Systems Innovation Concept Cards

Overview

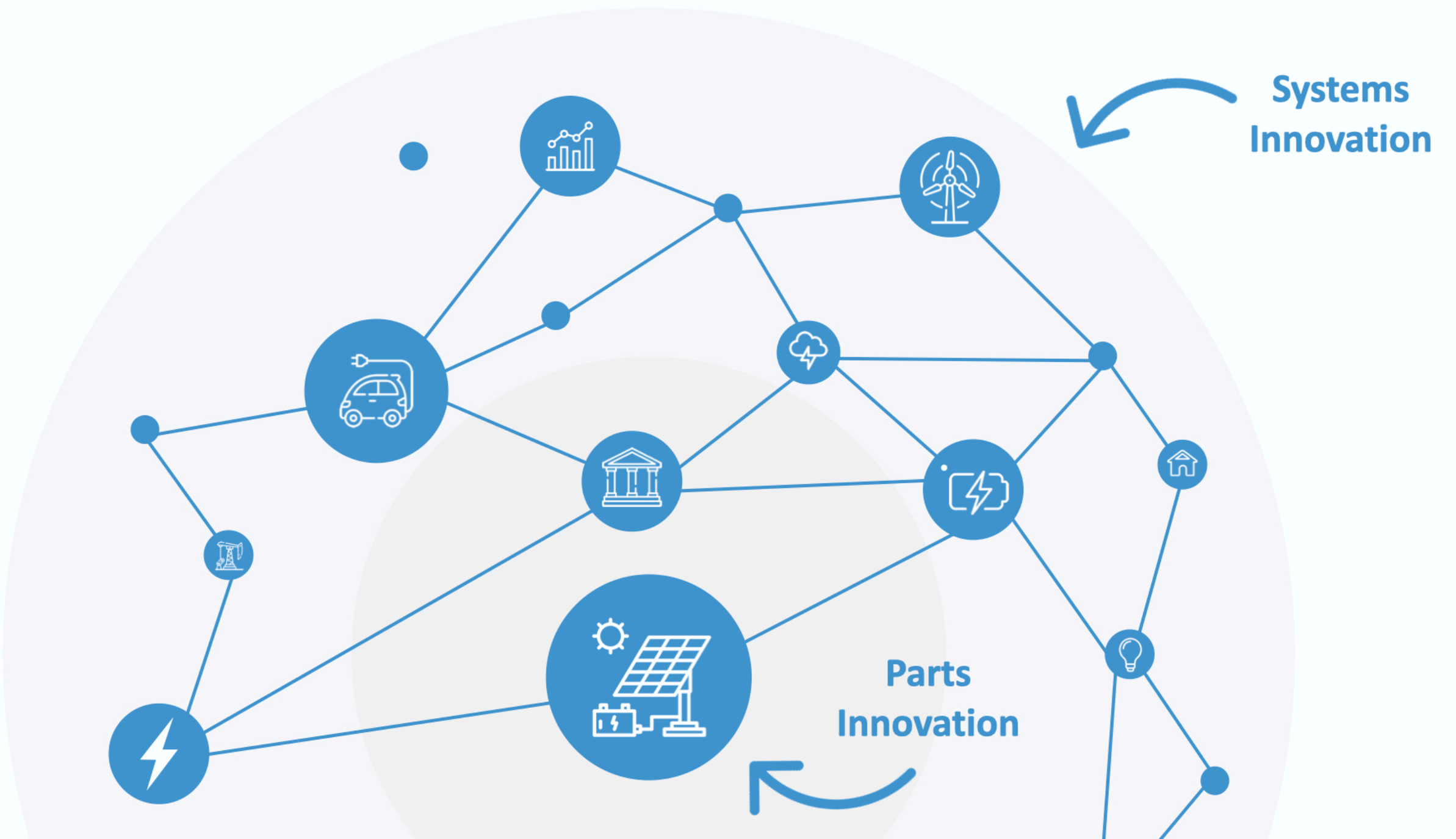
Concept Cards are a way of taking complex topics and decomposing them into simple examples that can be used to illustrate the principles needed to master the topic. The Si Carts are a set of cards that will help you learn or teach the key concepts and methods in systems innovation. Each card is designed to clearly summarise the concept while also visualising it graphically - to enable maximum learning.

Principle
1

Systems Innovation

Systems innovation is a holistic approach to innovation that works to change not just the parts of a system but also the overall system structures. It seeks to understand and change the ways of thinking and patterns of organizing that give rise to a dominant paradigm within a system and thus enable a more transformative kind of innovation.

Systems innovation is a nonlinear approach to change that tries to move away from linear approaches that center around identifying and changing the direct causes of an issue. It instead works with trying to change the context out of which a given challenge emerges. This is typically done by applying systems thinking to become better aware of the system; using systems mapping to understand the factors and interrelationships; identifying high leverage points to intervene while working to develop and connect new innovations into an ecosystem.

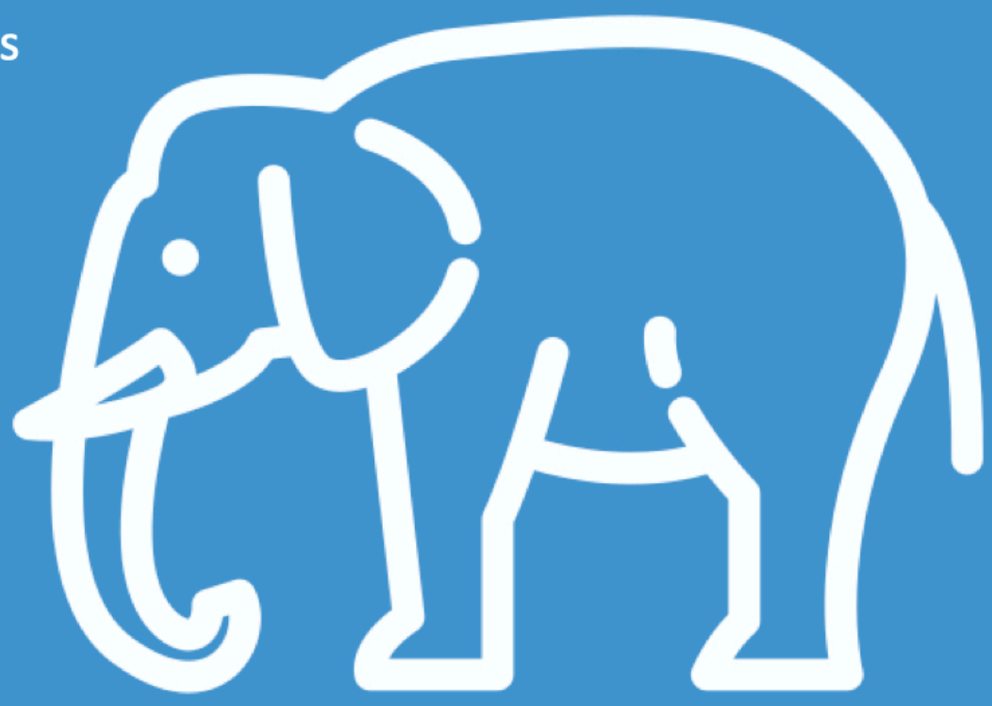


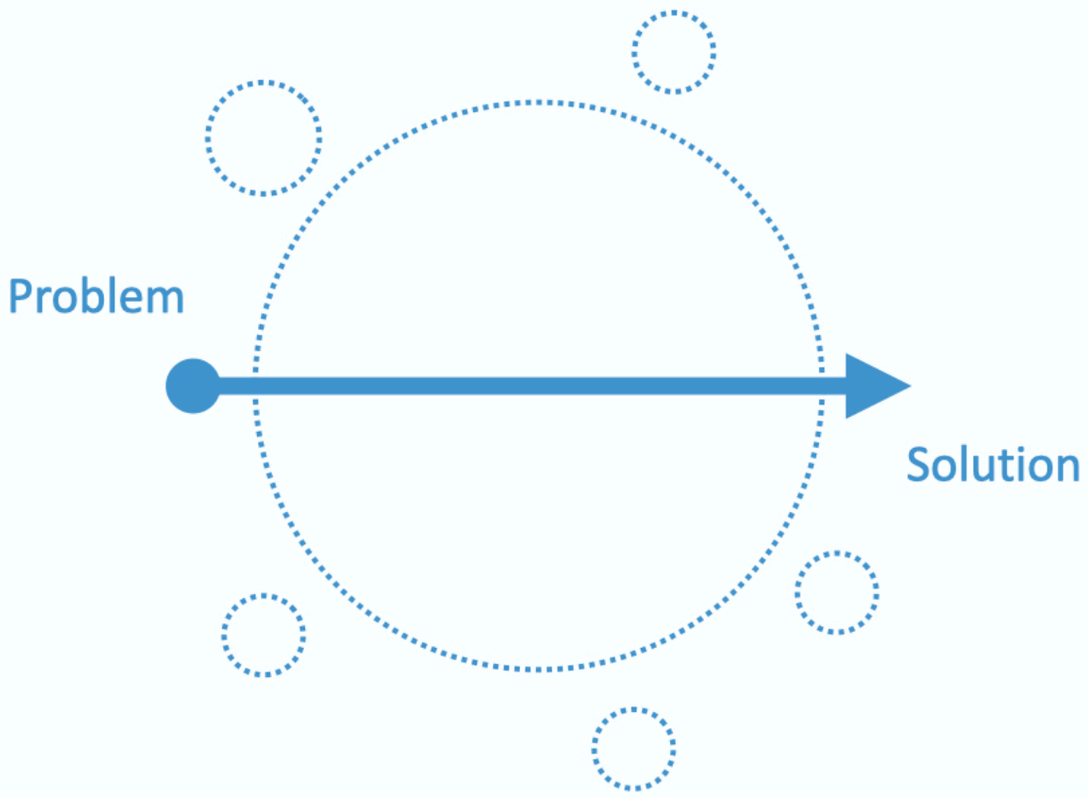
Principle
2

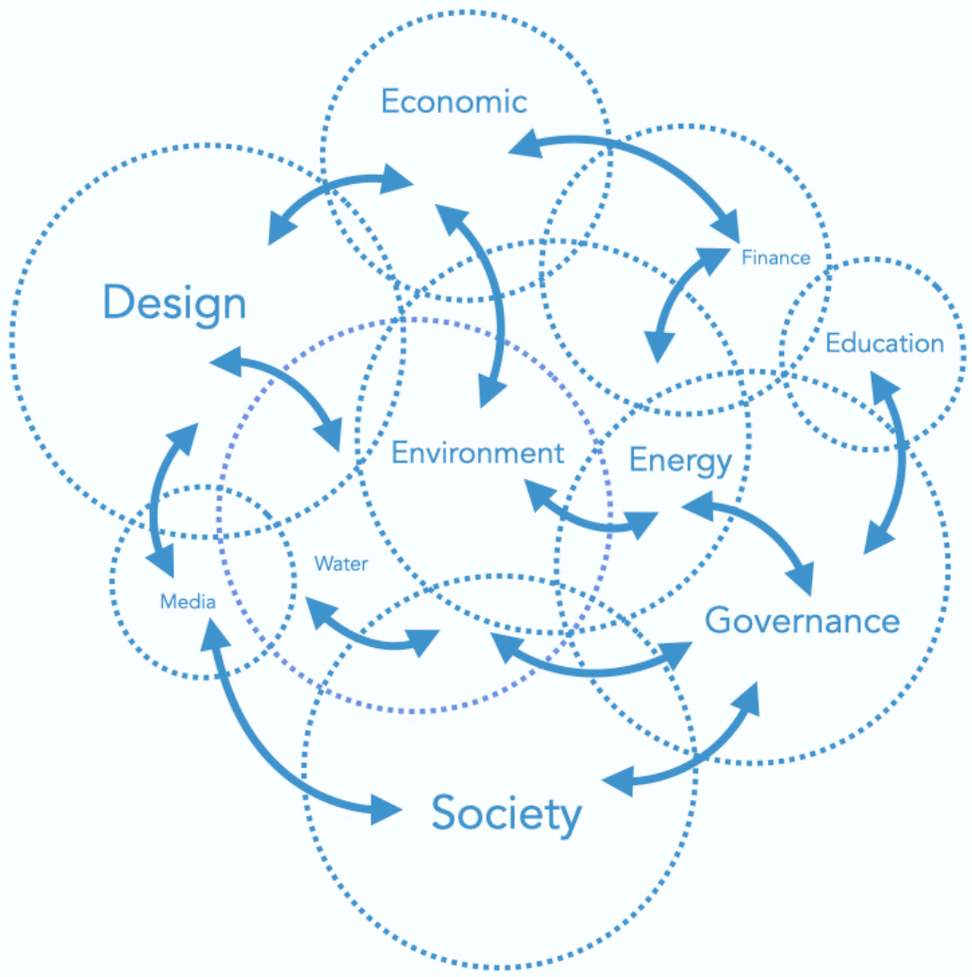
Wicked Problems

Wicked problems are highly complex issues that are systemic in nature, emerging out of the way a complex system is organized and how the actors, think, act and interact. Wicked problems are unstructured, they involve multiple perspectives on the nature of the problem and solution, they are open-ended, multi-dimensional, systemic, and may have no known solution.

Examples of wicked problems include; cybersecurity, international terrorism, migration, climate change, and biodiversity loss. These challenges are created by complex adaptive systems and continuously recreated through the ongoing choices, actions, and interactions among numerous actors within large networks. Because wicked problems are emergent and systemic they are not a product of one part of the system nor can be solved through linear approaches but require nonlinear systemic approaches.







Tame Problems

A problem with one part of the system that can be isolated & fixed

Wicked Problems

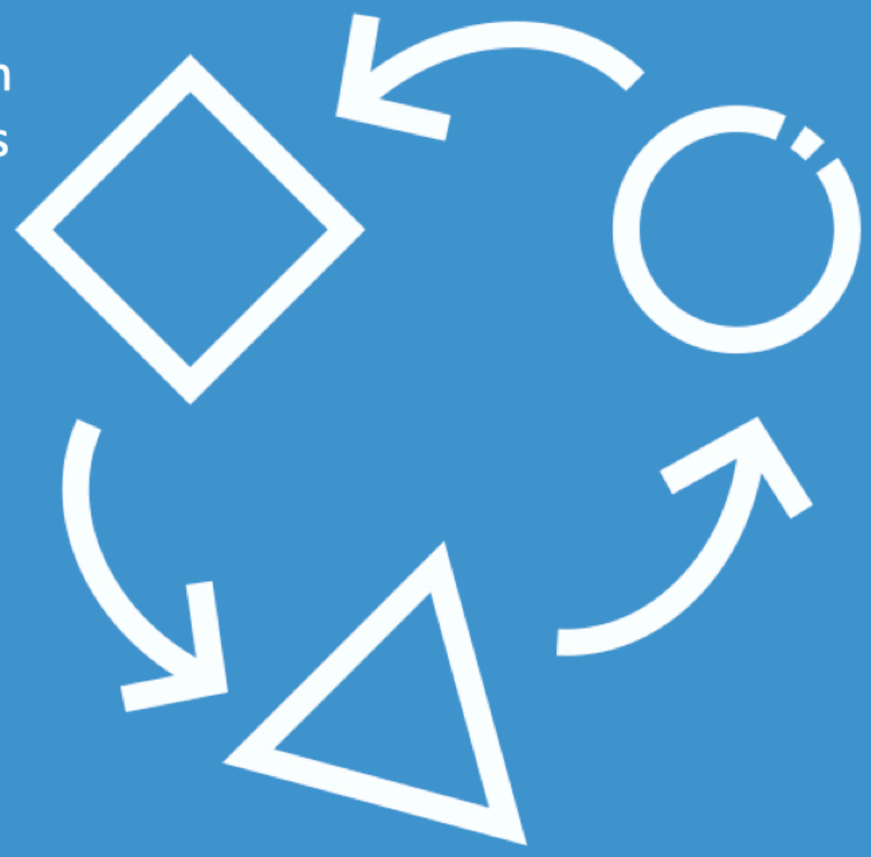
Issues that are emergent & systemic, thus require changes in the system's structures

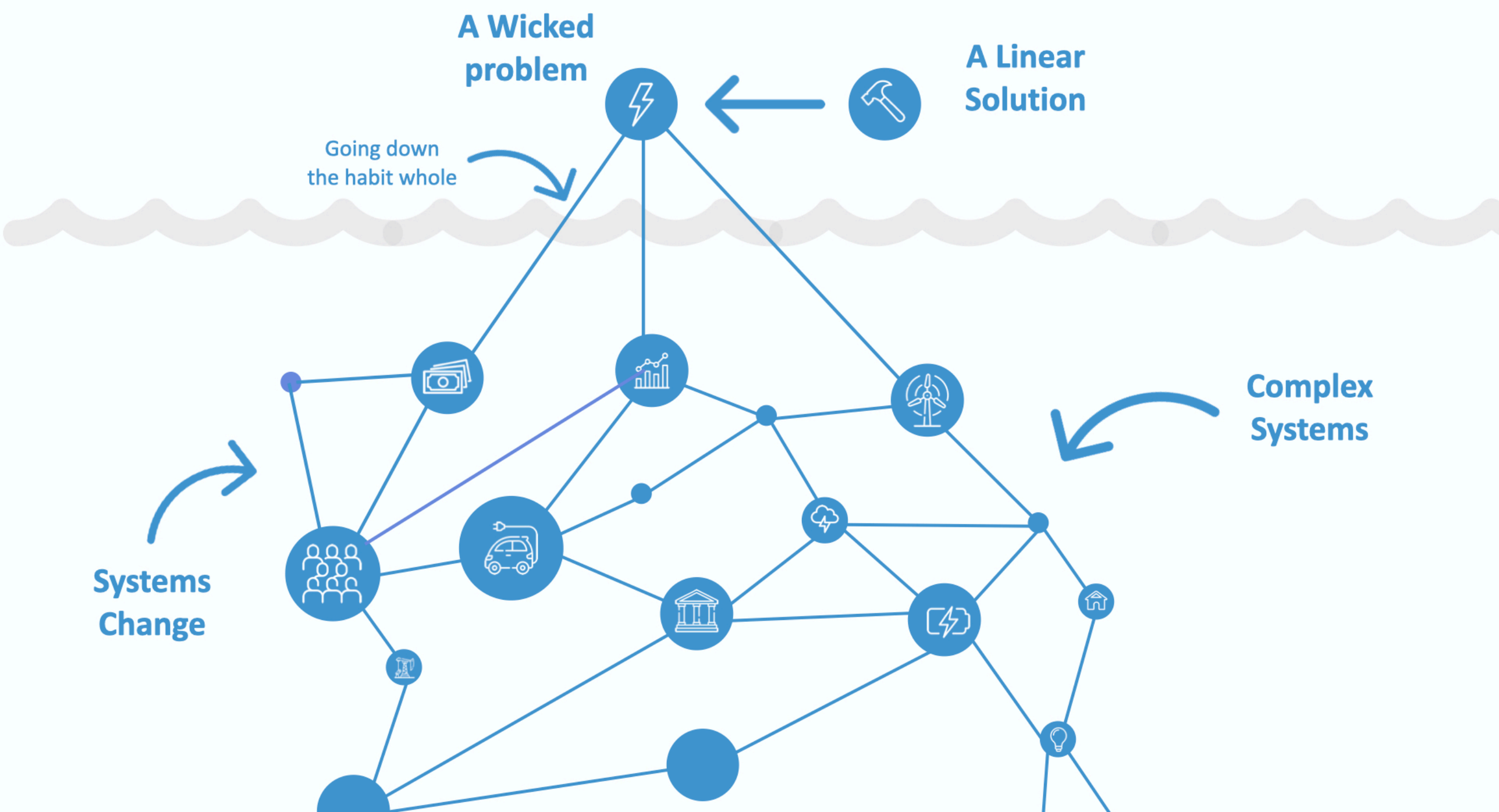
Principle
3

System Change

System change is a change in the pattern of connections and the way that a system is organized to fulfill its function. Systems change typically involved changes in values and mental models through which the actors within a system are understanding what the system is and does. These changes in values and thinking result in new ways of valuing and new value flows; new connections and patterns to the flow of information and communications; new rules and changes in who is included in the rule-making.

Examples of systems change would include; shifting from a fossil fuel-based linear electric grid to a networked, renewable, cooperative power grid; the shift from a teaching-focused industrial age education system to a learner-centered paradigm to education; from traditional design methods to co-design approaches; moving from traditional fortification approaches to cybersecurity to decentralized encrypted networked approach; shifting from a reductionist model to healthcare to integrated healthcare systems.



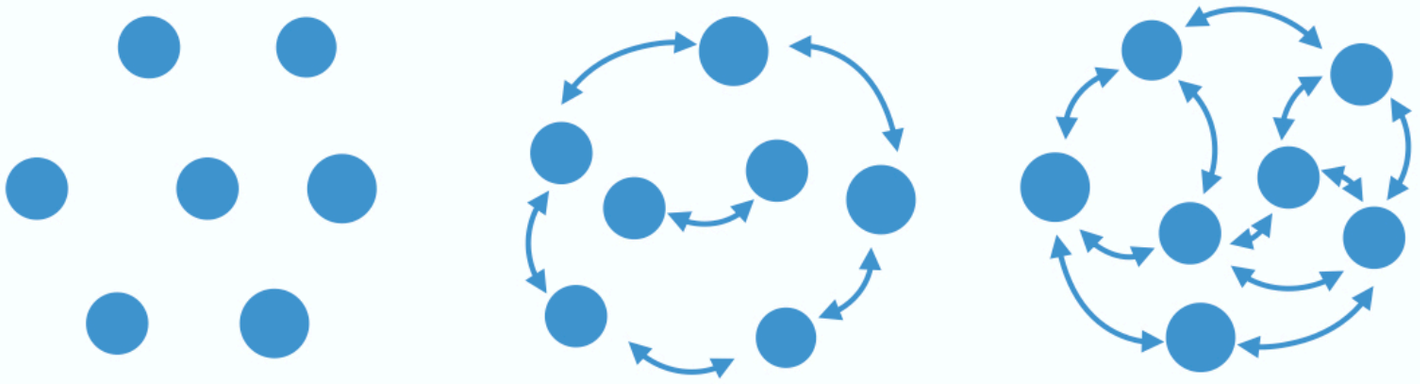


Principle
4

Nonlinear Change Theory

Theories of change describe the underlying assumptions, thinking and planning supporting a change initiative. Linear theories of change describe how to achieve a specific goal through a finite set of stages and are based upon the assumption that the system is relatively knowable predictable and controllable. Thus specific actions can be taken to directly change the parts in the system through cause-and-effect linear relations.

A nonlinear approach to change does not try to directly alter any of the parts in the system but instead works by trying to change the context within which the parts exist to enable a change in thinking, in the connections and patterns of organization. A nonlinear approach does not try to specify outcomes but invests in changing the system's structure by creating new connections, alignment between the parts, integration, and synergies so as to realize the emergence of a new overall state in the system.

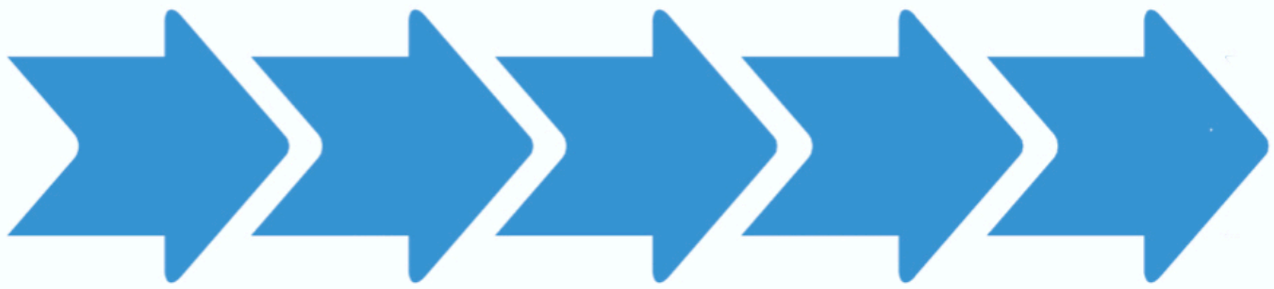


NonLinear Approach

Coordination and integration across a network to realize the emergence of new structures and outcomes.

Linear Approach

Planning the change according to a set of stages & based on assumptions that the system is predictable & controllable



Key Principles of Systems & Complexity

Holism

Reflexivity

Perspective

Dimentionality

Synthesis

Emergence

Self-Organization

Nonlinearity

Transitions

Integrative Levels

Systems & Complexity Cards

Connectivity

Interdependency

Synergies

Networks

Decentralization

Adaptation

Cybernetics

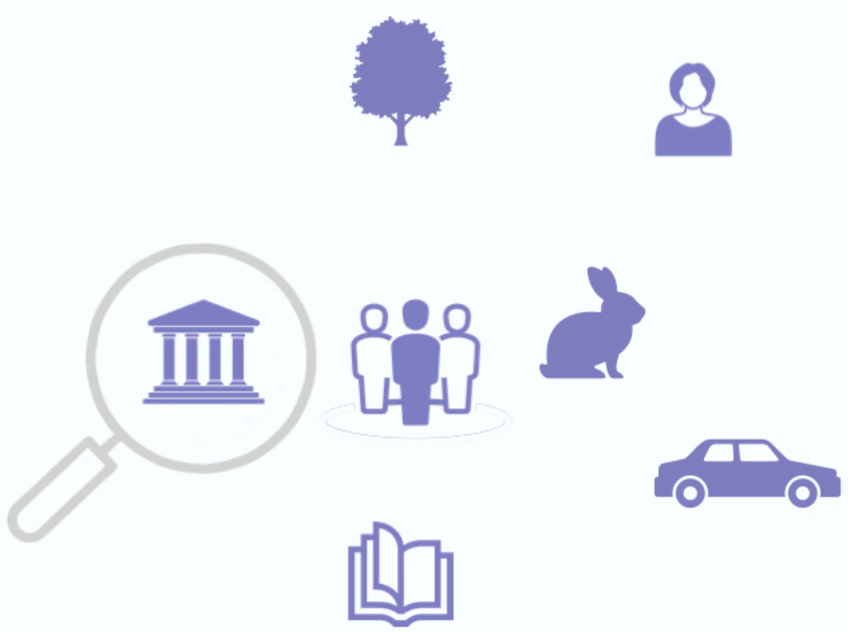
Game Theory

Evolution

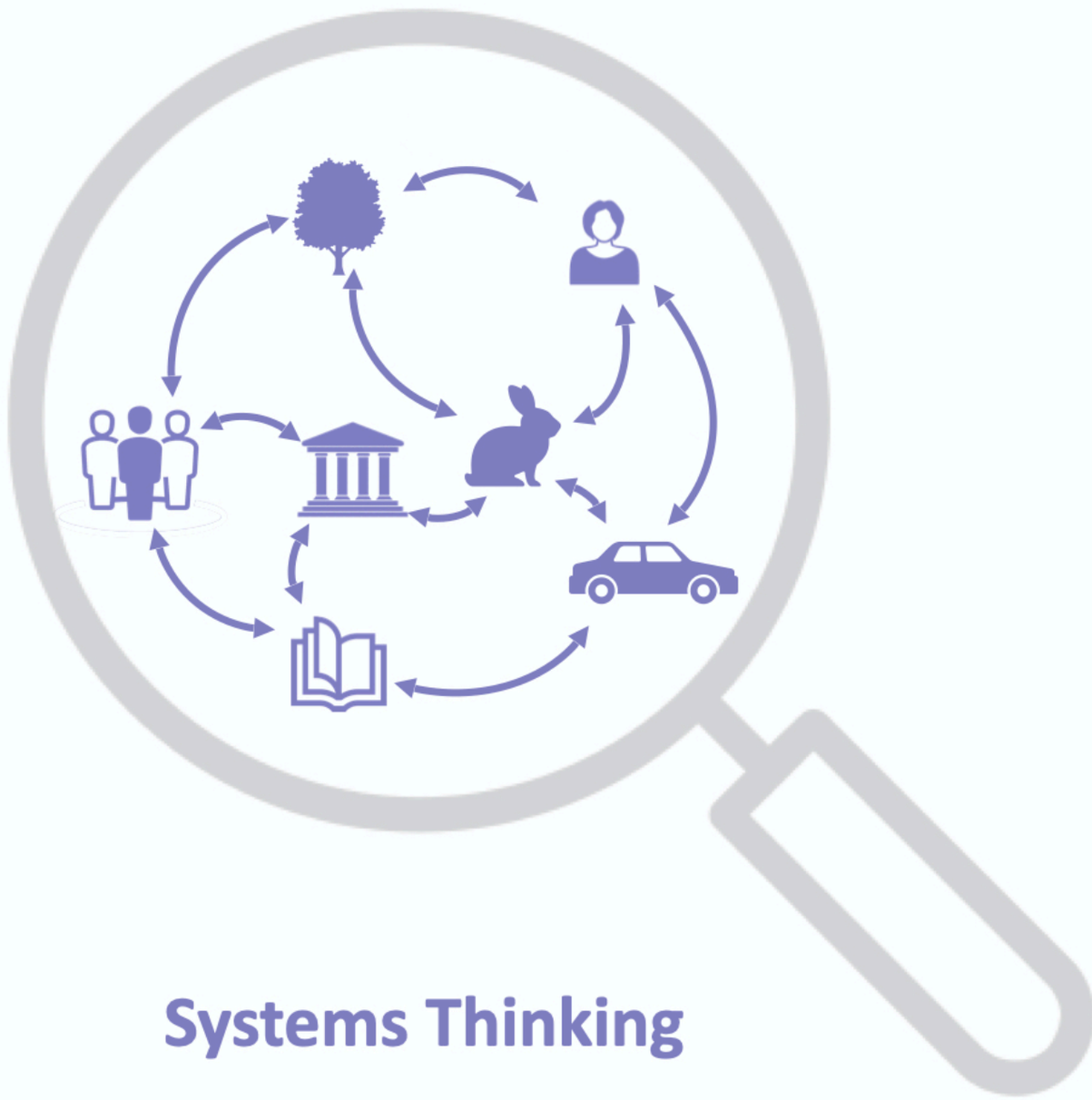
Resilience

Systems Thinking

Systems thinking is a very broad area that seeks to bring together the many different ways of thinking that are holistic in their interpretation of the world to balance and complement a more analytical view of the world. Holistic thinking seeks to understand phenomena as intimately interconnected and comprehensible with reference to the whole system or environment they form part of. Systems thinking is: A synthetic modes of reasoning that looks at what emerges when we put things together rather than taking them apart. It is nonlinear way of looking at the world that focuses on relations of interdependence and feedback dynamics. It is a relational paradigm interpreting things in the context of the network of relations they form part of. It is a dynamic way of looking at the world, understanding change in terms of nonlinear feedback processes that shape system structure and outcomes



Analytical Thinking

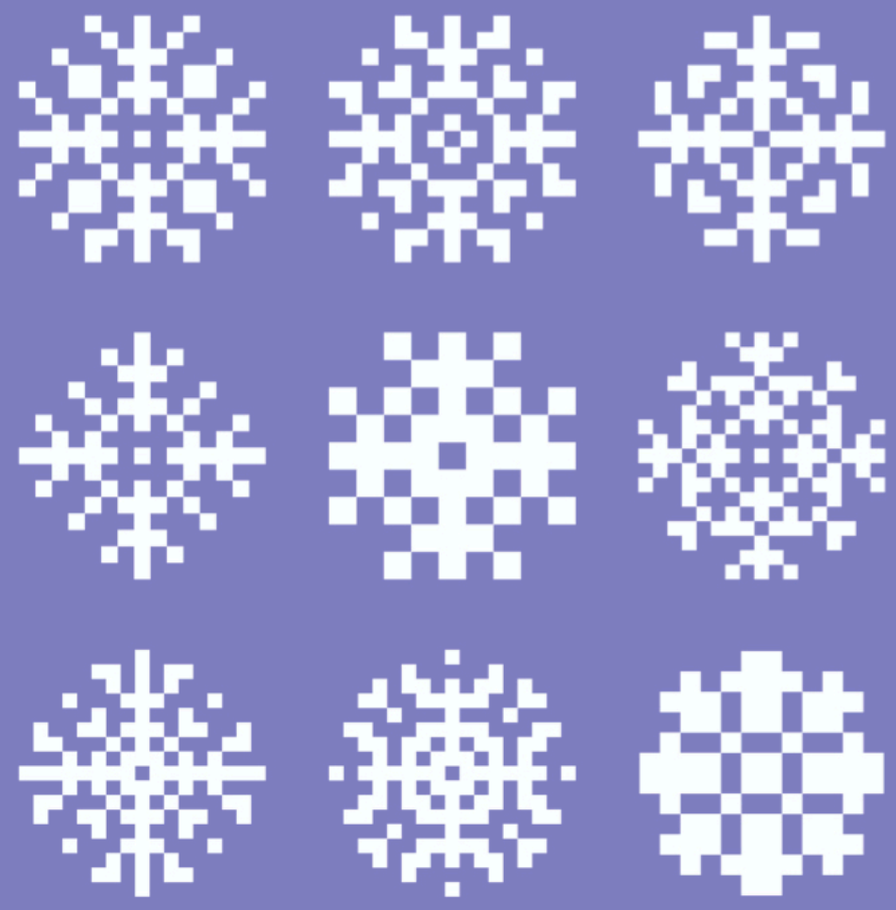


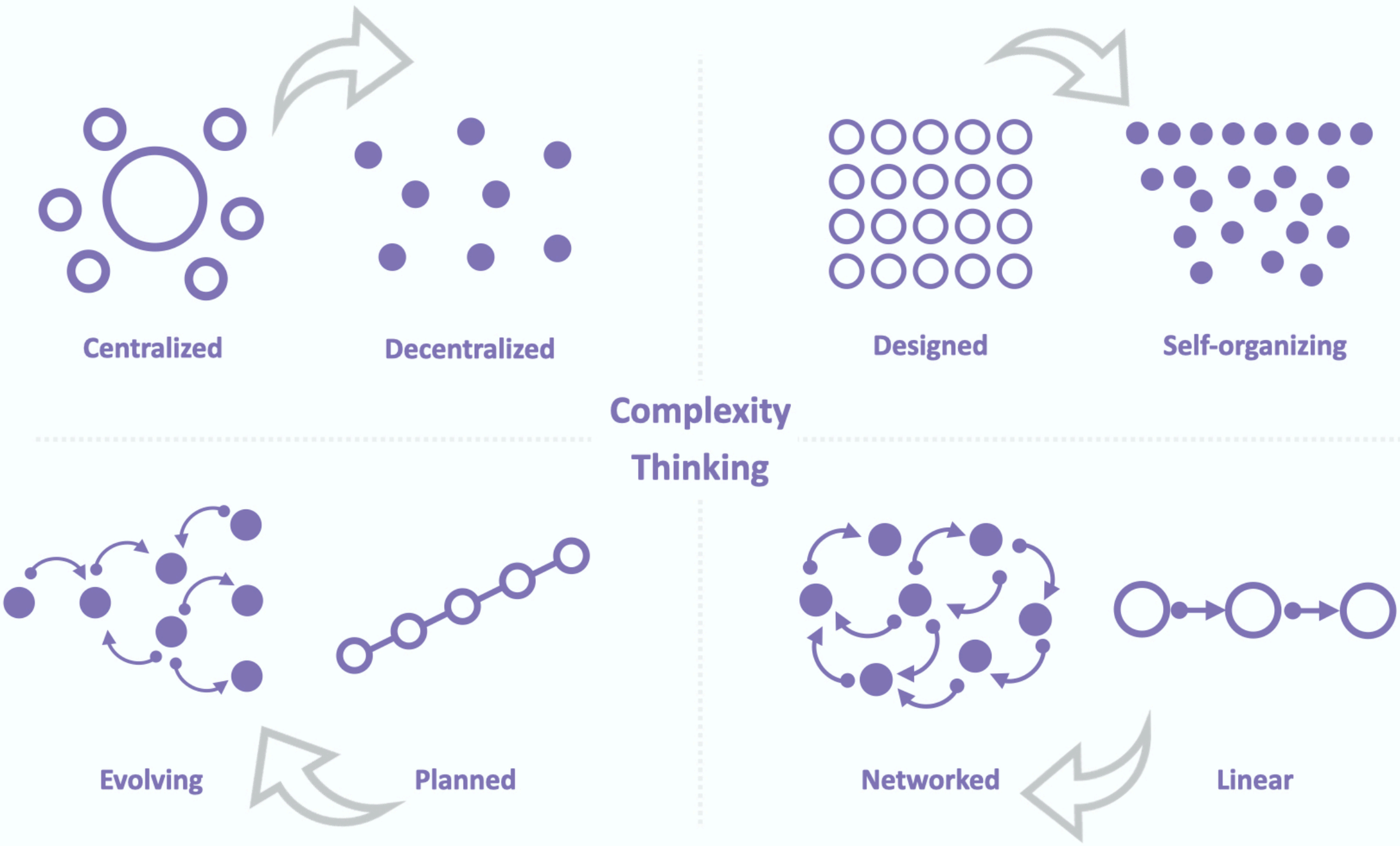
Systems Thinking

Complexity Theory

Complexity theory is a set of theoretical frameworks used for modeling and analyzing complex systems within a variety of domains. Complexity has proven to be a fundamental feature to our world that is not amenable to our traditional methods of modern science. As researchers have encountered it within many different areas from computer science to ecology to engineering, they have had to develop new sets of models and methods for approaching it.

Out of these different frameworks has emerged a core set of commonalities that over the past few decades has come to be recognized as a generic framework for studying complex systems. It can be understood as a composite of a number of major modeling frameworks that fall under its canopy including; systems theory; nonlinear systems; network theory; complex adaptive systems & self-organization theory.





Complexity

Complexity is a property of systems that have many diverse, and often adaptive, parts that are interconnected and interdependent in many ways to create emergent properties and dynamics. Examples of complex systems include conflict zones, cities, corporate supply chains, financial markets, or ecosystems.

All of these systems have a great many parts. These parts can have diverse properties, such as cultures or diverse creatures in an ecosystem. Elements likewise typically have adaptive capacity and network patterns emerge out of the local nonlinear interactions between the agents, such as traffic jams in a city.

Complex systems have the characteristics of being nonlinear with multiple feedback loops that allow for rapid change and make them unpredictable and highly dynamic. They are strongly defined by their network architecture and change over time through evolutionary processes.

Simple System

A set of hexagon tiles is a simple system because there are few parts that are all very similar without adaptive capacity and connected in a simple fashion. Anyone can understand simple systems.

Complicated System

A truck is a complicated system with many specific parts and sub-systems that are interrelated in many very specific ways. One needs to be an expert to understand these systems

Complex System

The global biosphere is a complex system as it consists of many diverse adaptive parts that are all interdependent and adapting to changes. To understand these systems you need a large amount of experience and insight from different perspectives

Principle
1

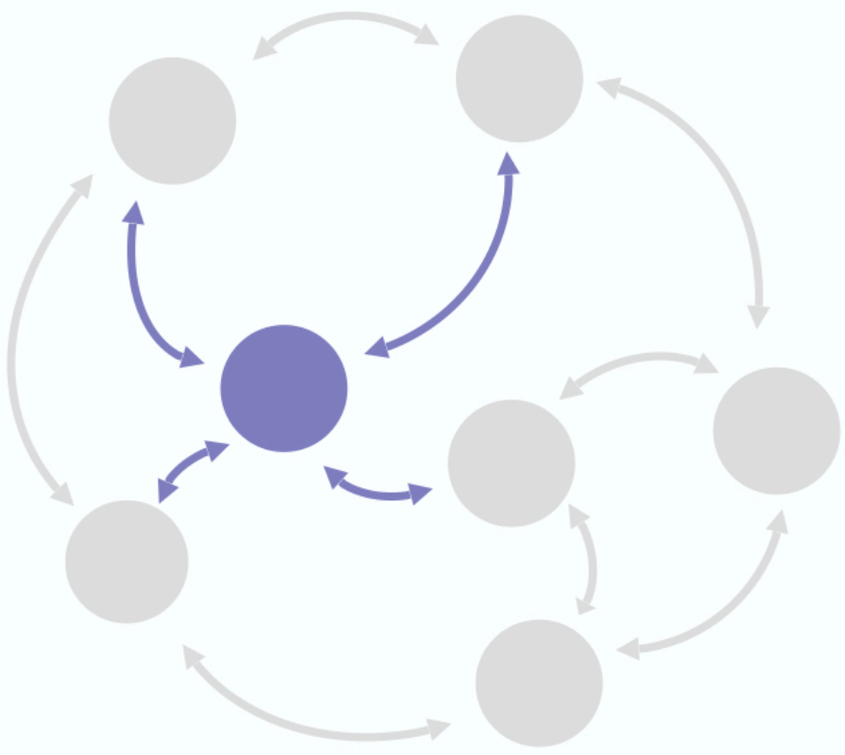
Holism

Holism refers to any approach that emphasizes the whole, rather than the constituent parts of a system. Holistic accounts of the world look for how an entity forms part of some larger whole and is defined by its relations and functioning within that broader system. What all holistic approaches have in common includes the principle that the whole has priority over its parts and the assumption that properties of the whole cannot be explained by the properties of its parts—the idea of emergence.

Within this paradigm, the ultimate sources of knowledge are seen to derive not from elementary component parts but, instead, from a reference to the system's broader context. Given that something can only be properly understood within its context, to gain a fuller understanding of something requires gaining a greater understanding of the environment or context.

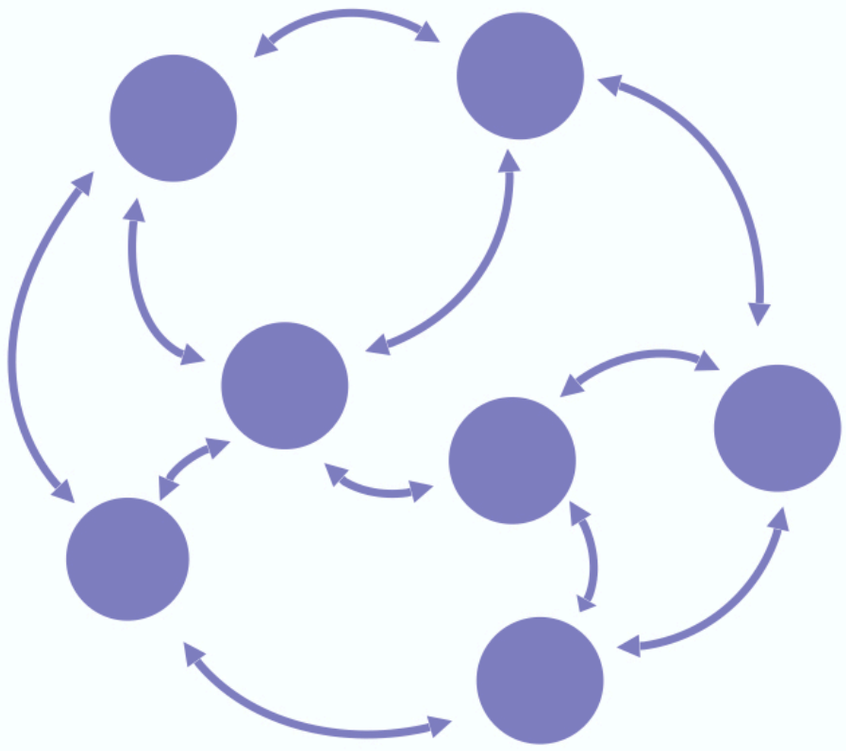
Analytical Reductionism

Reduce the complexity down by only focusing on the problem area, find the cause of it and change the cause to solve the problem.



Synthetic Holism

Expand outwards from the perceived issue to understand the structure of the system and the overall paradigm, then influence the parts and connections in the broader network to change the pattern.



Principle
2

Reflexivity

Reflexive thinking is about becoming aware of how our thinking shapes what we see, do, and thus the world we create. Systems thinking requires us to surface our paradigms and mental models so as to be aware of how they work, what they will enable us to see and how they will inhibit us in seeing other things.

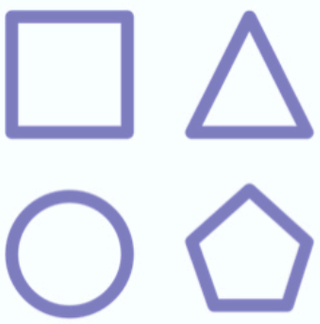
Being reflexive means examining and being aware of the assumptions we bring to what we do, that all of us hold opinions and preconceptions that are a product of what we have learned and our past experiences. Calling oneself a systems thinker is a commitment to an ongoing learning process of examining and trying to improve our mental models and thinking to become better at seeing systems. This starts with first understanding how we see the world, and the existing limitations of our thinking and assumptions.

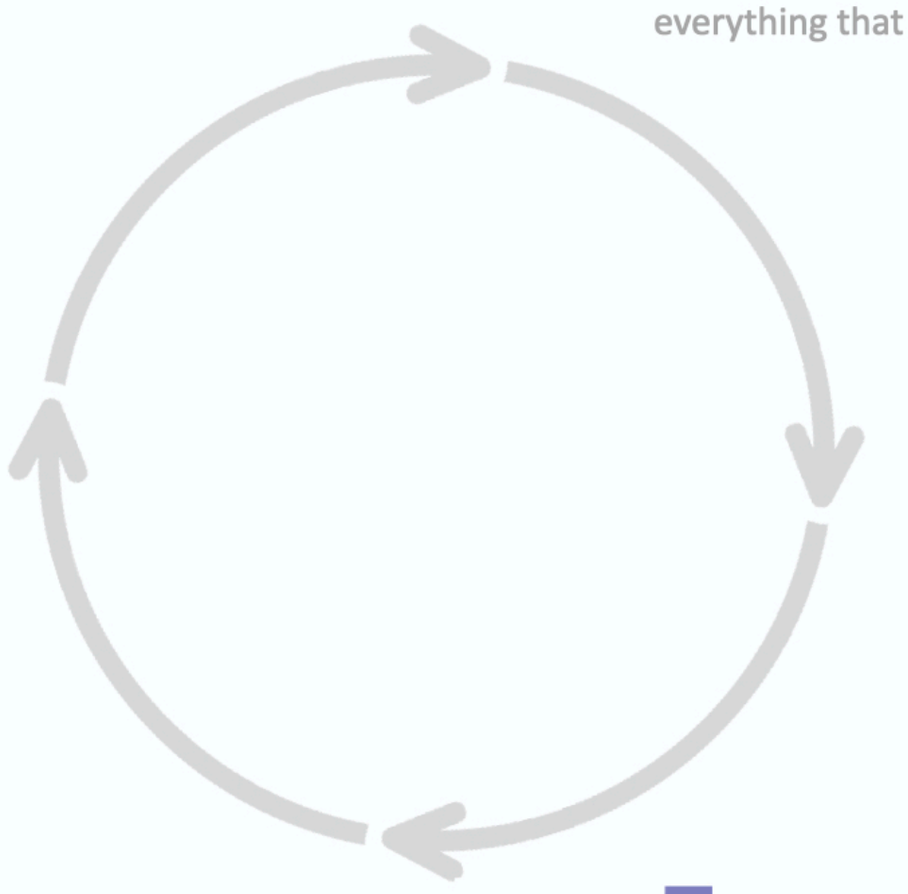
What We See

Our conceptual models shape everything that we see

Conceptual Models

Our paradigm shapes our conceptual models





What We Do

How we see the world determines how we act in it

The World We Create

Our actions create the world we live in which feeds back to shape our thinking again

Principle
3

Perspectives

Understanding and working with complexity requires that we build awareness through the synthesis of multiple perspectives. "A systems approach begins when first you see the world through the eyes of another.” This famous quote from Charles Churchman illustrates the need for us to be able to overcome our self centered view of the world if we wish to become systems thinkers and better understand complex systems.

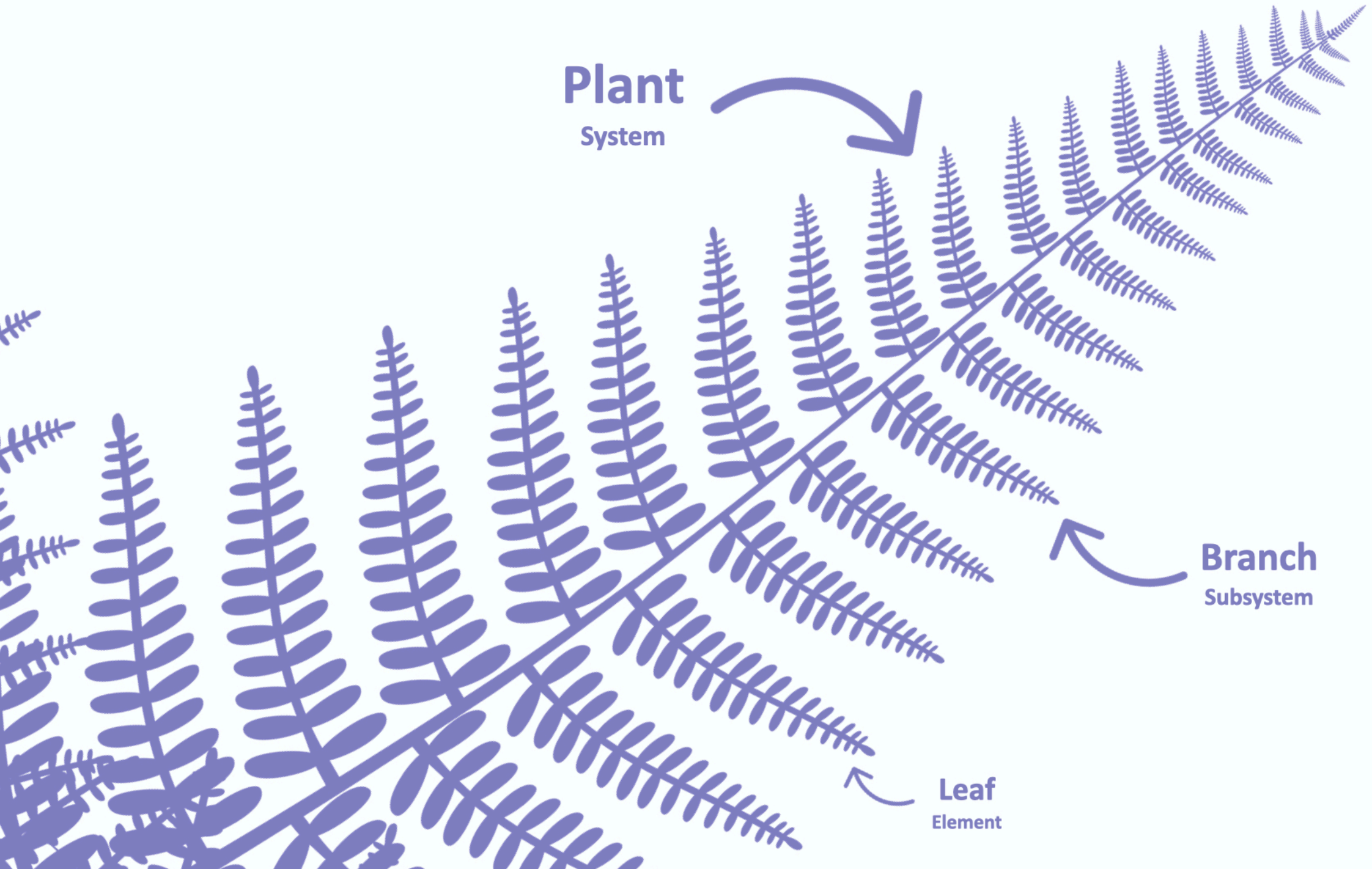
A greater understanding of complex systems can not be realized through gaining more expertise from one perspective but can only increase through the synthesis of multiple perspectives. From including more aspects we can move away form an eco-systems perspective to an “ecosystems" view of the world where we are able to better understand ourselves as part of many complex adaptive systems

Principle
4

Dimensionality

Multi-dimensionality refers to the nature of systems having multiple different patterns of organization across space and time horizons that form different paradigms. Working with complexity requires that we recognize these different frames of reference and their diversity.

While reductionism aims to reduce an account of reality down to a single dimension, systems approaches embrace the multi-dimensional nature of complex systems both in space and time. Systems thinking considers relationships among levels and their ordering according to emergent processes that form nested, multi-leveled structures. This emergent, nested structure can be found in virtually all complex systems such as patterns of governance where local administrations are nested within regions, nation, and global forms.

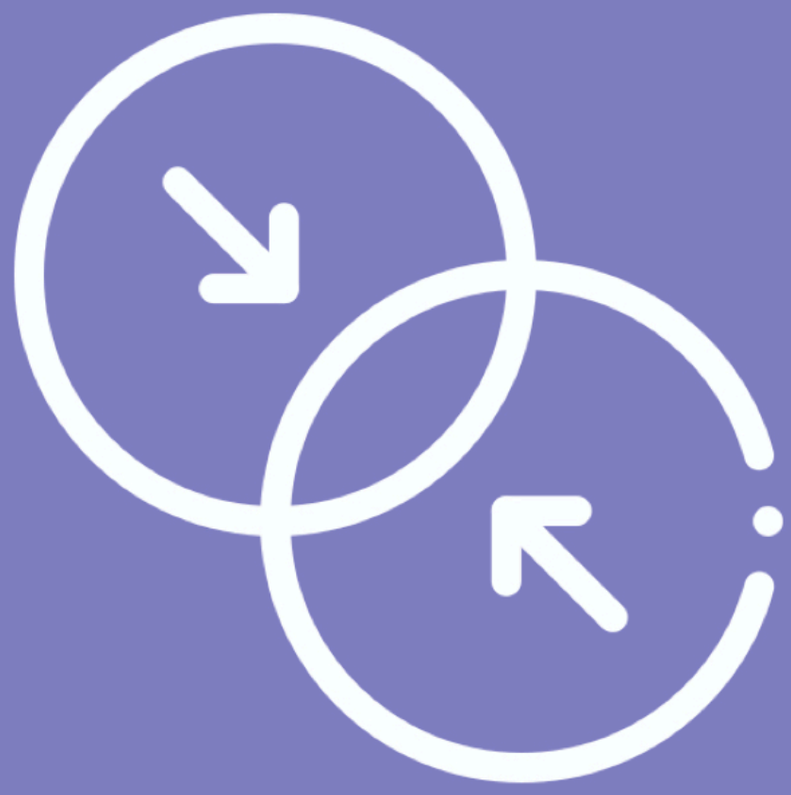


Principle
5

Synthesis

Synthesis means the combination of components or elements to form a connected whole. Synthetic thinking looks at the way the elements of a system are combined to form the functioning entirety. As opposed to analysis which breaks things down, this is a mode of thinking that reasons upwards to see what emerges when we put elements together. Synthetic thinking helps us to better understand emergent processes and the purpose of a system within its context.

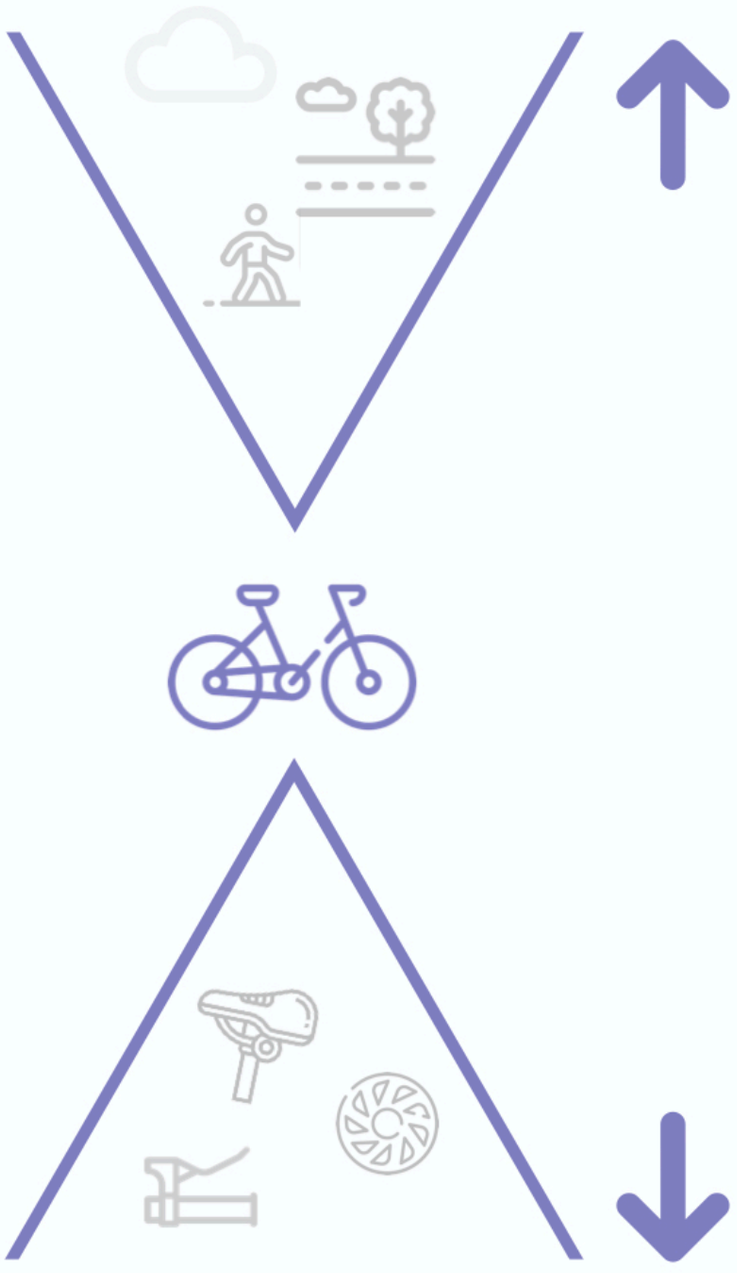
The first step in the process is to identify the system that our object of interest is a part of. Next, we try to gain a broad outline of how this whole system functions. Lastly, we try to understand how the parts are interconnected and arranged to function as an entirety. By completing this process we can identify the complexity of relations within which our entity is embedded, its place and function within the whole.



Whole

Shifting the Paradigm

Parts



Synthetic Thinking

Synthesizes parts to understand them with reference to the broader systems they form part of.

Is good for...

Understanding the “why"
Understanding context
Improving systems coordination
Transformational Change

Analytical Thinking

Reduces down to create an account of the whole with reference to the combination of more basic building blocks.

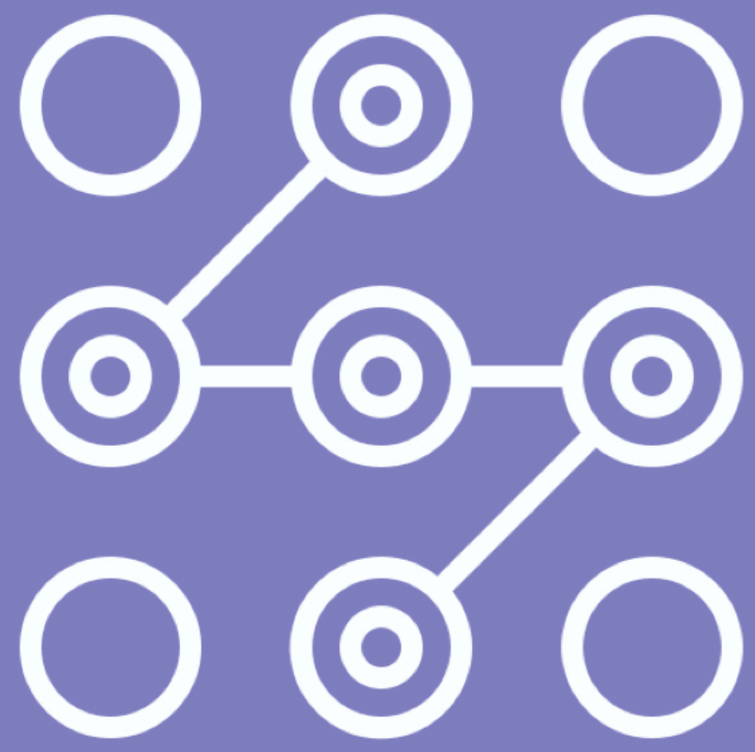
Is good for...

Understanding the “how"
Understanding internal workings
Increasing efficiency of parts
incremental improvements

Principle
6

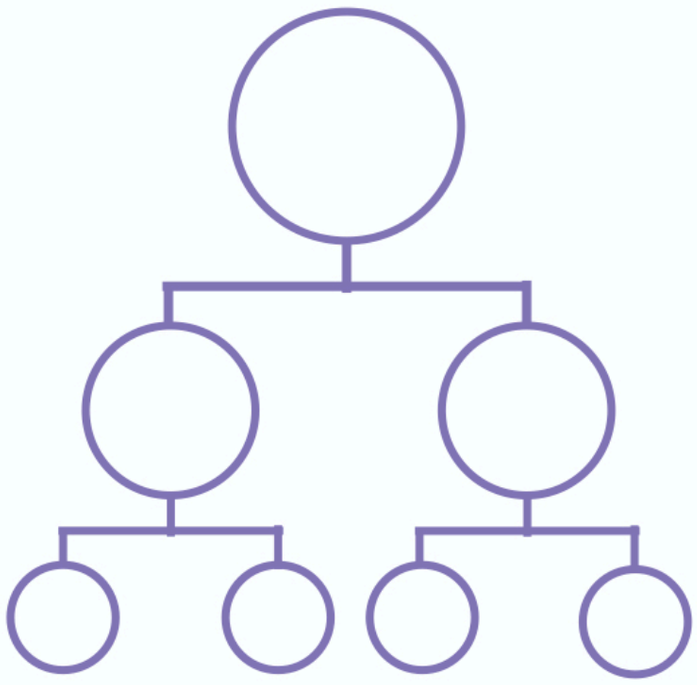
Emergence

Emergence is a term used in philosophy, art, and science to describe how new properties and features are created as we put things together. Emergence describes a process whereby component parts interact to form synergies, these synergies then add value to the combined organization which gives rise to the emergence of a new macro-level.



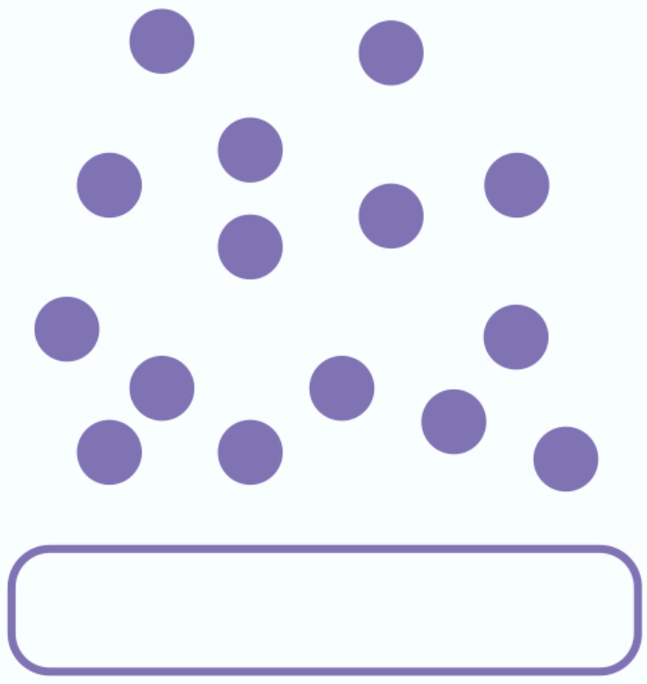
Because emergent properties are a product of the synergies between the parts, they cannot be observed locally in the subsystems, but only as a global structure or integrated network. In such a way emergence creates a system with two or more distinct and irreducible patterns of organization called integrative levels. Examples of emergent processes include the formation of hurricanes, social movements, traffic jams, and the flocking of birds or schooling of fish.

Emergent Thinking



Reductionism

Reductionism works to break systems down in to parts within hierarchical structures thus removing the possibility for understanding emergence



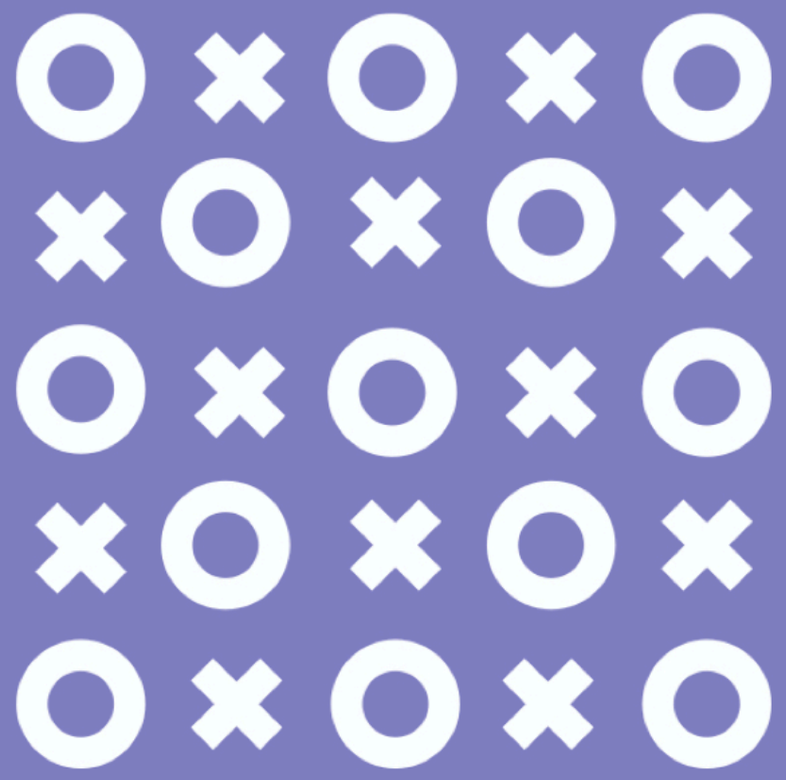
Emergence

Systems thinking looks at how small parts come together in a bottom-up way and thus helps us to better understand emergent patterns.

Principle
7

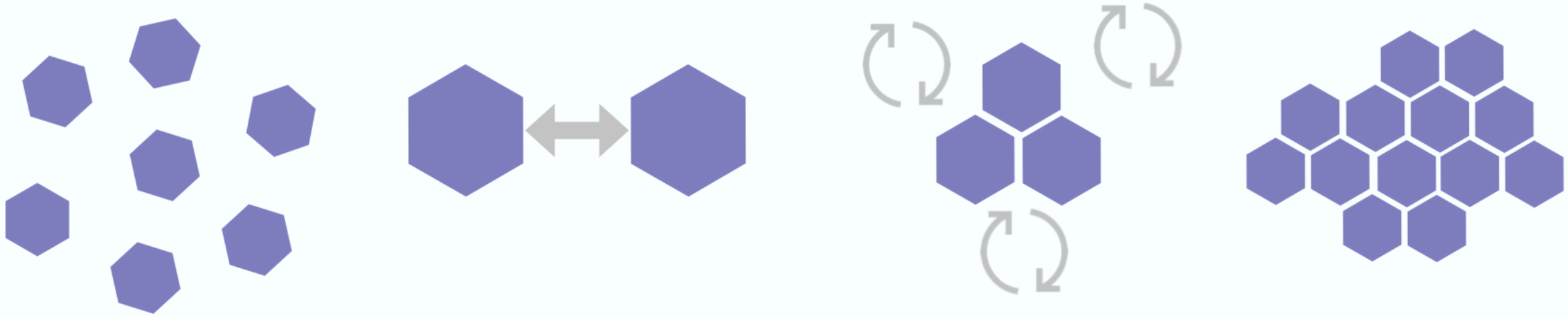
Self-organization

Self-organization describes how global patterns of organization within a system can emerge out of the local interactions between the components without global centralized coordination. The theory of self-organization seeks a description of how order emerges in a system through the interaction between the elementary parts in a bottom-up fashion.



The process of self-organization can be seen to work through nonlinear interactions between elements that are amplified by positive feedback loops to create attractors that close in on themselves resulting in a new pattern of organization emerging on the macro-level. Examples of self-organizing processes include the swarming of bees, chemical processes of crystallization, the formation of black markets or the creation of cultures or new languages.

Self-Organization - How it Works



Initial Disorder

Self-organization can only take place in the absence of a fixed global pattern

Peer Interaction

Component parts interact & some elements come to synchronize their states

Feedback

As coordination results in more efficient outcomes it creates a positive feedback dynamic

Attractors

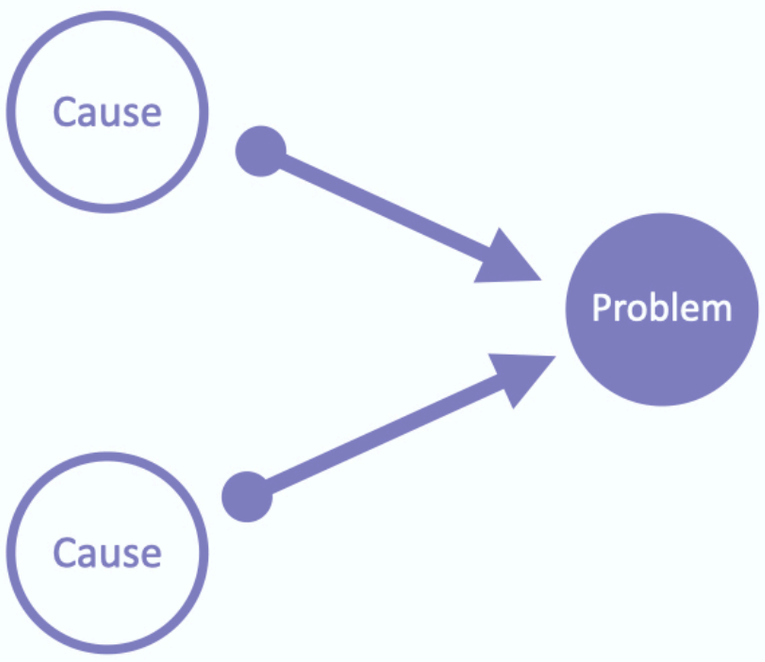
Positive feedback creates explosive growth bringing parts into an emergent pattern

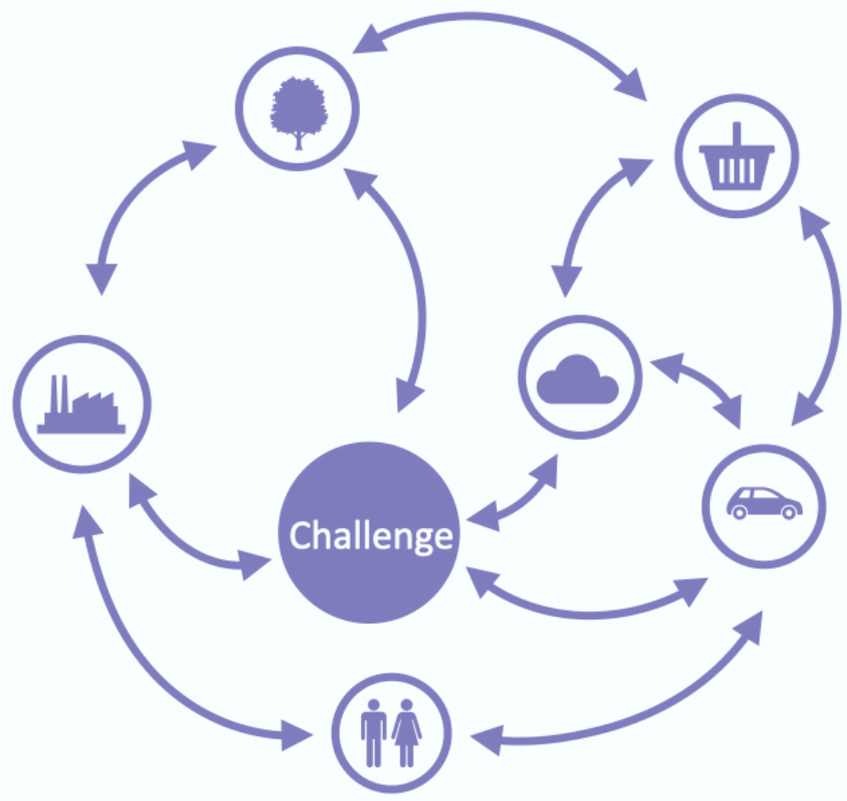
Principle
8

Nonlinearity

Nonlinearity describes a relationship where there is no direct linear connection between two variables, but instead changes can only be ascribe to multiple indirect connections or feedback dynamics. Nonlinearity allows for the output of an interaction to be more, or less, than the sum of the parts in isolation making nonlinear systems non-additive.

Nonlinearity is the product of the synergies between parts which makes their combined effect different from the parts taken separately. For example, due to the specific interactions within a drug concoction the combined effect of the drugs is different from each being taken separately. Because of the feedback loops between parts the output to a nonlinear system may be disproportionate to the input and they may grow or decay at an exponential rate. As can be seen in a financial crisis due to the positive feedback loops between the actions of the agents.





Linear Thinking

Reduce down to the most immediate and largest causes of the issue

Nonlinear Thinking

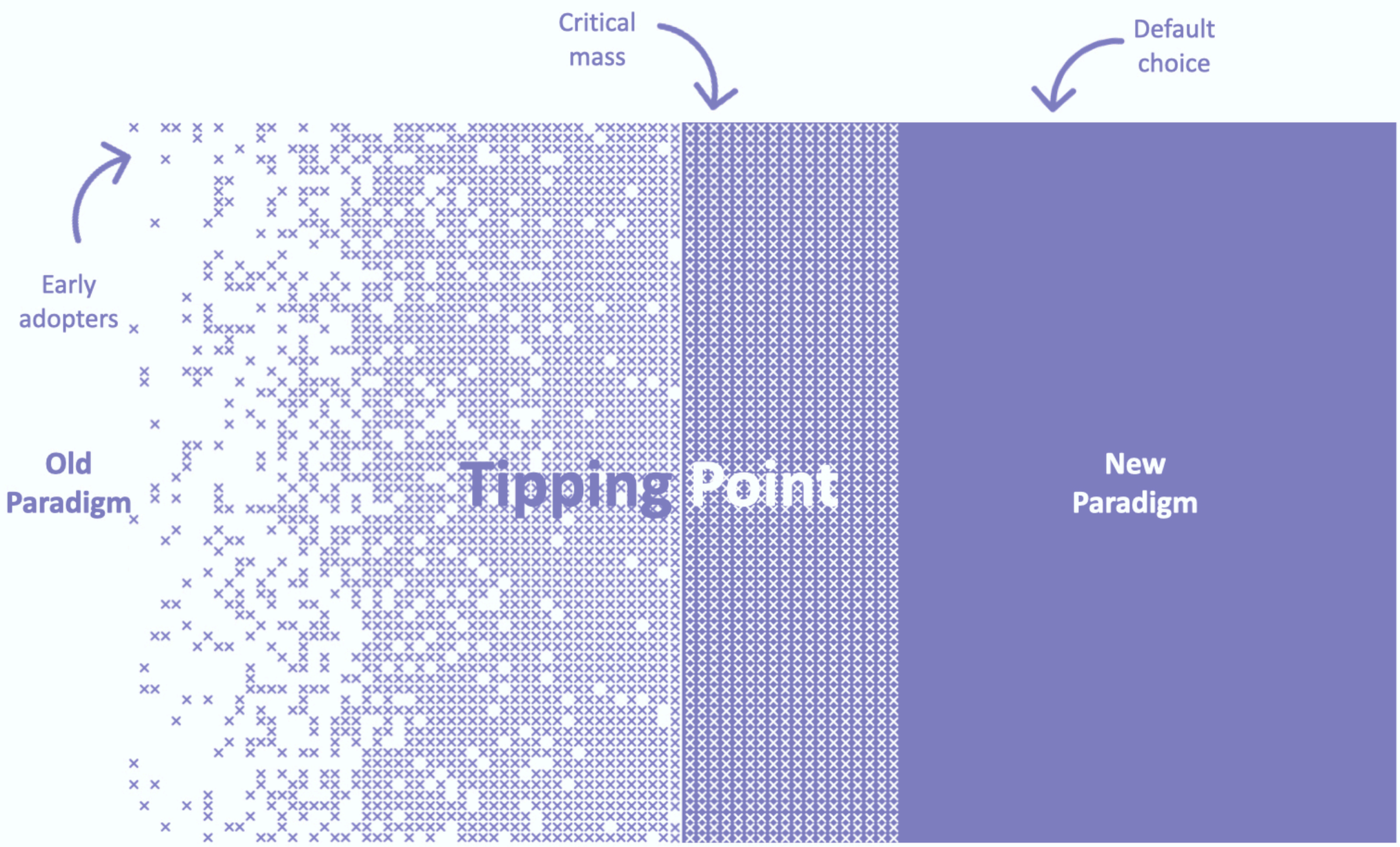
Look at the network of factors that are creating the system's dynamics out of which the issue emerges

Principle
9

Phase Transition

A phase transition is a qualitative change in the overall structure and conditions of a system as it transitions from one regime to another. During a transition the global structures that supported the system previously disintegrate and new ones have to emerge - this makes transitions inherently unstable periods marked by nonlinearity.

Phase transitions are inherently nonlinear processes involving periods of exponential change. The transition of ice to steam is one example of a phase transition. At some critical temperature, a small change in the system's input temperature value results in a systemic change in the substance after which it is governed by a new set of parameters and properties. For example, we can talk about cracking ice but not water. Phase transitions can be seen in all kinds of complex systems, such as a political transition from monarchy to democracy.



Principle
10

Integrative Levels

An integrative level is a pattern of organization emerging on pre-existing phenomena of a lower level. Typical examples include life emerging out of non-living substances, and consciousness emerging out of the nervous system or social institutions emerging out of individual people interacting.

As components combine to produce larger functional wholes in hierarchical series, new properties emerge, and one cannot explain all of the properties at one level from an understanding of the components at the level below. The idea of integrative levels is central to the theory of emergence as integrative levels can be understood as the product of the process of emergence having played out to generate two or more qualitatively different levels of organization.

Principle
11

Connectivity

Relational thinking is a way of seeing the world that places greater precedence on the relations or connections between entities rather than simply looking at those elements as separate. The main overarching principle in the relational paradigm is a shift in one's perception from seeing a fixed world, made up of things and their properties, to seeing a world that is primarily made of relations and connectivity.

Going from a system with a low degree of connectivity to one with a high degree of connectivity is not just a quantitative change in the number of connections it is also a qualitative change. It marks a shift from a component based regime, where we need to firstly think about the properties of the elements in the system and their linear interactions - to a relational based regime where we need to first look at how the system is interconnected and the nature of the interdependencies.

Parts View

Connected View

Principle
12

Interdependence

Interdependence is a type of connection or relation between elements. Relations may be defined as either dependent, co-dependent, independent or interdependent. Interdependent means an interrelationship between autonomous elements through the formation of a combined, emergent organization. Interdependency is a central concept used to define a system and complexity, in that without interdependency between parts there is no system - just a set of independent elements.

The essence of interdependence involves autonomy, differentiation, and emergence. Two or more autonomous elements coming together, differentiating their states with respect to each other, to create some combined organization that is greater than any of the parts, through the process of emergence. An example of this includes the interdependencies created in forming a family as well as most forms of social organization.

Emergent Interdependent Whole

Independent part

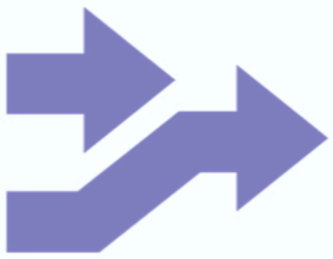
Independent part

Principle
13

Synergies

The term synergy comes from the word working together. A synergy is an interaction between two or more things that combine to create an effect that is different in some way from the two combined effects acting in isolation. Synergy is a prevalent phenomena in all types of systems that arises from the concerted action of multiple factors producing an amplification or cancellation effect compared with individual actions alone.

A positive synergy is when two things combine in a constructive fashion arising when the parts are both different from each other but also uniquely fitting together. Examples being the pollination process between bee and flower, or two companies working together that have different but complementary capacities. A negative synergy is a form of interference. Two people talking at the same time is a form of negative synergy.

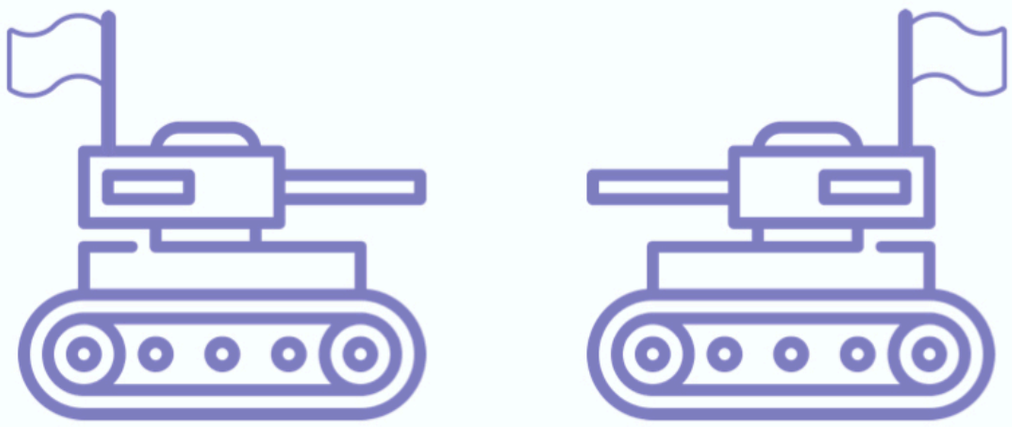


Positive Synergy

Parts are working in a constructive fashion to create a new organization with greater functional capacities e.g. the interaction between be and flower during pollination.

Negative Synergy

Parts work in a counteractive fashion to dampen down or destroy the effects of each other e.g. an arms race between two countries.



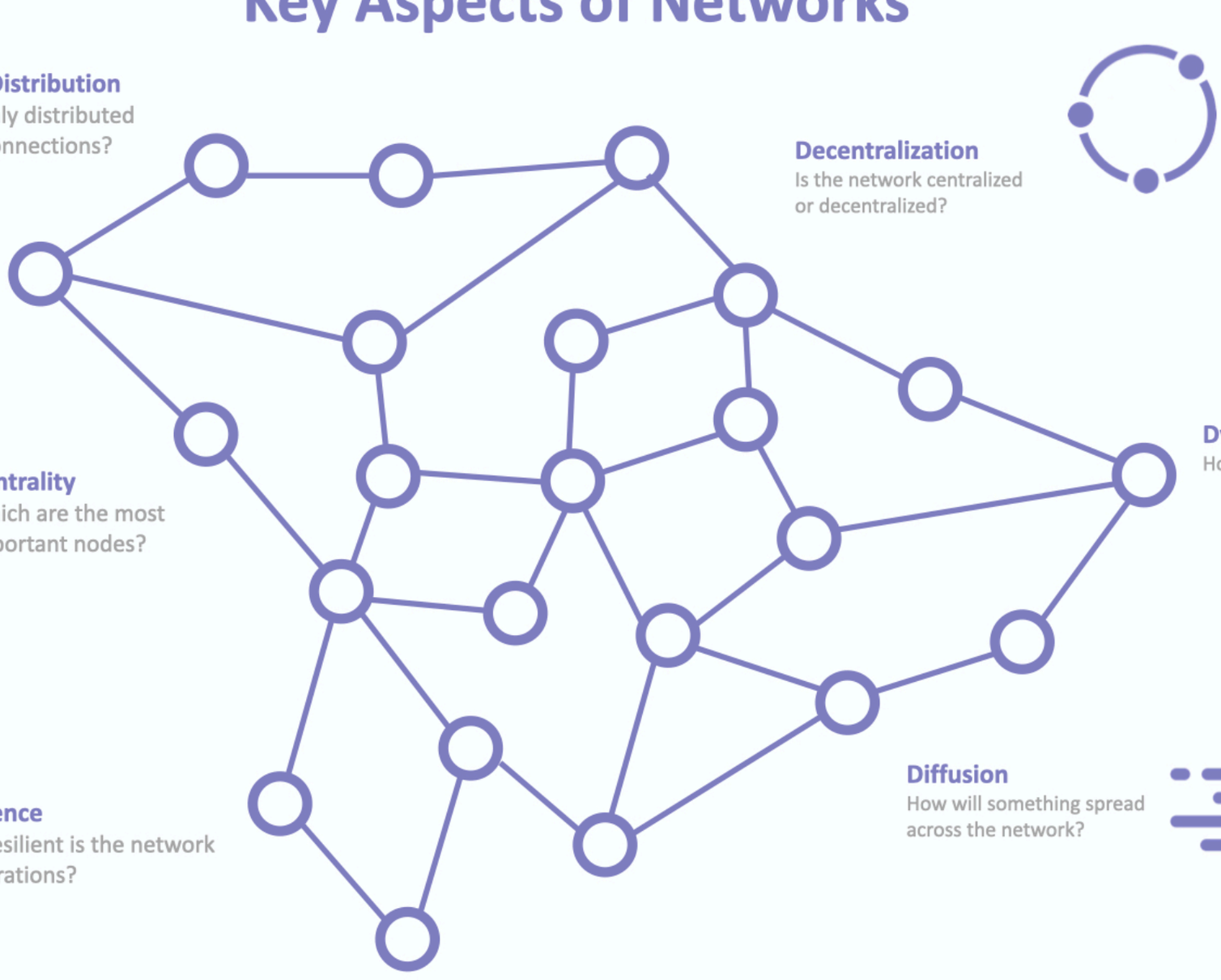
Principle
14

Networks

Due to their high level of connectivity, all complex systems have a network architecture to them and it is a defining feature of how they work. Thus network theory is central to understanding complex systems of all kinds, be that the Internet, a transport system, or a social network.

When attempting to understand a network there are a few key considerations. Firstly how connected are the elements in the system? Are there connections between all the parts or are some parts disconnected and separate from others? How dense is this set of connections? What are the patterns of clustering within the system? Is the network more centralized or decentralized? How robust is it to the failure of some nodes or connections? How might something spread across the network? Answering these will help us gain a deeper understanding of the workings of a system.

Key Aspects of Networks



Degree Distribution
How evenly distributed are the connections?

Decentralization
Is the network centralized or decentralized?

Dynamics
How is the network growing?

Centrality
Which are the most important nodes?

Diffusion
How will something spread across the network?

Resilience
How resilient is the network to alterations?

Principle
15

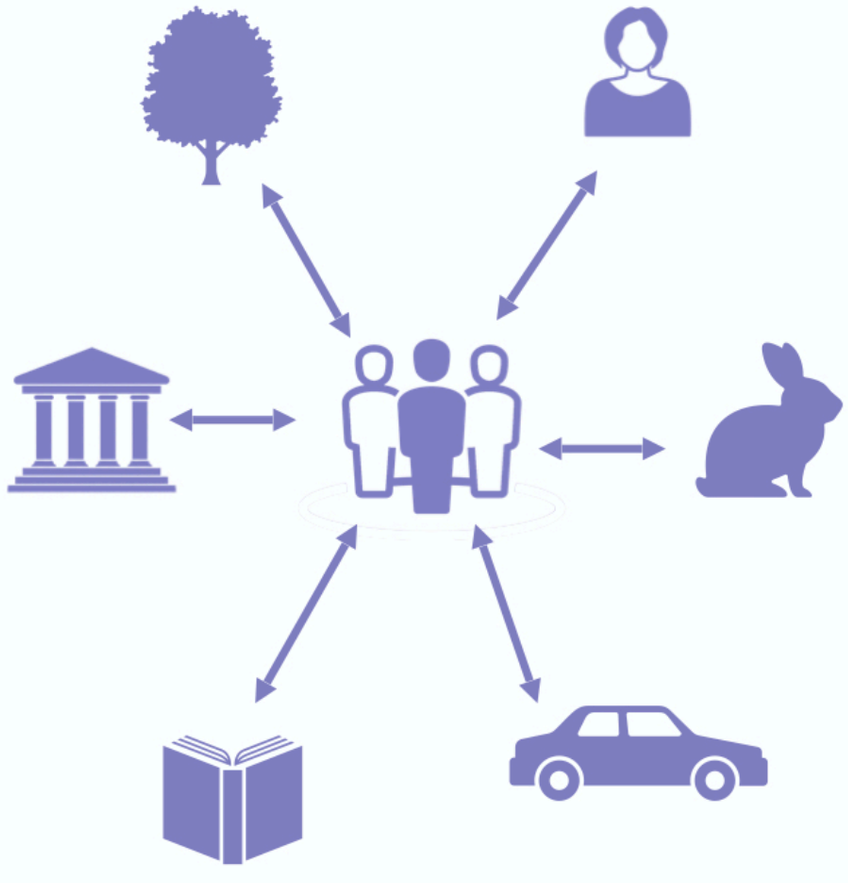
Decentralization

Decentralization is a structural feature of a network that has an even distribution of nodes and connectivity such that there are no elements with a radically higher level of connectivity and capacity that would make them central to the network. Examples include grid computing, social movements, or peer-to-peer file-sharing networks.

Decentralized networks have unique characteristics that differentiate them from centralized networks. Capacity and connectivity are more evenly distributed across the elements in the system. They are typically more adaptive and respond to local changes thus allowing for greater diversity of nodes. They have lower levels of dependency on key nodes making them less critical and potentially more resilient. With centralized nodes as super spreaders information often permeates more slowly across the network while alignment and coherence can be more difficult to achieve.

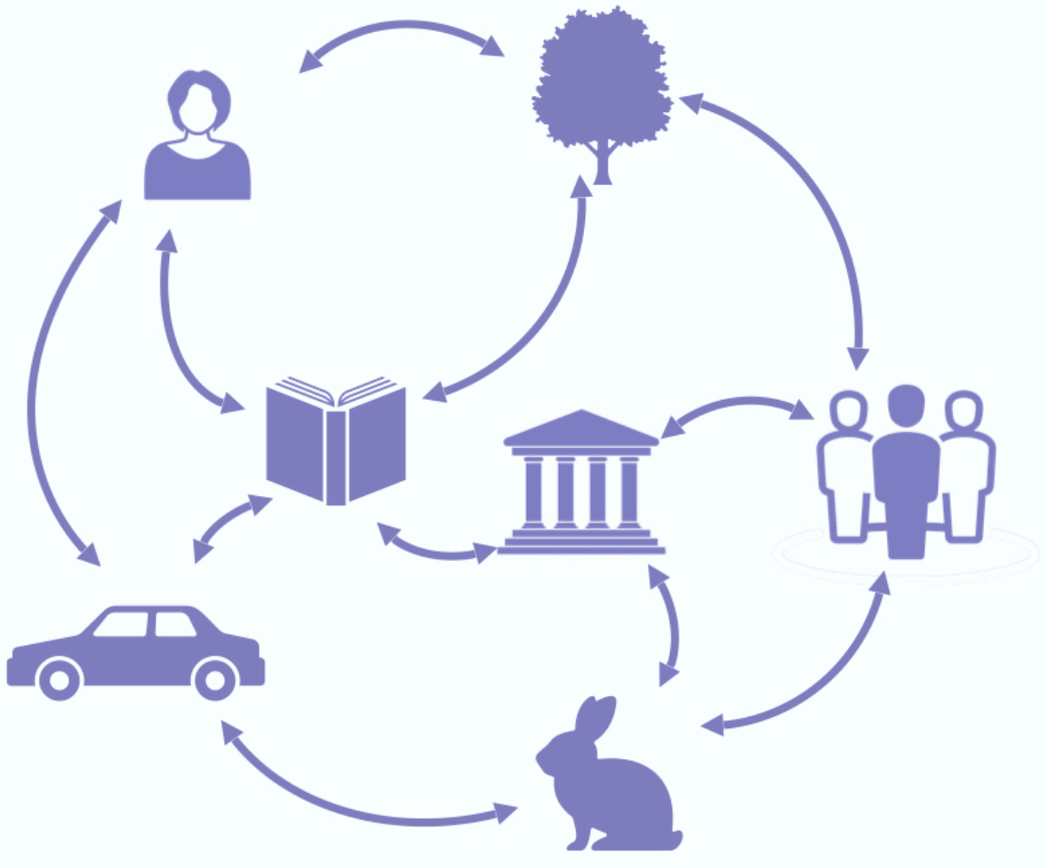
Centralized Network

Some elements have a very high number of connections



Decentralized Network

All elements have a relatively equal amount of connections



Principle
16

Adaptation

Adaptation is the capacity for a system to change its state in response to some change within its environment. An adaptive system is a system that can change given some external perturbation, and this is done in order to improve or maintain its condition within an environment by modifying its state.

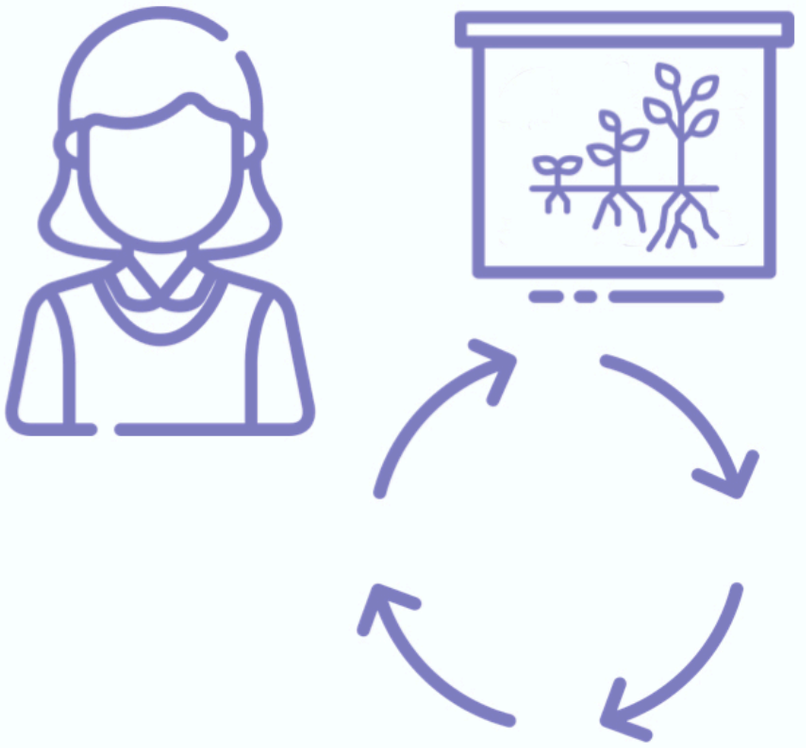
Complex adaptive systems are all around us from financial markets to ecosystems to the human immune system. These systems consist of many actors that are acting, reacting, and adapting to each other's behavior, out of this often chaotic set of interactions emerges global patterns of organization in a dynamic world of constant change and evolution where little is fixed & determined.

Fixed Planning Approach

Plan out a change process through analysis, design and control the parts towards a pre-specified desired state.

Iterative & Adaptive Approach

Set the conditions for iteration based upon simple rules to grow the change.



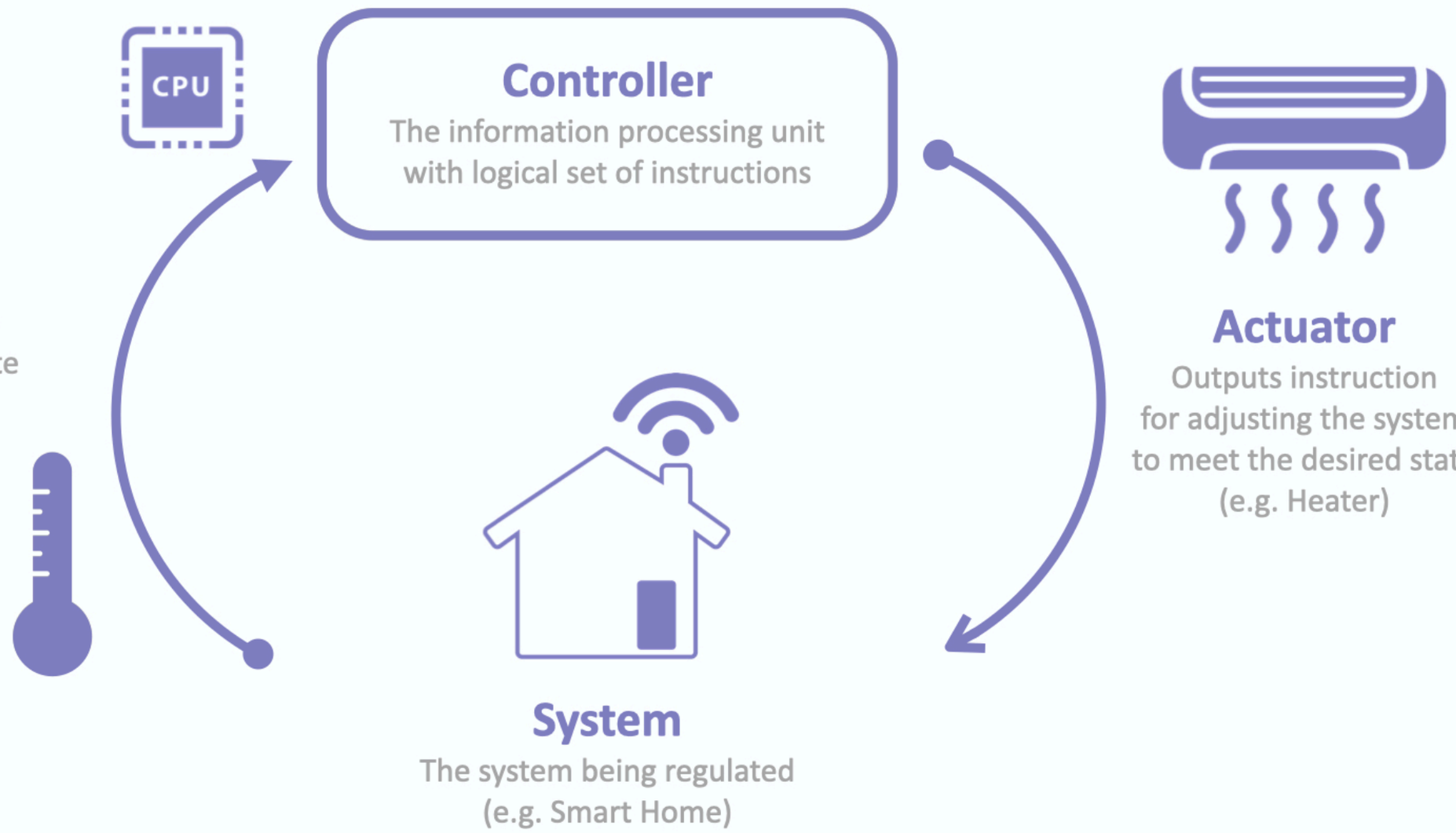
Principle
17

Cybernetics

Cybernetics is the study of control, communications and information processing within systems of all kind, biological, technological and social. The word cybernetics comes from the Greek word meaning “governance” or “to steer, navigate or govern”. Cybernetic systems use information and communications processes to guide a system in the direction of the set of environmental parameters that are best suited for maintenance homeostasis and functionality.

The primary object of study within cybernetics are control systems that are regulated by feedback loops. Feedback loops are a fundamental object of study within cybernetics in that they are accountable for the process of regulation within all control systems. Examples of cybernetic systems include the regulatory units to chemical processing plants, the human body, governments, etc.

How Cybernetic Systems Work



Principle
18

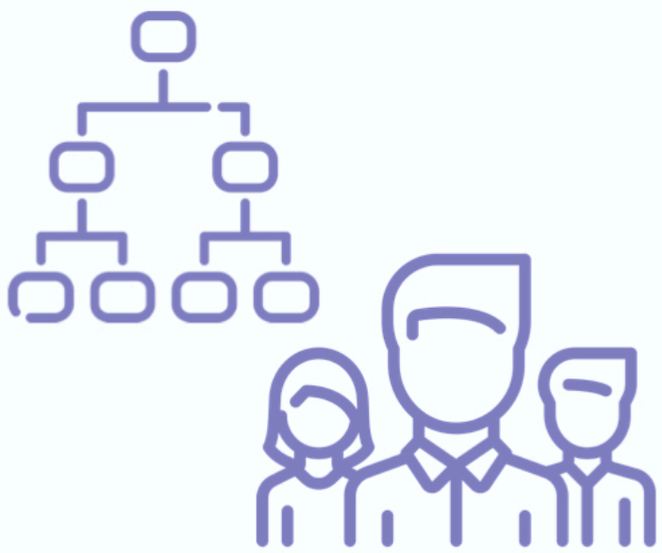
Game Theory

Game theory is the formal study of situations of interdependence between adaptive agents and the dynamics of cooperation and competition that emerge out of this. A game is a system wherein actors are interdependent in affecting each other and the overall outcomes of the situation. Game theory attempts to understand the structure of these games' incentives to determine the likely or optimal actions of the actors.

Examples of games include the political negotiations between two nations, the interaction of businesses within a market, and the different strategies adopted by creatures in an ecosystem. An understanding of games, their structure and inherent incentives towards cooperation or competition can lead to an increased capacity to design and guide them towards cooperative outcomes.

Cooperative

Where everybody cooperates, resulting in everyone gaining



Noncooperative

Where members do not cooperate, resulting in suboptimal outcomes for many.

Degree of Cooperation

Depends upon people interacting with others they know within structures that enable people to give feedback with a transparent rating, reputation, and identity around their level of cooperation in the past.

Principle
19

Evolution

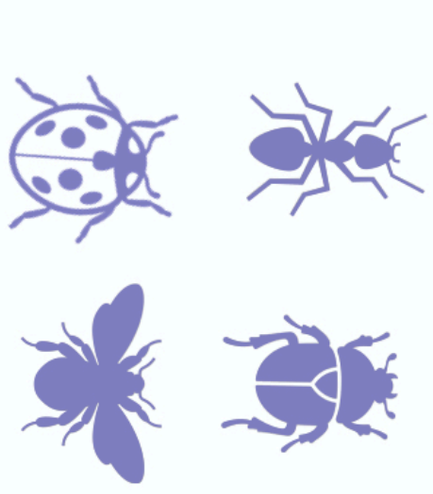
Evolution is the adaptation of a group of entities that occurs on a macro-level over a period of many life cycles reflecting the response of the collection of agents to changes in their environment. Evolution functions through a process of, variety production, interaction, selection, and replication which works to select those elements within a system that are best suited to their operating environment.

Through the iteration of this process of evolution over a prolonged period, a complex adaptive system can go from starting simple to becoming more complex. Although the idea of evolution is associated with ecosystems, complexity theory deals with the concept on a slightly more abstract level as it applies to all complex adaptive systems from the development of civilization to financial markets, cultures, and technologies.

Evolution - How it Works

1. Change

A population of agents exists within some environment and must periodically adapt as a whole in order to survive and maintain functionality.



2. Variety

Responding to changes means selecting from a variety of different internal states or strategies, thus the need for diversity.

3. Selection

The different variants in the system are exposed to their operating environment to see which are best adapted and most successful within that context.

4. Replication

Those that prove "fittest" attract more resources and are duplicated, thus the system as a whole comes to express more of their characteristics.

Principle
20

Resilience

Resilience is the capacity of a system to maintain or restore functionality given some alteration. When a system is subject to a disturbance, it responds by moving away from its initial state. The tendency of a system to remain close to its equilibrium state, despite disturbances, is termed robustness. While the speed with which it adapts and finds a new viable state after disturbance may be understood as its resilience.

Resilience is a function of several different factors including the network's structure, dependency on input variables, diversity of components, etc. Resilience is built through a system's exposure to and survival of different changes within its environment. Forests become resilient to fires through experiencing and surviving periodic small forest fires. A child's immune system becomes resilient through exposure to foreign invaders and developing an appropriate response.

What Makes for a Resilient System?

Decentralization

A decentralized network structure to a system creates fewer critical points of failure and slows the spreading of failure across the system.

Self-sufficiency

The fewer the dependencies the system has on inputs the fewer the vulnerabilities to change and the greater its capacity to adapt to a change successfully.

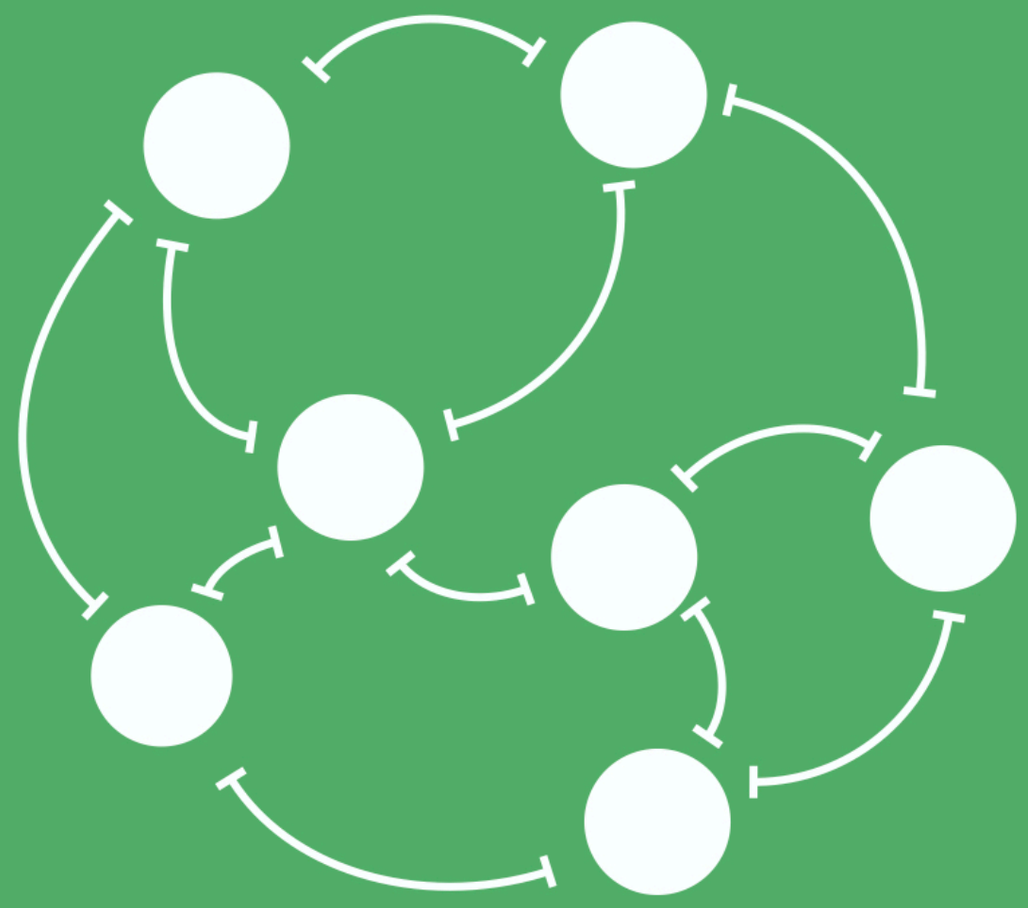
Variety

Variety creates more possible ways that the system could respond successfully to a given event and reduces the possibility of a given shock to cascade through the system.

Learning

Accumulated learning from having experience and successfully survived past challenges helps to build a systems adaptive capacity and resilience to future challenges.

Key Principles of Systems Mapping



System Modeling

Systems

Synergies

System Function

Environment

System Maps

Giga Mapping

Causal Maps

Feedback Loops

System Dynamics

Actor Mapping

Empathy Maps

Value Maps

Incentive Maps

Network Analysis

Systems Mapping Cards

Leverage Points

Iceberg

Assessment

Intervene Strategy

Hypothesis

Systems Mapping

Systems mapping is the process of creating a diagram representing the elements and relationships of a system in order to better illustrate and communicate the structure and workings of the system. Systems maps aim to give a overview of the system and how the parts interrelate to form the whole. These maps work to give us a shared sense of the “landscape" within which actors exist.

System maps are powerful visualization tools that can help change agents describe and diagnose the current state of a given system; understand how system structure creates the observable outcomes; create a shared vision of the system; gain consensus about the problems and identify opportunities for collaboration around key challenges.

Key Aspects of Systems Mapping

Leverage Points
Places to intervene in the system to enable change

Causal Links
To understand the causal relationships between the parts

Systems Dynamics
To understand the stocks and flows

Elements
Understanding the parts in the network

Feedback loops
Understanding the feedback loops in the network

Understanding Actors
Understanding the people in the system

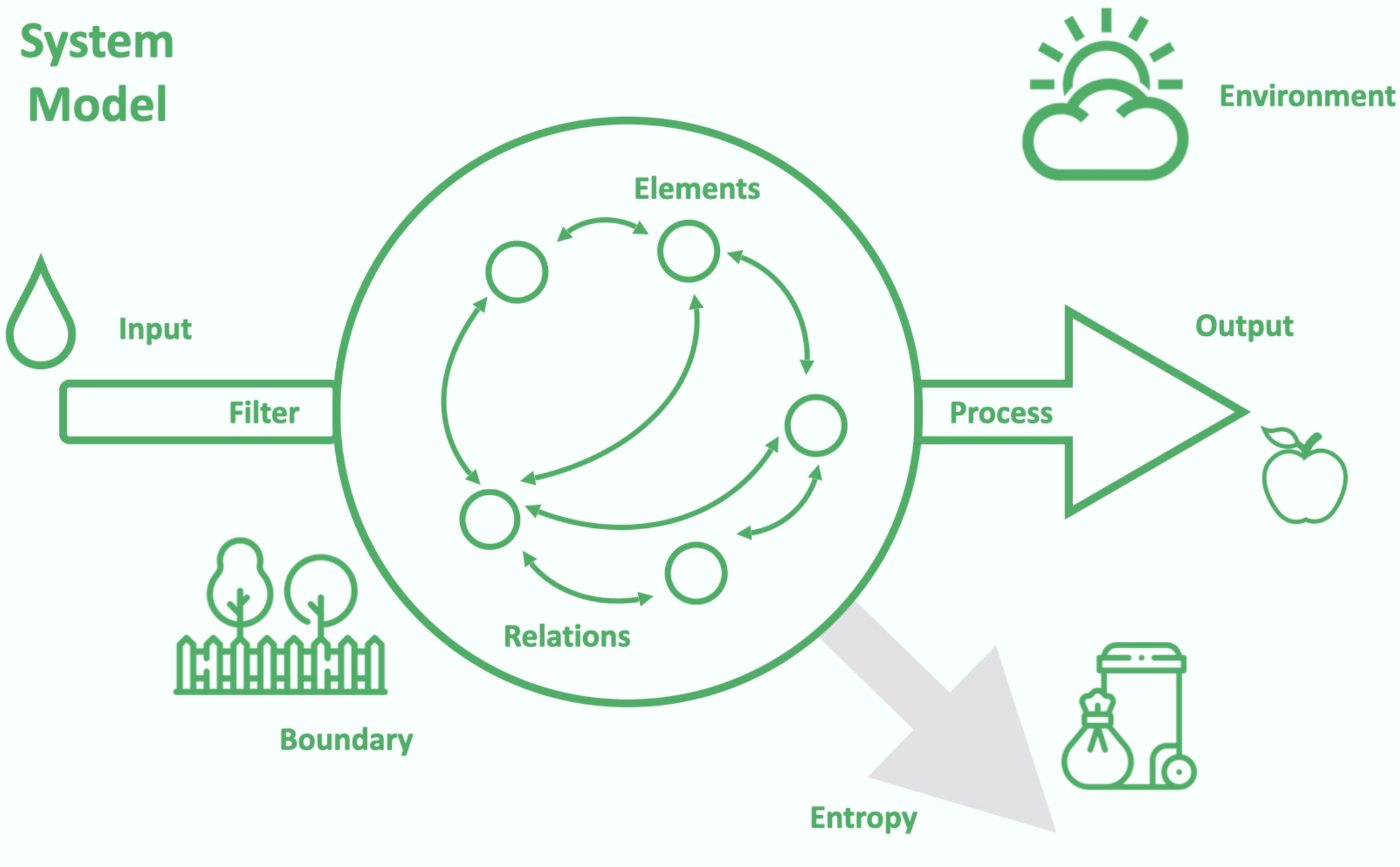
Principle
21

System Modeling

Systems modeling is a process of accumulating experience and understanding of a system in order to create an abstract representation of it that can help us to grasp the key features of the system and thus create a shared representation.

System modeling entails a process of gaining insights into a system from multiple perspectives to start to build up an understanding of its elements, connections, function and environment.

In the context of systems change the aim of systems modeling is to better understand the current workings of a system in order to identify key intervention points as a way to guide it in a change process.



Principle
22

Systems

A System is a set of parts - called elements - that are integrated in forming an overall pattern of organization. Systems can be contrasted with “sets" which are a simple collection of things without any particular organization to them. What makes a system is the network of connections and interdependencies between these elements and the overall organization that emerges when we combine them within a particular pattern to enable a collective function.

A business organization is an example of a system. It has a number of - elements including people, technology, resources, buildings, etc - exchanging information, resources, ideas, etc. Through this exchange, they are organized to perform the collective function of producing goods and services. There are many examples of systems: transportation systems, agricultural systems, healthcare systems, etc.

A Set of Things

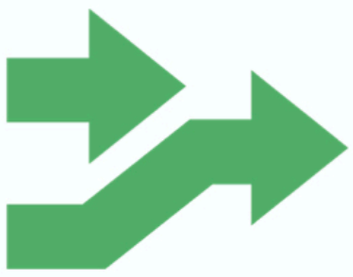
A System

Principle
23

Synergies

The term synergy comes from the term "working together.” A synergy is an interaction between two or more things that combine to create an effect that is different in some way from the two combined effects acting in isolation. Synergy is a prevalent phenomenon in all types of systems that arises from the concerted action of multiple factors producing an amplification or cancellation effect compared with individual actions alone.

A positive synergy is when two things combine in a constructive fashion arising when the parts are both different from each other but also uniquely fitting together. Examples being the pollination process between bee and flower, or two companies working together that have different but complementary capacities. A negative synergy is a form of interference. Two people talking at the same time is a form of negative synergy.

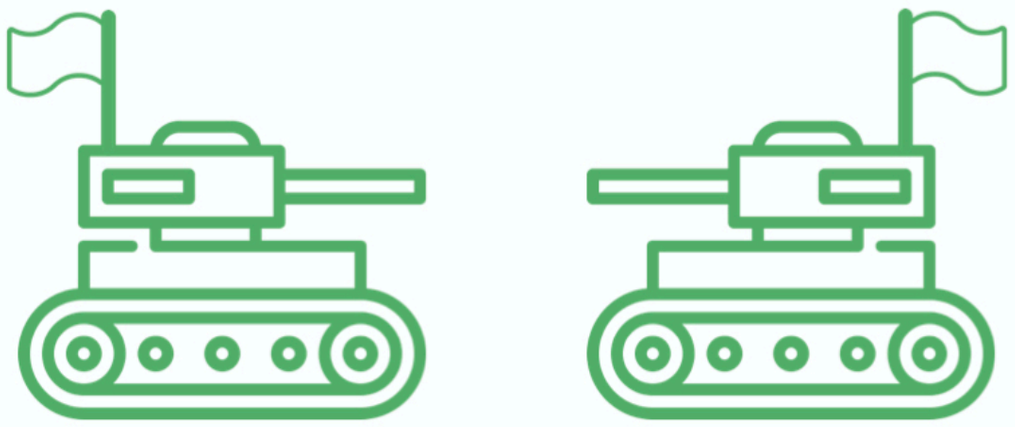


Positive Synergy

Parts are working in a constructive fashion to create a new organization with greater functional capacities e.g. the interaction between be and flower during pollination.

Negative Synergy

Parts work in a counteractive fashion to dampen down or destroy the effects of each other e.g. an arms race between two countries.



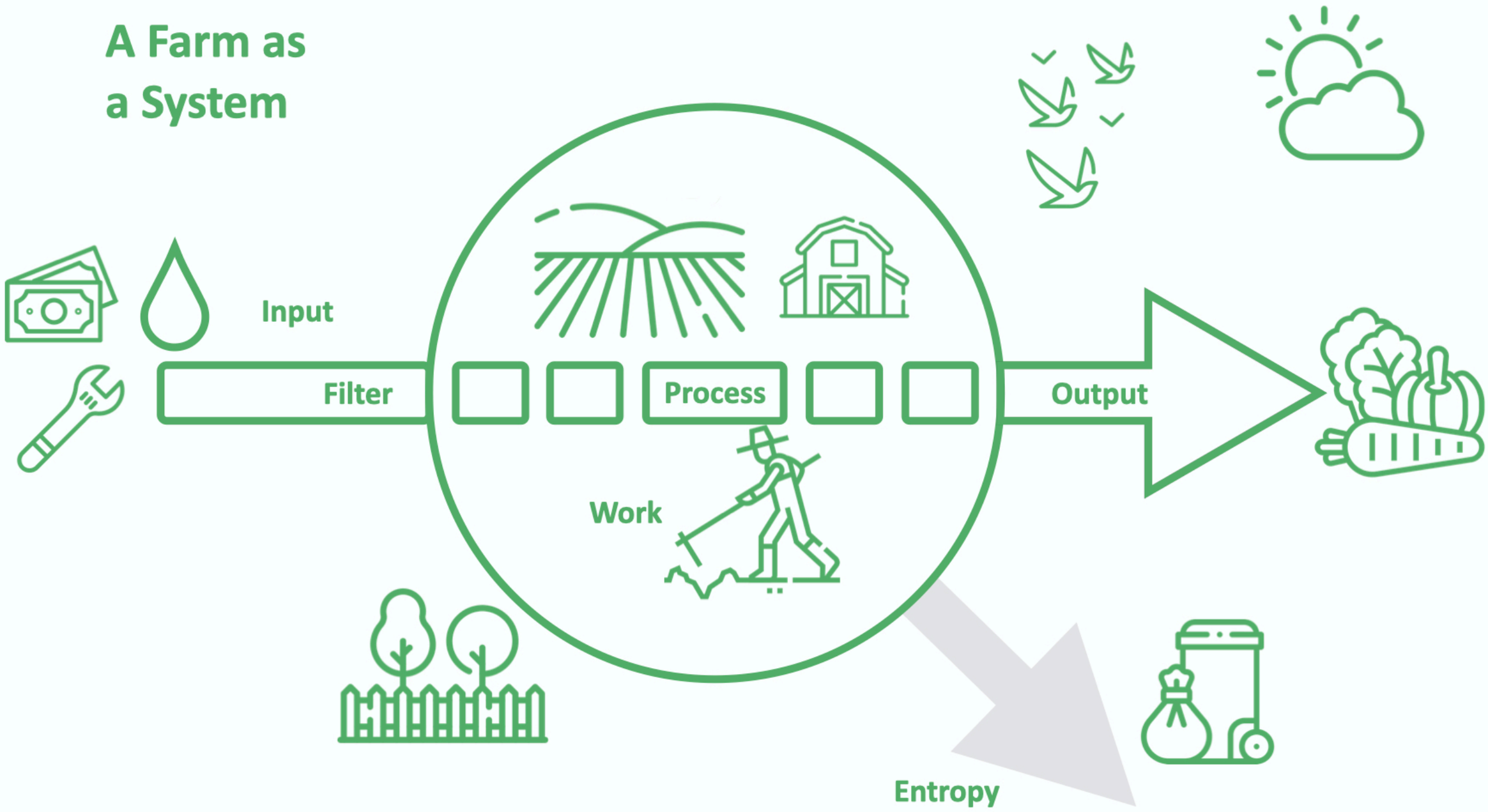
Principle
24

System Function

A function is a very broad and fundamental concept that is central to modeling and understanding systems. A function is a process that transforms energy or resources from one state to another through a series of stages. The effectiveness through which it processes inputs into functional outcomes is termed the system's efficiency.

Through a process, systems take in resources and perform a set of operations on them to generate an output. The output of the system can be of benefit to other systems and its environment - what we may call energy - or may be detrimental - what we call entropy. Understanding and defining the system's function is important in telling us what is a functional system vs a dysfunctional system; what is of value and what is not of value.

A Farm as a System



Principle
25

System Environment

The system's environment consists of the sum total of resources and systems that lie outside of the boundary of the entity of interest and interact with it providing its inputs and receive its outputs. A system’s environment is primarily relative to it's functioning. A biological system that requires the input and output of natural resources operates within the natural environment. The political system of a nation operates within the context of that society and the international political environment.

An environment is the broadest unit of analysis representing the sum total of all systems and interactions that we are considering within any given model. As the environment represents the sum total of the system’s interactions with other entities, it forms the context to a system, i.e. where it exists in relation to other systems that it is interdependent with.

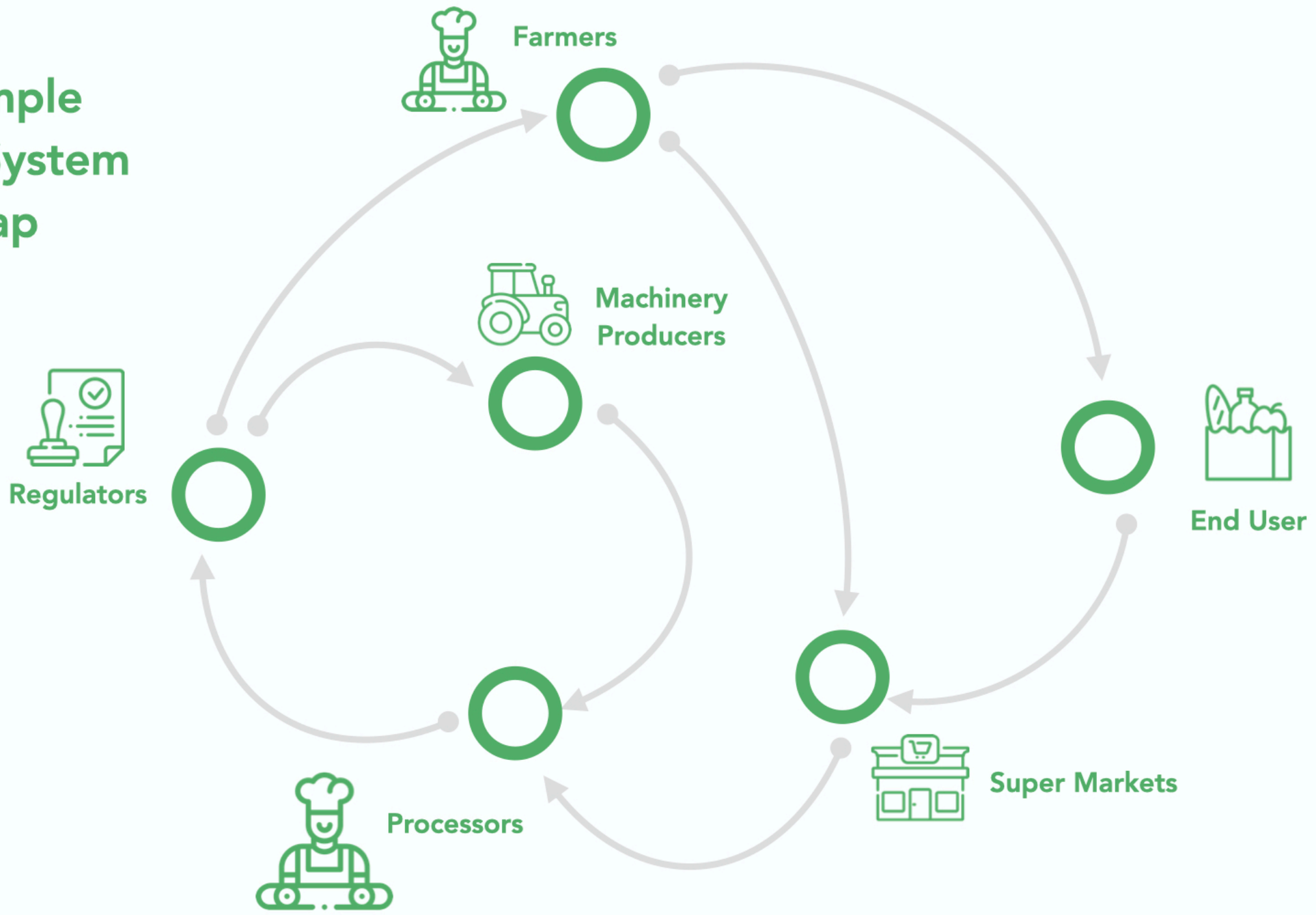
Principle
26

System Maps

Systems mapping is a type of modeling that is designed to reveal the underlying interrelationships and structure of a complex system. System maps are powerful visualization tools that can help change agents describe and diagnose the current state of a given system; understand how system structure creates the observable outcomes; create a shared vision of the system; gain consensus about the problems and identify opportunities.

System mapping is about gaining an empirical understanding of what is before we engage in envisioning what could be or what we would like to be. However, systems maps should not be seen as deliverables or endpoints, rather they are tools of exploration, stepping stones on our path to understanding the system dynamics that underly complex issues.

Example Food System Map



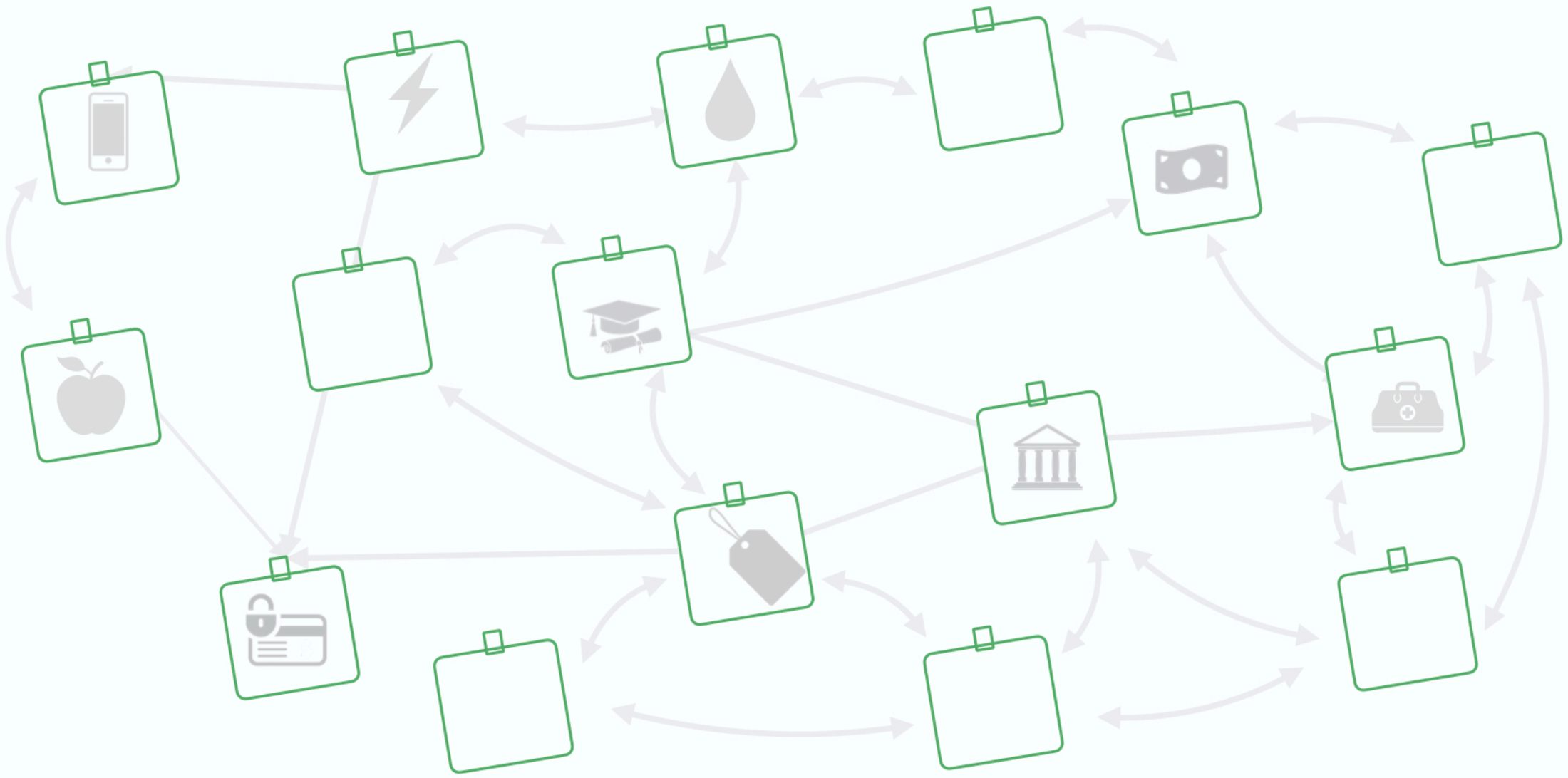
Principle
27

Giga Mapping

Giga-mapping is extensive mapping across multiple levels, scales and dimensions of a system. In being expansive and inclusive of all and any seemingly relevant information it is aimed at investigating pertinent far reaching connections between seemingly separated categories.

Giga-mapping is a way to bring in all information that may be of relevance in a system or situation. This may include both subjective as well as objective factors, such as the smell of a meal, the memory of a location or the weight of an object.

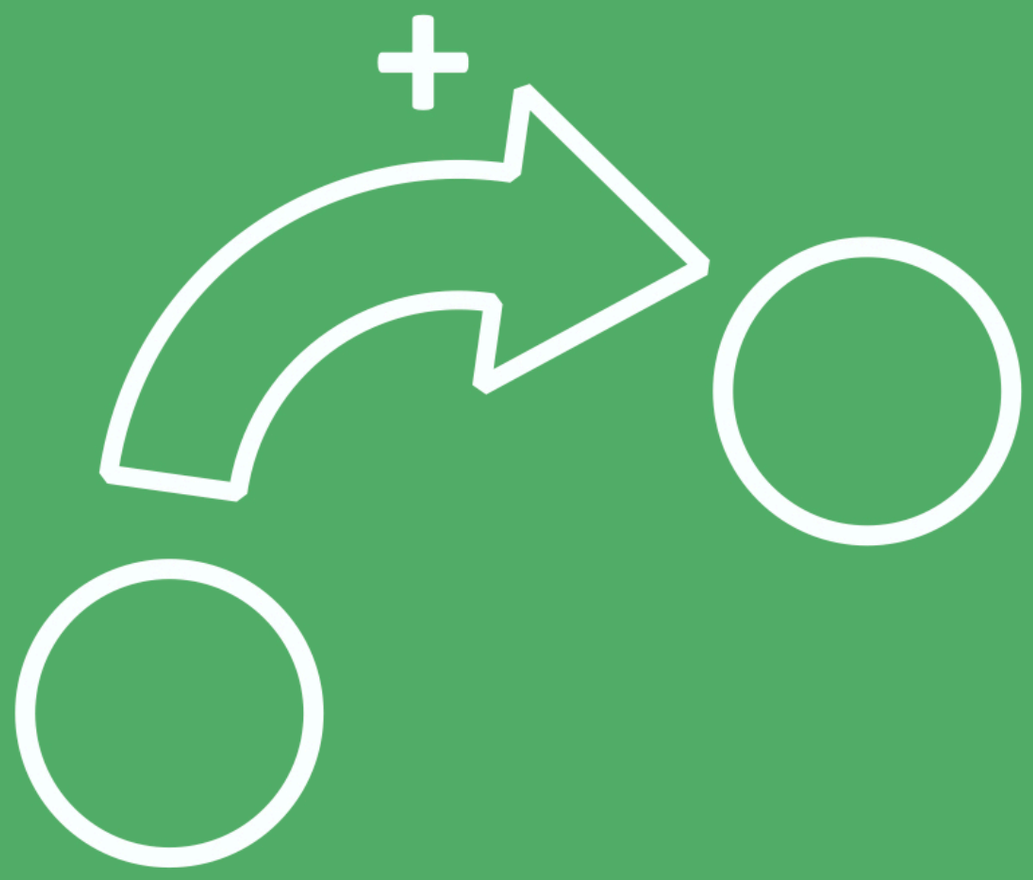
The aim of doing this is to include everything so as to not miss things that other mapping approaches may over look. It is away of getting everything out in front of people so that they can then start to search for week signals, patterns and connections.



Principle
28

Causal Maps

Causal maps define a set of relationships between entities that affect each other. They are designed to capture the network of relations through which one thing influences another within a system. For example, a map focused on obesity in Mexico would work to draw a set of causal relations between different factors that are relevant in affecting this situation, such as cost of food, amount of advertising, rate of urbanization, etc.



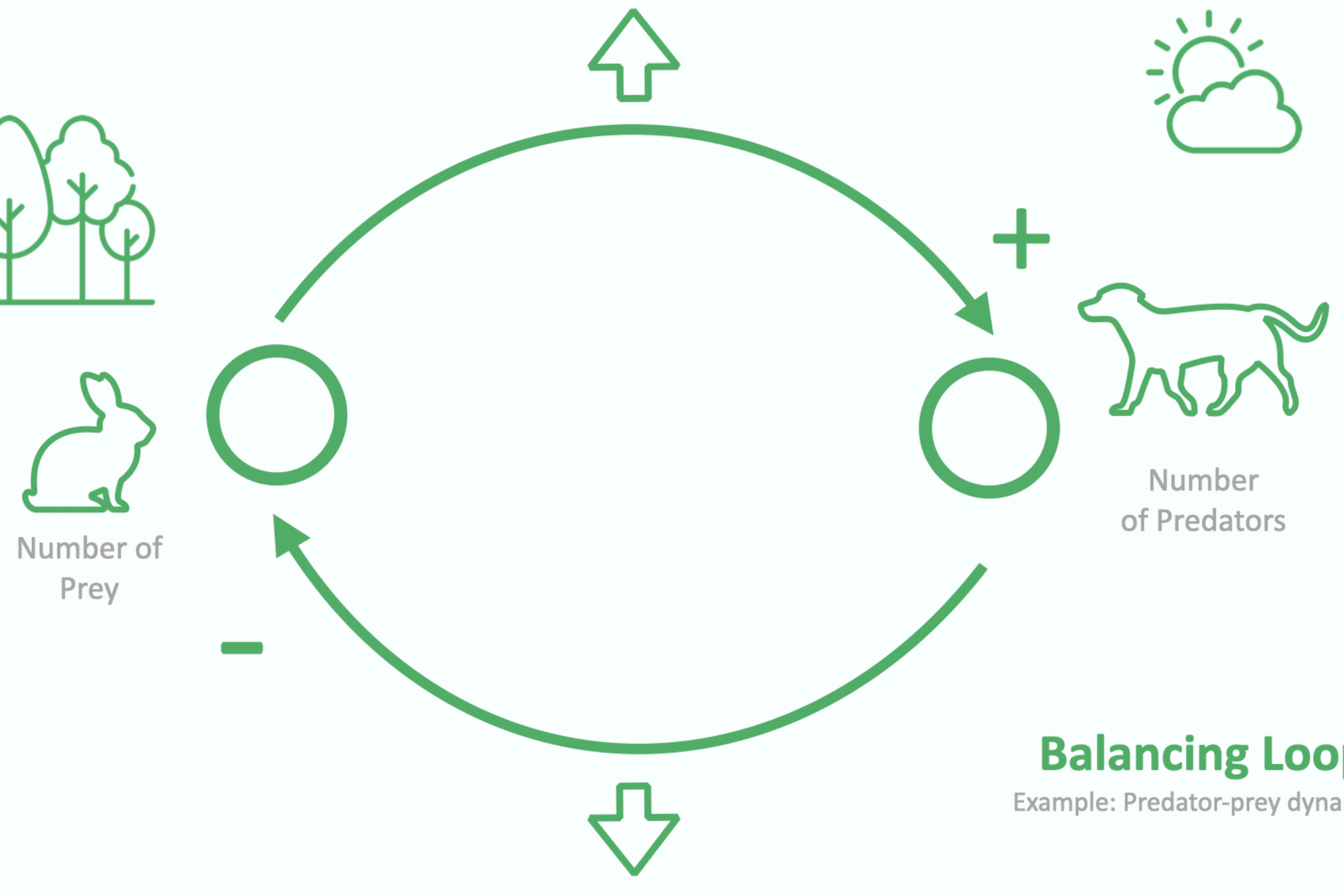
Causal relations describe the changes in the variables of the elements involved. These relations may represent positive correlations where the variables of each node move in the same direction or negative where the variables move in the opposite direction. A causal diagram can thus help us to represent the underlying structure of a complex system for us to better understand its behavior and dynamics.

Principle
29

Feedback Loops

A feedback loop describes how an influence originating in one element within a system to affect another will over time feedback to influence its source. Most causal maps will have at least one feedback loop that is affecting the workings of the system in driving its change over time, e.g. its system dynamics. These feedback loops can be of two fundamentally different kinds - positive and negative - that lead to two very different types of systems dynamics over time.

Positive feedback describes how two things interact to amplify each other, e.g. more of A creates more of B, which feeds back to create more of A. While a negative feedback loop is a balancing one where more of A creates more of B which then feeds back to create less of A. E.g. a thermostat regulating the temperature of a building involves a negative feedback loop as it counter balances the increase or decrease in temperature.



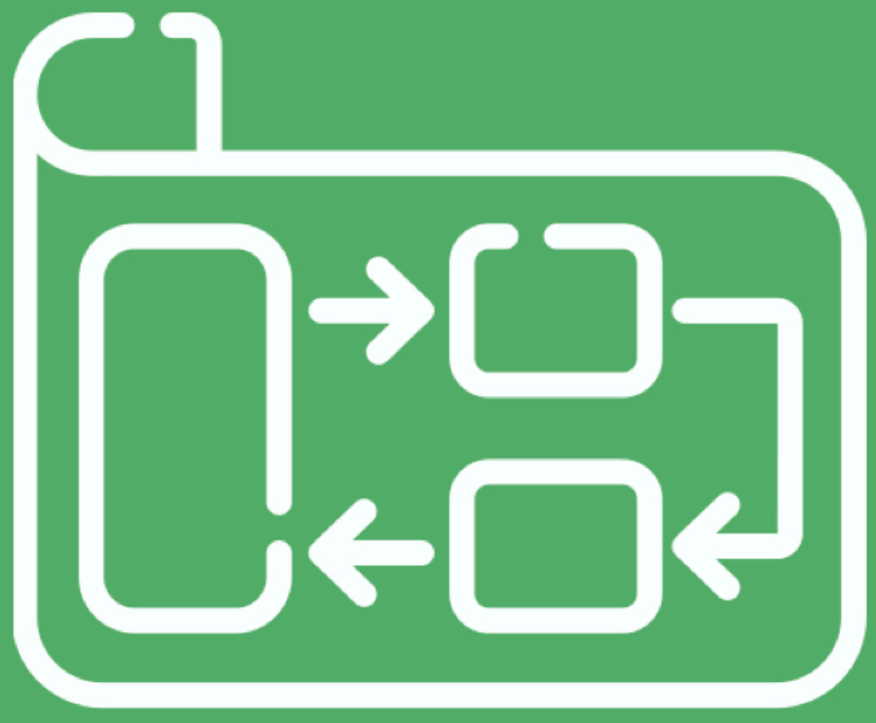
Balancing Loop

Example: Predator-prey dynamics

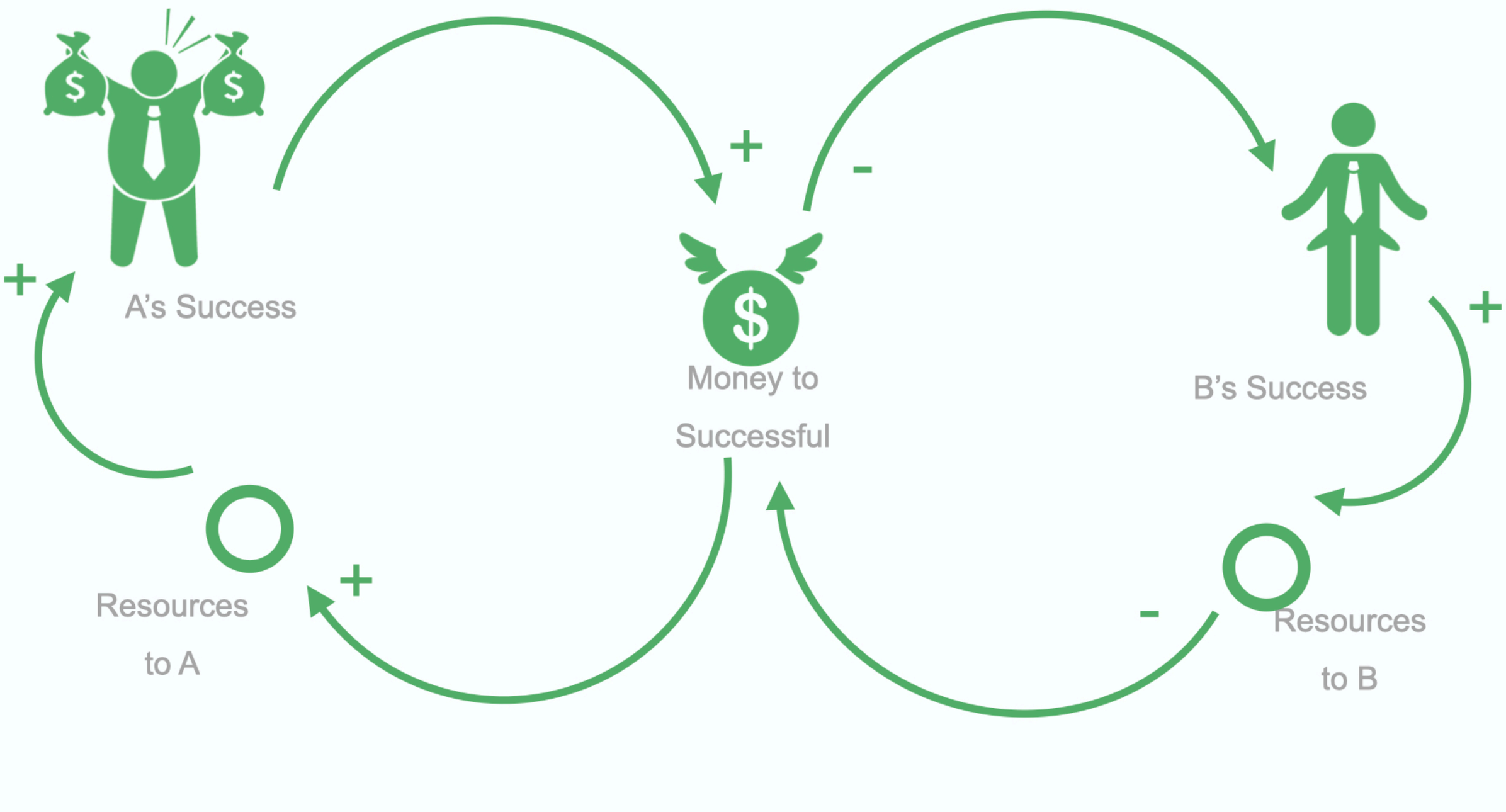
Principle
30

System Dynamics

System dynamics is a branch of systems theory that tries to model and understand the dynamic behavior of complex systems as they change over time. The basic idea behind system dynamics is that of feedback loops that try to capture the interactions between the parts and how they lead to a certain overall pattern of behavior over time.



Diagrams of the primary feedback loops in the system maybe are used to model how changes in one part of the system may affect others and the overall pattern of development. To perform a more detailed quantitative analysis, a causal loop diagram is transformed to a stock and flow diagram, which helps in studying and analyzing the system in a quantitative way, typically through the use of computer simulations.



Principle
31

Actor Maps

Actor maps are a type of system map designed to reveal the network of people and organizations within a given system and how they are interrelated. The aim is to gain a deeper understanding of the stakeholder's values, models, incentives and the power dynamics in the system. This is done by creating maps consisting of the various individuals and organizations that have a role in the system we wish to change.

With actor mapping, we are asking who are the individuals or organizations that have an influence in determining the pattern and outcomes of the system and who are influenced by it. These "stakeholders" have a stake in the outcomes to the organization and thus an interest in shaping events according to their stake. To be responsible in our systems change initiatives, we must be first aware of these actors, their perspectives and interests.

Why Actor Maps?

Involvement

Start to recognize who will be affected by a change process and thus who needs to be involved

Communications

To understand the mental models and values of actors so that we can better speak their language

Opportunities

Find opportunities for alliances, collaboration and recognize potential points of conflict

Explore Perspectives

Build up a better understanding of the system by looking at it from the different perspectives of the actors

Identify Gaps

Identify where gaps to the flow of information or resources are as potential intervention points

Adoption

Understand how an adoption process may take place; who would be likely to resist or promote change

Principle
32

Empathy Maps

Empathy maps are a method used to try to gain an understanding of the actors within a system. It is a tool used to build a shared understanding of the actors and their context through an ethnographic approach.

Ethnographic studies involve immersing oneself in the lives, culture, or situation of the people or organizations we are interested in over some time. We enter and spend a significant amount of time in the real environment needed to be observed to gain insight into actors, the context they find themselves within and how they behave in that environment.

Over time the insights drawn can be built up into an empathy map that captures key information while ensuring that it matches the underlying experience of the actors. The traditional empathy map begins with four categories: says, thinks, does, and feels.

What do they
Think & Feel?

What is on their mind, what worries and aspirations do they have etc.

What do they
Hear?

What are the people around them saying, friends, family, in the workplace, etc

What do they
See?

In publics spaces, at home, at work, in the media, etc.

What do they
Say & Do?

What are their behavioral characteristics, what words do they use, clothing, etc.

Principle
33

Value Mapping

Value mapping is a process for determining the values that the actors within a system hold in order to determine better peoples' motivation and actions. To get a deep insight into the workings of a complex system we wish to change it is important to map out and visualize the values and beliefs of the different actors in the system to learn how we can work with these rather than against them.

By learning how to elicit and work with values we can begin to understand what is important to the actors and why they do what they do. Values rank what is good or bad, better or worse, and in so doing they give structure to our world. These rankings then work to motivate or demotivate people. With a clear understanding of the values and motives of the actors, we can have a better idea of what is the appropriate narrative, activities, and organization structures to create in a systems change initiative.

Intrinsic Motives are..

Extrinsic Motives are...

Principle
34

Incentive Maps

Understanding the structure of incentives in a system is key to understanding how and why it operates the way it does and why it continues on the same path - irrespective of what the stakeholders may say. Incentive mapping is important because it lets us see the somewhat invisible fields of incentives that are acting on all of us every day. In our investigation we should be asking: what are the resources in the system? How do they flow through it? How do those flows influence the actors?

Take for example the flow of drugs and associated money through Central America that has distorted the social and economic institutions of many of those nations. Investigating these incentives will tell us a lot about the underlying structure of why and where conflict, competition, and cooperation arise and why. It also points us in the direction of possible ways to alter those incentives to realize new outcomes.

Mapping Resource Flows

Finance

How does money flow within the system, who has access to it, who not?

Power

How is political power and authority distributed out

Ownership

How is entitlement to ownership of resources in the system distributed out?

Influence

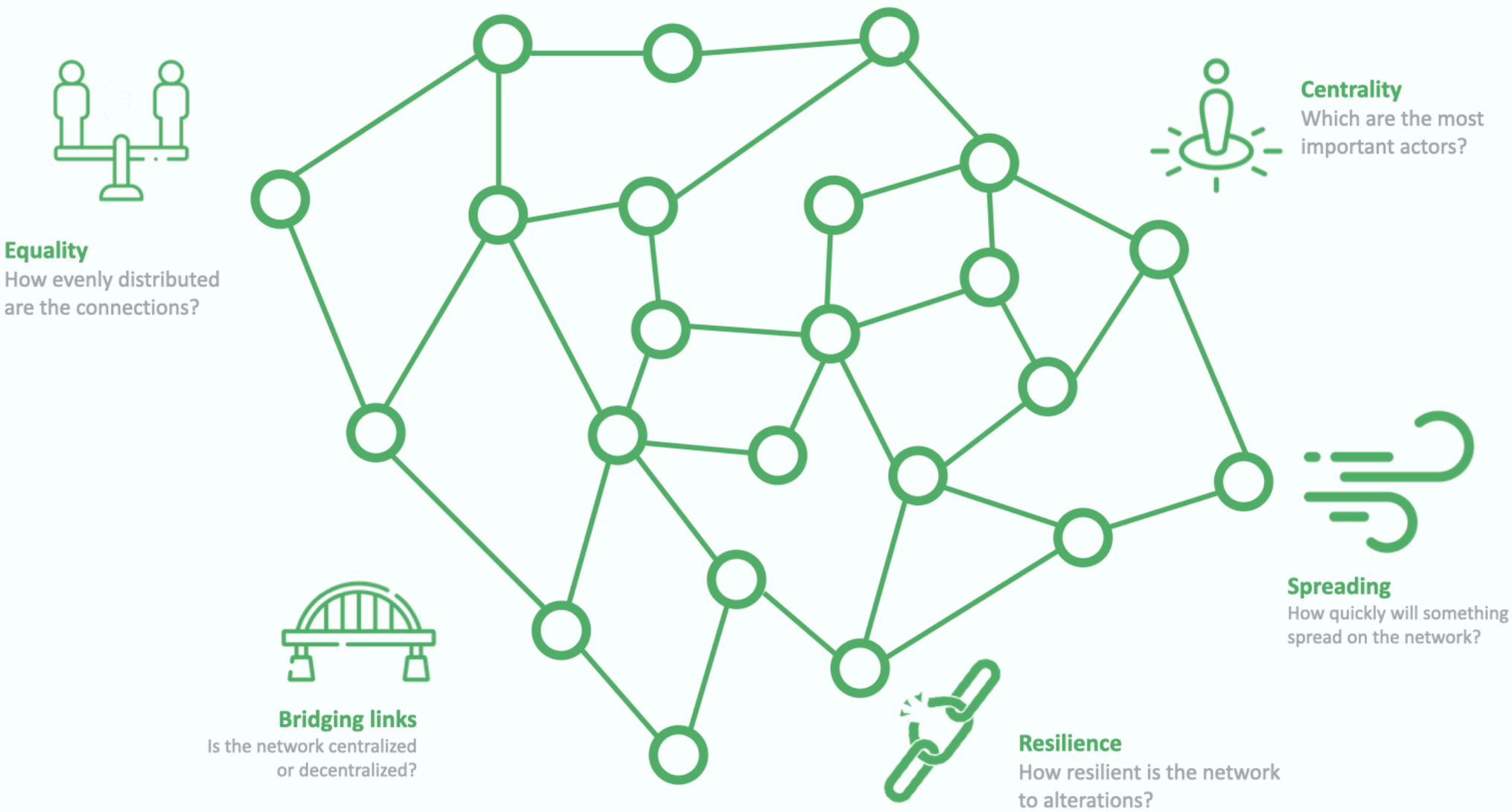
How is the capacity to influence peoples' perception and discourse distributed out?

Principle
35

Network Analysis

Social network analysis is the application of network theory to the modeling and analysis of social systems. It combines both tools for analyzing social relations and theory for explaining the structures that emerge from these social interactions.

Social network analysis can help to begin to ask questions about the degree of connectivity within a network, who are the most influential people based upon the degree of connectivity, who might be the bridging links between different groups, what is the overall structure of the social network, how fast will new information diffuse through it, or questions about the clustering of certain socio-cultural groups.



Principle
36

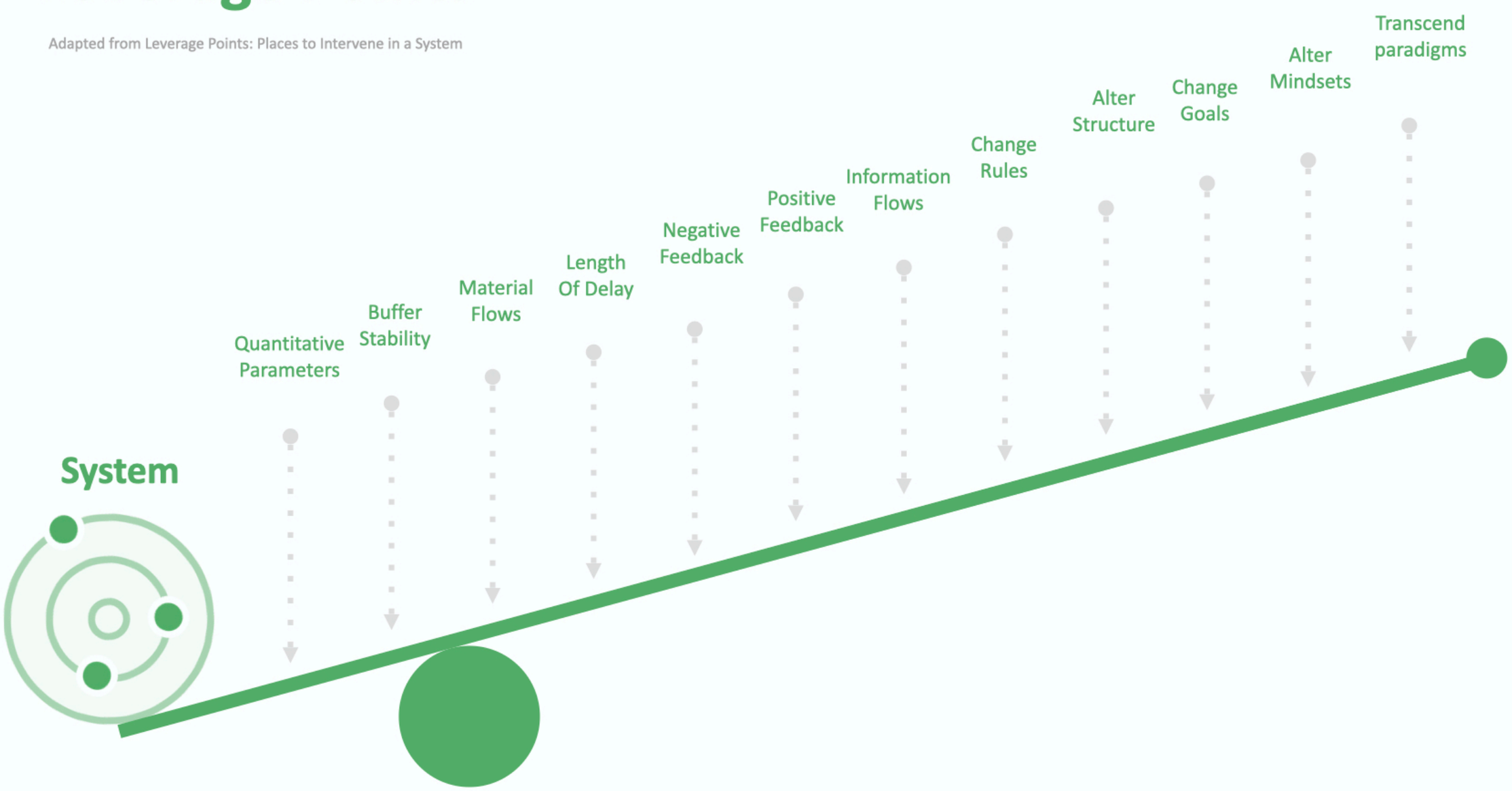
Leverage Points

The idea of leverage points was introduced by Donella Meadows in a paper where she proposed a scale of places to intervene in a system that would result in varying degrees of change within the overall organization. She started with the insight that there are levers or places within a complex system where a "small shift in one thing can produce big changes in everything."

Leverage is not found in the centralized points of the greatest manifest power in the system but is found rather in abstraction. By abstraction, we mean shifting up from the manifest observable everyday phenomena to look at information flows and mental models. Understanding these different levels of abstraction is done through the iceberg model. This approach is required on difficult problems since problem solvers can exert only limited amounts of force on a large system.

Leverage Points

Adapted from Leverage Points: Places to Intervene in a System



Principle
37

Iceberg Model

The iceberg model is a popular systems thinking model that uses the analogy of an iceberg to illustrate the systemic structures behind an observable outcome or event. The iceberg is used as an analogy as it is known to have only 10 percent of its total mass above the water while 90 percent of it is underwater. Thus the expression “tip of the iceberg” is used to connote that what one can see is only a small part of a larger dynamic, i.e. there is much more below the surface and what it looks like maybe surprising.

Just like with an iceberg, a large percentage of what is going on in our world is hidden from view and the Iceberg Model tries to make this explicit by depicting it as a series of layers that sit beneath the everyday phenomena observed. These levels proceed from that above the water, the observable events, to underlying patterns that generate these, to the supporting systemic structures and ultimately the mental models of the members of the system.

Iceberg Model

Events

What is currently happening in the system, what are the observable actions and phenomena

Patterns

What are the trends we see in the patterns of change over time, what is increasing or decreeing

Structure

What are the underlying systemic structures, the flows of information, rules, networks of connections among actors etc.

Models

What are the mental models and assumptions that are held by the actors in the system to understand the system, what they do and why they do it?

Principle
38

Intervention Assessment

An intervention assessment is an appraisal of the best places to intervene in a system to apply resources at the locations with the highest leverage and where the organizations have the greatest capacities to effect systems change.

Given the challenge of systems change it is important that organizations identify - based on their systems map - where is the most strategic place to intervene within the system in order to achieve the greatest potential for systems change. This is what an intervention assessment does.

The two primary factors to consider in this assessment are the degree of leverage the intervention point may have, based on the iceberg model, and the capacities of the organization to effect change at that point given its resources, connections, and capabilities.

Principle
39

Leverage Strategy

A leverage points strategy gives an outline of where in a system we plan to intervene to effect change. It builds upon a systems map that provides an understanding of the system's workings and its key stakeholders as well as an assessment of the places of high leverage and capacity in the system. This strategy would then set the overall conditions for developing the interventions.

A strategy of this kind would generally outline what we hope to achieve by doing so, e.g. the objective. It may define the key challenges to realizing this. As well as a how might we statement to turn the challenge into an opportunity.

Key Considerations

Objective

What is the objective we would like to achieve through making the intervention

Challenge

What are the challenges we need to over come to realize the objectives?

How might we

How might we over come the challenges to realize the desired objectives

Principle
40

Leverage Hypotheses

Leverage points hypotheses are hypotheses about the effects of our interventions in a system. The purpose of this is for us to increase our awareness of the possible consequences of our interventions within the system to avoid unintended consequences and to increase the likely hood of our actions having a beneficial effect.

For every intervention point in our systems map, we can define the intervention and then collectively think through the potential consequences of that intervention in the present and over time to the various stakeholders in the system. A key principle in leverage hypotheses is to remember that “for every action, there is an equal and opposite reaction”. For every force we introduce to the system - e.g. money, rules, physical structures etc. - there will be a counter effect that we must try to be aware of to the best of our ability.

Intervention

If we make an intervention what are the potential consequences of this

Stakeholders

Who will likely be most effected by the intervention?

Time horizons

What are the effects over different time horizons?

Unintended Consequences

What are the potential unintended effects of our actions?

Systems Change Cards

Transition Models

Two Loops

Multi-Level

Three Horizons

Adaptive Cycle

Horizon Scanning

Futures

Innovation Maps

Scenarios

Narratives

Systems Change Concept Cards

System Gardening

System Acupuncture

Attractors

Facilitation

Action Learning

CoDesign

Human-Centered

Service Design

Incentive design

Communication

Systems Change

Systems change is an intentional process aimed at enabling a systemic transformation within a complex system. Due to systems change being a nonlinear process, one cannot directly change a complex system only guide an ongoing transition. Thus systems change is about working with transition processes within complex systems to try and realize the emergence of new structures, functions and outcomes.

Systems change is about influencing the system at certain strategic “leverage points” to influence it in some way towards a new higher equilibrium that is more sustainable. To do this we need some insight into how the system is changing, where we might like to go to, points where we can influence it, as well as a story that illuminates the new paradigm. It is about working with context, fostering new attractors in the system, and about direction, not destination.

Linear Change

The most obvious and direct approach aiming to change the immediate parts causing the problem

Systems Change

Aims to change the overall context to realize the emergence of new outcomes over time

Systems Transitions

Transitions are changes in whole system structure - not simply changes in any of the system parts as would be the case during normal incremental periods of change. Transitions are different from normal linear processes of change where there is only a change in the individual parts, as with phase transitions new macro-level structures emerge.

Systems change comes about as a function of a qualitative change in the system, not a quantitative change in any of the parts. Qualitative change is a systems-level transformation because it is not about the system doing what it does better, fast or more efficiently, it is about the system doing something different as a whole. It is a change in the context, a change in the understanding of the end objective of the system and the function it performs - as a consequence the enabling structures and organizations required to fulfill these new functions.

Inception

The creation of the new system

Linear Change

The parts of the system are increased within the same overall pattern of organization

Transformation

The parts of the system are reconfigured towards a new system structure

Emergence

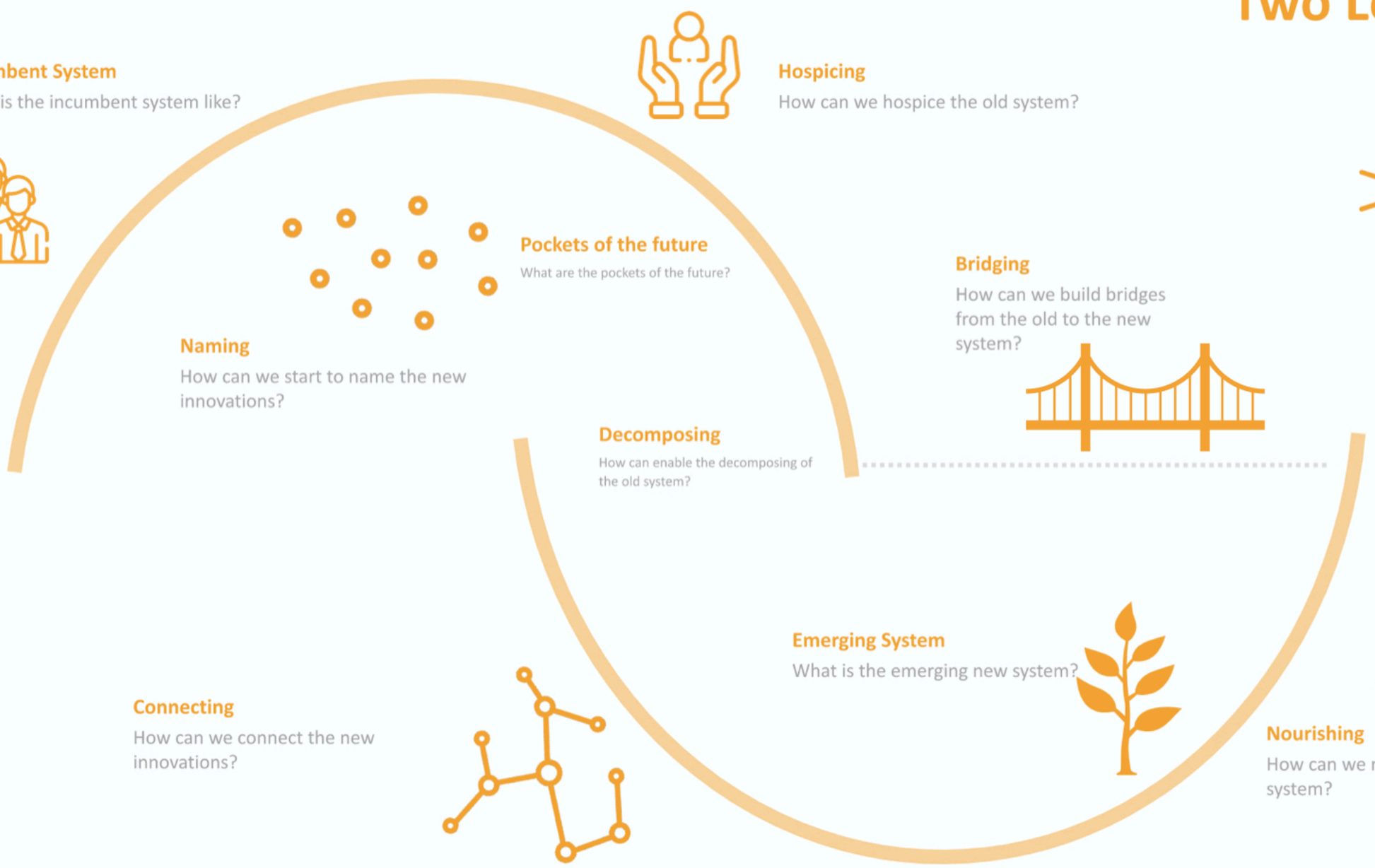
The emergence of a new system with new overall properties and capacities

Two Loops

The Two Loops is a model representing a transition process within a complex adaptive system based upon the ideas of living systems. It provides us with insight into the simultaneous growth and decline processes that are underway within a system during a transition period. The model - created by Margaret Wheatley & Deborah Frieze - as a whole describes two "loops." The first of these is used to represent the growth and subsequent decline of the existing incumbent system. The second loop is used to represent the new emerging next generation of this system.

The model helps us to think about a complex organizational change process, i.e. systems change. It serves as a heuristic to better try and recognize and connect the past to the future during a change process. It likewise gives us the possibility to try and come to some consensus about where we might be as a group in this process of change and the best actions to take at different stages.

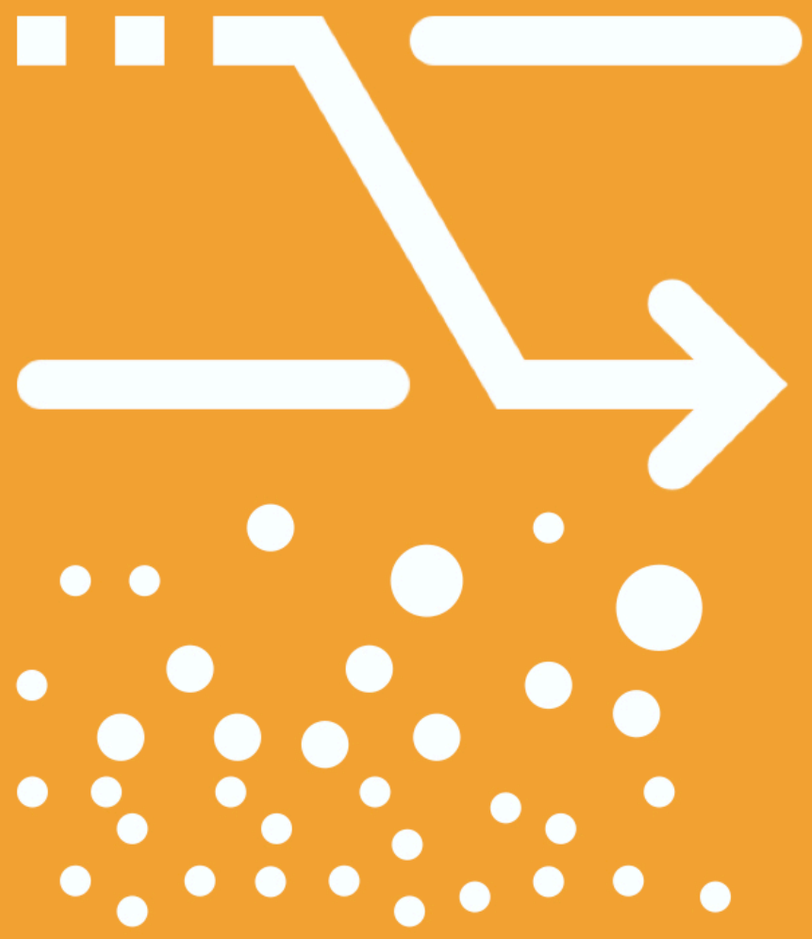
Two Loops Model



Multi-Level Perspective

The Multi-Level Perspective(MLP) is a prominent framework for describing transition processes in complex socio-technical systems developed by Frank Geels. This model helps us to think about and map out how change happens on many different levels from the micro to the macro. It has been designed to help us analyze and better understand the “long-term, multi-dimensional and fundamental transformation processes through which established socio-technical systems shift to more sustainable modes of production and consumption.”

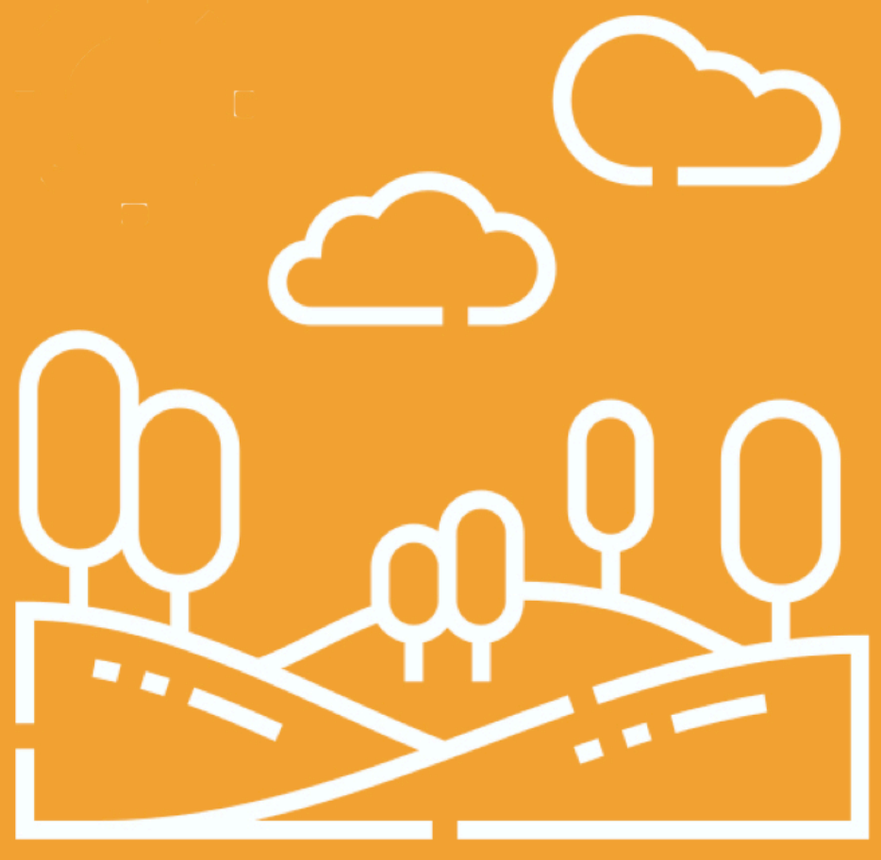
The MLP describes complex transition processes involving paradigm-shifting innovation. Examples of this might include the advent of personal computing, the Green Revolution that lead to the modernization and industrialization of agriculture globally, or the introduction of the automobile as a dominant mode of personal mobility during the 20th century.

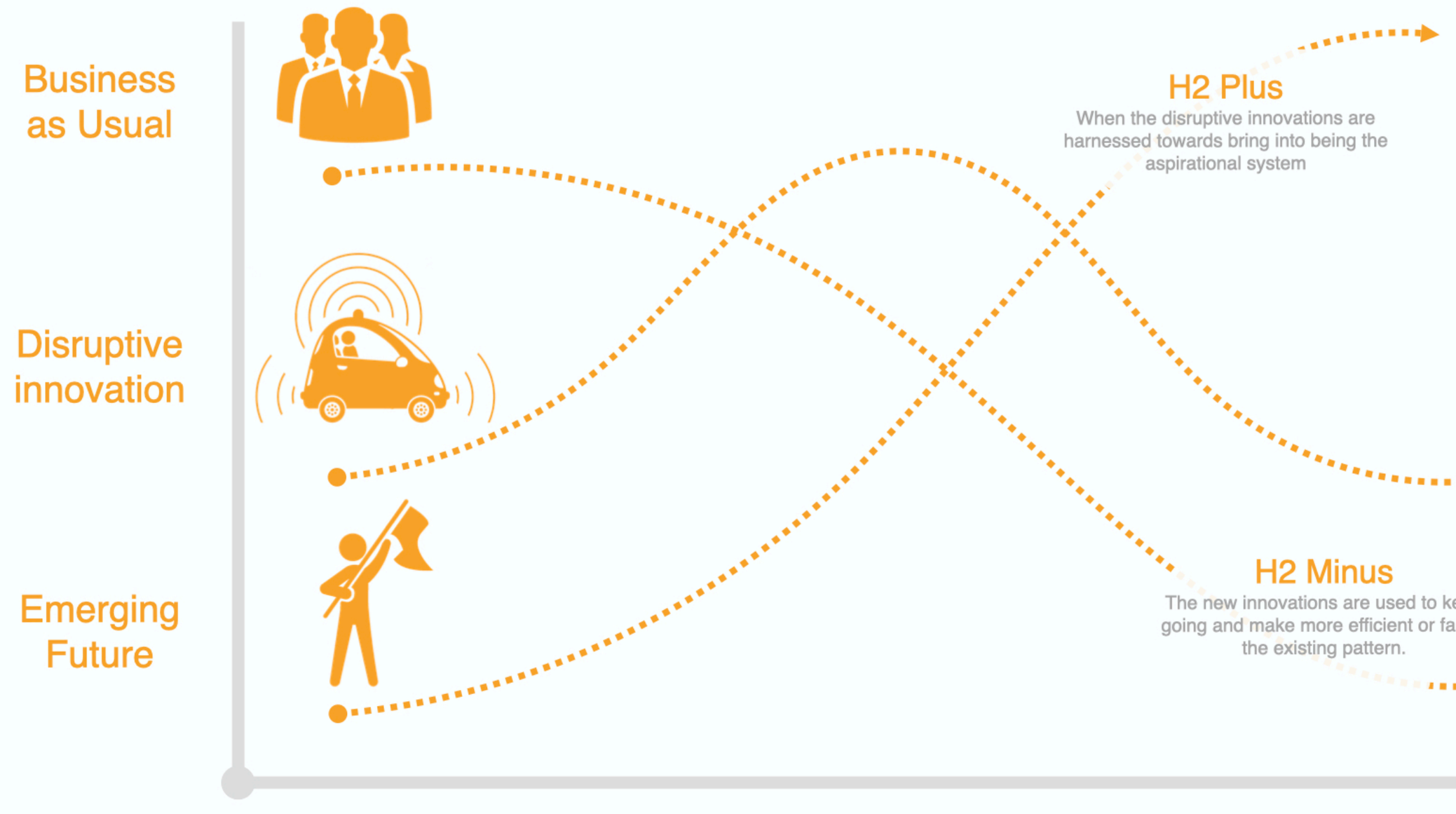


Three Horizons

The Three Horizons Framework by Bill Sharpe is a tool for thinking about transformation and how to bring it about - it is a tool to support and structure our thinking about the future and how different trends may evolve over time. It identifies three major factors involved in any transition processes by looking at the driving forces of innovation, the decline of incumbent systems, and the emergence of new patterns of organization.

The model attempt to identify how patterns of organization change over time during a transition process. It aids us in collectively asking where is business as usual taking us, where do we want to go, what are the trends taking us forwards and, how are or can those driving forces be harness to take us in either direction. The model does not trying to predict a specific outcome, instead try to see pockets of the future in the present and how certain trends are taking us forward.





Adaptive Cycle

The adaptive cycle is a heuristic model developed by C.S. Holling for understanding macro processes of change in ecosystems. The adaptive cycle is equally applicable to a transition process within any complex adaptive system. It can be used to identify structural patterns in both ecosystems as well as social systems as they go through nonlinear processes of change, i.e. systems change. The heuristic describes how complex adaptive systems evolve in terms of four primary phases. These four phases are; exploitation, conservation, release, and reorganization.

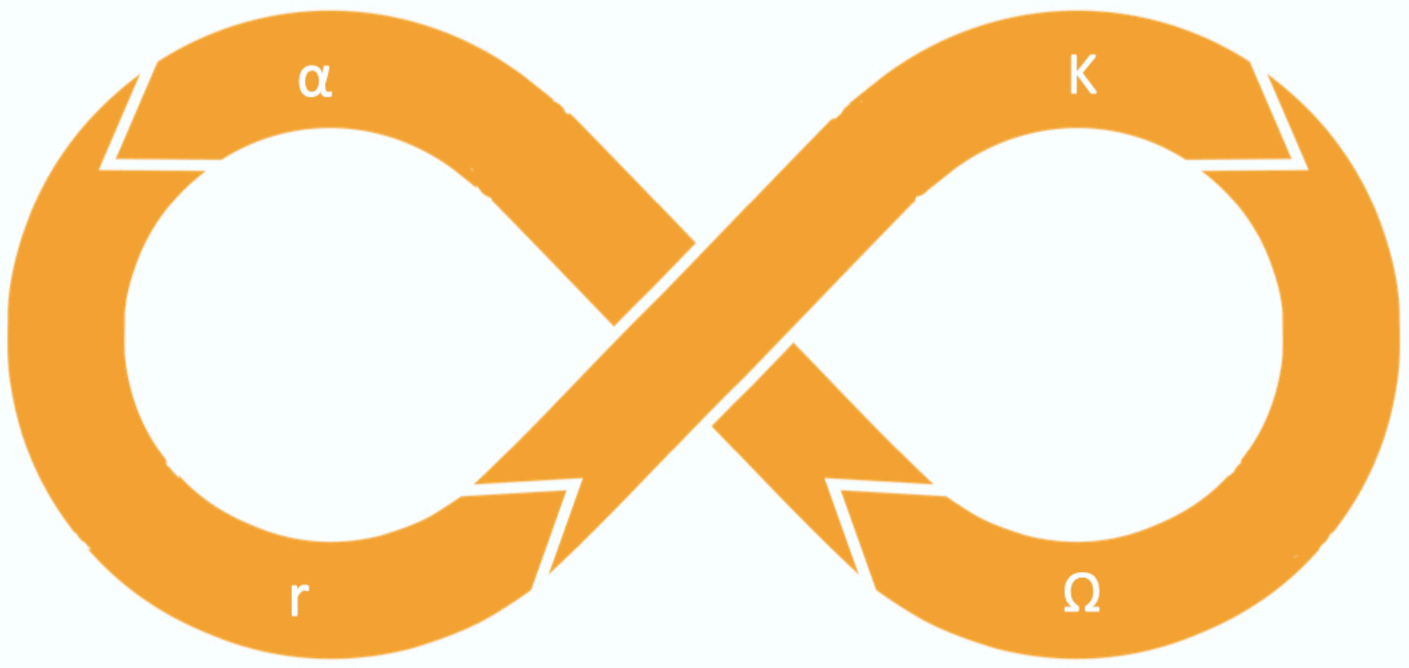
The first stage of exploitation is one of a new environment, it is one of growth, a time of expansion, and increasing complexity. The conservation stage is a state of equilibrium, it is about controlled development, and this ‘equilibrium’ is a time of stability. The release phase is one of crisis and collapse when the system is destroyed by an external disturbance. Reorganization is a time when the system begins to recover from falling apart.

Reorganize

A time when the system begins to recover from falling apart. A creative time when change can take a variety of possible directions.

Conservation

The conservation stage is a state of equilibrium, is about controlled development and this ‘equilibrium’ is a time of stability.



Release

The release phase is one of crisis and collapse when the system is destroyed by an external disturbance.

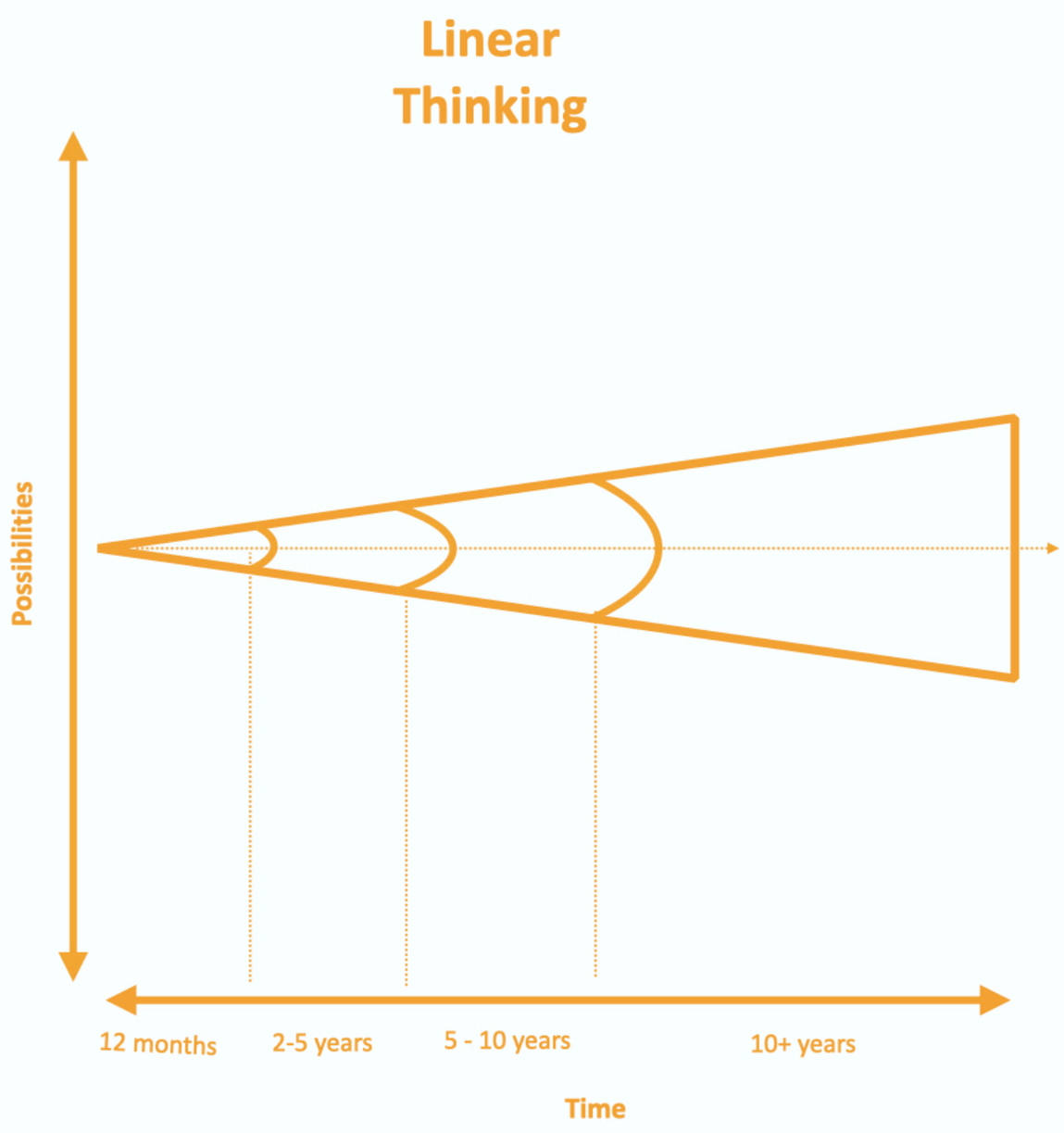
Exploitation

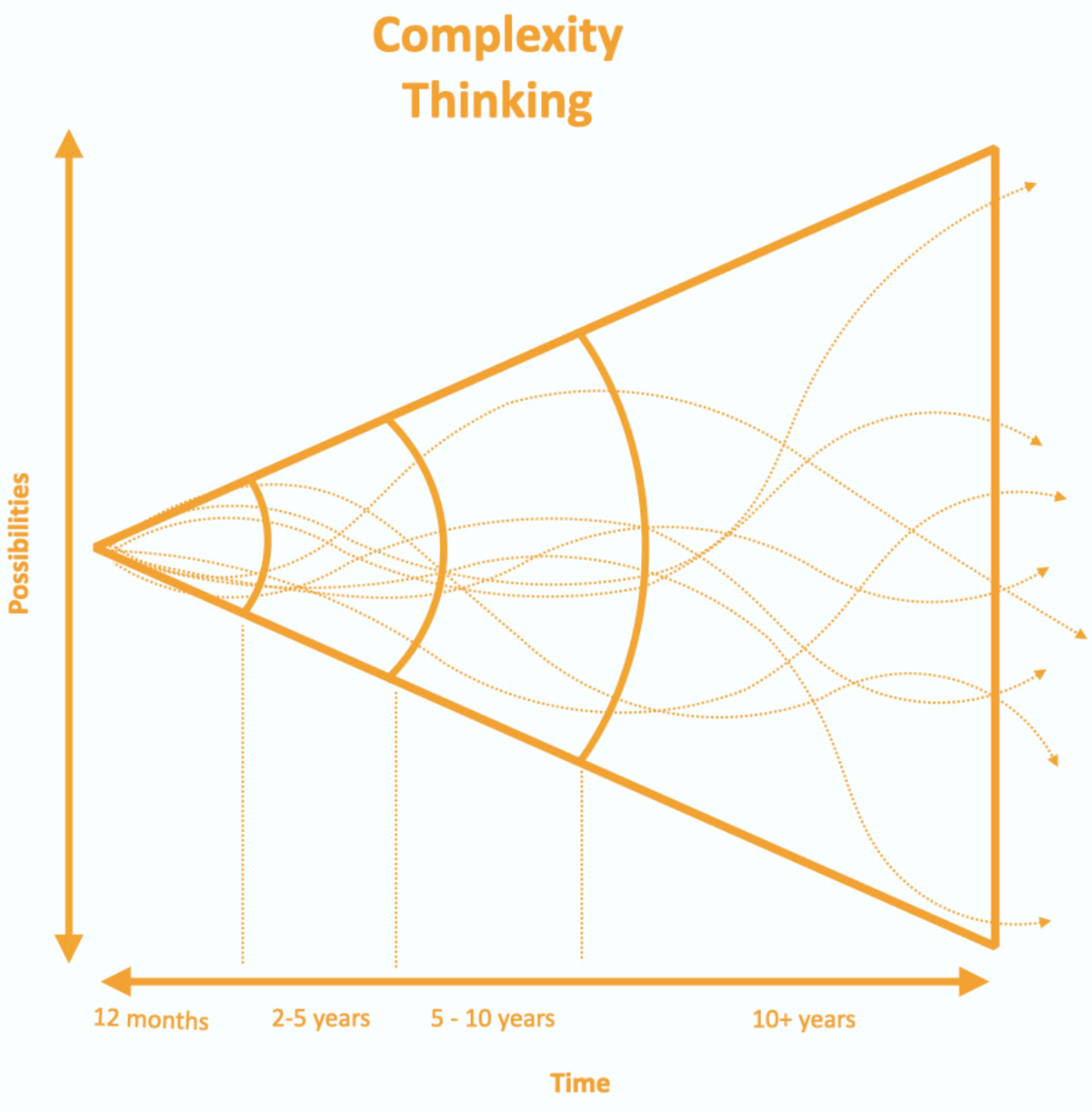
The first stage of exploitation is one of a new environment, it is one of growth, a time of expansion and increasing complexity.

Horizon Scanning

Horizon scanning is used by organisations in complex dynamic environments as a way to reason about the future. It is a method for identifying early signs of potentially significant developments through a systematic examination of opportunities. It explores novel and unexpected issues, including matters at the margins of current thinking that challenge past assumptions.

Horizon scanning seeks to understand what is likely to continue and what could plausibly change. It is viewed as a search for “signals” and is generally found at the beginning of any forward-looking activity. The core purpose of Foresight and Horizon Scanning activities is to better anticipate future opportunities or threats and to identify issues in the present that are of major importance for possible futures.

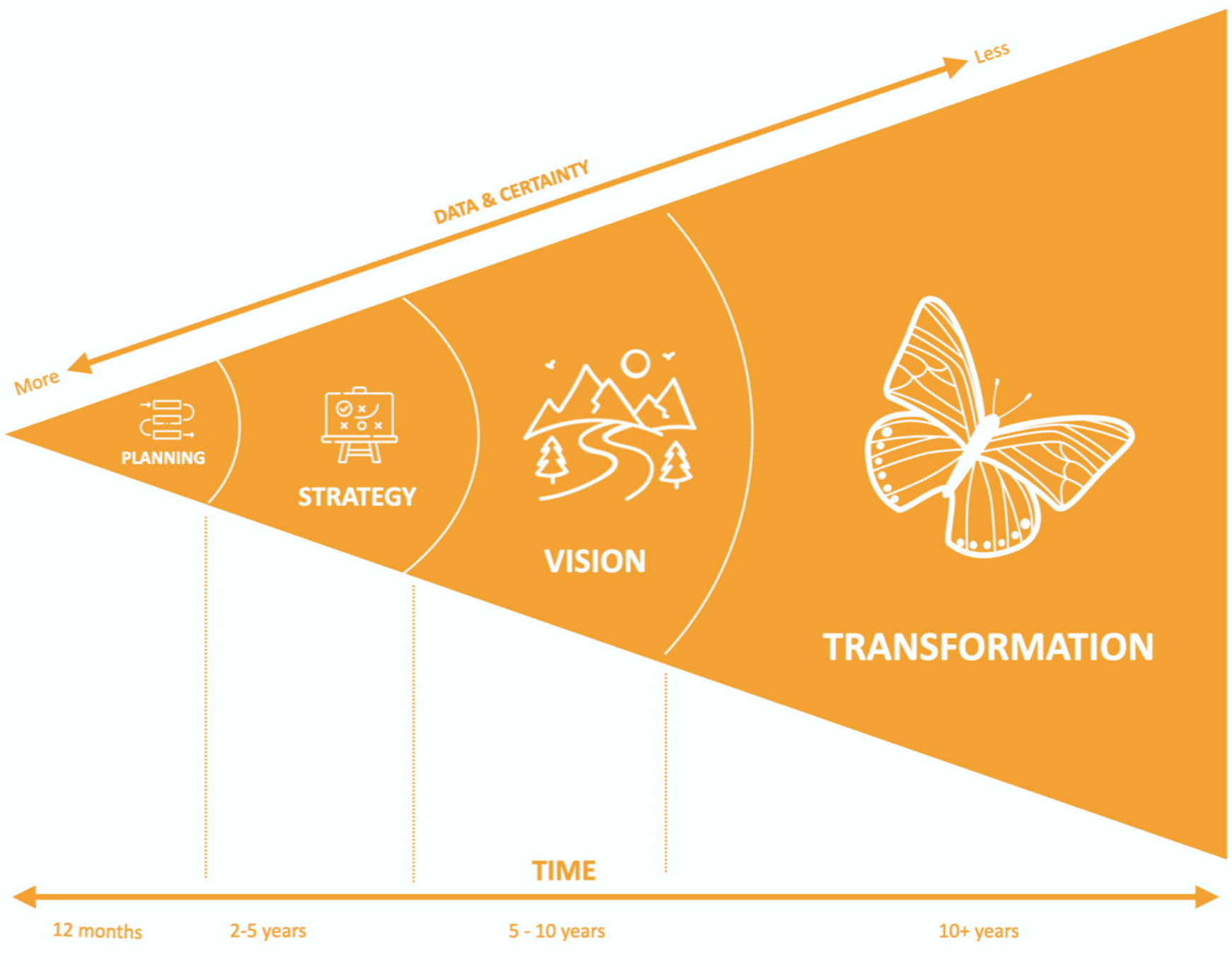




Futuring

Futuring is the use of a systematic process to think about the future; framing and forming possible scenarios for the future to gain insight into the best actions to take in the present. Futurists use what they see in the present as a view of the future; they watch trends and try to envision what may happen, but they are also aware that the future does not yet exist and thus is something to be created through the stories we tell.

Futures studies collect and analyze signals and trends from the past and the present, to create scenarios about probable, possible, or desirable futures. Futuring involves looking at both large-scale drivers of change but also weak signals as pointers of change beginning to emerge on the horizon - at the same time remaining conscious of "wild cards" and "black swan" events that involve great uncertainty and can’t yet be known.



Innovation Landscapes

Innovation landscapes are maps of the different types of new innovations found within a given location or area. The purpose of innovation landscape mapping is to identify what innovations are already happening within the system and to structure it according to some taxonomy that makes it easier and more accessible for people to see what is happening. These maps help to avoid re-creating the wheel, to build upon and work with what already exists.

In the context of systems innovation, the aim is to identify the "pockets of the future" in the present we wish to support and develop into a new ecosystem. Pockets of the future are examples of activities, behavior, or organizations that exist in the present as seeds that embody the attributes and qualities of a new desirable future system. We can use these pockets of the future that exist in the present as a way to demonstrate the new possibilities.

Transformative

These innovations change systems structure and paradigm

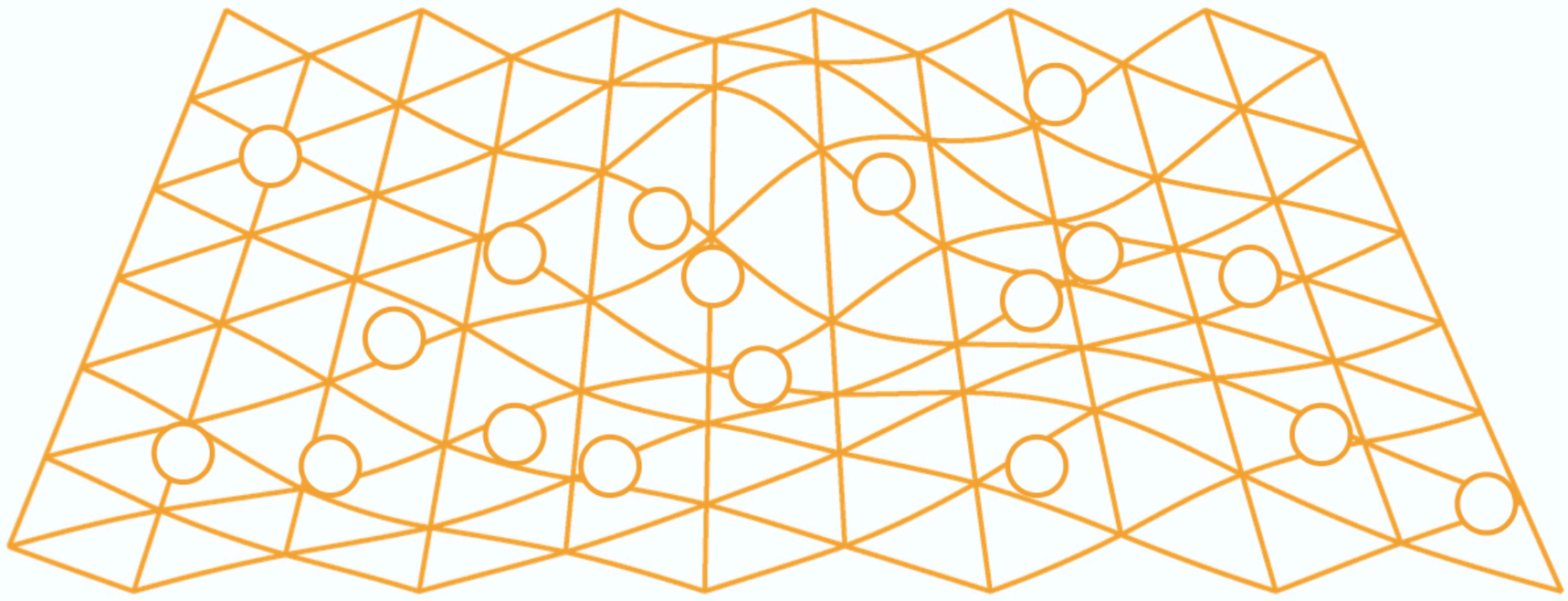
Environment

Ideas

Technologies

Social

Economic



Increment

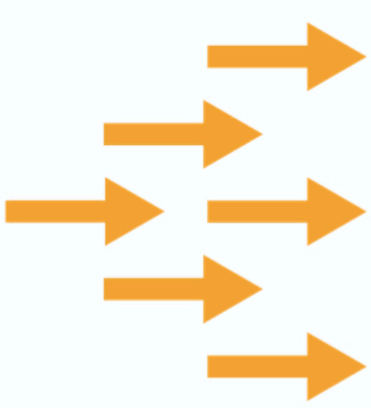
These innovations change the parts of the system

Scenarios

Scenario planning is a structured way for people to think about the future by creating a set of scenarios that are based on current trends. Scenarios are co-created stories about the different ways that the future may unfold based on current tendencies. Scenarios present alternative futures that together capture the most relevant uncertainties and driving factors. Scenarios aim to describe the potentially feasible region for the future.

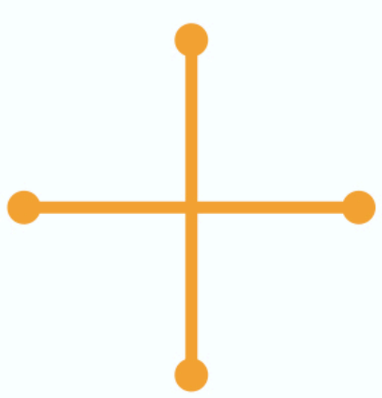
Scenario planning is done by exploring the forces that are shaping the future and combining this with imagination. It tries to look at the most important forces and most uncertain uncertainties that are shaping the future and bring those together to assemble a coherent narrative. Every scenario is a story about how the future may unfold - we build stories out of the forces shaping the future, how they may interact and our imagination of what those potential future worlds may be like.

Scenario Building



Driving Forces

Study current and past forces indicators to derive trends



Uncertainties

Define the key factors and uncertainties shaping the future

Scenario Making

A set of stories about what the future may look like

Implications

Step back and think of what it is like to live in each scenario

Narrative Building

Stories shape how we understand the world, our place in it, and our ability to change it; they can create, sustain, and lead to the collapse of systems. Stories for systems change are platforms that enable people to recognize their shared interdependence in the system and create shared identity and pathways for collective change. Our future is made up of the stories we tell today, thus we can change our future by simply telling different stories.

It's the narratives that we tell ourselves and the narratives that we tell each other that create the world we share - this shared world is shaped by institutions, which are based largely just on the stories that we agree upon. Thus narrative building is a key part of systems change. To change a system and create a different world, requires us to have a coherent story about the new possibilities, both aspirational and realistic, which will engage and ignite change.

Story Elements

Key aspects of a narrative for change

World Building

Gives meaning and context to the world and the changes that are taking place.

Values

They give an account of what is of value and not

Direction

Provide guidance and motivation for achieving desired outcomes

Identity

They give an account of the nature of the groups place in the world

Systems Gardening

Systems gardening is an approach to management and systems change that moves away from a linear mechanistic approach to looking at change in complex organizations as akin to that of the gardener working to cultivate plants. This approach shifts the emphasis from a direct form of change to working with context. The systems gardener seeds transition by identifying, connecting, supporting, and spotlighting pioneers of the new system.

By creating the right context and watering the seeds of new ideas the change agent enables transformation through emergence. A systems gardening strategy is to find these niches and "nourish" them with the resources they need. Like looking after plants, we might have to give them water to grow, but we may also have to alter the broader context they exist in so that they get enough light or are not crowded out by other plants, or maybe they have to be put in contact with other creatures to create synergies.

Identity Landscape

First identify the overall landscape, thus setting the context within which self-organization can take place.

Pockets of the future

Look for the fertile soil where there is potential for pockets of the future to emerge.

Dampen & Amplify

Dampen down or amplify the attractors depending if they are beneficial to the whole system or not.

Probing Experiments

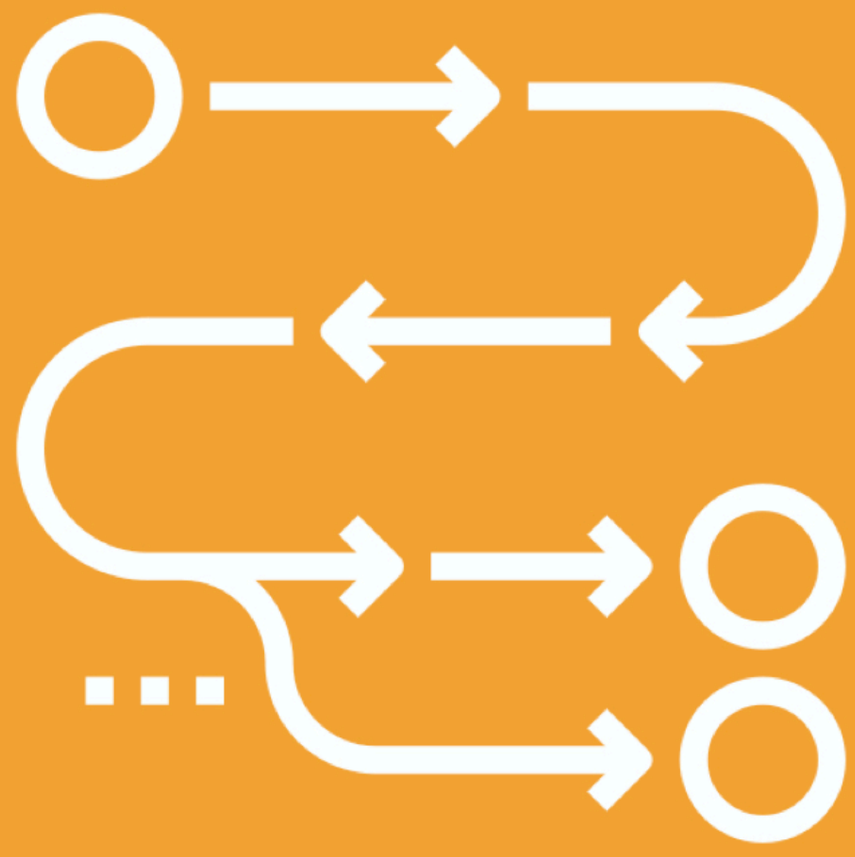
Introduce probes - safe to fail experiments to develop attractors.

Systems Gardening - How it works

Systems Acupuncture

Systems acupuncture draws insight from the ancient practice of acupuncture to provide a strategy for systems change. In general, acupuncture is a Chinese healing practice that sees the bodily system's health as a network of flows and aims to intervene at certain points to release blockages and restore balance in the system.

Orit Gal talks about systems acupuncture as working by analyzing existing flows across a certain system. We then design actions that make small accumulative interventions usually away from the core to strengthen or disrupt a given pattern. The objectives of our interventions are two-fold; they can be aimed at either disrupting or enhancing existing flows identified across the network to divert them into new and hopefully more productive configurations. Over time the dominant paradigm we aim to disrupt may be gradually destabilized while new flows will allow for the emergence of new practices.



1. Create Boundary

Define limits to the system, thus setting the context within which self-organization can take place

2. Probing Experiments

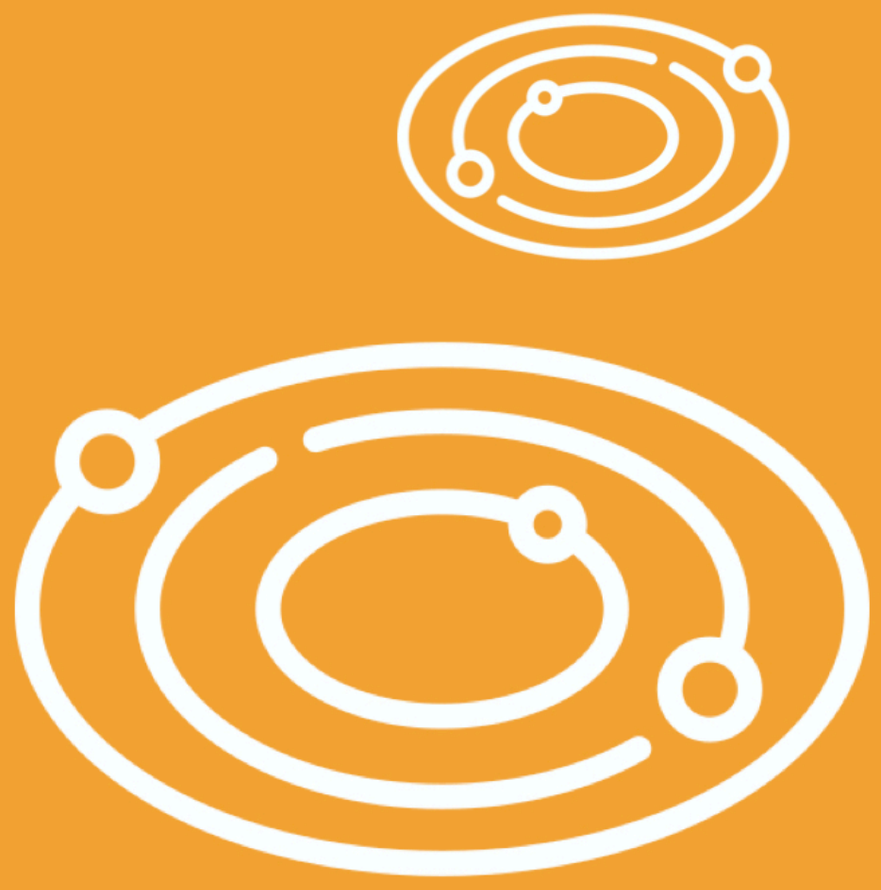
Introduce probes that attract members creating safe to fail experiments

3. Dampen & Amplify

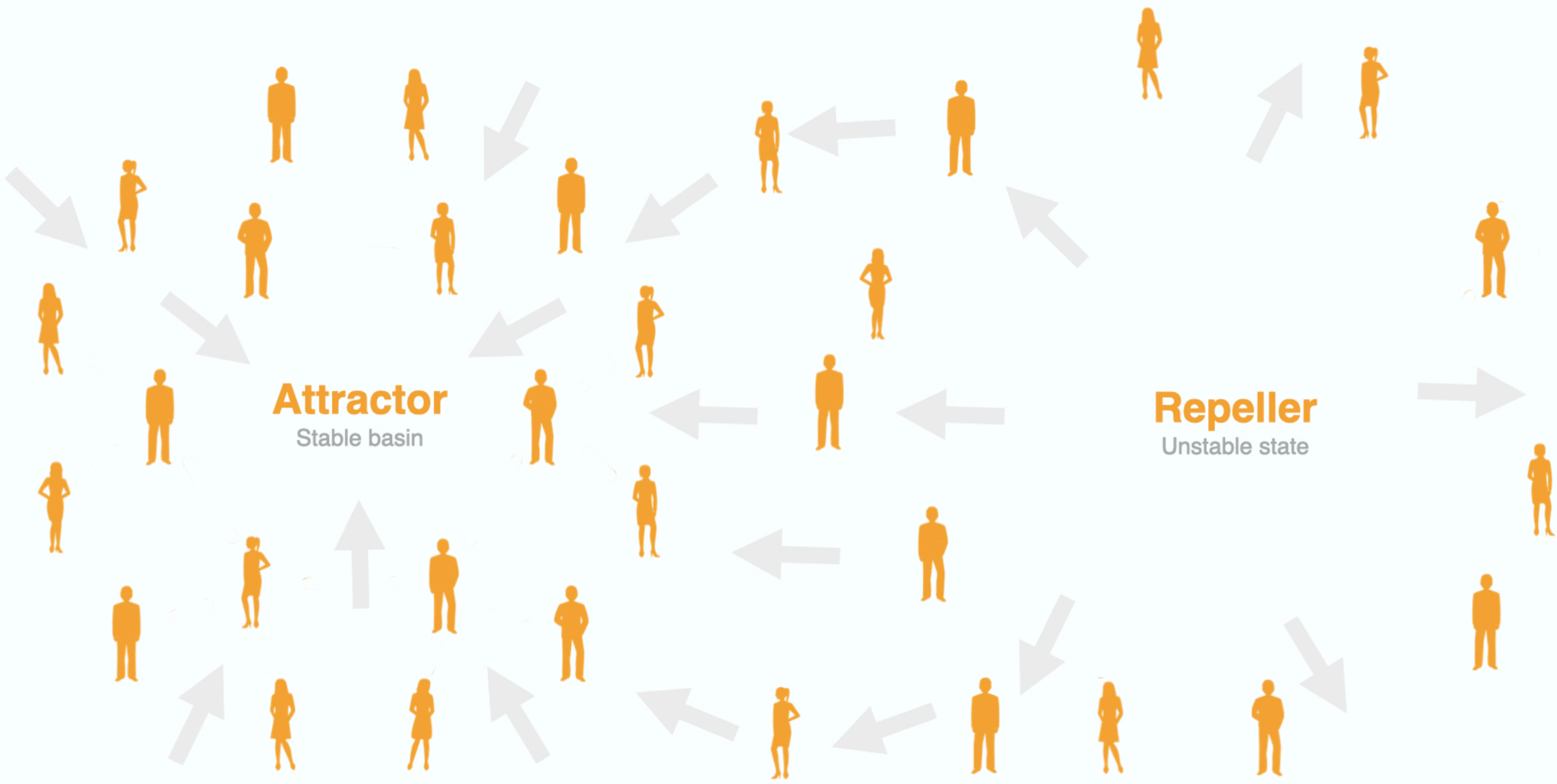
Dampen down or amplify the attractors depending if they are beneficial to the whole system or not

Attractor Landscapes

An attractor is a set of states towards which the elements within a system will naturally gravitate and remain cycling through unless altered. Repellers are a set of states from which the elements within a system will naturally move away from. An attractor landscape refers to the context within which elements are repelled or attracted toward certain states.



In the context of systems change attractor landscapes can be designed to influence and guide systems change by altering the default set of choices and behaviors of the actors within a complex adaptive system. For example, within a food system, we may map out the cheapest and easiest option for purchasing food within a location (attractors) and which are most difficult and expensive (repellers). We could then work to change these so that they correspond with the choices that are best for health and the environment.



Facilitation

Facilitation is the act of creating space for others to co-learn & co-create within a structure of activities. Facilitators design such spaces and guide participants through activities for them to achieve their objectives. Facilitation is central to systems change as no one actor is able to change a system nor can a group without coordination.

Thus there needs to be a space that enables self-organization and facilitation creates the appropriate structure for members to interact, and collaborate in pursuit of system change. Facilitation spaces may include, workshops, CoLabs, platforms, or innovation ecosystems all of which provide the context, structure, and activities for actors to work together around a shared challenge or learning objective.

Facilitators role is to...

Create conducive context
Plan the process
Inspire creativity
Promote transparency
Adapt process as needed
Create flow to activities

Helping groups to become...

Coherent
Think together
Aligned
Experimental
Collaborative

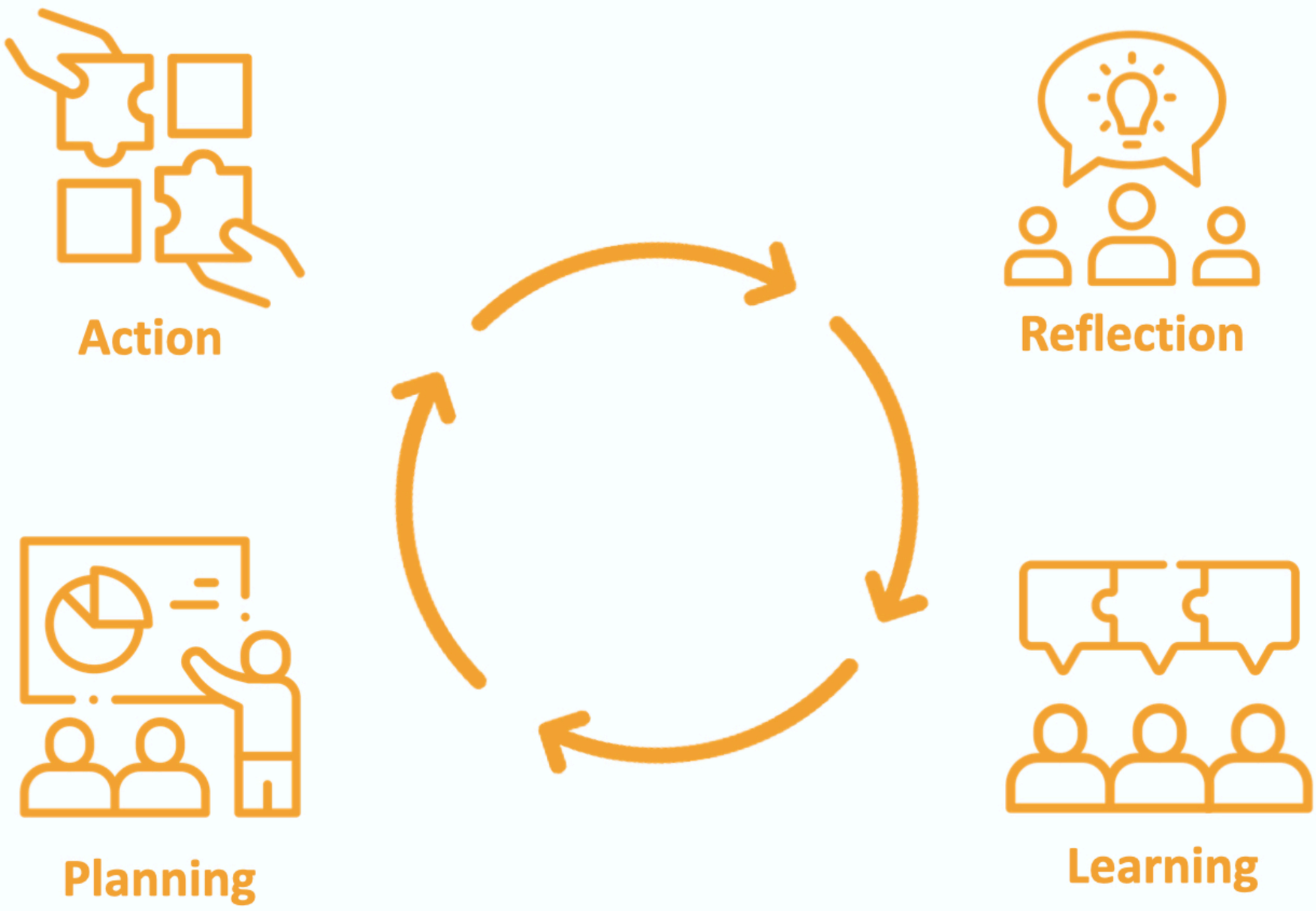
By members...

Sharing ideas
Being open
Listening
Thinking
Problem solving

Action Learning

Action learning is a process of group learning and problem solving where small teams work on real-world challenges, take action, and reflect upon the outcomes to learn in practice. It combines action and learning so as to get a dynamic feedback loop between theory and actions - requiring that participants reflect on the functioning of the team in action so as to learn and improve over time as a team.

The process of action learning involves asking questions to clarify the nature of the challenge, reflecting, and searching for a possible response before taking action. Action learning is not a solution but a group dynamic where people can openly discuss challenges, reflect and learn through taking actions in a practical fashion. Over time learning of theory can emerge through identifying patterns in action. Likewise, theory can be understood in a more comprehensive way by exploring it in practice.



Co-design

Co-design describes a design methodology where the uses of a system are actively involved in its design & development. Co-design fundamentally changes the traditional, more linear, designer-client relationship to one that creates space for a wide variety of actors to participate in the creation of the product, service, or system at varying stages and to varying degrees.

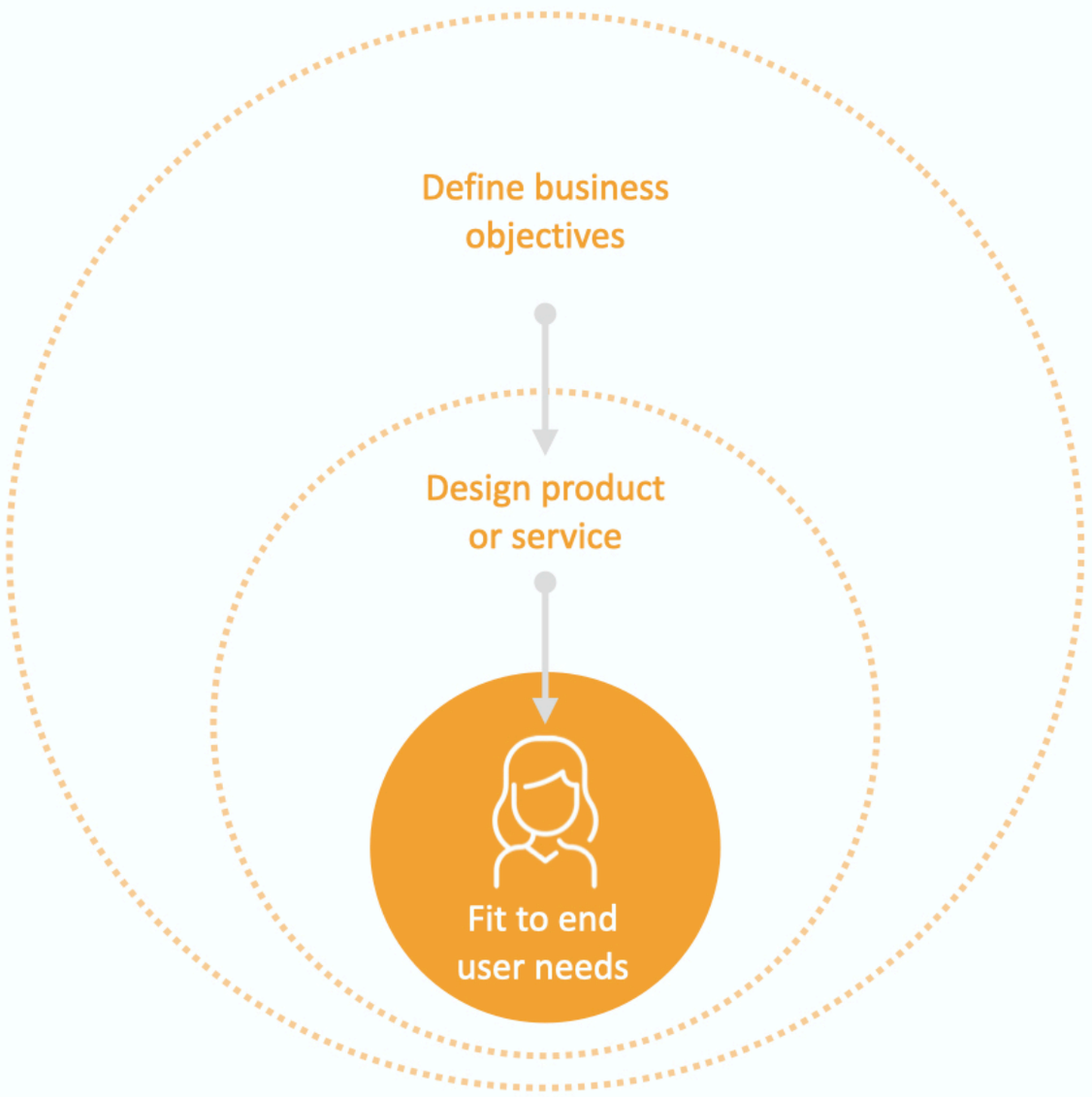
In co-design users are no longer seen as passive recipients of finished items but play an active role as experts of their experience with the system. The role of the designer then shifts to being more of a facilitator of the space and processes needed for a group of people to be productive in shaping their desired outcomes for the system. An example of co-design might be a local community working with, architects, city planners, public administration and local businesses do redesign a public square.

Human-Centered Design

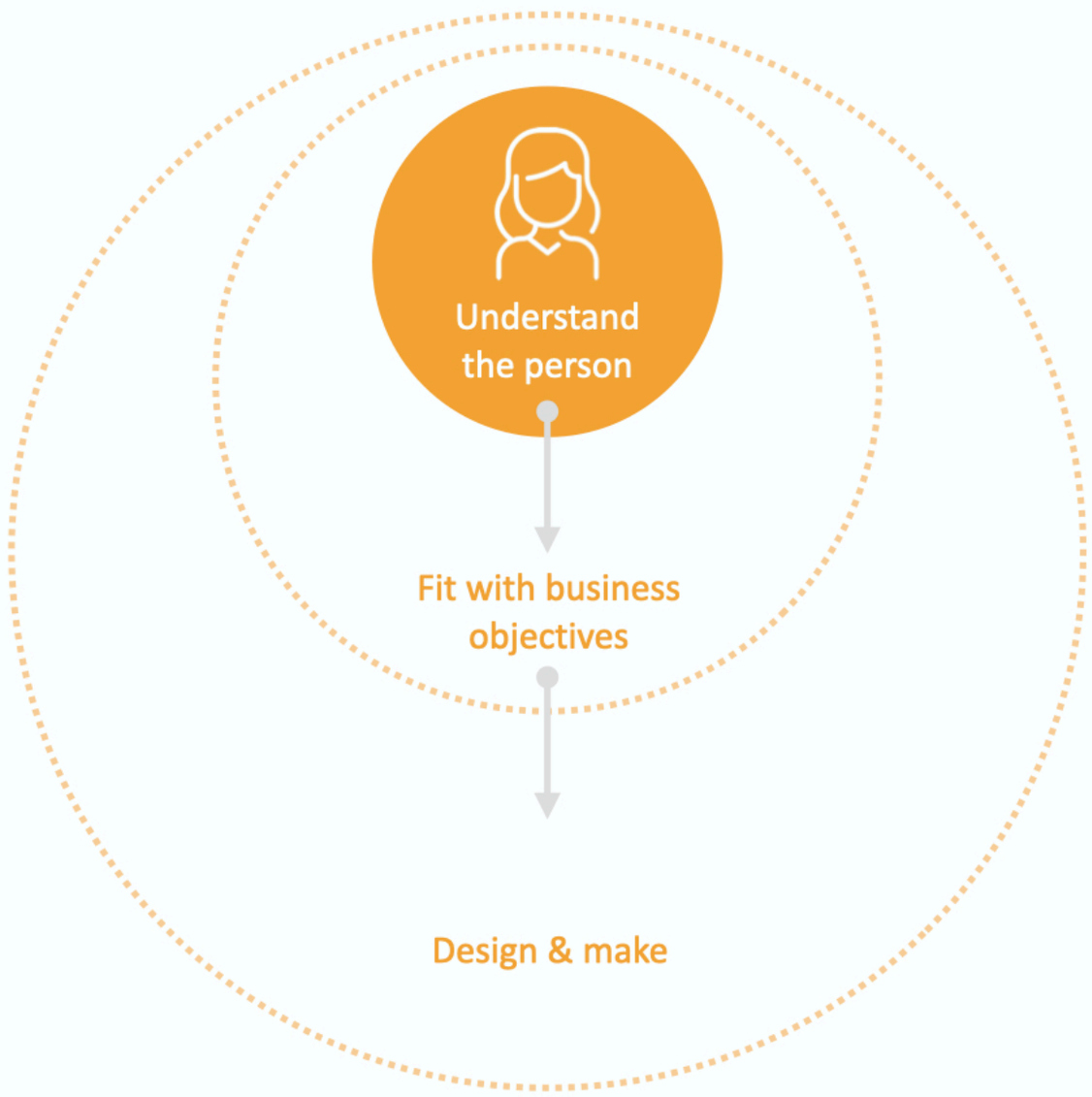
Human-centered design(HCD) describes any design methodology that puts the human experience of the system at the center of the design process and design decisions. HCD focuses on trying to understand the perspective of the people the design is for at each step of the process. Human-centered design is an inclusive approach to design that recognizes the diversity of people and their diversity of needs in using a system.

Empathy for the human experience of the system being designed is at the core of human-centered design. As such applied ethnography is a key part of a HCD approach. This requires design researchers to be fully immersed in the human experience of the system and the lived context of people so that context is considered and implicit details are not lost. The hope is that by developing deep empathy with the people using the system, it allows for solutions that will really improve their lives.

Traditional Design Process



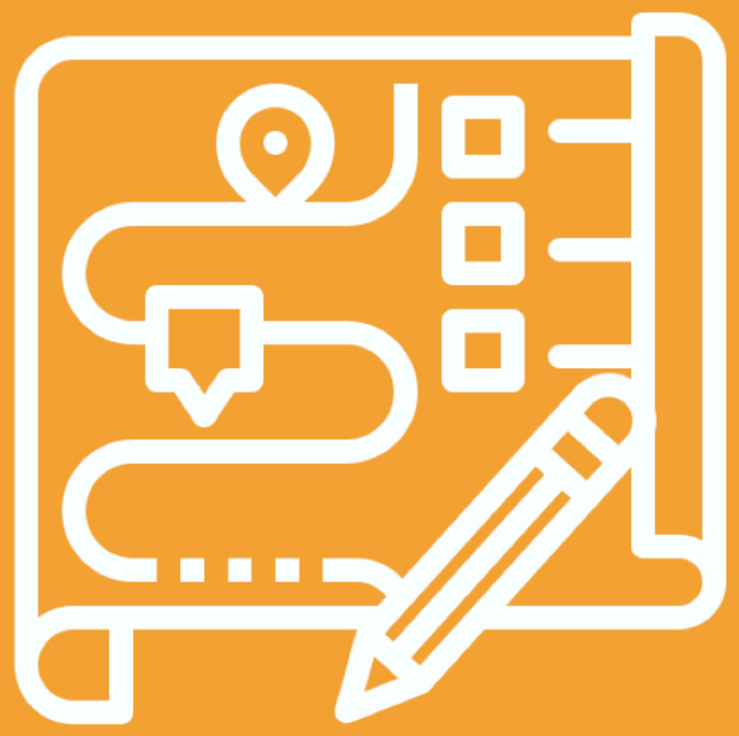
Human-Centered Design Process



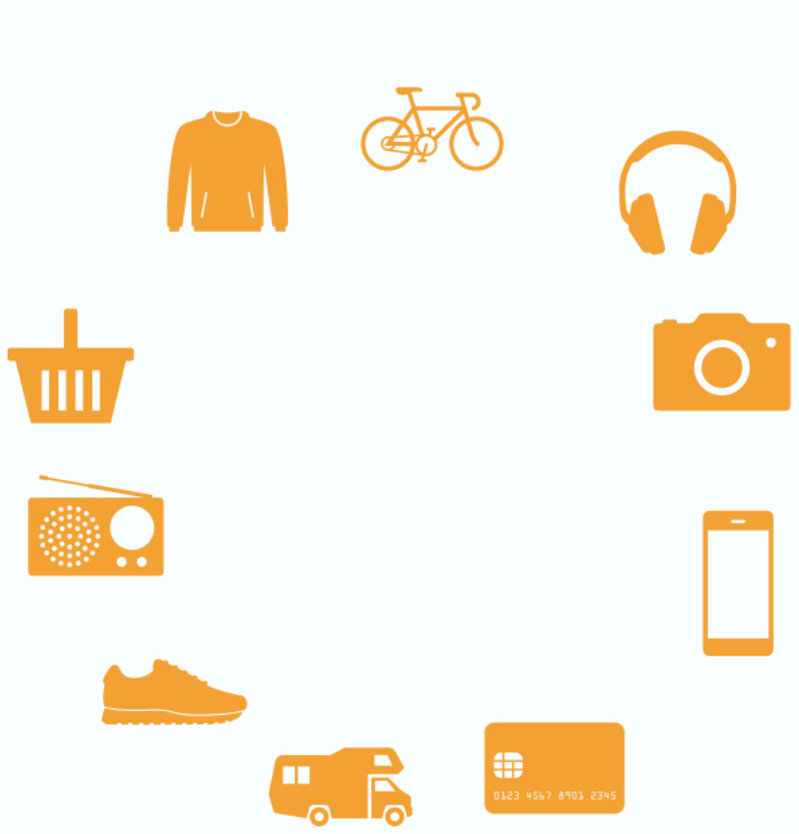
Service Systems Design

Service systems are the integration and coordination of objects, information, people, resources, and processes to deliver a desired outcome for a user. Service design is the process of imagining, conceding, researching, designing, and implementing service systems. Service design can provide a holistic view that works to connect and transform siloed organizations and products into integrated human-centered systems.

In the context of systems innovation service design allows us to rethink and redesign how we achieve results through connecting and integrating elements in new ways. Information technology now allows us to re-invent many of the ways that humans fulfill their needs. Through shifting products to services, service systems can build upon this digital transformation to disrupt existing ways of working and deliver better outcomes for both the user and the system as a whole.



From Ownership



To Accessing

Servitization

Incentive Design

Incentive design is the design of systems of incentives that work to align the actions and choices of the individuals with the overall beneficial outcomes for the system. The aim of incentive design is to create patterns of behavior and organization that shift a systems dynamics towards cooperation and beneficial outcomes for all. The need for the effective design of incentives can be found in many different challenges from driving too fast, to smoking, to lack of health insurance and consumer choice.

Incentive design builds upon game theory's understanding of situations of cooperation and competition - how the structure of institutions and payoffs for choices shape the outcomes we see in the world. Incentive design is also based upon insights from any different ares of economics, psychology, behavioral economics and design. Decentralized tech, like blockchains, are radically increasing our capacity to design new forms of economies & incentive systems at a large scale & thus enable systems change.

Communication Design

Communication design is the design of the message and medium to craft compelling stories and narratives for influencing people's perception and understanding of a given issue or system. Communications design involves researching topics, strategic thinking, market research, crafting and completing messages, designing multimedia, and managing channels to reach people with the right message in the right way to shape narratives.

Communication design is important in the context of systems change as it is a means through which we can raise awareness and influence mental models and paradigms. Just as communication design has been used in advertising to shape the perception of products it can be used to shape perceptions of systems and the potential for change through such media as documentaries, graphics, explainer videos, or slides.

Elements of Constructive Stories

Frame Context

Gives meaning and context to the world and the changes that are taking place.

Create Futures

Stories have to be aspirational about the future but also grounded in the reality of the present.

Create Identity

The story has to be able to connect and integrate people across divides.

Provide Direction

Has to create a sense of direction, conception of progress and agency.

Systems Building Cards

Systems Building Concept Cards

Ecosystems

System Entrepreneur

Platform Design

Collaboration

Networked Org

Value Models

Value Networks

Full Cost Accounting

Externalities

Cooperation

Scaling Change

Growing networks

Nonlinear growth

Network effects

Ecosystem growth

Systemic Evaluation

Systems Health

Qualitative Change

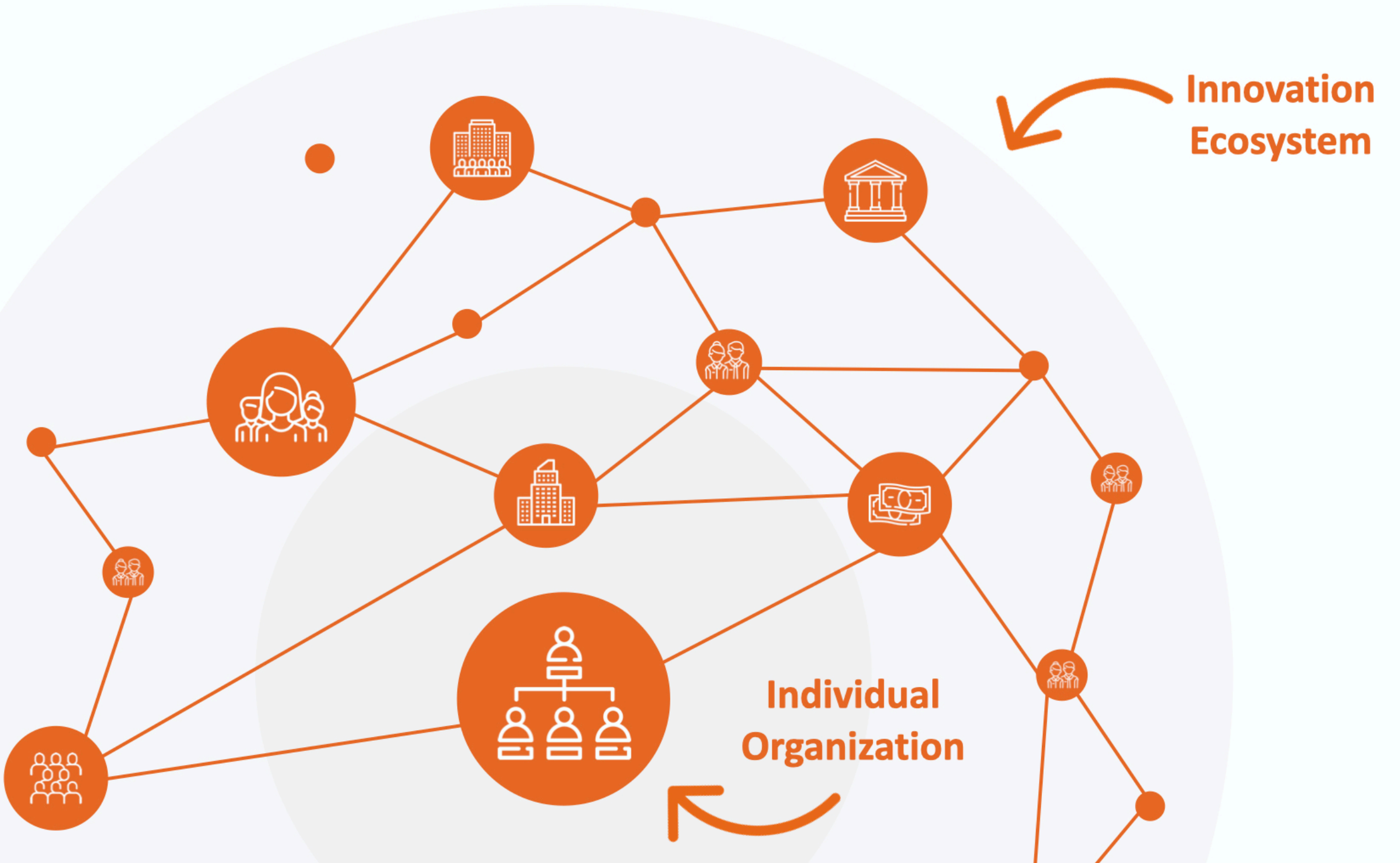
Systemic Investing

Learning Ecosystems

Systems Building

Systems building is the process of creating the narrative and context for organizing actors in new and productive ecosystems around a systemic challenge. Systems change is about changing the structure of a complex organization so as to realize the emergence of new overall functions and capacities. As such systems building is a complex endeavour to shape a new level of alignment across a system; to realize a new pattern of cooperation amongst actors and a higher level of overall functionality.

The job of the system builder is to develop innovation ecosystems that align diverse actors in new synergistic ways. Systems builders enable change by creating the appropriate conditions for the actors to change their overall ways of operating. This is done in ways that are intelligible to them, they see value in, and that utilizes & aligns the network's resources effectively around the challenge.



Innovation Ecosystem

Innovation is the value-adding process of creating and applying new ideas towards changing existing ways of doing things. An innovation ecosystem is a set of players, knowledge, processes, connections, and resources that make innovation happen through a combination of parallel, synergistic and decentralized activities across a network of actors.

Innovation is about connecting diverse elements in new synergistic ways to create value. When this is taken to the system-level it means connecting people and organizations in new configurations to realize new functional capabilities that can evolve to meet the challenges that exist on the macro-level. Building ecosystems involves working to enable the integration and positives synergies between members for them to become more productive as a whole community.

System Entrepreneur

A systems entrepreneur is a person or organisation that works to enable a network of actors to start to connect and collaborate around shared challenges and opportunities in addressing a systemic challenge. Systems entrepreneurs bring together relevant stakeholders to share their resources, knowledge, understanding, and capabilities in pursuit of a common goal. In their pursuit of changing a system, they must play multiple roles, they are networkers, facilitators, innovators, business developers and leaders.

Through their leadership entrepreneurs bring things together and create momentum among the other actors. As entrepreneurs, the business model is the strategy of the systems innovator. They create platforms that organise people and resources in a productive way to deliver value and in so doing make it possible for them to attract the required revenue to support their initiative and grow it.

Defines Identity

Creates the overall narrative identity and scope of the ecosystem

Dissolves Barriers

Identifies and dissolves current and potential future limitations

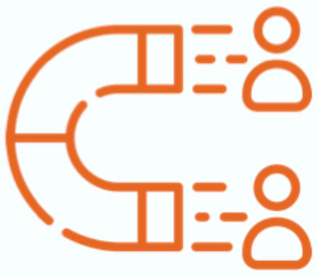
Creates Opportunities

By building connections and access to resources

Creates Structure

Develops guidelines and templates for organizational structure

The Roel of the Systems Entrepreneur



Attracts Members

Communicates value proposition to attract & integrate new members

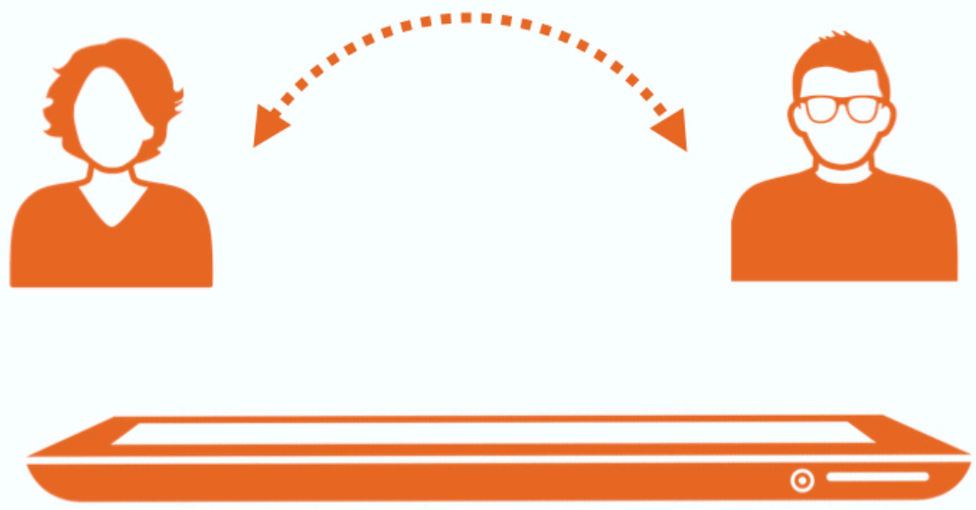
Platform Design

A platform is generally something that supports something else. As a type of organization platforms provide the infrastructure to empower others - it facilitates and enables the creation and exchange of value between others. In developing a platform we are not trying to do everything ourselves within our organization, instead, we are working to enable others to be more productive as a whole community through enabling connectivity, value exchange and the tools to empower them in co-creation.

Platform design involves sepperating out what is an infrastructure versus what is the application of those resources. The organization then moves away from creating the application and delivering the service directly but instead works to build the infrastructure and onboard the developers and platform ecosystem for them to build and deliver the applications using the platforms underlying resources. Examples of platforms include city infrastructure, market places or co-working spaces.

Bureaucracies

Closed
Centralized
Authoritative
Vertical
Static



Platforms

Open
Decentralized
Value Exchange
Horizontal
Dynamic

Collaborative Network

Collaboration is the value-adding process of two or more actors working together synergistically to achieve a share outcome. A collaborative network is a network composed of a variety of actors that are generally autonomous, and diverse in values and goals, but perceive common interest in working together to better achieve common or compatible goals.

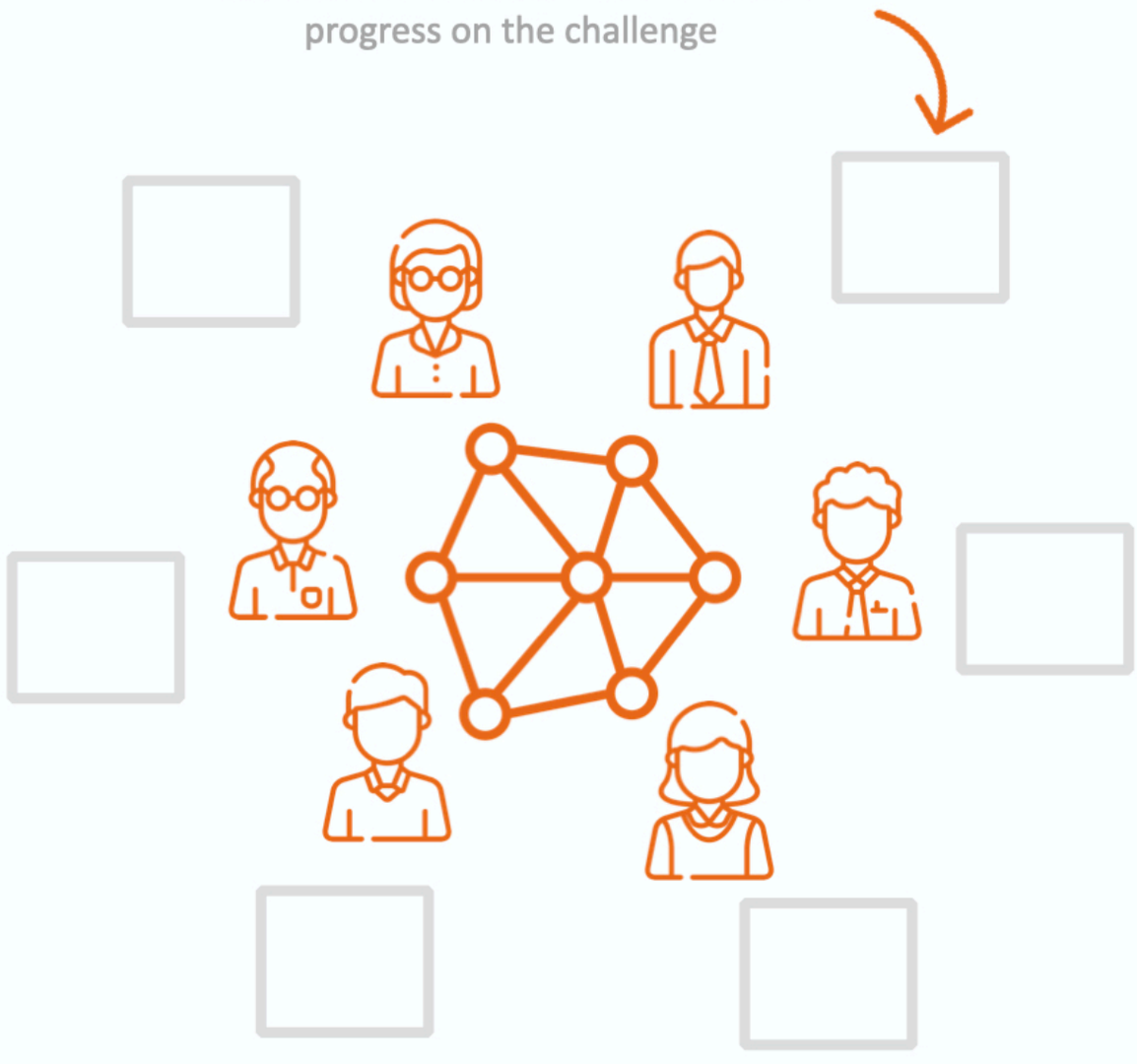
Such networks are typically supported by information technology enabling them to be often geographically distributed and may have low barriers to entry due to low admin costs. Today collaborative networks are emerging as a new way to organize work at a large scale and create collective action and impact on a level that is required to meet today's most complex challenges. These “ecosystems” are a new kind of networked organization that integrates and aligns diverse actors towards common ends.

Business as usual

People inside of closed organizations each trying to improve their metrics & re-creating the wheel.

Collaborative Network

People collaborating around the challenge with metrics of success tied to overall progress on the challenge



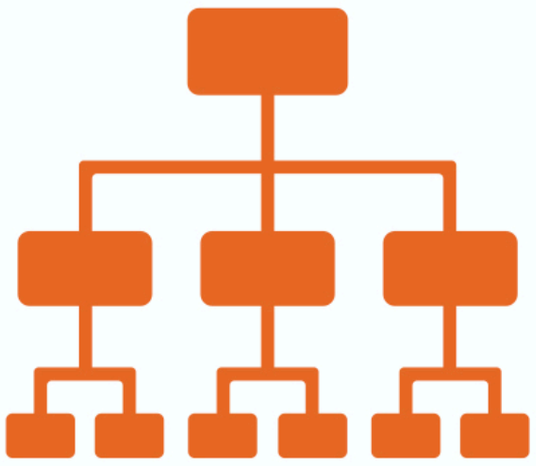
Network Organizations

Networked organizations are organizations that aggregate and coordinate members through peer-to-peer network platforms. They are typically open organizations enabling them to harness the mass of people's productive capacities through on-demand networks. This results in a very dynamic organization that can expand to meet capacity as members fluidly join or leave the organization.

The reduction in transaction costs due to IT makes it possible to create new forms of organization that can harness the efforts of the many within informal networks instead of depending upon a few within formal organizations. It now becomes viable to create open organizations where anyone that can contribute anything is of value and by getting enough people to contribute only a small amount, a network can compete with a traditional organization and may change whole industries.

Ordered

Finite number of part interacting in a well defined linear fashion



Hierarchy

Fixed structure with routine and predictable processes

Complex

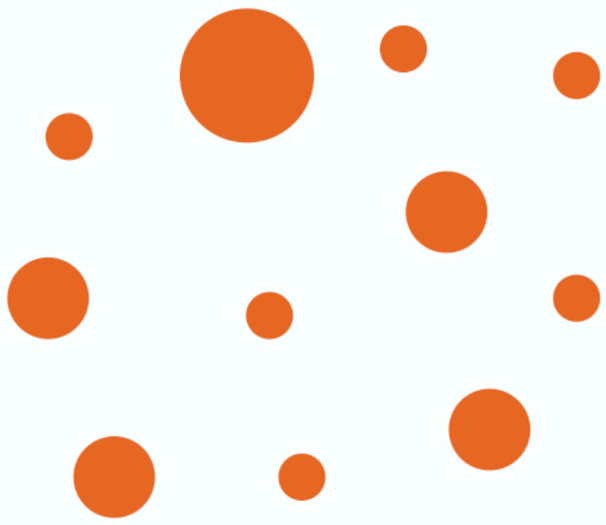
Many parts that are highly interconnected, interdependent with nonlinear dynamics

Networks Organizations

Decentralized networks that can adapt and learn fast

Chaotic

Independent events without known patterns of correlation



Nodes

Independent separate units without macro structure

Value Models

A value model is a model through which organizations and economies value and account for the production and exchange of goods and services. Systems change typically involves the introduction of new values into a system and the development of new value models to account for this. This helps to shift the system from a reductionist monodimensional value model to a more holistic multi-dimensional value model that is accounting for externalities.

Systems innovation involves the regeneration of whole systems, not just the improvement of parts. This requires introducing new value sets and models that account for and develop the value flows required to sustain the whole system. For example, value models that account for and work to incentivise not just the creation of timber or honey but also the maintenance of the ecosystem required to provide these outcomes.

Creating new Value Flows in a System

Reuse

Reuse underutilized existing assets

Repurpose

Connect and utilize existing assets in new ways

Multi-Value

Tap into new value streams that are not accounted for in the current system

Long tail

Use IT to access the many small producers and consumers

Value Network

Value networks are networks of connections through which a set of actors create, exchange and consume value. Whereas a business model describes the value exchanges at the level of one organization, value networks describe the business for an ecosystem of actors. The aim of systems innovation is not to solve problems by creating more things but to align a network of actors in productive ways - to create new value networks that enable actors to realize new functions.

Value networks are how value gets created in a coordinated way within ecosystems, they require actors collaborating, the exchange of ideas, resources and goods from producers to consumers. For example, an ecosystem for addressing homelessness within a city would require a great number of actors working to create value at different levels and across different dimensions of the system for an overall functional and inclusive accommodation system to be realized.

New Value Model

Business Model

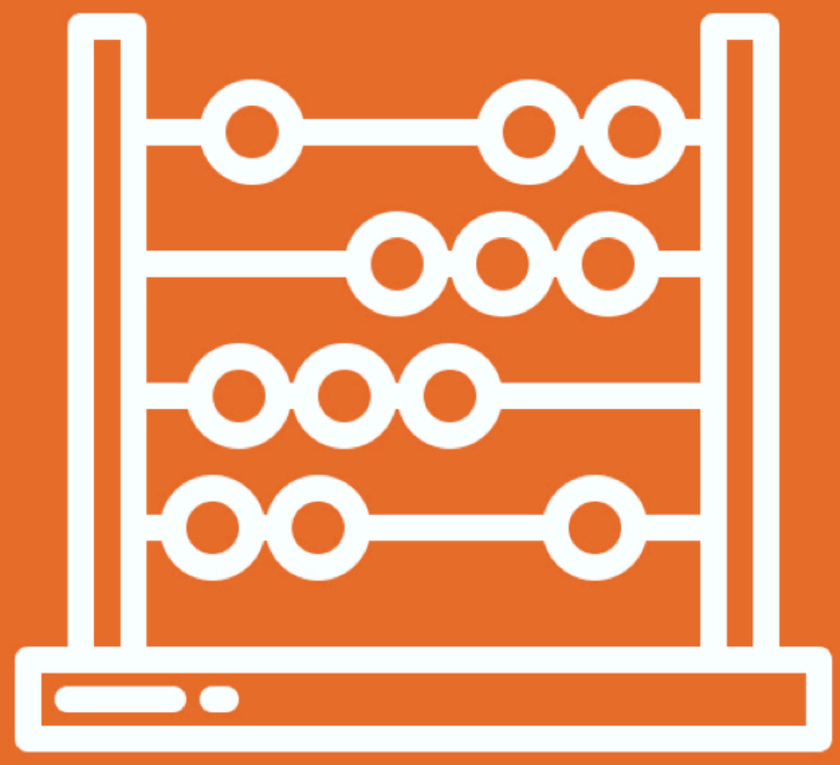
The traditional business model accounts for value to the individual organization. The aim is to attract more revenue often involving competition between actors and suboptimal outcomes for the whole

Value Networks

System change is about creating self-sustaining ecosystems, our job is to create new flows of value across the whole system that incentivizes actors towards cooperation within an overall systems-level function.

Full Cost Accounting

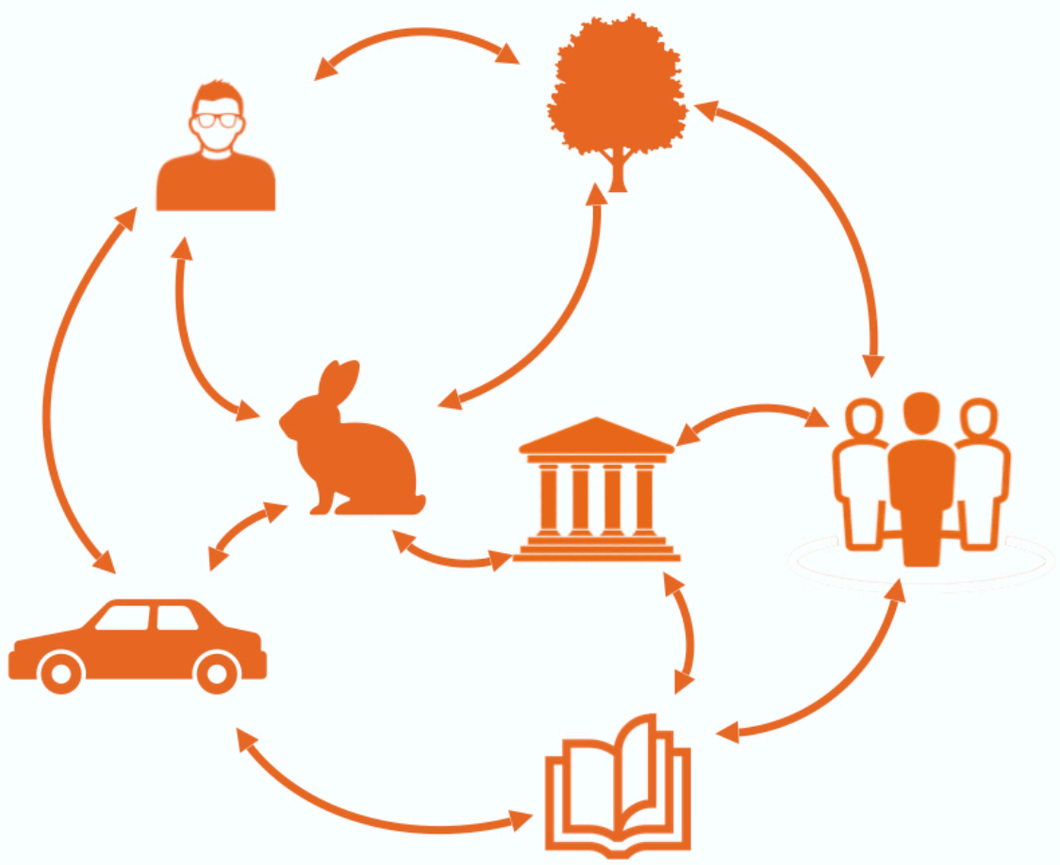
Full cost accounting refers to accounting for the complete cost or benefit of some product or service in terms of its social, economic and environmental effects. It represents an expansion of our traditional accounting systems to incorporate the full set of impacts relating to a given economic activity. Full cost accounting is accounting for the whole, not just the specific parts that may have immediate utility.



Our traditional accounting systems are designed to account for what economists call utility, utility and monetary value only account for what something is worth to an individual, it does not account for its cost or value to the whole of society or the ecosystem. Many activities have both positive and negative externalities, full cost accounting tries to value and account for these externalities so that they can be effectively managed.

Utility

Accounts for value to the individuals in the system - accounts for just extrinsic value



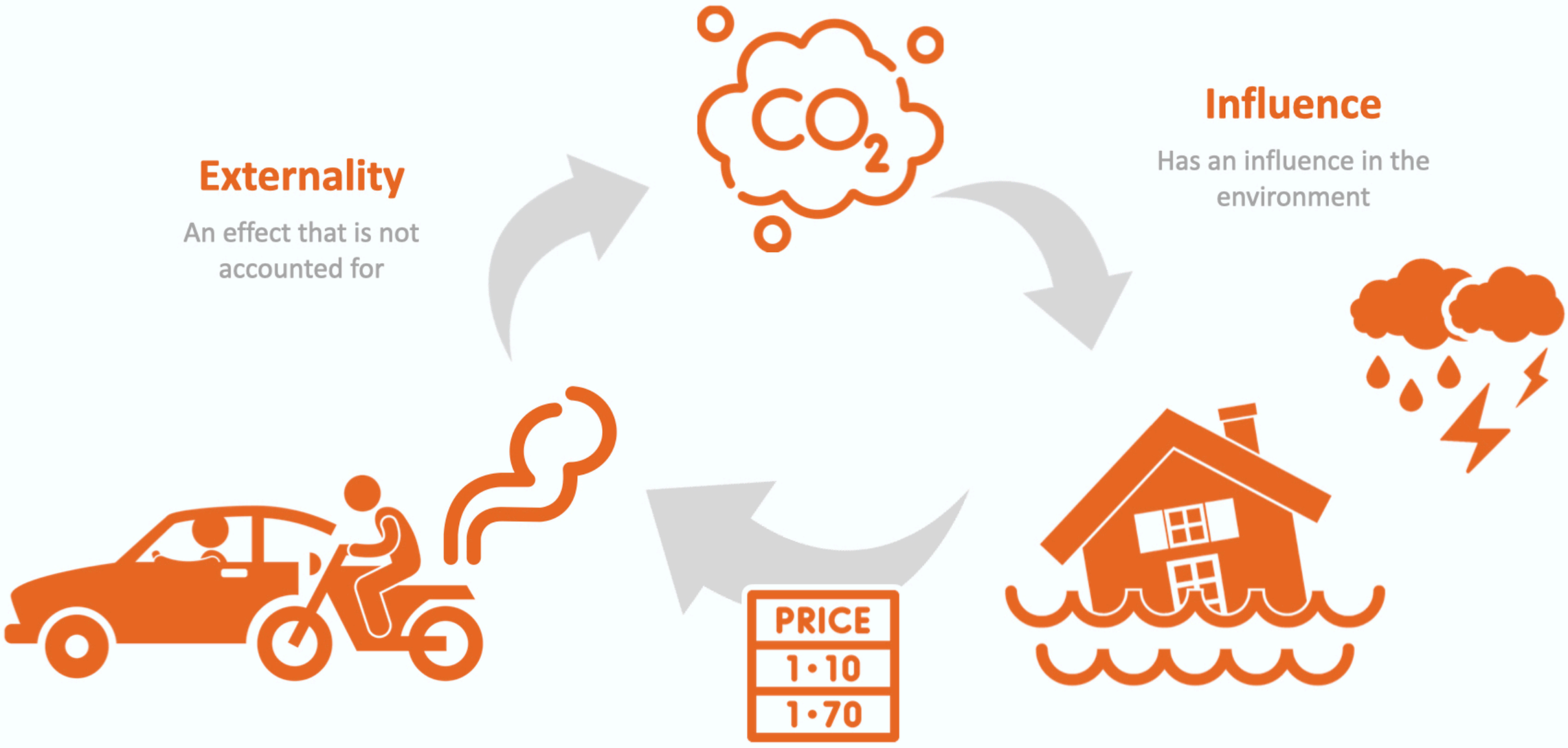
Full Value

Accounts for value with respect to the system as a whole - both extrinsic and intrinsic value forms

Externalities

Positive and negative externalities are value flows within a system that are not accounted for by traditional accounting methods. Because many systemic issues come from a uni-dimensional economic model that creates negative externalities a central aspect of systems innovation is learning to work with externalities both positive & negative to change the set of incentives towards new outcomes.

Because these externalities fall outside the current regime, systems change can happen by creating new networks that harness them and disrupt or transform the old model. Systems regeneration builds value models that add the externalities back into the equation under which actors are making a decision within the system and thus has the potential to create more self-sustaining systems. Externalities can be resolved by increasing the feedback loops between the actions, the effects and the costs to the actors taking them so as to change behavior.



Externality

An effect that is not accounted for

Influence

Has an influence in the environment

Closing the loop

By adding the costs back into the actors accounting system

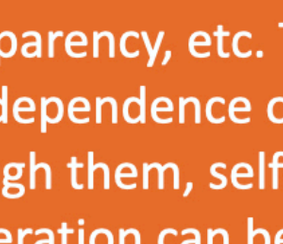
Cooperative Dynamics

In every socio-economic organization, there is an opportunity for collaboration and cooperation that leads to optimal outcomes for all. While the opportunity for competition and conflict will lead to suboptimal overall outcomes and unequal payoffs for actors. In all aspects of human activity, value flows from cooperation. Value models are built within ecosystems by creating attractors towards cooperation, turning competitive frictions into synergies that create value.

Building systems of peer cooperation means enabling ongoing interaction with identifiable others, with some knowledge of previous behaviour, lists of reputations that are durable and searchable and accessible, feedback mechanisms, transparency, etc. These are all means of fostering positive interdependence once interconnectivity is present and through them, self-regulating and sustainable systems of cooperation can be formed.

History
A history of interactions in the past

Reputation
A record of how people acted in the past



Identities
Interaction with identifiable others

Enabling Cooperation within Networks

Feedback
Peer feedback from past interaction

Interaction
Multiple interactions to build trust

Transparency
Disability as to feedback left

Scaling Change

Scaling in the context of systems change is about growing new networks and patterns of organization that will enable a set of actors to collaborate around addressing a given challenge. Traditionally scaling is looked at as growing an organization or enterprise as opposed to growing a concept. Looking beyond scaling a particular organization requires a major mindset shift. We must determine how we can collaboratively scale action around a particular problem through the engagement of all the stakeholders affected by the issue.

Systems change is a lot about unlocking the collective genius of everyone. That is why systems-changing innovations are best looked at as movements. Movements start with stories and culture that bring different actors together within a new paradigm and values set. Over time these movements need to be organized, to create new value flows and ultimately become the default ways of doing things.

Permissioned

Mass production

Centralized organization

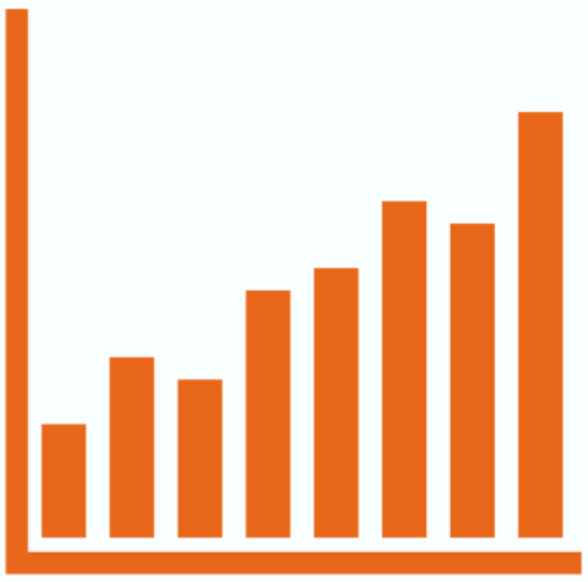
Incremental

Planned

Professional generated

Changing components

Artificial growth



Linear Scaling

Permissionless

Network effects

Emergence

Exponential

Organic growth

Decentralized growth

User-generated

Working with Connections

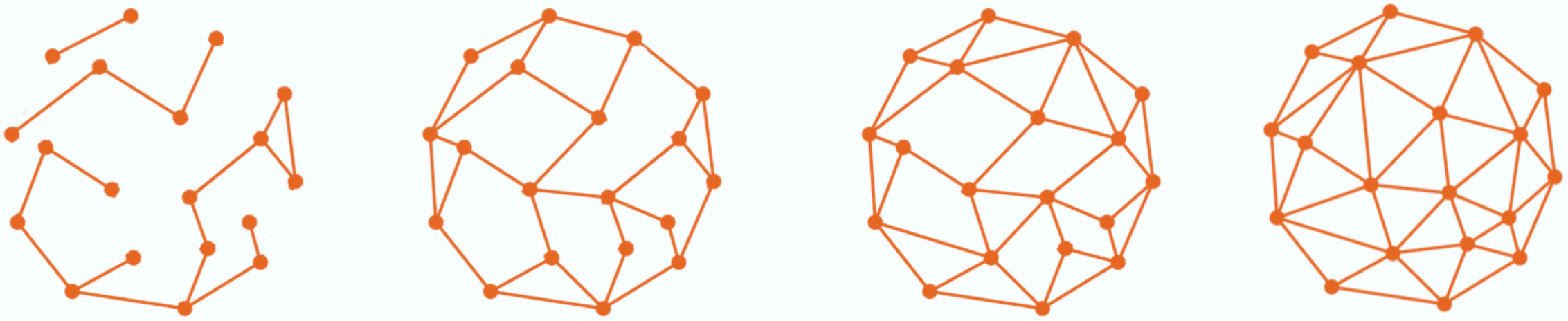
Nonlinear Scaling

Growing Network

Systems change is not about scaling an organization; it is about scaling a network and its capacities. Scaling systems innovation requires asking, how we scale the outcomes not by growing one organization or program but by connecting it with others so that together they can form a new, more functional pattern. Scaling an ecosystem means creating connections; create the context within which people can connect and the local incentives that drive its expansion through network effects.

The Internet is a paragon of a systems innovation approach to scaling through network effects. The most radical force re-patterning social and economic organizations around the world, the Internet is essentially just a set of protocols that connect computers and people. Everything else was created by the system's users, individuals, and organizations, empowering them in new ways.

Integrity



Low Integrity

Lack of coordination

High Integrity

Conditions for emergence

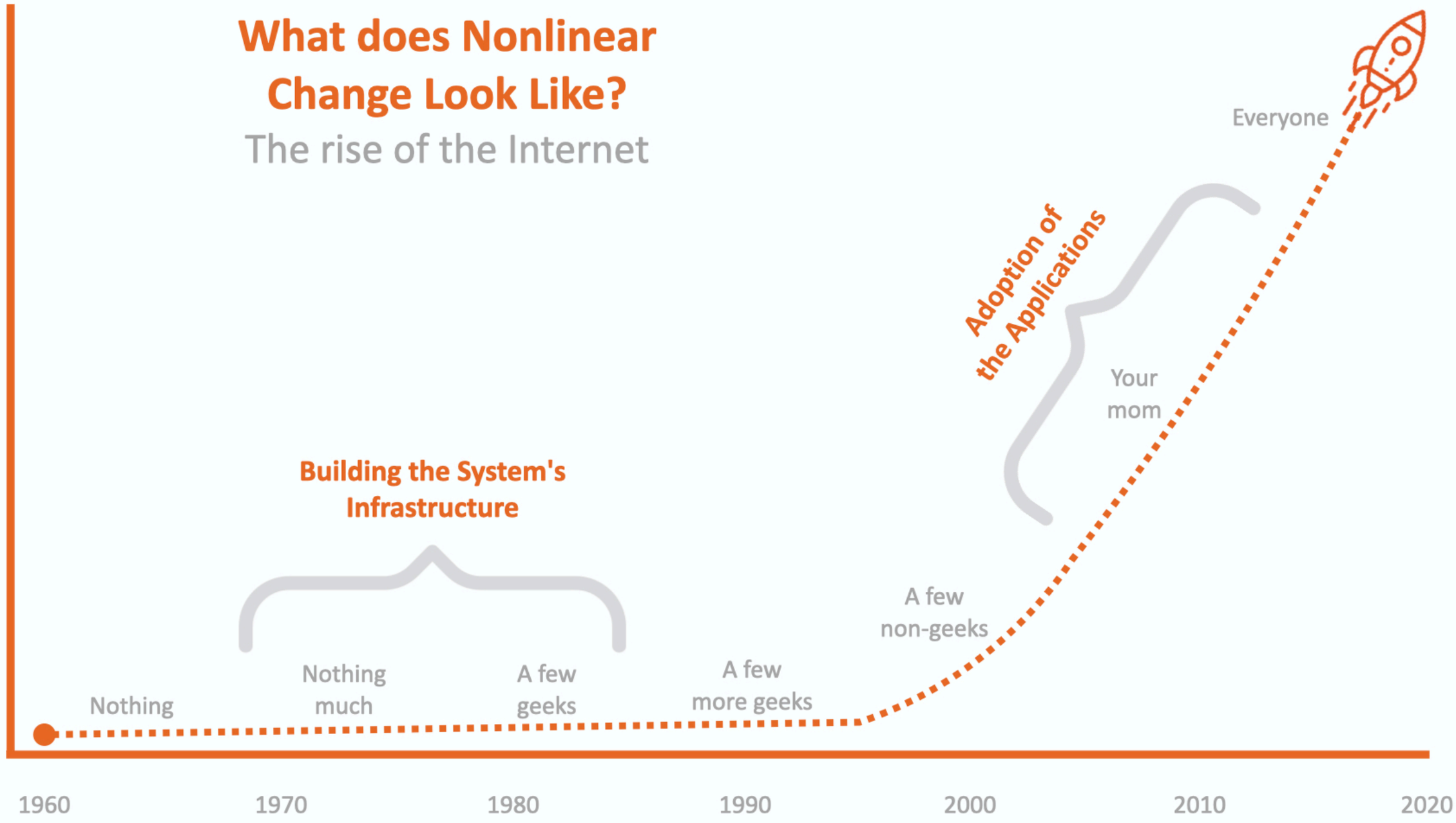
Nonlinear Growth

A nonlinear approach works with open networks. Here, scaling system change is not about numbers but about changing the system's structure. Thus, instead of creating more organizations, projects, or pilots, we are looking at the protocols that interrelate existing solutions. Connections create the potential for nonlinear paradigm shifts. Nonlinear scaling happens through connectivity and the feedback loops this enables rather than changing parts.

As opposed to a linear scaling process nonlinear growth through networks is more decentralised, as it can not be directly the result of one organization. It is exponential involving tipping points that cannot be fully controlled. It is emergent, driven more by the participants of the system rather than a centralized group. It works with connectivity and network effects. It often comes from a more permissionless form of innovation to reduce dependencies on gatekeepers.

What does Nonlinear Change Look Like?

The rise of the Internet



Network Effects

Network effects describe a positive feedback loop where the more people joining a network, the more attractive the network becomes for others to join. This positive feedback can then drive compounding, exponential change. For example, the more people that join a social network, the more valuable it will be for the next person to join because they will have more options to connect to people.

With network effects value is created by increasing interoperability - the capacity for people to connect with and share with others. The value of a phone or the Internet is that we have all chosen to use that same medium and this turns it into a way for us to connect with others. A networking event is similar, the value lies in the fact that we all choose to be at a certain place at a certain time. Value is the result of synchronization which is created by protocols that enable people to connect and coordinate in new ways.

How can Networks Grow so Fast?

1. Network Value

The value of the network is proportional to the number of nodes connected

2. Value Increase

Every time a new person joins this makes being connected more valuable for everyone else

3. Positive Feedback

the more that join the more others are attracted to join because of the increased value

4. Tipping point

When it is more valuable to be part of the network than it costs to join it can grow exponentially

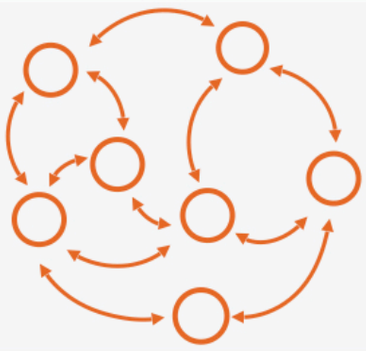
Ecosystem Growth

An innovation ecosystem is a network through which a set of diverse actors interact to enable constant innovation outcomes in a given region or domain. Building an ecosystem requires defining the purpose, the challenges, the actors, the value model, the platform, assessment criteria, etc. Growing an ecosystem involves the activities of working to enable the integration and positive synergies between members for them to become more productive as a whole community, create additional value and attract more actors and resources into the network.

Key considerations in the growth of an ecosystem include; how to build connections between the actors, e.g. hosting events, networking, etc; how to build shared intent to strengthen real collaborations around shared purpose; how to connect across networks and develop systems awareness; how to enable systems-level identity and shared direction to emerge.

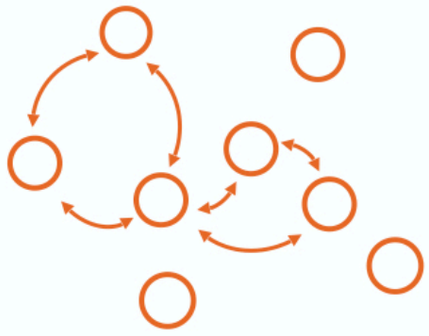
Systems Change

Systems wide infrastructure for collaboration, synergies and alignment towards change



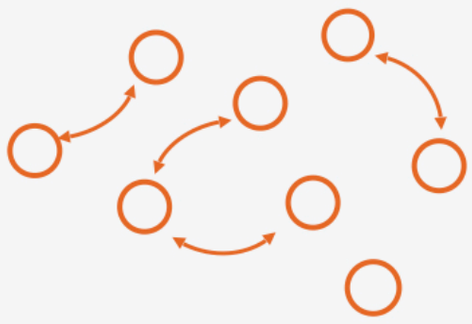
Collaborations

Networks of actors collaborating in sharing resources and capacity towards a common end



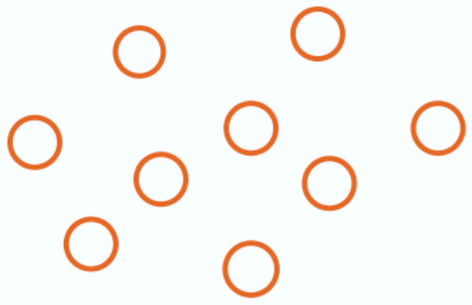
Exchanges

Actors are aware of each other and interacting to meet their own needs and objectives



Group

There are a set of actors in the space but they have limited interaction or connections



Systems Evaluation

Systems assessment or evaluation is a holistic approach to assessing changes within a system. It aims to account for and evaluate changes within the structure, and the system as a whole, rather than just accounting for change to the parts. Measuring system change requires a paradigm shift in our thinking and assessment frameworks and methods; as we are interested in changes in structure rather than changes in parts.

This means shifting from quantitative metrics to a more qualitative assessment of systemic aspects such as; network structure & its integrity, alignment between parts, synergies, distribution, resilience, etc. The point of assessing impact is ultimately to aid us in making better decisions about future activities and initiatives. It should inform us as to where we should be investing our time and resources going forward based on the current state of the system and upon what has or has not worked in the past.

Non-Systemic Impact

Change in parts
Quantitative in nature
Aims for a direct outcome
Key performance metrics
Symptoms

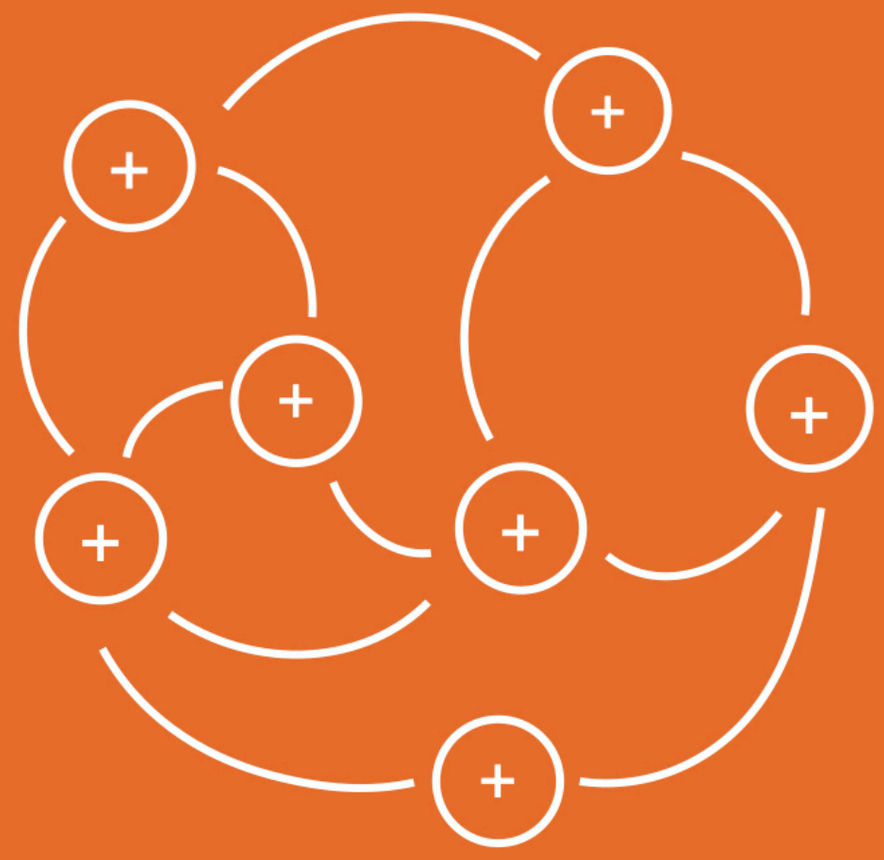
Systemic Impact

Structural changes
Improve health of system
Multi-Dimensional
Integration
Emergent outcomes

Systems Health

Systems health is a way of considering the overall conditions and regenerative capacity of a system. The aim of systems change is not to solve a particular problem but instead to prove the health of the system as a whole. Every system has an underlying structure and pattern of organization that enables it to operate and perform a function. Just like a gardener has to improve the quality of the soil and overall context - the infrastructure - if they want good crops, with systems health we are asking about the quality of the infrastructure of the system.

Drawing on the analogy of the human body, systems change is about improving the system, i.e. the health and fitness of the body, rather than fixing a particular ailment. By improving the systems structure we work to improve the overall system's capacity to respond to challenges rather than fix them. By improving the health of the system we dissolve issues rather than solving them.



Measuring System Health

Key factors to assess and track in a system change initiative

Integrity

How integrated is the overall network. A measure of the degree of equality in the system

Synergies

How well are the parts working together. A measure of the degree of cooperation

Alignment

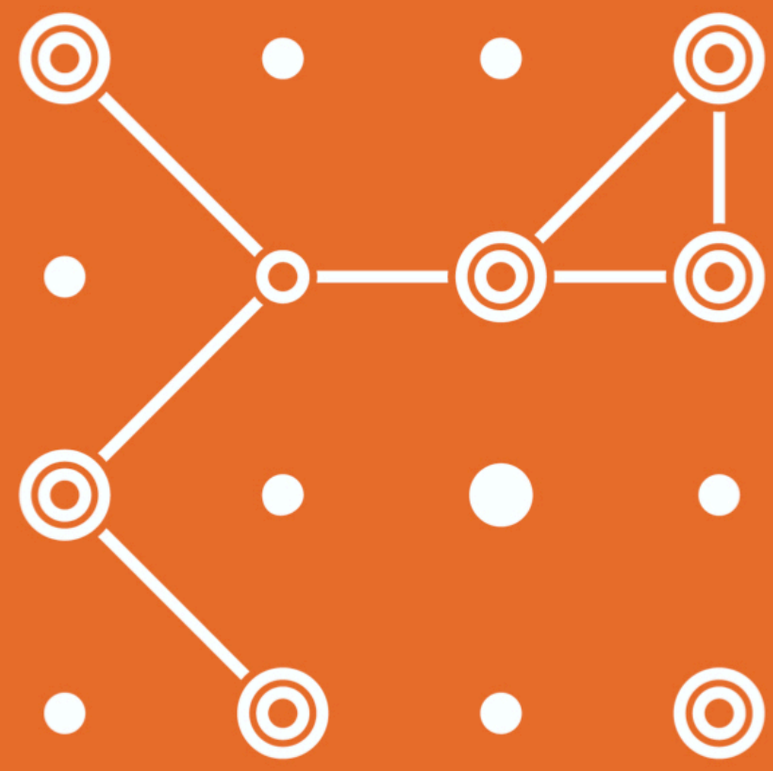
How aligned are the actions toward an overall function. A measure of the capacity to realize collective actions

Adaptation

Degree of agility, flexibility and resilience of the system. A measure of system sustainability

Qualitative Change

Transformational change is a qualitative kind of change where the quantitative aspect of the parts of a system may not change but instead the nature of the organization of the system as a whole changes. Thus in assessing for systems change our primary aim should be to track qualitative changes in structure and values rather than a change in the metrics associated with the parts. Quantity tells us about scale; numbers measure things and their properties.



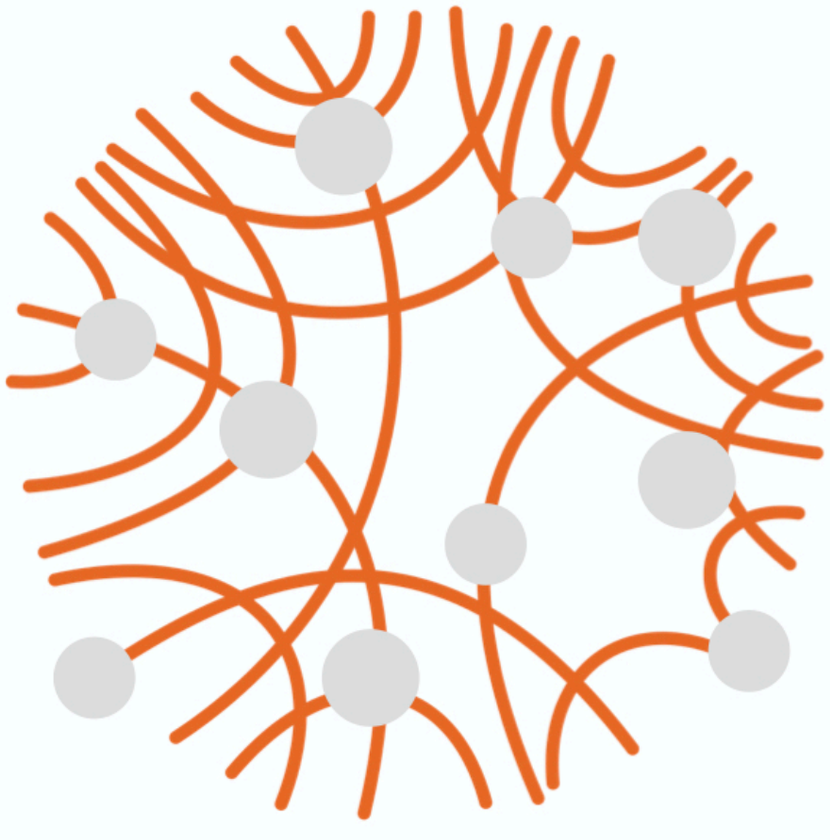
Quantitative assessments alone will only tell us about the amount it will not tell us about the nature and quality of the connections. Thus a focus on quantity can lead to scale but also fracturing. We may fund many health initiatives across Africa, but without integration, coordination and synergies between them we will achieve only suboptimal outcomes. To get real impact we need to assess for quantity and quality. “Warm Data” is one way of doing this as it represents information about the quality of the interrelationships that integrate elements of a complex system.

Quantitative Change

Normal period of change in parts without changing system structure

Qualitative Change

Non-normal period of change in the system structure

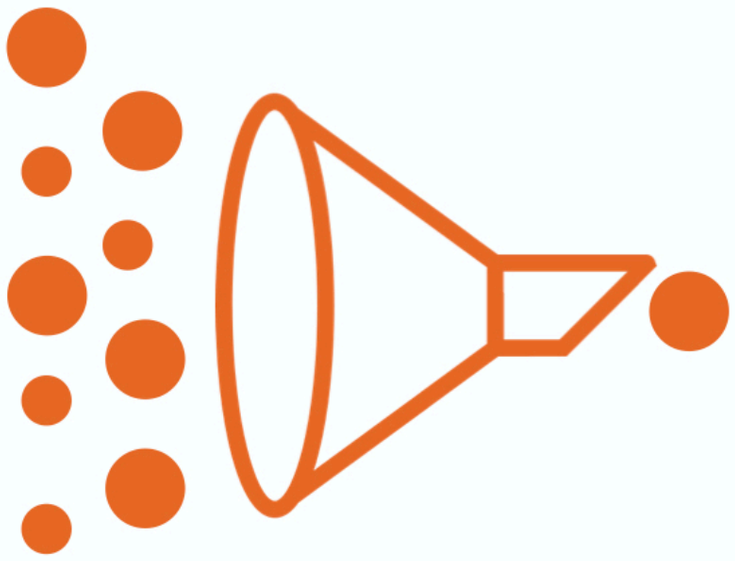


Systemic Investing

Systemic investing describes approaches to investment that aim to improve and change the whole of a system rather than any of its parts. Systems investment engenders a very different logic to that of conventional investment as it is about investing in the commons. While traditional financial investment, in general, is based upon on maximization of returns to investor logic, systemic investment is about the maximization of returns for the system itself.

This systems approach starts with a recognition that finance is only one part of the broader set of factors that needs to come together and work synergistically to realize these changes. Systemic investment approaches are holistic in that they do not narrow down to find the optimal return on investment, but instead, take a portfolio approach investing at multiple complementary points in the system towards enabling broader change.

Investment Approaches



Reductionist

Funneling down
Single value
Reduction process
Investing in parts
Aim to find the "best"
Selection of few
Private investment

Wholistic

Expansive
Multi-value
Multidimensional
Invest in connection building
Synergistic combinations
Integration of many
Investment in the commons

Ecosystem Learning

Ecosystem learning is a process of generating new insights and changing patterns of interactions within and between diverse organizations and social units to enhance capacities to develop new knowledge and apply that collectively for the development of the whole ecosystem. Agility within the overall ecosystem is required so that it has the feedback loops to make those changes in practice that it discovers through learning.

Learning not only applies to individuals and organizations it refers also to the whole ecosystem of actors within a system. A systems change project requires restructuring a system so that it has the right feedback loops for learning about itself, where it is, and where it is trying to go. Learning at the ecosystem level is required because the gap between our simplified model and the complex reality of a wicked challenge is at the start huge, closing the gap requires experimentation, feedback, iteration, and learning accross networks.