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CALVING MANAGEMENT: TAKING A SYSTEMS APPROACH

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Introduction

When discussing management of livestock, and beef cattle in particular, the "system" is often referenced, in context of "cow-calf systems," "pasture-based systems," or even "confinement systems;" this is a narrow context of the term "system" and to truly take systems thinking approaches to management decisions the broader definition of system must be appreciated. When considering the decision-making process for operational management from a systems-thinking approach, the "system" is considered in a much larger context and the influence of things potentially greatly removed in time and space from the observed event can be recognized as the driving forces that might result in observed outcomes-either desirable or undesirable.

In addition to the broader definition of system, system-thinking requires recognition of the consistent inherent behavior of the system, in which each system behaves in ways that resist change, making understanding of the drivers and leverage points necessary if change to the system is to be fruitful and long-term. Recognition that systems behave in ways that result in exactly the outcomes that they were designed to yield can be both empowering and frustrating for individuals that are working to enact change but demonstrate why deep understanding of the drivers of the system and the system's inherent behavior is the best way to identify useful leverage points within the system to solve problems.

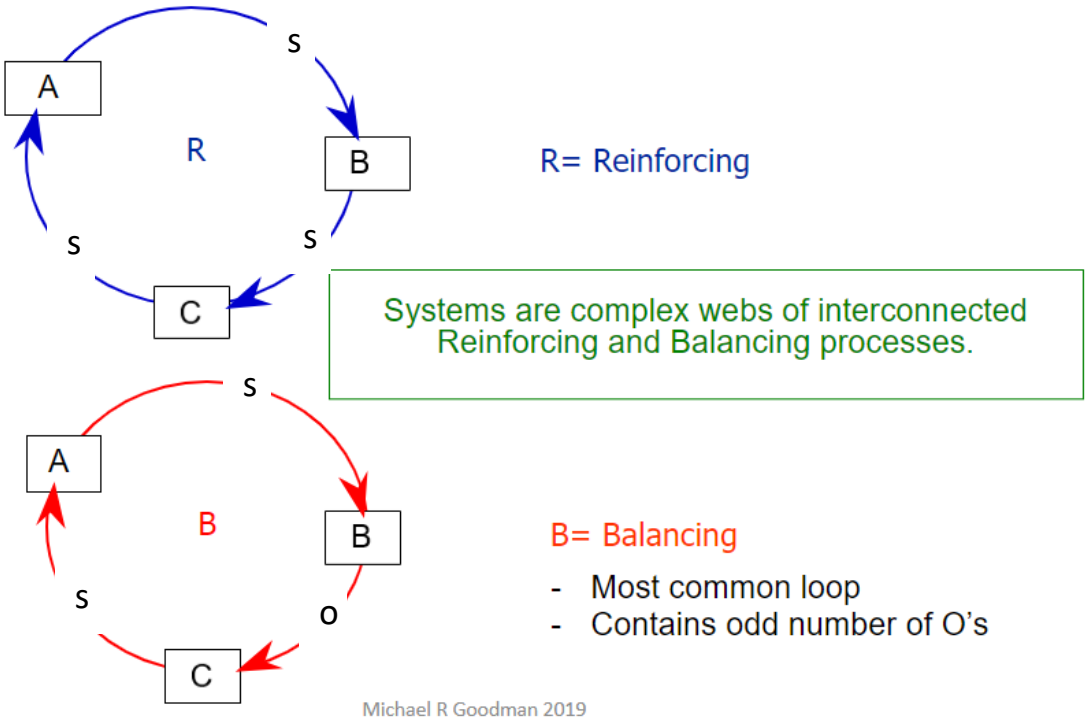
History of Systems Thinking

Systems Thinking is an outgrowth of the field of Systems Dynamics, developed by Massachusetts Institute of Technology Sloan School of Management Professor Jay Forrester. Forrester credits growing up on a Nebraska cattle ranch for his insights into the interrelationships of complex systems. Although System Dynamics is built upon computer models driven by non-linear calculus, Systems Thinking offers a more practical and fundamental way to address and investigate difficult and persistent problems. Fundamental to Systems Thinking is the concept that all parts of the system are inter-related and impact each other. Understanding how components of a system are inter-related and how they feed back to other parts of the system is core to understanding the non-linear nature of this thought exercise. Our professional education

has taught us to solve problems in a linear fashion and we use step-by-step methods for analyzing and solving problems. In fact, linear thinking and linear logic is critical when pursuing scientific discovery; but it can also limit our ability to understand the "system" as a whole. Systems Thinking provides a way to look at complex problems from the 30,000-foot level and gain insight into the non-linear relationships that exist in a system.

Language of Systems Thinking

Balancing loops, reinforcing loops, vicious cycles, virtuous cycles and causal loop diagrams provide the "language" of Systems Thinking. The relationship between language and thought processes can't be underestimated. Most western languages are linear in nature which tends to drive linear thinking and linear problem solving. A fundamental principle of Systems Thinking is that parts of a system are related in non-linear ways and are interconnected in circular associations and feedback loops. The exercise of investigating a complex problem using the "Systems" language tools provides a way to model and communicate thoughts and ideas with profound clarity. It also provides a framework for others to "see" how you view problems and allows them to contribute their own concepts. As team members discuss and investigate problems using the tools of this new language, their thoughts are integrated into a causal loop diagram. Eventually, the diagram becomes a synthesis of the group's thoughts. The process of building a causal loop diagram provides a visual representation of how the complex problem exists within the system and allows a more complete understanding of the problem and the system. The visual language of systems thinking exists as a dynamic document describing processes currently in progress rather than a static snap-shot of a challenging problem.



Laws of Systems Thinking

Within the definition of systems thinking it is important to understand the relationship of delays and system inertia, these challenges can be best described in several "laws" that systems operate within. One component of systems that is key in understanding how they develop over time is to recognize that many of the problems we try to address today were actually initiated as solutions for past problems. When we are unaware of the systemic forces at play or underestimate the power with which they drive the system, we become trapped by the system.

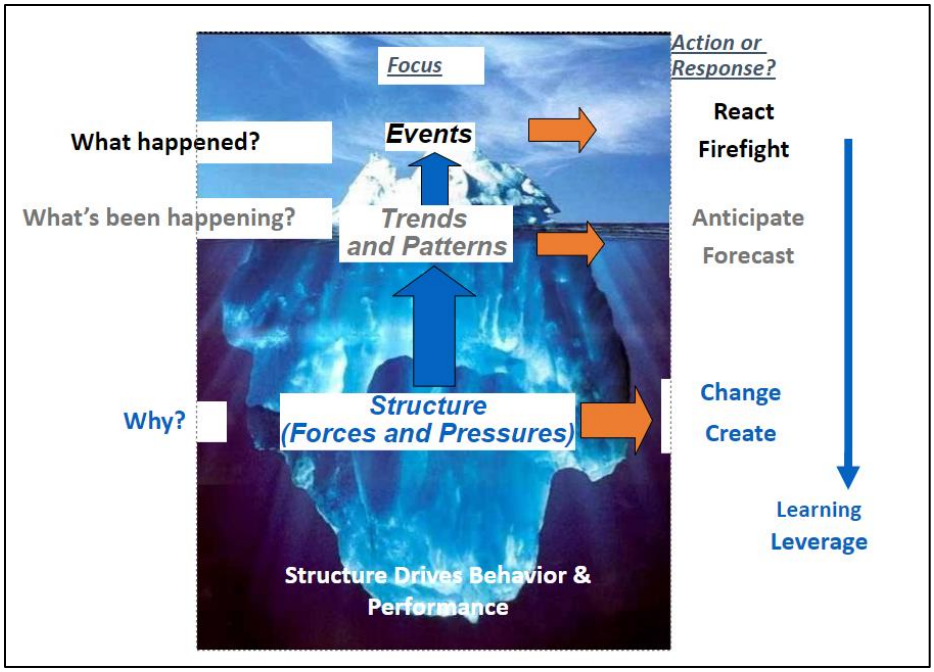
The Law of Unintended Consequences: Systems are seductive, and it is easy to be pulled into what appears to be the "obvious" solution to problems. Understanding that unintended consequences of decision making are virtually guaranteed, and are often removed from the initial solution in time and space allows deeper evaluation of the solutions that we reach for.

The Law of Worse Before Better: Oftentimes solutions that that work well in the short term contribute to making things worse over the long term within the system; while those solutions that provide durable fixes are the ones that appear to make conditions worse in the short term. This law explains why long term fundamental fixes are so difficult to implement in many systems.

The Law of Compensating Feedback: Explains the inertia of systems- the harder one pushes for change within the systems, the greater the pushback from the system in resisting change to its established equilibrium.

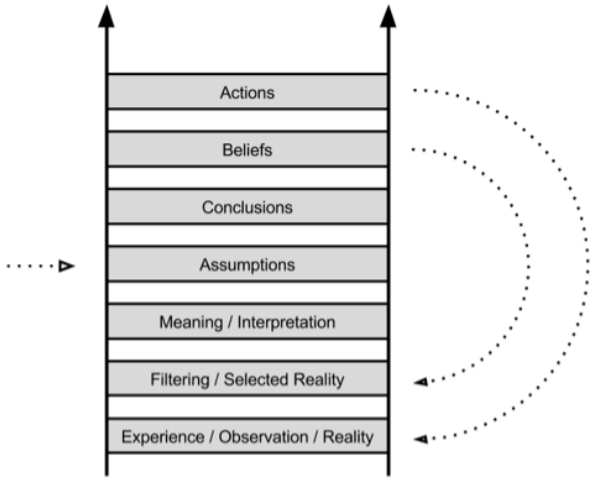
The Iceberg

The Iceberg Framework is a tool used in Systems Thinking that helps accurately define and deeply understand the problem being investigated. Problems, like icebergs, have a small visible part we observe as undesirable events or trends. Just like icebergs, most of the structure, the underlying and root causes, that create the events and trends are at a level that is difficult to appreciate. Understanding the problem at the deepest level possible enhances our ability to understand meaningful solutions.



Mental Models in Systems Thinking

Mental Models are instinctive theories we have about how the world works. They are driven primarily by our past experiences and how we have previously learned to solve problems. Systems Thinking provides the framework to break out of the models that hinder your ability to innovate. Being aware of how our own mental models, and the mental models of others, influence the way people think is important to finding new and creative solutions.



https://synergycommons.net/resources/the-ladder-of-inference/

Common Examples of How Systems Behave

Early workers in System Dynamics and Systems Thinking recognized repeating patterns and similar causal-loop diagrams when studying how large complex systems function. Understanding these classic "archetypes" gives insight into the structure of the problem and where higher-leverage interventions can be implemented.

Common Archetypes Represented in Beef Systems

Limits to Growth: The archetype that describes how growth in a system behaves, although in theory a reinforcing process should result in unlimited growth, the reality is that somewhere in the system will be a force that slows or stops any systems ability to grow unchecked.

Fixes That Fail: The archetype that describes the "easy" or "obvious" fix to address a problem in the short term, which then goes on to make the problem worse over the long term. In this archetype it is often challenging for individuals to identify that the initial solution is what is ultimately contributing to the worsening of the problem as the two events are separated by a delay in most cases.

Shifting the Burden: This archetype describes the phenomenon were pursuing a short-term solution to the problem actively prevents the pursuit of the long-term fundamental change within

the system that needs to occur to enact lasting solutions. The challenge in this archetype is the appreciation of dedicating resources to the fundamental fix when allocating those resources to the short-term fix will alleviate pressure immediately.

Accidental Adversaries: Accidental adversaries describes the system structure when two or more participants in the system are dependent on each other and should work to their mutual benefit. Over time they become opposed in the system and contribute to each other's detriment due to their view of the system and unappreciated drivers that they feel they cannot change.

Summary

The discipline of Systems Thinking offers an opportunity and methodology to understand the inter-related forces that impact complex systems over time in ways that help identify innovative and high-leverage solutions. Systems Thinking is a dynamic tool that has long been used by businesses to gain insight into effective and sustainable management strategies. This paper provides an introduction to the language and methodologies of Systems Thinking and how it can be applied to beef cattle management in a way that allows us to understand and impact the challenging and complex problems inherent to livestock production.

References

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