

Systems Thinking

"A journey in the realm of systems"

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Archetypes

Interaction Structures of the Universe

This article is essentially a continuation of [Systems Thinking: An Operational Perspective of the Universe](#) in which the Reinforcing and Balancing structures were developed. This article develops a set of frequently recurring structures resulting from various combinations of Reinforcing and Balancing structures. This article essentially represents an elaboration of the work of [Senge](#) (1990) and [Pegasus Communications](#) (1989-1996).

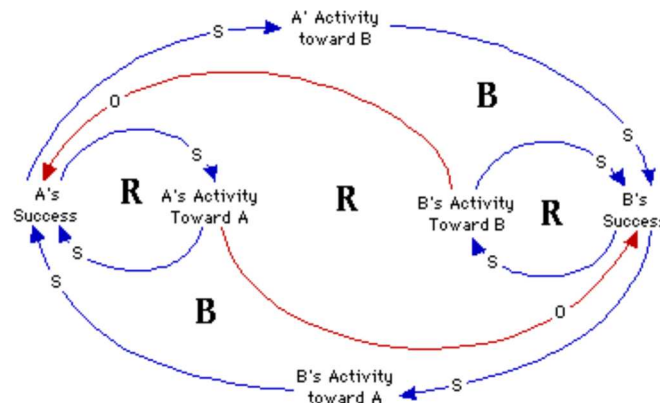
Note that all the archetype examples that were previously wired into this article are now accessible via [theWay](#) which is considered to provide a more comprehensive treatment of the archetypes, as well as a few additional ones, and uses the "+" and "-" influence notation.

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Accidental Adversaries

The Accidental Adversaries structure is composed of three reinforcing loops and two balancing loops. Overall system growth is driven by a global reinforcing loop. Two local reinforcing loops create balancing loops which then limit the growth of the overall system. This is by far not one of the easiest archetypes to understand.



The loop consisting of **A's Activity toward B**, **B's Success**, **B's Activity toward A**, and **A's Success** represents a cooperative reinforcing loop between A and B. At the same time that A and B are taking actions to enhance each others success they are taking actions to promote their own success. This activity is represented by two inner reinforcing structures represented by **A's Activity toward A** influencing **A's Success** which in turn influences **A's Activity toward A**, and **B's Activity toward B** influencing **B's Success** which in turn influences **B's Activity toward B**.

This local self-enhancement activity would be fine except that the locally directed activities by A and B have an unintended consequences. **A's Activity toward A** inhibits **B's Success**. This in turn influences a decline in **B's Activity toward A** inhibiting **A's Success**. The inhibition of **A's Success** further decreases **A's Activity toward B**. This represents a balancing loop which limits the overall intended cooperative efforts between A and B. This balancing loop is mirrored in the actions by B where **B's Activity toward B** inhibits **A's Success**. This in turn influences a decline in **A's Activity toward B** inhibiting **B's Success**.

Archetypes

Interaction Structures of the Universe

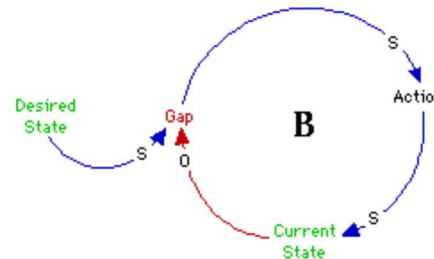
The Way of Systems

The inhibition of **B's Success** further decreases **B's Activity toward A**.

This structure points out how myopic local activity, with the best of intentions, can lead to an overall limiting development of the global system, and actually inhibit local development as well.

Balancing Loop (⤴)

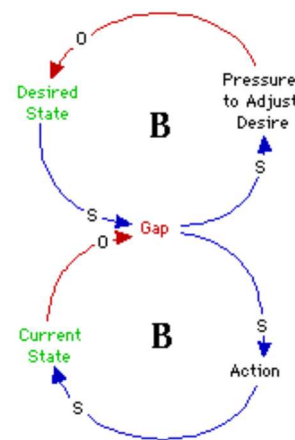
The Balancing Loop attempts to move some current state to a desired or reference state through some action. The structure may begin with the current state greater or less than the desired state, in which case the current state may approach the desired state from above or below.



The **Desired State** interacts with the **Current State** to produce a **Gap**. The larger the **Gap** the stronger the influence to produce **Action**. The **Action** taken then moves the **Current State** toward the **Desired State** reducing the **Gap**. When the **Action** succeeds in moving the **Current State** to the **Desired State** the **Gap** is reduced to zero and there is no more influence toward **Action**.

Drifting Goals (⤴)

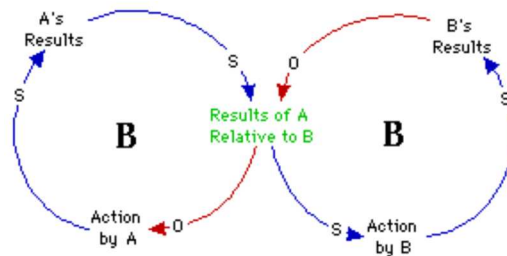
The Drifting Goals structure is composed of two balancing loops which interact in such a way that the activity of one loop actually undermines the intended balance the other one seeks to achieve.



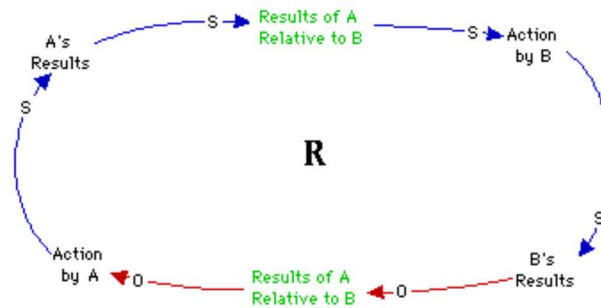
The **Desired State** interacts with the **Current State** to produce a **Gap**. This **Gap** influences **Action** intended to move the **Current State** in the direction of the **Desired State**. At the same time the **Gap** influences **Action** it creates a **Pressure to Adjust Desire**. This pressure essentially acts as an influence to reduce the **Desired State**. As the **Desired State** is undermined it works to reduce the **Gap** lessening the influence toward **Action**. The final result of this structure is that it reaches an equilibrium other than what was the initial **Desired State**.

Escalation (⤴)

An Escalation structure is composed of two balancing loops which interact in such a way as to create a single reinforcing loop.



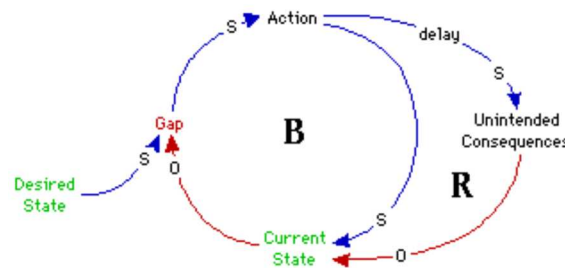
An increase in the **Results of A Relative to B** influences more **Action by B**. An increase in **Action by B** enhances **B's Results**. As **B's Results** increase it tends to reduce the **Results of A Relative to B**. This reduction tends to influence more **Action by A**. Additional **Action by A** increases **A's Results**. The increase in **A's Results** then increases the **Results of A Relative to B**, and the cycle then repeats.



The above redrawn Escalation structure makes its reinforcing nature rather apparent.

Fixes That Fail (^)

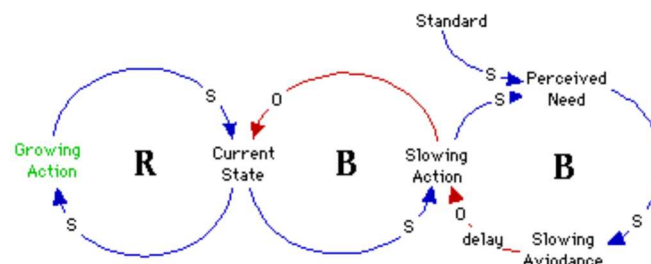
The Fixes That Fail structure consists of a balancing loop and a reinforcing loop. These two loops interact in such a way that the desired result initially produced by the balancing loop is, after some delay, offset by the actions of the reinforcing loop.



The internal balancing loop operates in the standard balancing loop fashion. The **Action** that influences the migration of the **Current State** also influences, after some delay, some **Unintended Consequences**. These **Unintended Consequences** subsequently impede the migration of the **Current State** in the intended direction.

Growth and Underinvestment (^)

A Growth and Underinvestment structure is simply an elaborated Limits to Success structure where the slowing action is part of another balancing loop with an external standard and some delay.



The **Growing Action** which initiates this structure influences an increase in the **Current State**. The

increase in the **Current State** then influences more of the **Growing Action**, producing the reinforcing characteristic.

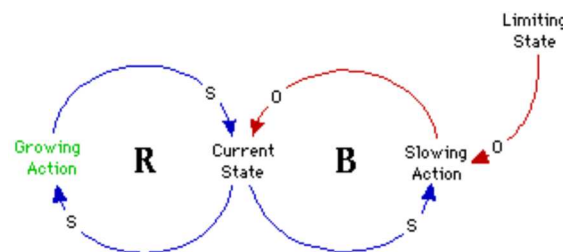
As the **Current State** moves in the desired direction it also influences the increase in a **Slowing Action**. This **Slowing Action** subsequently impedes the migration of the **Current State** in the desired direction.

This system can be enabled to grow more if the **Slowing Action** is reduced. As the **Slowing Action** interacts with a defined **Standard** there is developed a **Perceived Need** for action which influences the development of something which will act as **Slowing Avoidance** which will after some delay reduce the **Slowing Action**. The annoying part of this structure is the delay associated with the **Slowing Avoidance** interaction with the **Slowing Action**.

What happens is that the **Slowing Action** works in a shorter time frame reducing the **Current State** thus reducing the **Slowing Action** and eliminating the **Perceived Need**. As such the system is limited in its growth because the **Perceived Need** for action is actually undermined by the systems own actions.

Limits to Success (△)

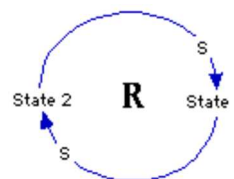
The Limits to Success structure consists of a reinforcing loop, the growth of which, after some success, is offset by a action of a balancing loop.



Growing Action interacts with a **Current State** in such a way that the **Current State** promotes more of the same **Growing Action**. As the **Current State** increases it interacts with some **Limiting State** to produce a **Slowing Action**. This **Slowing Action** then influences the **Current State** in such a way as to limit the growth promoted by the **Growing Action**.

Reinforcing Loop (△)

A Reinforcing Loop is a structure which feeds on itself to produce growth or decline.

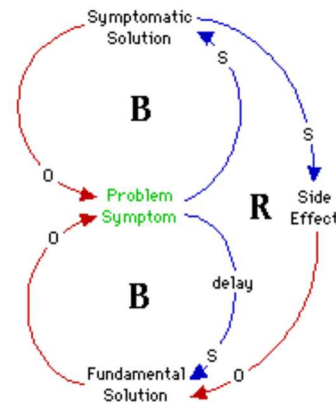


As **State 1** increases or decreases **State 2** is influenced to move in the same direction. **State 2** then influences **State 1** to continue to move in the same direction it is moving.

Because this structure is reinforcing it generally produces an exponential growth or decline. This exponential change may be unnoticeable for a period of time until it reaches the a noticeable range. The structure then seems to change very rapidly causing one wonders how it began all at once, when in fact it really didn't.

Shifting the Burden (△)

A Shifting the Burden structure is composed of two balancing loops and a reinforcing loop. It is a very annoying structure because the two balancing loops act as a single reinforcing loop migrating the situation in the same direction as the reinforcing loop. Both structures end up moving the system in a direction other than the one desired.

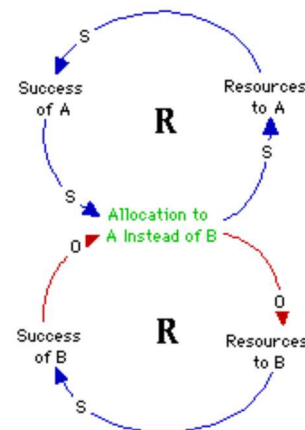


In the above diagram a **Problem Symptom** is perceived with multiple possible courses of action. One course of action, the **Symptomatic Solution** has an apparent time frame advantage over the **Fundamental Solution** because of other associated delay. As a result the **Problem Symptom** influences the application of the **Symptomatic Solution**. Application of the **Symptomatic Solution** reduces the **Problem Symptom** which dissolves the perceived necessity of pursuing the **Fundamental Solution**. A failure to implement the **Fundamental Solution** ensures that the **Problem Symptom** will return.

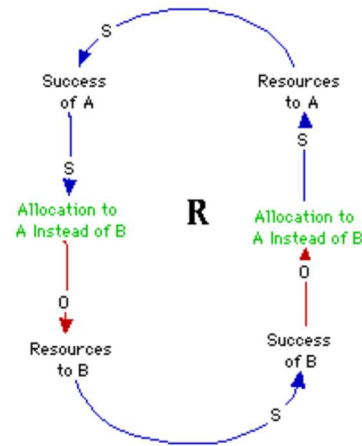
As if this wasn't annoying enough, implementation of the **Symptomatic Solution** often influences the development of unintended **Side Effects**, which are usually some sort of dependency. This **Side Effect** further dissolves the perception that there is a need to pursue the **Fundamental Solution**. The interactions between the **Problem Symptom**, **Symptomatic Solution**, **Side Effect**, and **Fundamental Solution** for a viscous reinforcing loop which make the problem even more difficult to resolve.

Success to the Successful (△)

The Success to the Successful structure consists of two reinforcing loops which act together as a single reinforcing loop.



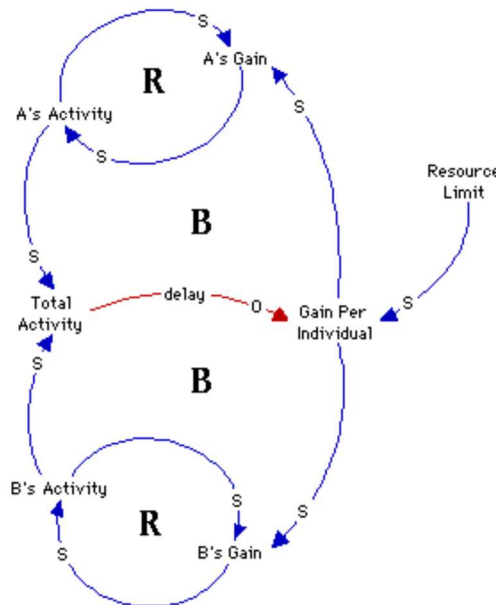
The **Allocation to A Instead of B** results in more **Resources to A**. More **Resources to A** enhances the **Success of A** which enhances the perception that there should be an **Allocation to A Instead of B**. With the **Allocation to A Instead of B** there are fewer **Resources to B**. Fewer **Resources to B** impedes the **Success of B** which further reinforces the perception that there should be an **Allocation to A Instead of B**.



The above redrawn version of the Success to the Successful structure makes its reinforcing nature much more obvious. It is the Success to the Successful structure which is at the heart of so many self-fulfilling prophecies, which are actually the result of unperceived influences on our own part.

Tragedy of the Commons (△)

The Tragedy of the Commons structure represents a situation where two or more reinforcing structures are contingent on some limited common resource.



Initially using the resource contributes to each reinforcing loops results. After some time the total activity of the reinforcing structures exceed the capacity of the resource which results in a reduction of the growing action for each of the reinforcing structures. As the **Total Activity** approaches the **Resource Limit** it begins to limit the **Gain Per Individual** essentially limiting the gain of both reinforcing structures.

Please refer to [theWay of Systems](#) for a more comprehensive treatment of the archetypes as well as strategies for dealing with them.

[Vensim PLE](#) and [itink](#) Versions of the Archetypes

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