cards (ace through king). These patterns give us a way to understand and predict the behaviour of the deck, even though the order of the cards is random. So, while

randomness may seem like chaos, there is actually a hidden order that can be discovered through mathematics.

Theories in the sciences explain and predict regularities in the world through modelling the correlated changes in properties between things. In the everyday world, it is the aggregation of correlated phenomena into composite patterns that enables us to make sense of our environments, predict outcomes and act effectively within it.

Synergies

The concept of synergy is often used to explain the phenomenon of emergence. Emergence occurs when a new macro-level phenomenon is created, one that cannot be predicted by looking at the properties of its parts. Instead, this new phenomenon emerges as a result of the synergies between the parts. In other words, it is the result of two or more elements working together to create something new. The concept of synergy can help to explain many of the complex phenomena that we see in nature, from the formation of galaxies to the development of human consciousness. Without an understanding of synergy, these phenomena would remain a mystery.

Linear systems are nothing more than the sum of their parts. The relations between the parts do not add or subtract value to the whole system. Thus, emergence is theoretically impossible within a linear system. Emergence occurs in nonlinear, complex systems. This means that the whole is greater than the sum of its parts. When people are introduced to the idea of emergence without understanding synergies, then everything starts to look a bit mysterious… like we're somehow getting something for nothing, but this is certainly not the case. This conclusion is simply a product of how we are looking at the situation. Emergence provides us with a way to understand complex systems.

Emergence occurs when the relationship between the parts of a system creates value that didn't previously exist. This added value can't be predicted by looking at the individual parts of the system; instead, it can only be observed at the macro, or whole, level. One of the best examples of an emergent system is the brain. The human brain is made up of billions of neurons, each of which is a simple cell. However, when these neurons interact, they give rise

to behaviours that are far more complex than anything that could be produced by a single cell. Thus, emergence occurs when simple things come together to create something more complex.

These specific non-linear relationships between the parts are called synergies. In nature, we see synergies all the time. A great example is how a beehive works. Each bee has a specific job to do and they all work together to keep the hive running smoothly. The bees are able to achieve things together that they couldn't do on their own, and that's because of synergies. Synergies occur when different parts work together in a complex way that amplifies their effect on each other. In other words, synergies make things happen that couldn't happen with just the sum of the parts working independently.

In order for synergy to occur, the elements must be interdependent – that is, they must each play a different role in relation to the others in order to create the desired effect. Synergies are always contingent upon context. In other words, the way two things interact can change depending on what else is going on around them.

In business, the term ‘synergy’ is often used to describe the cooperative interaction between two or more entities that results in a greater effect than the sum of their individual effects. This interdependence between the parts within a synergy is a function of the degree to which they're both integrated and differentiated. Differentiation means that the parts are performing different functions or occupying different states with respect to each other. For example, in a manufacturing setting, raw materials and labour might be considered differentiated inputs because they occupy different states (raw vs. processed) and perform different functions (input vs. output). In contrast, if the raw materials and labour were interchangeable and performed the same function, they would be considered undifferentiated. The degree of differentiation is an important factor in determining the potential for synergy because it affects the extent to which the parts can be combined to create new value. Parts that are highly differentiated have more potential for synergy because they can be combined in ways that create new value that is not possible with undifferentiated parts. Thus integration is just as important as differentiation in that it ensures all the different parts are working together.

Synergies can be described as being positive or negative, where a positive synergy describes a nonlinear interaction that adds value to the whole system. A negative synergy is a nonlinear interaction that subtracts value from the whole system. Emergence thus describes the way complex systems patterns arise out of a multitude of synergies. There are two main types of emergence: weak and strong. Weak emergence occurs when the behaviour of the system can be explained by the interactions between its parts. Strong emergence, on the other hand, refers to situations where the global behaviour of the system is completely unpredictable and cannot be explained by its individual parts. When a system undergoes weak emergence, the components within it begin to interact with each other. This can lead to computational complexity, and ultimately, the emergence of something new.

Macro and Micro Dynamics

Understanding emergent behaviour can help you to better understand the world around you and how it works. It can also help you to see beyond the individual parts of a system to the larger picture of how the system as a whole behaves. And it can help you to understand how different levels within a system interact with each other and why coordination between those levels is so important. The micro/macro-dynamic is the dynamic between the micro and macro levels in a system. The micro level is governed by completely different sets of rules than the macro level, but they both need to interoperate. This can be seen in the overall interaction between the two levels. The macro level is governed by laws, while the micro level is governed by physiology. The two levels are also interconnected, with the macro level affecting the micro level and vice versa. For example, changes at the macro level can impact the functioning of cells at the micro level. Understanding the micro macrodynamic is essential to understanding how systems work.

Think of a market system like a game of Monopoly. On the micro level, each player is trying to amass as much wealth as possible. They're competing against each other to buy properties, build houses and hotels, and charge other players high rents. But in order to play the game, the players have to cooperate on the macro level. They have to agree on the rules of the game, how much money

each player starts with, and what happens when someone goes bankrupt. And they have to be willing to enforce those rules even when it's not in their individual best interest to do so. Otherwise, the game would quickly become chaotic and no one would want to play it. The same is true of the market system. The actors may compete on the micro level, creating one dynamic of the market system, but for all to achieve optimal outcomes, they also have to cooperate on the macro level. Typically, through government services and regulation. This creates two different levels with two different sets of rules: those for the market, and those for public institutions. But both the market and public levels have an impact on our everyday lives. And it's important to understand how they work together in order to make informed decisions about our economy.

When dealing with micro and macro dynamics, there is always a hierarchy at play. Each level in the hierarchy operates under different rules and is driven by different objectives or shaped by different factors. There are two different types of hierarchies: those with limits from below and those with limits from above. In a hierarchy with limits from below, the lower levels are constrained by the higher levels. That is, the lower levels can only do what the higher levels allow them to do. For example, in a school hierarchy, the principal may set rules that the teachers must follow. Or in a military hierarchy, the general may give orders that the captain must obey. In a hierarchy with limits from above, on the other hand, the higher levels are constrained by the lower levels. That is, the higher levels can only do what the lower levels allow them to do. For example, in a democracy, the government is constrained by the people it represents. Or in an organisation, the board of directors may be constrained by the shareholders. So when you're thinking about hierarchies, it's important to make this distinction between limits from below and limits from above.

The macro level is the highest level in the hierarchy and is responsible for maintaining balance, stability and functionality within the whole system. This level is also responsible for the system interacting with its environments. The meso level is the next level down and is responsible for maintaining balance, stability and functionality within a team or group. This level is also responsible for the team or group interacting with its environment. The

microlevel is the lowest level in the hierarchy and is responsible for maintaining balance, stability and functionality within individual parts of subsystems.

TASK: Think of the model of the system you created for a wicked problem you are passionate about solving. Are there any patterns, synergistic relationships, or macro/micro dynamics that you wish to research to better understand how the system functions?

6
SYSTEM DYNAMICS

The interplay of micro, meso, and macro dynamics lead a system to behave in certain ways. System dynamics focuses on the relationships between different elements in a system, and how these relationships can change over time. System dynamics can be used to model everything from ecosystems to economic systems. One of the key insights of system dynamics is that even small changes in a system can have major effects over time. For example, a slight increase in the birth rate of a population can lead to exponential growth, while a small decrease in the death rate can result in a significant increase in the size of the population. System dynamics can help us to understand how even small changes in complex systems can have major consequences.

When trying to understand system dynamics, it can be helpful to think in terms of inputs and outputs. Inputs are the things that go into the system, while outputs are the things that come out of it. For example, when trying to understand how a car engine works, we need to consider the inputs (fuel and air) and the output (power). However, this simple model doesn't always accurately capture reality. In particular, it doesn't take into account how systems change over time. Systems dynamics as a tool helps to make sense of these kinds of complex behaviours, by considering how inputs and outputs change over time. Feedback is the process in which information about the current state of a system is used to

modify the inputs to the system. In other words, feedback occurs when the output of a system affects the further input into that same system.

In systems thinking, feedback loops are one of the most important concepts. A feedback loop is created when the output of a system is fed back into the system as an input. This feedback can either be positive or negative. Positive feedback reinforces or amplifies the current state of the system, while negative feedback destabilises it or creates change. Feedback loops play a crucial role in how systems evolve over time and how they respond to perturbations. For example, in a simple predator-prey relationship, the population of prey animals declines as the population of predators increases (negative feedback). As the prey population declines, there is less food available for the predators, which leads to a decline in the predator population (positive feedback). The two populations oscillate over time in response to each other, with no net change in either population. However, if there are changes in either the predator or prey populations (for example, if another predator species moves into the area), then this can disrupt the balance and lead to large changes in both populations.

To properly measure these two factors, it is necessary to track both the quantity and quality of resources going into the system, as well as the results that are produced by the system. This can be done with various methods, such as data collection and analysis, surveys, and interviews. By effectively measuring input and output, systems thinkers can identify areas where a system is performing well and areas where improvements can be made.

In any complex system, there are always a variety of positive and negative feedback loops at work, each of which can have a significant impact on the overall behaviour of the system. By studying these feedback loops over time, we can begin to see a story unfold about how the system behaves. This story can be helpful in identifying potential problems and developing solutions. There are typical stories known as system archetypes that often occur in systems.

Systems archetypes are one of the tools that capture the "common stories" in systems thinking— dynamic phenomena that occur repeatedly in diverse settings. They are powerful tools for diagnosing problems and identifying high-leverage interventions

that will create fundamental change. By understanding the underlying dynamics at play, it is possible to take steps to prevent escalation from occurring in the first place. Systems archetypes are valuable tools for anyone interested in understanding and improving complex systems.

The first study of system archetypes was conducted in the 1960s and 1970s by Jay Forrester, Dennis Meadows, Donella Meadows, and other systems thinkers. Since then, these archetypes have been widely recognized and studied. Let's explore some of the common archetypes you might be familiar with, so you can begin to understand how systems typically behave over time.

Fixes that Fail

In system design, there is often a tension between meeting short-term needs and investing in long-term stability. The 'Fixes that fail' archetype represents a failure to find the proper balance between these two priorities. This archetype is characterised by a series of quick fixes that address immediate problems but do not resolve the underlying issues. As a result, the system is constantly in a state of flux, and each new problem simply creates the need for another fix. Over time, this patchwork approach leads to increased complexity and fragility, eventually leading to a complete breakdown of the system. To avoid this fate, it is essential to take a holistic view of the system and make decisions that will ensure its long-term health. Otherwise, the system will inevitably succumb to the 'fixes that fail' trap.

A quick fix is a solution may seem like a good idea at the time, but it can often lead to unintended consequences. These consequences may not be evident at first, but they can often end up adding to the symptoms of the original problem. For these reasons, it's important to take the time to carefully consider all potential solutions before implementation. Quick fixes may seem like an easy solution in the moment, but they are often more trouble than they're worth in the long run.

A classic example of the fixes that fail archetype is the infamous fix for the Millennium Bridge in London. The bridge, which was designed to be pedestrian-only, began to sway dangerously soon after it opened. In an attempt to correct the

problem, engineers installed dampers that were intended to absorb the movement. However, these actually made the bridge sway even more, and it had to be closed to the public for several months while the problem was corrected. The fixes that fail archetype is often seen in social systems as well, such as shouldering the blame for a failed relationship or taking on extra work in an attempt to fix a strained work-life balance. In both cases, the underlying problems are not addressed, and the fixes only serve to make things worse.

Shifting the Burden

'Shifting the burden' is a problem that occurs when a symptom is addressed by a short-term and a fundamental solution. The short-term solution may produce side effects that affect the fundamental solution. As this occurs, the system's attention may shift to the short-term solution or to the side effects. This can lead to a cycle of addressing symptoms and side effects, rather than addressing the root cause of the problem. This cycle can be difficult to break, but it is important to try to do so in order to address the underlying issue. One way to break this cycle is to make sure that the fundamental solution is given priority. This may mean making some sacrifices in the short term, but it will ultimately be worth it in the long run. Another way to address shifting the burden is to improve communication and collaboration between different parts of the system. This can help to ensure that everyone is aware of the root cause of the problem and is working towards a common goal.

The shifting the burden system archetype is a very common pattern that can be seen in many different systems. For example, consider a manufacturing process that relies on two machines to complete the work. If one of the machines breaks down, the other machine will have to take on more work in order to keep the process going. In this case, the burden has been shifted from the broken machine to the working machine. Of course, this can eventually lead to problems if the working machine is not able to handle the increased workload, but it is often a necessary stop-gap measure. Other examples of this archetype can be seen in systems where there is an unequal distribution of resources, such as in a food chain. The higher up on the food chain an organism is, the less competition there is for resources. This means that animals at the top of the food

chain may be able to expand their range and population size while those at the bottom are forced to compete for dwindling resources. Ultimately, this can lead to a collapse of the entire system.

Limits to Success

In a complex system, there may be limited resources available to achieve success. This system archetype refers to the way that these limited resources can impact the ability of the system to achieve its goals. For example, a company may have a limited budget that prevents it from investing in new products or expansion. Alternatively, a system may have a limited supply of raw materials that prevents it from increasing production. In both cases, the "Limits to success" system archetype is at play.

The "Limits to success" system archetype is based on the premise that there are only a limited number of resources available, and that competition for these resources will eventually lead to a situation where one group or individual is successful while the others are not. This can be seen in many real-world examples, such as the struggle for scarce supplies of water in arid regions, or the race to develop new technology before rival firms do. In each case, the limited availability of resources creates a situation where those who are able to obtain them are likely to be successful, while those who cannot access them will not succeed. The Limits to Success system archetype thus highlights the importance of obtaining and holding on to limited resources in order to achieve success.

Drifting Goals

The "drifting goals" archetype describes a situation where the goals of a system change over time, without any clear plan or direction. This can happen for a variety of reasons, including shifting priorities, budget constraints, or changing circumstances. As a result, the system can become unfocused and inefficient, wasting resources on activities that no longer align with its goals. The "drifting goals" archetype is often seen in large organisations, where decision-makers are constantly reacting to the latest crisis or opportunity. While there may be some benefits to this approach, it can also lead to long-term problems if the goals of the system are not carefully monitored and course-corrected on a regular basis.

A few examples of this archetype include: A company that constantly changes its product lineup, without a clear strategy or vision for the future; A team that is continually assigned new tasks, but never given the opportunity to complete them; A project that constantly shifts direction, as new stakeholders are brought on board. The "Drifting goals" system archetype often arises when there is a lack of clarity or agreement about what the goals of a system should be. This can be due to an inability to define the goals upfront, or to changes in the external environment that make the original goals obsolete. In complex social systems, this archetype can lead to reduced efficiency and effectiveness, as well as frustration and confusion on the part of users.

Growth and Underinvestment

The "Growth and underinvestment" system archetype describes a scenario in which one aspect of the system pursues growth at the expense of long-term investment. This system operates under the assumption that growth is always good and that there is never enough investment to meet the needs of the system. As a result, this system archetype typically leads to an ever-increasing cycle of growth and underinvestment. This can eventually lead to the collapse of the system if the resources required for growth are not available.

For example, a company that is always seeking to grow its market share may eventually find itself overextended and unable to generate enough revenue to cover its costs. This can lead to bankruptcy and the collapse of the company. Similarly, a government that is always seeking to expand its territory may eventually find itself in conflict with other nations and unable to defend its borders. This can lead to war and the destruction of the nation. Therefore, it is important to be aware of this system archetype in order to avoid its negative consequences.

We often see the growth and underinvestment system archetype when organisations pursue growth without investing in the necessary infrastructure and resources. This can lead to a downward spiral as the organisation becomes increasingly unable to keep up with demand, resulting in lower quality and reduced customer satisfaction. In many cases, this can eventually lead to the

collapse of the organisation. The bankrupt retailer Toys "R" Us is a prime example of this archetype in action. In an attempt to compete with online retailers, the company invested heavily in aggressive growth strategies such as opening new stores and expanding its product range. However, it neglected to invest in upgrading its outdated IT systems and supply chain management, leading to widespread stock shortages and cancelled orders. As a result, customers began to desert the company en masse, culminating in its eventual bankruptcy.

Success to the Successful

In systems thinking, the “success to the successful” system archetype describes a situation in which those who are already successful are more likely to continue to be successful, while those who are not successful are less likely to become successful. This can create a self-reinforcing cycle in which the successful become increasingly successful, while the unsuccessful become increasingly unsuccessful. This archetype can often be seen in economic systems, where those with more money are able to invest in resources that make them more likely to generate even more money, while those with less money find it harder to get ahead. The “success to the successful” system archetype can ultimately lead to inequality and poverty traps. To avoid these traps, it is necessary to design systems that provide opportunities for all, regardless of their current success or failure.

The success-to-the-successful system archetype is a repeating pattern in which the success of one element leads to increased resources for that element, and ultimately to even more success. This can be seen in many real-world examples, from the self-reinforcing cycle of poverty to the competitive landscape of the business world. In each case, those who are already successful are able to use their resources to become even more successful, while those who are not successful are left behind. This amplifies inequality and creates winner-take-all dynamics that can be difficult to break out of. The success-to-the-successful system archetype is a powerful example of how systems thinking can help us to understand and design solutions to intervene and address complex problems.

Escalation

In systems thinking, the “escalation” system archetype refers to a feedback loop in which a small change or disturbance in a system triggers a series of events that eventually result in a much larger change or disturbance. This feedback loop is often depicted as a downward spiral, in which each successive event amplifies the initial change or disturbance. The escalation system archetype is often used to explain how large-scale disasters can occur from relatively small beginnings. For example, the outbreak of a minor conflict can escalate into a full-blown war, or the failure of a single component can cause a cascading failure of an entire system. The key to preventing the escalation of a small change or disturbance into a larger one is to identify and address the underlying causes before they have a chance to take hold. By understanding and addressing the root causes of potential problems, we can prevent them from escalating out of control.

The “Escalation” archetype can happen in both natural and human-made systems, and it often happens because of a lack of communication or coordination between different parts of the system. For example, imagine that a small company has two departments that don't communicate well with each other. One department might make a decision that unintentionally creates a problem for the other department, which then has to scramble to fix the problem. This can lead to tension and conflict between the two departments, and it can eventually escalate into a full-blown crisis. In another example, imagine that a city has a limited budget for street repairs. If the city doesn't repair the streets on a regular basis, then potholes will start to form. These potholes will then get larger and more numerous over time, eventually leading to major road damage. If the city had been proactive about repairing the streets from the beginning, then this escalation could have been avoided.

Tragedy of the Commons

The “tragedy of the commons” is a system archetype that can occur when individuals acting in their own self-interest deplete a shared resource. The term was first coined by ecologist Garrett Hardin, who used it to describe the problem of overgrazing on

common land. In his 1968 essay, *The Tragedy of the Commons*, Hardin argued that, without rules or regulations, individual herders would have an incentive to graze as many cows as possible on the common land. As a result, the land would become overgrazed and depleted, leading to the collapse of the grazing system. The tragedy of the commons is often invoked to explain why it is difficult to manage natural resources in a sustainable way. When individuals are free to use resources as they see fit, they may not have an incentive to conserve them for future generations. As a result, the resources may be overexploited and eventually die out. The tragedy of the commons is a warning against unrestrained self-interest and a reminder of the importance of cooperation in order to sustainably manage our shared resources.

The "tragedy of the commons" is a system archetype that can occur in any system where there is a shared resource. Under this archetype, the members of the system are motivated to use the resource for their own benefit, without regard for the long-term sustainability of the resource. As a result, the resource is gradually depleted, leading to the eventual collapse of the system. This archetype is often used to explain environmental degradation, as well as other issues such as rising income inequality. In recent years, economists have also begun to apply the concept of the “tragedy of the commons” to explain problems such as systemic risk in financial markets. Ultimately, understanding this system archetype is essential for preventing and managing disasters.

7
INNOVATING FOR SYSTEMS CHANGE

Donella Meadows was an environmental scientist who advocated for the study of systems thinking in order to solve complex problems. In her book, *Thinking in Systems*, she writes that before making any changes to a system, it is important to first understand how it works. This can be done by observing the system and its history. Only then can you make informed decisions about how to change the system. This advice is just as relevant today as it was when Meadows wrote her book. In a world that is increasingly complex, understanding how systems work is essential to making sustainable changes. By taking the time to study a system before making any changes, we can avoid unintentionally causing more harm than good.

Too often people get caught up in their vision for the future and they forget about the present context. This can lead to irrelevant innovations that don't meet the needs of the current market or user base. It is important to be realistic about the current context in order to create an innovation that is truly relevant and valuable. past, present, and future are all important when it comes to innovation. But if you want to create something truly innovative, you must start with a deep understanding of the current context. Only then can you create something that is relevant and valuable in the present moment.

Think about some of the greatest inventions of the last century, like the aeroplane, the computer, the smartphone. What do they have in common? They all build on ideas that came before them. The Wright brothers didn't just sit down one day and design a working aeroplane from scratch. They studied the work of other innovators in the field, including Otto Lilienthal, and used that knowledge to create something new. The same is true of the computer. While Bill Gates and Steve Jobs are often credited as the inventors of the personal computer, they were standing on the shoulders of giants like Alan Turing and Grace Hopper. And the smartphone? It's a direct descendant of earlier mobile devices like two-way pagers and cell phones. The point is, innovation isn't about coming up with something completely new out of thin air. It's about taking what already exists and remixing it to create something better. And that's something anyone can do.

Many people believe that creativity and innovation come from within ourselves. We believe that we have the capacity to change things for the better and that we can make a difference in the world. However, recent studies have shown that this may not be the case. Instead of thinking that we are the ones who are creative and innovative, we should instead think that the capacity for change lies in the system itself. By doing this, we can become more productive and effective in our efforts to change things for the better. We can also become more open to new ideas and ways of thinking. This way of thinking can help us to better meet the challenges of the future and make a positive impact on the world.

All too often, we think that change can only come from external forces. We wait for others to enact the changes we want to see in the world. But the truth is, change often starts from within. It is the result of our own actions and decisions. We may not always be aware of it, but the change is happening right in front of us. All we have to do is look and listen. Look at the world around us and see what is really happening. Listen to what people are saying and try to understand their needs. Only then can we begin to make the changes we want to see. Many times, the solution is already there. We just have to be open to it.

The word “innovation” is often used to describe something that is new and different. However, innovation does not necessarily have to be completely original. In fact, many times it is the execution

of an idea that makes it innovative. For example, the iPad was not the first tablet device on the market. However, Apple's version was released at a time when people were starting to use tablets for more than just simple web browsing and email. As a result, the iPad became one of the most popular tablet devices on the market. So, while innovation does not always have to be new, it does need to be relevant to the world around us.

Innovation does not always mean inventing something new. Sometimes, it can simply be a matter of taking something that already exists and making it relevant for a new context. This is true for both products and systems. When it comes to systems, we often think of them as being complex and ever-changing. However, these complex adaptive systems have a lot of history behind them. Part of innovation involves looking back at the ways things were done before the current system became dominant and reinventing those solutions for this new context. In other words, it’s about taking the best of what worked in the past and reinventing it for the present. This is not always easy, but it can be extremely effective. And, when done well, it can lead to some truly groundbreaking innovations.

In a 21st century, high tech, globally integrated economy, it can be difficult to bring about change. These systems are often so large and complex that it can be hard to make a difference. The idea of coming in and defining a desired outcome, then imposing it on the system, is often not realistic. Instead, it is important to work within the system to bring about change. This may require patience and perseverance, but it is possible. Bringing about change in this way is never easy, and those who fight for it often face a lot of resistance. Dr. Samir Hanney, co-author of *Complexity and Public Policy*, has studied this phenomenon in the English health care system. He explains that when you try to implement a big change, the system is designed to resist it. This can be frustrating for those who are trying to improve the system, but it's important to remember that even small changes can have a big impact.

In recent years, there has been an increasing awareness of the limitations of the traditional top-down, centrally planned approach to social and economic development. This approach, which relies on a linear understanding of cause and effect, has led to a series of unintended consequences, including environmental degradation, social inequality, and financial instability. In response

to these challenges, the field of systems innovation has emerged, which takes a more holistic, networked, and evolutionary approach to social and economic development. Building on the insights of systems theory, complexity theory, and system dynamics, systems innovation offers a more realistic and effective way of addressing the challenges of our time.

So, why can't we solve the big problems? It may be that we have become too good at solving small problems and not so good at solving big ones. The ability to identify and solve problems is critical to survival. And for most of human history, the problems our ancestors faced were mostly small-scale and local: finding enough food to eat, staying warm in winter, avoiding predators. As our species has evolved, we've gotten very good at solving these sorts of problems. But today, many of the problems we face are global in scale and require new ways of thinking. Climate change, for example, is a challenge that requires us to think about the long-term health of the planet, not just our immediate needs. To solve these kinds of problems, we need to find new ways to think creatively and collaboratively. We need to learn how to see the world differently and look beyond our own narrow perspective.

Issues like sustainability, economic inequality, social cohesion, and public health are complex because they involve many different sectors and stakeholders, they are interconnected, and they are constantly changing. To meet these challenges, we need to change the way we think about and design public policies. We need to move from a linear, cause-and-effect thinking to a more complex systems thinking. We need to shift from a top-down, centralised approach to a more decentralised, networked approach. And we need to move from an isolated view of the world to a more connected view of the world. In short, to enable transformative change within a complex system, we need to understand the system as a whole and identify ways to innovate within it.

Innovation is different from pure creativity in that it is looking at both ends of the equation, both the creation of something new and useful, but also its adoption and usage within society. Society itself is an important stakeholder in the innovation process, as it must decide whether to adopt the new product, process or service. We have got really good at creating, designing, and redesigning things. After many centuries of perfecting our industrial

model, we have created a lot of things. Indeed. We might say we have created too many things. Whereas much of our traditional thinking is focused on parts and closed forms of incremental innovation. Many of the challenges we face today require a different form of change, a different form of thinking. Environmental issues, social issues, health crises - these are complex problems that no longer respond to parts-based thinking and linear solutions. We need to start thinking about how to create systems that are more sustainable and more equitable. We need to design for the future, not just for the present. And we need to do it quickly. Otherwise, we will continue to create too many things that we don't really need and that do more harm than good.

Systems innovation is about enabling transformation in the structure and interrelationships of the parts within a complex organisation. So as to realise the emergence of new behaviour and functionality required for that organisation to operate successfully within its environment. In other words, it is about changing how a system works so that it can better adapt to its surroundings and achieve its objectives. This often requires not just changes to the way individual components of the system interact with each other, but also changes to the overall structure of the system itself. For example, a business might implement a new customer relationship management system in order to improve its sales and marketing processes. Or a government might redesign its tax system in order to make it fairer and more efficient. In both cases, the aim is to change how the system works so that it can better meet the needs of those who use it.

Systems Theory of Change

Systems change is about changing complex systems. It is thus, before anything, what we would call a theory of change. It will give us a set of ideas and methods about how to change in complex environments. People have been thinking about how to do change within society long before we came up with the idea of systems change. Theories of systems change typically start with one or more assumptions about how the world works, but a systems approach to change adds an important dimension to this by also considering the larger context within which it operates. Systems approaches to

change look at both the “black box” of the system itself and also the “white space” around it - the environment within which it is embedded. For example, if we want to bring about a change in an organisation's culture, we need to think not just about what happens within the organisation, but also about what happens in the wider cultural context within which it is embedded. We also need to think about how different elements of the system— such as laws, regulations, norms and values— interact with each other to shape behaviour. In other words, a systems approach helps us to see the bigger picture and understand how different elements of the system interact with each other to influence behaviour. It is this understanding that can help us design effective interventions that lead to lasting change.

Theories of change act as a guide for initiatives, outlining the steps that need to be taken in order for goals to be met. By understanding the logic behind systems change, practitioners can better assess the effectiveness of their work and identify areas where adjustments need to be made. In addition, theories of change can also be used to build support for systems change initiatives, by clearly articulating the benefits of proposed changes. Ultimately, a well-developed theory of change is an essential tool for any practitioner hoping to bring about lasting systems change.

All of us have theories of change, whether we think about them explicitly or not. A theory of change is simply the belief that if we take a certain action, it will lead to a desired outcome. For example, if we want to lose weight, we might believe that cutting out sugary drinks and exercising more will help us to reach our goal. While a theory of change is always present, making it explicit can be helpful in achieving our objectives. By laying out our assumptions, we can question whether they are valid and whether the planned course of action makes sense. We can also identify where the potential issues might be. Ultimately, explicit acknowledgement of our theory of change can help us to achieve our goals.

Theory of change as a framework for understanding how social change happens was developed in the 1990s from the field of program evaluation, and since then its use has grown dramatically among NGOs, philanthropies, government agencies, and other organisations working for social change. The theory of change

approach helps individuals and organisations to clarify their goals, identify the activities and strategies that are most likely to lead to success, and track progress over time. In recent years, the theory of change approach has been used to inform a wide range of social change initiatives, from education reform to poverty alleviation.

A systems theory of change can be used to support the planning and implementation of systems change by setting out the assumptions that underpin a proposed change process and identifying the actions that will lead to the desired outcome, in a way that informed by the contributions of systems theory, complexity theory, and systems dynamics that underpin systems thinking. This process can help to clarify the linkages between actions and outcomes, and to identify any potential bottlenecks in the change process. When used effectively, a systems theory of change can be a powerful tool for achieving social or political change in complex systems and contexts, that helps to anticipate changes that would otherwise be unexpected with a more linear approach.

A theory of change is a potent tool for any organisation or individual engaged in social change work. By providing a road map for how we expect our activities to lead to desired outcomes, theories of change help us to better understand and communicate the assumptions and enablers that surround our initiatives. In addition, theories of change can help to identify potential pitfalls and areas that require further investment. When used effectively, theories of change can be an invaluable tool for planning and evaluation. However, it is important to remember that theories of change are not static documents; they should be dynamic tools that are regularly updated as our understanding of the social landscape evolves.

Transitions

Systems change can be a difficult thing to accomplish. After all, systems are designed to maintain stability and resist change. However, there are times when change is possible, and even necessary. One of those times is when a system is in transition. A system in transition is one that is undergoing a significant change. During these times, the system is more open to change, and it is possible to make significant alterations. Of course, this doesn't mean that change is easy; it still requires careful planning and execution.

However, if you want to make systemic change, target times when the system is in transition. That's when you'll have the best chance for success.

In order to bring about change in a large-scale complex system, it is essential to wait for the current paradigm to stop working. Once the system has faced a number of critical issues that the old model is unable to solve, the mainstream of the system will be ready for transformation. Only at this point will you have a chance of affecting systems change. If you try to bring about change before the current paradigm has failed, you may not be successful, as the system will not be ready and will not support your efforts.

A crisis presents an opportunity for transition. It is a time when things cannot continue as they are and must change. A crisis may be personal, such as when we face a life-changing event that forces us to rethink our goals and values. Or, a crisis may be societal, such as when a country is in the midst of economic or political upheaval. In either case, a crisis represents a moment of opportunity, when the status quo is no longer tenable, and transformation is possible.

Systemic transformation occurs when an existing system is replaced by a new one. This can happen gradually, as happened with the transition from feudalism to capitalism, or it can happen suddenly, as happened with the collapse of the Soviet Union. A systemic transformation is often precipitated by a crisis, but it does not necessarily require one. For example, the rise of the Internet has led to the transformation of many industries, even though there was no crisis that precipitated this change. In general, however, it is fair to say that if a system is not in some form of crisis, then it is not going through a systemic transformation.

The Adaptive Cycle

The adaptive cycle is a heuristic model developed by CS Holing for understanding macro processes of change in social-ecosystems. However, the adaptive cycle is equally applicable to many complex adaptive systems. It can be used to identify structural patterns in both ecosystems, as well as social systems as they go through non-linear processes of change. The model suggests that systems move through four distinct phases— creation, growth, conservation and

destruction— in a never-ending cycle. In each phase, the system undergoes different transformations, which prepare it for the next phase of change. Although the adaptive cycle is often used to understand social-ecological systems, it can also provide insights into other complex systems, such as economies or political systems.

A complex adaptive system is a system in which agents interact with each other and their environment in order to adapt and survive. These systems are often highly unpredictable, as they are constantly changing in response to the ever-changing world around them. One of the most important aspects of a complex adaptive system is its ability to learn from past experience and adapt its behaviour accordingly. This learning process is what allows these systems to continue to exist in spite of the constant changes in their environment.

The adaptive cycle's four phases of change are exploitation, conservation, release, and reorganisation. During the exploitation phase, agents exploit their environment in order to obtain resources that they need in order to survive. This phase is followed by the conservation phase, during which agents conserve their resources in order to protect them from being depleted by other agents. The release phase occurs when agents release their resources in order to allow other agents to access them. Finally, during the reorganisation phase, agents reorganise themselves in order to adapt to the changes that have occurred in their environment. These four phases are essential to understanding how complex systems evolve over time.

The first stage of exploitation is one of growth, a time of expansion and increasing complexity. A system in this stage has successfully reoriented post-crisis and there are now plenty of freely available resources for rapid growth and development. This is a time dominated by positive feedback and self-organising processes of assembly. The key to success in this stage is to identify and exploit these newly available resources before they are depleted or replaced. This requires a combination of Opportunity Identification, which is the ability to see new opportunities that others cannot, and Resource Access, which is the ability to mobilise the resources necessary to exploit these opportunities. Those who are successful in this stage will reap the rewards of their efforts in the form of increased wealth, power, and prestige.

The conservation stage is characterised by a high level of complexity and a dynamic equilibrium between its parts. At this stage, the system is optimally performing, exhibiting strong stability and negative feedback cycles. The system has reached a high level of connection between its parts and is able to control development. This state of equilibrium is a time of stability in which the system can be seen to be optimal. The conservation stage is an important time for ecosystem or societal development, as it enables the system to reach its full potential under its current conditions.

As the system begins to stabilise, there is the possibility of rigidity. A rigid system is one that is highly centralised and thus prone to collapse. In a social context, a rigid system is characterised by few key nodes of power and influence. This concentration of power makes the system more brittle and vulnerable to disturbance. Additionally, rigid systems tend to have low diversity, both in terms of the number of node types and the number of pathways. This lack of diversity makes it difficult for the system to self-organise and adapt to change. As a result, rigidity can lead to formlessness and chaos. While a certain degree of rigidity is necessary for any system to function properly, too much rigidity can be damaging and lead to instability.

In any complex system, there are always a number of dependencies between different parts of the system. This is often essential for the efficient functioning of the system, but it also has its downside. In particular, when unanticipated changes or shocks occur, the system may be less able to adapt and recover. This can eventually lead to stagnation and rigidity, making the system more vulnerable to collapse from an external disturbance. The release phase is typically one of crisis and chaos, as the system tries to find a new equilibrium. Often, this process leads to widespread destruction before a new, more resilient system can emerge. When the system is destroyed by an external disturbance, positive feedback generates dramatic change, and the system falls apart as it is pushed out of its stability domain. The test of a system in the release state is its capacity to survive in the face of extreme disturbance or disordered collapse. A system must maintain vital functions throughout the release process in order to emerge from it with a reorganised structure that is better equipped to deal with future perturbations. The key to successful release is therefore

resilience, the ability to withstand and recover from disruptive change. Release may be a painful and chaotic experience, but it is also an essential part of growth and transformation.

A system has the potential to enter into a new stability domain after crises. This is due to the fact that change can be important to the system's reorganisation. The growth stage that follows reorganisation will depend on which new stability domain is entered. In order to reorient after crises, the system must reconnect pathways and node relations. This allows for new stability domains to be created which can aid in the growth of the system.

The adaptive cycle tells us something about the different stages of the process of evolution. We need to understand these inherent dynamics of complex adaptive systems, because this is how we change them. The four phases of the cycle are not mutually exclusive, but they often occur in sequence. The adaptive cycle may then be repeated. Understanding the adaptive cycle can help us to manage complex systems more effectively and to make more efficient use of resources. It can also help us to anticipate and prepare for potential problems, such as resource depletion or environmental change.

Rather than trying to achieve static goals, we need to work with this adaptive cycle to enable it to evolve in a certain direction. Without understanding these inherent cycles or where the system might be in them, we have little chance of working with those dynamics and will likely exert our resources in the wrong direction without success.

8
TOOLS FOR SYSTEMS CHANGE

If we want to change a system, it is essential that we first take the time to understand it. This means creating a model of how the system works. Only then can we begin to identify where changes need to be made. Too often, people try to effect change without this understanding, and as a result, their efforts are often unsuccessful. We must remember that we are not just trying to change one thing, but an entire system. By taking the time to study and understand the system, we can give ourselves the best chance of making lasting change. In chapter two, we explored the components that should go into a model of a system during the system mapping process; now, let's look at some other useful system mapping tools.

The Iceberg Model

The iceberg model is a popular way of thinking about system change. It suggests that there are various levels of abstraction to a situation or organisation, from the observable events to the underlying patterns that generate these to the supporting structure. The model is helpful for thinking about how to create change at different levels. For example, changing the observable events may require changing the underlying patterns, and changing the underlying patterns may require changing the supporting structure. The model can also be used to think about what level of change is most appropriate in a given situation. For example, if the goal is to

create lasting change, it may be necessary to change the supporting structure. If the goal is to create immediate change, changing the observable events may be more effective. The iceberg model is useful for thinking about systems and how to change them.

An iceberg is used as an analogy to represent the underlying structures, generating perceived events and issues, as it is known to have only 10% of its total mass above the water. While 90% of it is underwater. The expression tip of the iceberg is used to connote that what one can see is only a small part of a whole situation. In other words, the underlying structure creates the issue or event, while the tip of the iceberg represents what is visible to us. It's important to remember this when addressing problems or looking for solutions, as often times the root cause is not immediately apparent. By understanding this model, we can start to look past the surface level and get to the heart of the matter.

Just like an iceberg, there is much more below the surface of our world than meets the eye. A large percentage of what is going on in our world is hidden from view. The iceberg model tries to make this explicit by depicting it as a series of layers that sit beneath the everyday phenomena observed. The iceberg model argues that events and patterns, which are observable, are caused by underlying factors that are not always visible. By understanding the hidden structure of our world, we can gain a greater understanding of the events that take place within it.

A fundamental system's thinking concept is that different people in the same structure will produce similar results. That is to say structure causes 80 to 90% of all issues. Thus, we must first identify and then understand the systemic structures and underlying mental models that cause them. The iceberg model typically identifies four basic levels to system thinkers: The environment or context in which a system operates; The visible structures, processes, and practices that shape interactions among people; The shared values, beliefs, and assumptions that guide decisions and actions; And finally, the individual and group behaviours that result from the interaction of all three previous factors. When we first come across a problem, we tend to see only the tip of the iceberg-the surface behaviour. If we want to truly understand the problem and find an effective solution, we need to dig deeper and look at all four levels. By doing so, we can begin to see the interconnections

between different factors and identify patterns that would otherwise be hidden. Only then can we develop targeted interventions that have a real chance of making lasting change.

The iceberg model is often used to describe the way we see the world. We tend to focus on the tip of the iceberg, the small part that is visible above the surface, while the much larger part below the surface remains hidden from view. This can be applied to global issues, where we tend to focus on events that make headlines in the news, while the underlying causes and consequences remain largely unnoticed. For example, we might hear about a new president in Italy or an increase in commodity prices, but we might not be aware of the underlying economic and political conditions that led to these changes. By understanding the iceberg model, we can begin to see global issues in a new light and develop a more comprehensive understanding of the world around us.

While most of the world operates at the event level, there is a lot that goes on beneath the surface. Patterns are the changes and variables that occur over time, and they can tell us a lot about what is going on below the surface. By looking at patterns, we can start to see trends and identify underlying causes. For example, a pattern of increasing crime rates might be caused by a lack of investment in education or economic opportunity. By understanding patterns, we can start to see the world in a new light and identify potential solutions to problems. Whether we're looking at our personal lives or the broader world, patterns offer valuable insights into the underlying forces at work.

Patterns are an important tool for understanding the world around us. By observing the relationships between events, we can start to see patterns emerge. These patterns can then be used to anticipate, plan and forecast future events. Patterns are also influenced by the structures that create them. Structures can be thought of as the rules of the game, and they dictate how events will unfold. By understanding these rules, we can better understand the patterns that emerge from them. In this way, patterns can help us to understand and make sense of the world around us.

Structures are composed of cause-and-effect relationships. These are connections between patterns. For example, the underlying structure of a problem such as recurring oil spills might be determined by the fact that there is a pipeline leak every time

there is an earthquake. The cause-and-effect relationship is that the earthquake causes the pipeline leak, which causes the oil spill. In order to solve the problem of oil spills, then, it might be necessary to fix the pipeline so that it doesn't leak when there is an earthquake. Like all structures, cause-and-effect relationships can be complex and multi-layered. But understanding how they work is crucial to solving many problems.

Rules, norms, policies, and guidelines are the backbone of any system. They provide a framework for how things should be done and help to ensure that everyone is on the same page. But these structures can also be invisible, hidden from view by the very people who benefit from them. Inequality, for example, is often perpetuated by unseen rules and norms that advantage some while disadvantage others. Power structures can also be difficult to see, but they can have a profound impact on who has access to resources and who doesn't. The patterns we see in the world around us are often explained by these unseen structures. It may not be easy to see them, but they have a real and tangible impact on our lives.

In any system, there are going to be a set of mental models that dictate how the system runs. For example, in a business mental model, there would be the processes and reasoning behind why the business is structured a certain way and performs specific tasks. This could include things like the company's mission statement, goals, budgeting, or management structure. Similarly, in a personal relationship, there would be a mental model dictating how the two people involved interact with each other. This could include things like communication styles, conflict resolution, or expectations. Ultimately, it is these mental models that keep the structure doing what it does.

Most people are not aware of the mental models they hold, but these models guide our perceptions and actions, nonetheless. In many ways, they are like a set of lenses that we view the world through. Just as different pairs of glasses can help us to see things more clearly, mental models can help us to understand the complexities of the world around us. Of course, just as glasses can distort our vision if they are not properly calibrated, mental models can lead us astray if they are based on false assumptions or incomplete information. Nevertheless, mental models are an

essential part of how we make sense of the world, and they can be incredibly powerful tools for understanding complex systems.

Mental models are very important in our lives, but they can also be very difficult to identify. The iceberg model is a perfect example of this. We can see the events that happen on the surface, but we don't always know what is causing them. For instance, if we catch a cold more often when we are tired, we might not realise that it is because we are not getting enough rest. We might just assume that we are more susceptible to colds when we are tired. However, if we take the time to examine the systemic structures or causes for our fatigue, we might discover that it is because we are working too much and not getting enough rest because we feel that we are behind in our work. By identifying these mental models, we can begin to change our behaviour and create better outcomes for ourselves.

In any complex system, there are always going to be places where small changes can have a big impact. These are called leverage points. The iceberg model is a helpful tool for identifying leverage points, because it illustrates the different dimensions of an issue. Each of these levels has its own leverage points, and by targeting our efforts we can have a much greater impact. Of course, it's not always possible to change the system from within, and there may be times when direct action is the only way to effect change. But understanding the different levels of a system and their respective leverage points is a helpful way to think about how best to enact change.

Icebergs may seem sturdy and permanent, but they are constantly changing. The same is true of systems. In order to find high leverage points, we need to go below the surface to where the root causes are. Only then can we begin to transform the system. This may seem like a daunting task, but it is essential if we want to create lasting change. By starting at the bottom, we can exert a downward force that will cause the entire system to shift. This is how we can create real change and make a lasting impact.

Systems change requires being able to identify the high leverage points in a system and targeting those in order to create lasting change. Otherwise, you'll just be applying band-aids to a bigger and bigger problem. If you want to solve a problem, you need to understand the root causes. That's because events are only symptoms of the real issue. And if you only react to events, you'll

never get to the bottom of things. You'll be constantly putting out fires, but the blaze will always come back. It's like trying to put a Band-Aid on a broken bone. You might stop the bleeding, but the bone will still be broken. To truly solve a problem, you need to apply force at the low leverage points. That way, you can overcome the innate dynamics of the system and get to the root causes.

In conventional approaches to change, we are merely dealing with the symptoms of the problem. When we start to notice a pattern of those events, we have more options. We can anticipate what is going to happen, and we can plan for it. When we start noticing patterns, we can begin to consider what is causing the same events to happen over and over again. For example, if we keep having car accidents, we might start to question our driving skills or the condition of our car. If we keep getting sick, we might start to think about our diet or whether we're getting enough rest. By noticing patterns, we can begin to find the root causes of problems and find more effective solutions.

The term “mental model” was first coined by social psychologist Karl Weick and is defined as “the images, assumptions, and beliefs we use to simplify and understand the world”. In social systems, mental models are often implemented in the form of structures and processes. For example, a company may have a hierarchical structure with clear lines of authority, or a process-oriented approach to product development. These structures and processes can result in significant advantages for the organisation, but they can also be limiting. When we start to look at the underlying structures, we can begin to see where we can change what is happening. We are no longer at the mercy of the system. We can begin to identify the thinking and the mental models that are resulting in those structures, taking the form of unconscious bias or outdated assumptions. Once we have identified these mental models, we can begin to transform them. Changing the mental model that a system uses is the highest leverage way to create lasting change. It is also one of the most difficult challenges changing a system can undertake. But it is only by changing our thinking that we can hope to change the world.

Social change involves an alteration in the social order of a society, and the base of social change is alteration in the thought process in the minds of people. Social change may refer to the notion

of social progress or sociocultural evolution, the philosophical idea that society moves forward by evolutionary means. It may refer to a paradigm shift, a major change in how we see things. Ideas can be contagious and can travel fast through a population, but their effects are often subtle and not easily measurable. Such changes require time and often involve generations of people. But it is possible for them to occur relatively quickly when conditions are right and when people are ready for change. If enough people adopt a new idea, it can spread rapidly and lead to large-scale change. When this happens, it can feel like society is transformed overnight. But in reality, it is the result of many small changes that have taken place over time. Social change can be driven by many different factors, including technological innovation, economic growth, population changes, and political developments. While it is often hard to predict which ideas will catch on and lead to widespread change, history shows us that even the most unlikely ideas can sometimes lead to transformation.

In our fast-paced, hyper-consumer culture, it can be easy to get caught up in the quest for more— more money, more things, more followers. But what we often fail to realise is that real change comes not from an increase in quantity, but from a change in quality. The high leverage points are really in the qualitative factors of the system. They are the things that are not being measured or accounted for. And thus, they go largely unnoticed. A reductionist analytical approach has led our cultures to place an over-emphasis on quantity and numbers has given us the idea that what we can measure is more important than what we cannot. But if we want to create lasting change, we need to start paying attention to the qualitative factors that are driving the system. Only then will we be able to create real, lasting change.

As anyone who has studied history knows, great changes often come about as a result of small actions. In fact, it is often the one person who acts differently that makes the biggest impact. This is because non-linear change is a qualitative change. When someone stands up and says “no, I will not take a bribe,” they are acting in a way that is qualitatively different from those around them. And it is this type of qualitative difference that can have a profound ripple effect on the world.

Stakeholder Analysis

At its heart, every problem we face is a sociocultural one. This is because our society and culture dictate the way we interact with the world and each other. And, when these interactions are not healthy or harmonious, problems arise. For example, the water crisis is not really about a lack of water. Instead, it is about the way our society uses and abuses this vital resource. We waste water through inefficient irrigation practices, industries pollute our waterways with toxic chemicals, and individuals use too much water for non-essential purposes. Similarly, environmental degradation is not really about a lack of land or resources. Instead, it is about the way we mistreat the planet we call home. We clear-cut forests, pollute the air we breathe, and dump toxic waste into our oceans. Inequality is not really about a lack of money. Instead, it is about the way our economic system favours those who are already wealthy and penalises those who are not. And cybersecurity is not really about a lack of computer code. Instead, it is about the way our digital world has created new opportunities for criminals to exploit vulnerabilities in our systems. So, while it may seem like there are many different problems out there in the world, they all have one thing in common: they are socio-cultural in nature. And, until we address the root causes of these problems, they will continue to plague us.

Take our global food system, for example. Food is one of the most fundamental human needs, yet we often take it for granted. We go to the grocery store and purchase whatever looks good, without giving any thought to how it got there. We think of food as being about farms, tractors, and produce, when really it is a socio-ecological system. Our food system is immensely complex, and involves interactions between social, economic, and environmental factors. Probably our biggest blind spot today is people. We adopt an analytical approach and try to shift everything into the technical realm. However, at the end of the day, food is about people. It's about farmers, growers, processors, distributors, retailers, and consumers. It's about culture, tradition, and identity. To truly understand our food system, we need to take a holistic approach that acknowledges the importance of people and relationships.

We often assume that systems are rational, and that by understanding the system, we can optimise it. However, systems are

often complex and unpredictable, and this can lead to blind spots that can have far-reaching consequences. For example, in many systems, humans are assumed to be rational actors. However, this assumption can lead to blind spots wherein we fail to account for human emotions and behaviours. As a result, these systems can be optimised in ways that unintentionally create new problems or exacerbate existing ones. In order to avoid these blind spots, we must first understand the system we are dealing with - including all of its complexities and potential for change. Only then can we hope to create lasting positive change.

Culture refers to the beliefs, values, traditions, and behaviours that characterise a group of people. It is often passed down from generation to generation and shapes the way we see the world and our place in it. Social structure, on the other hand, refers to the way that different groups of people are organised within a society. Each group has its own set of customs, rules, and hierarchies. Together, culture and social structure create a unique environment that can either support or inhibit change. In order to navigate these waters successfully, it is essential to understand the stakeholders involved and what they stand to gain or lose from potential changes. Only then can we begin to develop a plan for enacting meaningful and lasting change.

The stakeholder analysis is a process of assessing how the interests of those stakeholders should be managed and dealt with in a project. The stakeholder mapping is the analysing and creation of models to identify these different stakeholders. In this process, it is essential to firstly identify all the stakeholders that are involved or have an interest in the project at hand. After all the stakeholders have been identified, they are then ranked according to their level of influence and importance in the project. This will give you a better understanding of who needs to be pleased and kept happy during the project in order for it to succeed. Furthermore, by doing a stakeholder analysis you will be able to develop strategies on how to deal with difficult stakeholders, or those that may have competing interests. In other words, knowing your stakeholders is half the battle when it comes to managing a successful project.

This may be the case in some instances, but not always. In fact, most of the traditional stakeholder analysis focuses on looking at the individual actors within the model and assuming a degree of

rationality in their behaviour. We assume that people make decisions in some way, rationally and independently, which is often not the case. We typically think that it is the parts that create the system. The reality is that it is the interactions between people - and between people and their environment - that create the system. These interactions are often complex and not amenable to rational analysis.

The question is, what is wrong with the system? Not what is wrong with the people in it. In this context, this means that it is the incentive structures within the organisation or system that creates the behaviour of the members. This is a basic idea in game theory, that we study the structure of incentives that the actors are operating within as a game, in a general sense, we are trying to optimise for outcomes for a particular set of rules. The problem is that when you look at most social systems, they are not designed to be optimised for outcomes, but rather to maximise some other metric such as profit or power. As a result, the incentive structures within these systems often lead to suboptimal outcomes for society. In order to fix this problem, we need to change the way that we design social systems so that they are incentivised to produce good outcomes for society, not just for people in positions of power.

Getting out of our own perspective is important in order to understand the system from other points of view. As Donella Meadows writes, we should defy traditional disciplines and boundaries in order to expand our thought horizons. This means that we should not be limited by what we majored in, or by what the textbooks say. Instead, we should follow a system wherever it leads us. In order to truly understand any system, one must be willing and able to learn from a variety of sources. This means that you cannot allow yourself to be limited by the tunnel vision that can come from specialisation. You must be opened to hearing what economists, chemists, psychologists, and theologians have to say, even if it is delivered in jargon-filled language. It is also important to be able to recognize the limitations of each perspective, and to filter out any information that is distorted by bias. Only then will you be able to gain a well-rounded understanding of the system under examination.

Incentive Mapping

Incentives play a critical role in determining the behaviour of individuals within organisations and shaping the overall culture. As Charles Munger famously said, “show me the incentive and I'll show you the outcome.” When incentives are misaligned, it can lead to suboptimal decision-making and bad outcomes. This is why it's so important to understand the structure of incentives within any given system. By understanding how incentives work, we can better align them with our desired outcomes. Only then can we hope to change the system for the better.

Incentives are a key driver of behaviour, both in individuals and organisations. They can take the form of both positive and negative reinforcement, but their ultimate goal is to encourage a desired action or result. When it comes to business collaboration, incentives play a vital role in determining whether two entities will work together or compete against each other. In order to create a successful partnership, it is essential to identify the shared goals and objectives that each party is trying to achieve. Once these objectives have been identified, the next step is to create incentives that will encourage both parties to work together towards these goals. Positive incentives can take many forms, such as financial rewards or recognition, while negative incentives may include penalties or withholding of resources. By aligning the incentives of both parties, it becomes much more likely that they will be able to successfully collaborate towards their shared objectives.

In any system, there are always going to be incentives that either resist change or enable it. For example, in a corporation, the incentive may be to maximise profits for shareholders. In a government, the incentive may be to get reelected. In a criminal justice system, the incentive may be to convict as many people as possible. The list goes on. If we want to change the system, we need to be aware of how those incentives are working. We can use game theory to gain a more rigorous analysis of the structure of incentives that people find themselves under. By understanding the incentives, we can start to change them. We can create new incentives that support our goals instead of resisting them. Incentives are a powerful tool, and if we want to change the system, we need to use them to our advantage.

Game theory is the study of strategic decision making. More specifically, it is the study of how people behave in situations where their decisions affect not only themselves, but also other people. For example, when two people are playing a game of chess, each person is trying to optimise his or her own position. At the same time, each person is also aware that his or her actions will have an impact on the other player. As a result, each player must take into account the other player's possible reactions in order to make the best possible move. Game theory can be used to model a wide variety of situations, from simple games like chess to more complex situations such as economic interactions and political campaigns. In recent years, game theory has been used to help explain a wide variety of phenomena, from the spread of viruses to the formation of social norms.

In any game, there are three major elements: players, strategies, and payoffs. A player is a decision maker in a game; they must choose which actions will lead to the best outcome for them. A strategy is a specification of a decision for each possible situation in which a player may find themselves; it is a plan that outlines how to achieve the best results. A payoff is a reward or loss that players experience; it is the result of their choices and can be either positive or negative. When all the players follow their respective strategies, games are played over some mutually desired resources. The winner is the player who comes out ahead in the end, often by having more resources than the other players. By understanding how games work, we can better understand how complex systems work as well.

In any organisation, the resource is whatever is of value to the people within it. When designing a game, one of the key considerations shaping the overall game dynamic is whether the total value distributed to all agents will remain constant irrespective of their actions. Will it be possible for them to grow or decrease the amount of value they receive based on their capacity to cooperate? This is an important question to answer, as it will have a major impact on how the game is played. If agents are able to increase the total value they receive by cooperating with each other, then they will be more likely to do so. However, if they feel that they will not be able to make any gains by cooperating, then they may be more inclined to act in self-interest. Either way, the distribution of value

within an organisation is a key factor in determining how agents will behave.

In game theory, a zero-sum game is a mathematical representation of a situation in which each participant's gain or loss of utility is exactly balanced by the losses or gains of the utility of the other participants. If the total gains of the participants are added up and the total losses are subtracted, they will sum to zero. Zero-sum games are a special case of constant-sum games, in which the sum of all gains and losses is constrained to be zero. Zero-sum games are often contrasted with non-zero-sum games, in which the total gains and losses can be either positive or negative and often vary greatly from game to game. Games that are not zero-sum can nonetheless be said to have 'zero-sum elements' if some participants gain more than others do, but no single player can earn an unbounded return while another player suffers an unbounded loss. Many real-world situations can be analysed as zero-sum games, such as applied mechanics, business competition, politics, war, and trading. In addition, much theoretical research in economics, social science, and biology has been devoted to understanding mathematically the properties of zero-sum games and their generalisations.

In any zero-sum game, there is a clear winner and loser. The goal of the game is to take resources away from the other player, so that you can increase your own chances of winning. This can be seen in games like paper, rock scissors, where each player is trying to beat the other by choosing the correct strategy. It can also be seen in sporting events like basketball, where one team is trying to score more points than the other. In both cases, the relationship between the two agents is one of negative interdependence, meaning that they can only achieve their goals by causing the other agent to fail. This type of relationship is common in many aspects of life, and it is important to be aware of it in order to make the best decisions possible.

A cooperative game is one in which players can cooperate with each other to achieve a common goal. These games are an example of non-zero-sum games, because in cooperative games, players may win or lose together. Cooperation in these games can be achieved through several different methods, such as trade, communication, and joint action. Cooperative games usually have

some sort of reward system in place to encourage players to cooperate with each other. These rewards can be either tangible, such as points or money, or intangible, such as satisfaction or pride. Cooperative games are a great way to encourage teamwork and communication between players and can be a lot of fun to play.

In cooperative games, players may adopt different strategies in order to achieve the best possible outcome for themselves. However, it is also possible for players to cooperate in order to achieve a desired outcome. Cooperation may be achieved through several different possibilities. For example, cooperation may be built into the dynamics of the game. In positive sum games, payoffs are positively correlated, and this creates an incentive for players to cooperate in order to improve their chances of winning. Additionally, cooperation may be achieved through communication between players. By communicating with each other, players can come to an agreement on how to best cooperate in order to achieve their desired outcome. Finally, cooperation may also be achieved through the use of sanctions. If players know that they will be penalised for not cooperating, they may be more likely to cooperate in order to avoid punishment. Ultimately, there are many different ways in which cooperation can be achieved in cooperative games.

The benefits of cooperation are most apparent in non-constant games or non-zero-sum games, where the total value to be distributed can increase or decrease depending on the degree of cooperation between actors. For example, members of a business working together can create more value than working separately. When everyone cooperates, the whole payoff gets bigger. However, there may be times when it is advantageous for an individual to act alone. In these cases, cooperation does not lead to a net gain in value and may even result in a loss. Therefore, it is important to weigh the costs and benefits of cooperation before deciding whether or not to participate.

There are many reasons why cooperation is important in both positive and negative sum games. For one, it helps to ensure that everyone is on the same page and working towards the same goals. Additionally, cooperation can help to prevent conflicts from arising. Finally, cooperative behaviour often leads to more efficient outcomes than when individuals act alone. Thus, it is clear that cooperation is essential to the success of any organisation or team.

While there may be many factors that contribute to cooperative behaviour, it is often the case that the structure of the game itself plays a role. In positive sum games, for example, payoffs are typically positively correlated. This means that it is in the best interest of each individual to cooperate in order to maximise their own payoff. As a result, the game itself creates an incentive for individuals to cooperate. In negative sum games, cooperation may be less likely since individuals are typically competing against one another for a limited resource. However, even in these cases, cooperation can still be beneficial for the team as a whole. By cooperating, individuals can pool their resources and knowledge in order to better solve problems and reach objectives. In short, cooperation is essential for any organisation or team to be successful. While there may be various factors that contribute to cooperative behaviour, it is often the case that the structure of the game itself plays a role.

The term ‘mutually beneficial’ is often used to describe business relationships or agreements between two parties. In essence, both sides feel that they are getting something out of the deal that is beneficial to them. A good example of this is the mutually beneficial gains from trade and goods and services between nations. If businesses or countries can find terms of trade in which both parties benefit, then specialisation and trade can lead to an overall improvement in the economic welfare of both countries. Both sides see it as in their interest to cooperate in this organisation because of the extra value that they are getting from the arrangement. This type of cooperation can lead to a win-win situation for all involved.

In any system, there are a number of different forces at work. These can include things like the goals of the individuals within the system, the rules that dictate how the system operates, and the incentives that are offered for certain behaviours. Of all of these factors, incentives may be the most important in shaping the dynamics of a system. After all, individuals will usually act in ways that are most likely to lead to outcomes that they find desirable. As a result, by offering incentives for certain behaviours, it is possible to encourage individuals to act in ways that are beneficial for the system as a whole. Incentives can take many different forms, but they all serve to influence the behaviour of individuals within a

system. As such, they play a crucial role in shaping the dynamics of any system.

Incentive mapping is a tool that helps individuals and groups to identify and understand the incentives that influence their behaviour. By understanding the incentives that are at work, it is possible to make better decisions about how to behave in order to achieve desired outcomes. In addition, incentive mapping can help to resolve conflicts by identifying areas of agreement and disagreement. By understanding the reasons why people behave in certain ways, it is possible to find new ways to cooperate and achieve mutually beneficial outcomes.

Value Mapping

In his book *Zen and the Art of Motorcycle Maintenance*, Robert Persig discusses the importance of understanding the systems that create the things we take for granted in our lives. He argues that when a factory is torn down, the rationality that produced it is still present and will simply create another factory. This is an important point to consider when thinking about systems change. If we want to change the way things are done, we need to understand the underlying systems and how they produce the results we see.

A revolution may destroy an oppressive government, but if the fundamental patterns of thought that produced that government are left intact, then those patterns will simply give rise to another oppressive regime. To truly break the cycle of tyranny, it is necessary to change the mental models and values that shape our view of the world. Only by altering the way we see ourselves and our place in society can we create a more just and equitable world. Mental models are the foundation of how we understand and interact with the world around us. They are based on our past experiences and beliefs, and they heavily influence our actions and decisions. Consequently, if we want to create lasting change, we must begin by changing the mental models that underpin our worldview. Values are the principles that guide our behaviour and shape our interactions with others. They arise out of our belief system and form the basis of our morality. If we want to build a fairer society, we must promote values such as equality, solidarity, and justice. Only by changing the way we think about ourselves and the world

around us can we hope to create a truly free and equal society. In order to create lasting change, we need to map out the values and beliefs of the different actors involved and understand how they interact with each other.

Mental models are the beliefs, values, and assumptions that we hold that influence our perception and reasoning. They are based on the information we have accumulated through our lived experiences. Mental models help us make sense of new information and create new knowledge. They determine how we see the world and how we make decisions. Everyone has their own mental model that is unique to them. Our mental models can change over time as we gain new experiences and learn new information. It is important to be aware of our mental models so that we can understand why we see things the way we do and make sure that our decision making is based on accurate information.

In order to bring about change in a system, it is essential to first understand the different perspectives of the various actors involved. Without this understanding, it will be difficult to build a shared language around the problem and express how we see the world. Part of a change initiative will involve gaining insight into the different perspectives of those involved in order to facilitate communication and collaboration. By better understanding the various perspectives, we can build a strong foundation for change that will result in a more efficient and effective system.

When communicating with others, it is important to try to understand where they are coming from. We all have our own individual perspectives, shaped by our life experiences, values, and beliefs. These differences can often lead to misunderstandings and conflict. However, if we take the time to learn about one another's worldviews, we can find common ground and build bridges of understanding. One way to do this is through cognitive mapping. This involves identifying and exploring the different mental models that guide our thinking and behaviour. By understanding the diverse perspectives of those around us, we can start to build a shared language and move towards a more peaceful and prosperous future.

Values can be mapped in many ways. One of the most common is Maslow's hierarchy of needs. That structures values in terms of their abstraction. People pursuing basic needs of food security or economic welfare will differ hugely in motivation and

worldview to those pursuing more abstract motivations, such as self realisation, understanding the mix of different values and motives that drive and direct human action is a valuable tool for anyone, whether they are an individual or an organisation. The ability to read and understand these different maps can help individuals set goals and stay on track while avoiding costly detours. It can also help groups work together more effectively by identifying and articulating shared values. In either case, understanding the terrain is essential to charting a successful course.

9
SYSTEMS LEADERSHIP

Change doesn't come about by accident or overnight. It starts with a small group of people who are passionate about making a difference. These individuals are the pioneers who lead the charge and inspire others to join the cause. Without their dedication and commitment, change would never happen. Systems change is a complex and social process that involves many people and organisations working together. But it all starts with a few individuals who are willing to fight for what they believe in. As anyone who has ever embarked on a journey knows, facing challenges is an inevitable part of the process. This is especially true when that journey involves leaving behind the comfort and familiarity of the past in order to explore the unknown territory of the future. Change on a systems level is impossible without the subjective, personal transformation of those who pioneer it. In a metaphorical sense, someone has to pay the price for the creation of this new world. But even though it may be difficult, facing these challenges is essential if we want to bring about positive change in our world. By courageously confronting the fears and uncertainties that stand in our way, we can open up new possibilities for ourselves and for everyone around us.

At the beginning, those are the leaders, the ones who step across the line, create a new space and are prepared to resist the forces that will be inevitably directed at them for challenging and

threatening. The existing system leaders illustrate how, what is, is not the only possible way that things could be. This both inspires people, but also threatens the existing regime change requires creating something that did not previously exist, which can be scary and difficult. When people cross over into this new territory, there are often challenges and difficulties along the way. Nevertheless, these pioneers help to show others that it is possible to make a change and create something new. In doing so, they help to pave the way for larger-scale transformation.

If we are going to lead change, we have to see the new, create it in our lives and live. Doing this requires that we separate ourselves from what is, from what we have grown up with and been taught. It means stepping into the unknown, which can be scary. But it is only by doing this that we can create something new. Only by living our lives in a new way can we create a new world. This doesn't mean that we have to abandon everything that is familiar to us. We can still hold on to our values and beliefs. But we also need to be open to new perspectives and ways of being. We need to be willing to let go of old patterns of thought and behaviour that no longer serve us. Only then can we lead the transformation that we so desperately need.

Systems leaders are those who see and live the future possibility of their systems. They understand that leadership in its essence is the capacity to shift the inner place from which we operate. This shift allows for a different way of being and doing in the world. Systems leaders build the capacity of their systems to operate differently and to release themselves from the exterior determination of outer circle systems change. In doing so, they create the potential for something new to emerge. Leaders who are first to see and live this possibility provide a space for others to enter into and co-create with them. When we work together in this way, we can bring about transformative change in our systems.

But a lot of the difficulty is not out there. It is in one's own subjective journey that begins long before the objective endeavour of changing a system begins. A lot of the challenge in changing complex organisations is in finding the right motivation. And this requires a deep dive exploration into one's values. So, what are your values? What do you believe in? What are you motivated by? Once you have clarity around these things, it becomes much easier to take

action towards change. If you value justice, then you will be naturally motivated to fight for more equitable systems. If you value creativity, you will be more likely to work towards organisations that support and encourage creativity. The key is to know yourself and what you stand for. Only then can you hope to create lasting change in the world around you.

As change agents, it is important that we have clarity around our values. This enables us to focus our time and energy in a way that is aligned with what is important to us. When we are clear about our values, we are able to set boundaries and priorities, which helps us to prevent overwhelm and maintain a sense of balance in our lives. Values also provide a foundation for our actions - if we are clear about what we believe in, it becomes easier to make decisions and take action in line with those beliefs. Ultimately, living in accordance with our values creates a sense of fulfilment and helps us to create positive change in the world.

As change agents, the success of our actions depends primarily on our motives, which are defined by our values. Our values are important because they determine how far we can go in systems change. This is a creative process that is deeply personal. Our values help us to identify our goals and objectives. They also help us to set priorities and to make decisions about what is important to us. Ultimately, our values define the kind of change agents we are and the kind of impact we can have on the world around us. Too often, people try to change complex systems using extrinsic motivators such as rewards or punishments. However, research has shown that these sorts of motivators are generally ineffective in the long term. Instead, people are more likely to successfully change a system if they are driven by deep intrinsic motivation. This may be a passion for justice, a desire to make the world a better place, or a commitment to excellence. Whatever the form, this sort of intrinsic motivation is essential for sustaining the long-term effort needed to change a complex system. Indeed, changing a complex system can be a lifetime's work, and those who undertake it must be driven by more than mere self-interest. Only by tapping into deep intrinsically motivators will they be able to sustain the necessary dedication and commitment.

Trying to achieve success without first understanding what it is you are trying to achieve is like putting the cart before the horse.

It's much more effective to invest the time upfront to get clear on your motives and objectives, as this will serve as a compass to help guide your actions and decision-making. This is not to say that you won't face obstacles and challenges along the way - we all do. However, if you keep your eye on the prize and maintain alignment with your original motives, you'll find that these stumbling blocks are simply part of the journey. The key is not to give up when things get tough, but rather to adjust your sails and course correct as needed. After all, the road to success is rarely a straight line. So, embrace the detours, setbacks, and failures as simply part of the process— after all, each one brings you one step closer to your ultimate goal.

We all face obstacles in life, whether it's a personal goal that seems out of reach or a professional challenge that seems insurmountable. It's easy to get discouraged and give up when we encounter these obstacles. However, if we can maintain a connection to something larger than ourselves— whether it's our community, our country, or the world— then we can find the strength to overcome these challenges. When we are motivated by a higher purpose, we are more likely to keep trying even when things are tough. We may not always succeed, but by remaining connected to something bigger than ourselves, we increase our chances of ultimately achieving our goals.

Traditionally, leadership is focused inward, on control and efficiency. Systems change, on the other hand, requires a focus on collaboration and relationships. Leaders need to be able to build trust and partnerships with people inside and outside their organizations. They also need to be comfortable with ambiguity and uncertainty. Because systems are complex and ever-changing, there is no one right solution. Leaders must be able to embrace this uncertainty and work with others to find creative solutions that meet the needs of all involved. In short, the kind of leadership needed for systems change is much different from our traditional conception. It requires a focus on collaboration, relationships, and creativity in the face of uncertainty.

Most people think of leadership as a position of authority, but this is only one kind of leadership. Systems leadership is significantly different from business leadership, and it is becoming increasingly important in our rapidly changing world. A systems

leader is someone who shows leadership qualities, regardless of their position or title. This is especially important in times of change, when the traditional leaders are often the ones who are most invested in the past. In order to create lasting change, we need leaders who are willing to think outside the box and challenge the status quo.

Economist Professor Banergy explains that the first paradigm of leadership, leadership 1.0, is marked by the ability to execute as exemplified by the military leader or the role of the CEO. In contrast, leadership 2.0 requires understanding humans and experiences to create change. He pauses to note that while leadership 1.0 is about control, leadership 2.0 is about influence. He goes on to say that leadership 3.0, the future of leadership, is about co-creation, which he sees as the ultimate form of democracy. He describes it as a process in which all stakeholders have an equal say in decision-making, and he believes that this type of leadership is essential for system change. The quest for us as systems leaders is simplicity, not on this side of complexity, but on the other side. He describes a key capacity of this leader as the ability to create a certain kind of innovation capacity in this system that is currently lacking. It is about enabling others to deal with the scale and complexity of challenges. In this context, the system's leader's job is to make sure that people arena able to see problems from different perspectives, that they have the necessary skills to engage in creative problem solving, and that they are motivated to do so. This requires creating an environment in which people feel safe to take risks, experiment, and learn from failures. It also means providing the resources and support needed to turn ideas into action. only then can we hope to meet the challenges of our time with the kind of creativity and ingenuity that is required.

As society becomes more and more complex, it is essential that we have systems leaders who can help us see the larger picture. These leaders need to be able to create a space for new ideas to form and take root. In order to do this, they need to have an emptiness within them – a space where anything is possible. This may seem like a tall order, but it is precisely this quality that makes a true leader. Without it, we would be stuck with the same old ideas and ways of doing things. With it, we can move forward into the unknown and create something truly special.

Systems change requires creativity and liminality. The creative process can be a mystery. It's often hard to say where inspiration comes from or how exactly an idea takes shape. However, there are some general principles that can be applied to any creative endeavour. First and foremost, it's important to create space for creativity to emerge. This means setting aside time for brainstorming and letting go of any preconceived notions about what the outcome should be. Once you have a general idea of what you want to achieve, it's time to start experimenting and taking risks. Trying new things is essential to the creative process, even if it means making mistakes along the way. Ultimately, the goal is to produce something original and meaningful that can add value to the world. By following these steps, you can increase your chances of success in any creative endeavour.

In between spaces. That is what liminality is all about. It is the space in-between two worlds. It is the space of transition. And it is in this space that transformation takes place. We all find ourselves in liminal spaces at different times in our lives. When we are transitioning from one phase to the next. When we are moving from one job to another. When we are leaving one relationship and embarking on another. These are all times of transition, and liminal spaces are where these transitions take place. In these spaces, we pause and reflect and wait for the next thing to begin. The same applies to systems change— if you find yourself in a liminal space, embrace it. Embrace the change that is happening about to happen, take this opportunity to really understand and prepare for the approaching period of transition.

In our rapidly changing world, it is more important than ever for leaders to have a systems mindset. Systems leaders are unafraid of the unknown and recognise that points of intervention can be found in any system. They combine a will to understand systems with a recognition that they will always have to take action without complete knowledge. This enables them to function successfully in the face of complexity and make positive change happen. When faced with a problem, systems leaders ask not only 'what is the problem?' but also 'what system created this problem?' and 'how can we change the system to prevent it from happening again?' They are constantly learning and evolving, and their open-mindedness and willingness to experiment means that they are always at the forefront

of change. If we are to create a better world, we need more leaders with a systemic mindset.

We should only be changing a system if it is systemically dysfunctional. And the system itself is not dealing with that core contradiction. There is nothing wrong with a dysfunctional system or one that has contradictions. Our world is not perfect. All systems have failures and contradictions. The question is whether they are working to resolve those issues and the system's level of engagement with the people it was designed to serve. If a system is not serving its people, then it needs to be changed.

Changing Narratives

In a world where dominant systems are constantly trying to silence marginalised voices, stories have the power to shape how we understand the world, our place in it, and our ability to change it. They can make prop up and bring down systems. It is through language that we build our shared understanding and culture evolves. It's the narratives that we tell ourselves and the narratives that we tell each other that actually create the world. Stories have always been used as a tool for resistance, for survival, for hope. In a world that is constantly trying to erase us, storytelling is one of the most powerful tools that we have.

Stories have always been an important part of human culture. They help us to make sense of the world and our place in it. Over time, our understanding of the world has become more complex, and we have increasingly turned to stories to help us navigate this complexity. The rise of agrarian societies was a significant milestone in this process. For the first time, humans began to live in close proximity to the land, and our myths began to reflect this new relationship. We glorified the land and highlighted the seasonal and daily rhythm of life. This close connection to the land helped to shape our understanding of the world and our place in it. Today, we continue to use stories to give coherence to the complex world around us. institutions are largely just stories that we share. By understanding the role that stories play in shaping our lives, we can better appreciate the importance of institutions in shaping our world.

As humans have settled into cities and built institutions, they have created myth to imbue these places with new values. On a

cultural level, the stories we live in and tell about our world justify the status quo, make certain solutions seem legitimised and inevitable, and make our world feel preordained. In reality, though, it is largely the story that adds these attributes. We can change our future by simply telling different stories. If we want to change a system, create a different world. We are going to have to have a coherent story about the new possibilities as such the output to a vision should be a story that is both aspirational and realistic, which will engage and ignite change. It has been said that those who do not learn from history are doomed to repeat it. This is especially true when it comes to the future. If we want to create a future that is different from the past, we need to tell stories that reflect our desired future, rather than repeating the stories of the past. When we tell new stories, we create new possibilities. When we share these stories, we inspire others to do the same.

System change is a daunting task. It requires not only a deep understanding of the problem at hand, but also a clear vision for how things could be different. Without a shared story, it is all too easy for people to become discouraged and give up. This is why stories are so important in the process of system change. A good story can inspire hope and provide a sense of direction. It can help people to see the potential for change and feel connected to something larger than themselves.

In a rapidly changing world, it can be difficult to make sense of our experiences and understand the underlying forces that shape our lives. We are bombarded with information from a variety of sources, and it can be tough to sort out what is important and what is not. Our rational minds can often seem like they are working against us when we try to make changes in our lives. We may set goals for ourselves, but then find that we are unable to stick to them. We may want to change our values or mindsets but feel like we are powerless to do so. The story of our lives is foundational to our sense making process. It provides us with a framework for understanding the world around us and helps us to make meaning of our experiences. In the 21st century, the rise of the anthropocentric perspective has led to a greater focus on individual experience and personal narratives. This has made sense making more complex, but also more important than ever before. As we navigate the ever-changing landscape of the 21st century, it is essential that we strive

to make sense of our experiences and understand the stories that shape our lives. It's true that the world is a complex place, and our old stories are no longer suffice. We feel overwhelmed and the world falling apart because we lack a direction. It's scary when we don't have a sense of control, but we can't give up. We need to find new stories that will help us make sense of this uncharted territory. These new stories will give us the direction we need to navigate through these difficult times. They will help us to find meaning and purpose in our lives. So, don't give up, even when it feels like everything is falling apart. There is hope for a better future, if we're willing to create it.

We all have stories that we tell about ourselves. They may be small stories, like what we did last weekend, or bigger ones, like where we grew up or what our parents do for a living. These stories help to create our identity— they are the things that make us who we are. But where do these stories come from? In order to create an identity, there must be a fertile ground of connectivity and shared experience. This can come from many places— our family, our friends, our culture, our religion. It is the story that builds upon that to give it coherence. Our identities are not static; they are constantly changing and evolving as we experience new things and meet new people. But at their core, they are the stories that we tell about ourselves.

The world today is more connected than ever before. People from all corners of the globe can now communicate and share experiences with ease. This has led to the rise of a new global middle class. This group is defined not by its wealth, but by its shared values and worldview. The members of this new class are united by their belief in the power of education, hard work, and opportunity. They are also committed to making the world a better place for future generations. Despite their differences, they see themselves as part of a global community that is bound together by a common sense of purpose. In order to meet the challenges of the 21st century, it is essential that we continue to connect with people across old divides.

In a divided world, stories have the power to bring people together. By sharing our experiences and perspectives, we can build empathy and understanding for others. Stories can also help us to see the world from different viewpoints and find common ground. When we come together to share our stories, we can create a more

compassionate and connected world. We have to be careful in creating our narratives so that they do not leave out anyone who needs to be a part of the change process. As OT Sharmer notes, narratives in their different forms can help us see ourselves and understand our commonalities better by holding a mirror up to a group of people. This is especially important when we are trying to create change, because we need everyone on board in order to make progress. If even one person feels left out or excluded, it can hinder our efforts. So, it is crucial that we take care in crafting our narratives- ensuring that they are inclusive and represent the diverse perspectives of all those involved. Only then can we hope to create true, lasting change.

Data provides the evidence that helps us understand what is happening in the world around us. It allows us to see patterns and trends that would otherwise be hidden. The more data we have, the more accurately we can understand the world. Deep data is data that goes beyond superficial appearances to reveal underlying principles. It is data that is collected over time, from multiple sources, and with great care. Deep data gives us a more complete picture of the world and allows us to make better decisions. When deep data is used wisely, it has the power to transform our institutions, our societies, and our planet.

The ability to communicate has always been a fundamental human need. Over time, the methods of communication have evolved from spoken word, to writing, to print, to film and television. Now, with the advent of digital technologies and a global telecommunication infrastructure, the tools we have at our disposal for telling stories and communicating a message are quite profound. We have the potential to reach billions of people with our stories and messages, and this gives us a great deal of power to change systems. It is up to us to use this power wisely. With great power comes great responsibility. We must use our new tools wisely, in order to make the world a better place for all.

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