A SYSTEMIC VIEW OF CHANGE – THE CHALLENGE OF CONTINUOUS IMPROVEMENT

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ABSTRACT

The drive towards continuous improvement often belies the need for continuous and transformational change. This paper illustrates through the use of a case study in the home improvement retail sector, how the development of systems representations and systems perspectives provides insights about the complex of relationships and inter-dependencies that impact change, and how those insights about the systemic nature of change may contribute to the effective management of sustainable change.

Keywords: six-sigma quality, continuous improvement, quality management, systems methods.

INTRODUCTION

This paper complements other work that has sought to demonstrate the benefits of building understanding of systemic structure through the use of systems representational tools, and then how systems representations are able to contribute to the generation of meaning [8] [9]. In particular, the paper seeks to provide insights of the dynamic and systemic nature of a *six–sigma* initiative deployed within a large scale home improvement product retail chain, and in doing so, to contribute to understanding of the nature of change.

Attention on systemic structure/pattern is focused by representing the *six-sigma* initiative/problematic situation using the causal loop diagramming approach of qualitative systems dynamics, which approach reveals behaviours, outcomes and consequences that emerge as the result of inter-connected and interacting causal loops and systems structures or patterns described by Senge as systems archetypes [10].

The nature and focus of this case-based paper provides an illustration of the views that research examining operations management may not only differ from other areas of management research in that it necessarily addresses the "physical and human elements of organisation" [4] [11], but also that case research can be a powerful research methodology in operations management, developing new and creative insights and understanding, enriching theory or the development of new theory.

The *Six Sigma – So Yesterday?* Case[6] (see below), provides some evidence of the impact that the adoption of *six-sigma* philosophy and practices can have on business - reflecting and highlighting a range of outcomes and emotions which include expectation, success, fervour, resistance, disappointment, etc. This may not be surprising given the findings of various reviews of the *six-sigma* literature [3] [12] (2010). They report that *six-sigma* has not only been conceptualised and interpreted in a multiplicity of ways; but is introduced and implemented for different reasons via a number of processes reflecting a spectrum of organisational goals and objectives.

Some suggest that the life-cycle of *six-sigma* has systemic parallels with that of other management tools or fads and that much can be learned from recognising the systemic structure underpinning individual and organisational systems behaviours associated with the use of such managerial practices.

Too often, workers will say that new processes introduced by operations managers will work for a while; everyone will get enthusiastic as successes are achieved by picking low hanging fruit; life will start to get difficult; heads will drop as problems crop up elsewhere in the business; workers and customers resent bearing the brunt of cost-cutting; workers run out of steam, demoralised and ending up "back where we started"; and too fed up with change to try anything new! The individual comments and criticisms are familiar, but the question remains of whether they should be considered anecdotally as relating to unique events or whether attempts should be made to understand the systemic structure that gave rise to them, and with which operations managers have to contend.

The paper seeks to show how recognition and understanding of systemic structure may elevate anecdote to insight, and also convey how insight and meaning that may otherwise be overlooked or dismissed as anecdote or situational. In particular, it seeks to show how the recognition of embedded common systems structures, systems archetypes, such as Senge's *Limits to Growth (LtG)*, *Fixes that Fail* (FtF) and *Shifting the Burden (StB)*, may

elevate understanding to a meta-level involving interacting systemic structures rather than the interaction of individual variables. As such, it is hoped that not only will those charged with the management of change may be able to share contemporary experiences and understanding, but that lessons can be gained from other similar change initiatives, about the communality of issues and relationships that are surfaced.

The paper provides a demonstration of an approach that is reminiscent of Senge in its invocation of systems notions and systems representations [10] [11]. In particular, we use the causal loops diagrams (CLDs) of qualitative systems dynamics (SD) to capture and represent the impact and consequential effects of *six-sigma* initiatives undertaken in the home improvement retail sector.

THE SIX-SIGMA CASE

For some, the origins of *six-sigma* represent a movement and philosophy around continuous improvement and quality improvement. Along the route to the present, however, benefits arising from recognised cost-savings and reduced costs accelerated the uptake of *six-sigma* primarily, almost pre-emptively, as a systematic means of controlling and cutting costs, and secondarily, pursuing other relevant quality and process improvement objectives [1]. In addition, the commitment to rigour in the implementation of the *six-sigma* approach, and adherence to the process of process improvement, may have unwittingly divorced those implementing *six-sigma* from those who had envisaged it as a manifestation of the philosophy of continuous improvement in its many forms.

Hindo & Grow [6] suggest such a situation as having happened at the Home Depot home improvement retail chain, where some sought after improvements were achieved in the early years of the millennium, but were later accompanied by some unforeseen consequences. For example, whilst the streamlining of the checkout process, and an improvement in in-store product placement policy, could be linked to increases in profitability across the company, a drop in worker morale and customer satisfaction became apparent, over time. Store workers became disaffected by the data-driven nature of work, and the consequential fall in the time that could be spent with customers. In parallel, Home Deport suffered in comparisons made possible by the publication of the American Customer Satisfaction Index, and sales started to fall – casting a shadow on the proponents of *six-sigma*.

Eventually, CEO Robert Nardelli was replaced by Frank Blake, who concluded that slavish adherence to *six-sigma* protocols across the organisation was no longer appropriate, and also that imposing company-wide policies on store management unnecessarily limited their discretion to use local knowledge in attempts to build company profitability. Indeed, such views suggest an implicit acceptance that profitability gains need not necessarily be driven by cost-cutting initiatives alone, but should be complemented by alternative initiatives that foster innovation and promote growth in sales and sales revenues.

However, the unintended side-effects of imposing *six-sigma* protocols may include disaffection and lowering of morale that makes commitment of staff to other initiatives problematic. They may also include attrition of disaffected staff, the remaining workforce more suited to data-driven analysis rather interaction with customers.

In the following sub-sections, we demonstrate how different features and relationships implicit in such anecdotal narrative can be captured and represented by the causal loops diagrams (CLDs) of qualitative systems dynamics [5] [11]. In an initial CLD, we reflect the dynamic implicit when early easy gains from metaphorically plucking low hanging fruit provide no indication of latter difficulties, and note that this dynamic is redolent of the common systemic structure labelled by Senge [11] as a *Limits to Growth* (*LtG*) systems archetype.

Then we attempt to reflect in a second CLD how an action chosen to create immediate benefit to a problem situation, may have an unintended consequence or side-effect of making the problem worse in the longer run. We note that this second CLD is redolent of Senge's *Fix that Fails* (FtF) archetype. In a third sub-section, we show how the chosen action may well address the problem short term, but may also have a side-effect of undermining other alternative actions that could have lasting value – the common systemic structure of a *Shifting the Burden* (StB) archetype.. In a final sub-section, we synthesise the three prior CLD representations into a composite CLD by identifying common variables and relationships and using them as basis for linking the three CLDs.

Quality Improvement Initiatives and Low Hanging Fruit

Low Hanging Fruit and Misplaced Expectations

Here, we suggest that the systems representation in Figure 1a reflects and confirms the often expressed intuition that change initiatives pursuing quality improvements will, in an initial phase, often proceed and seemingly succeed with surprising ease and pace, at first, perhaps as low hanging fruit is picked (Loop R01). Then, in a

second phase, the initiatives will face slower and/or limited further improvements as additional improvements become more difficult to achieve when faced with emerging technological or cost constraints (Loop B01).

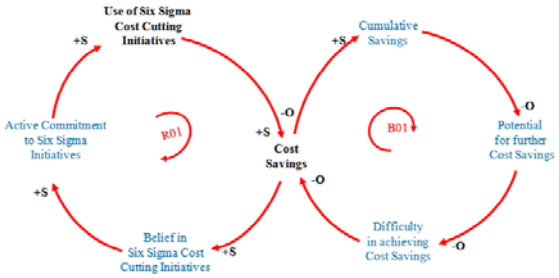
Figure 1a: The *Growth* Loop

Figure 1b: The Inhibitor Loops.

Note: The cause effect links in Figure 1 are denoted by arrows. An arrow with a '+S' indicates that 'if the cause increases, the effect increases *above what it would otherwise have been'*, that is, a change in the cause is positively associated with a **S**ame direction change in the effect. So, if the cause decreases, the effect would decrease. That is, if *Active Commitment to Six Sigma Initiatives* grows, then *Use of Six Sigma Cost Cutting Initiatives* will also grow.
A negative arrow with a '-O' indicates that 'if the cause increases, the effect decreases *below what it would otherwise have been'*, ie a change in the cause is associated with an **O**pposite direction change in the effect. So, if the cause decreases, the effect would increase. Parallel lines on an arrow indicates a delay or time lag between cause and effect.

As such, we recognise an initial dominance of loop R01, followed by the latter dominance of the B01 loop; and thus recognise the *six-sigma* initiative as evolving through implicit phases associated with the dynamic nature of dominant loops that share a common variable *Cost Savings*.
This variable thus becomes the link between two loops whose interaction is manifest as an evolution of changing loop dominance whose dynamics impact change associated with implementation of the *six-sigma* initiative. The extended CLD in Figure 1c is redolent of the *Limits to Growth* archetype (*LtG*) outlined by Senge [11].

Figure 1c: Six Sigma CLD – reflecting the *Limits to Growth* archetype.



In general**,** the *LtG* pattern recognises and reflects how seeming initial success, may not be sustainable as opportunities for improvement diminish, or improvements become too difficult. In such circumstances, we learn to recognise the need to **manage the constraining factors** (Loop B01), rather than focus effort on the getting more out of the growth loop (R01). We also note the notion of how *LtG* resembles boom and bust; and how, mistakenly, the **growth** reinforcing loop may be taken for granted, especially when the possible constraining factors and balancing loops are not identified **and** managed! We also note the **dangerous** nature of reinforcing loops – how the **virtuous** growth loop can become a **vicious** spiral of decline, if the constraining factors and balancing loops are not identified in timely fashion, **and** managed effectively.

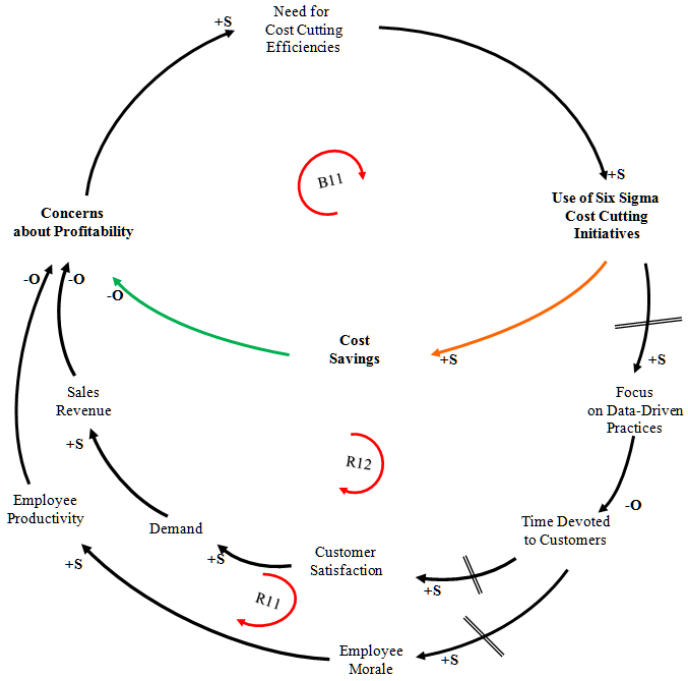
Quality Improvement Initiatives and Side-Effects that Make the Problem Worse

Low Hanging Fruit and Unintended and Unanticipated Consequences

Here, we first surface the notion of the *Fixes that Fail (FtF) archetype*. Figure 2 provides a representation of this scenario where the intended fix to an organisation's ailing performance, in this case, the implementation of cost-cutting six-sigma initiatives, may well work in the short-term (Loop B11), but may be associated with unintended and unfortunate consequences and side-effects that make the ailing performance worse in the longer term (Loops R11 & R12), reflecting Senge's *FtF* archetype. In illustration of how the CLD may be narrated and interpreted, we note how, for Loop B11, growing *concerns about profitability* generate a greater need for *cost cutting efficiencies* which in turn promotes the *use of cost cutting initiatives* leading to increases in *cost savings* and hopefully diminished *concerns about profitability*. We also recognise that the *cost cutting initiatives* may have

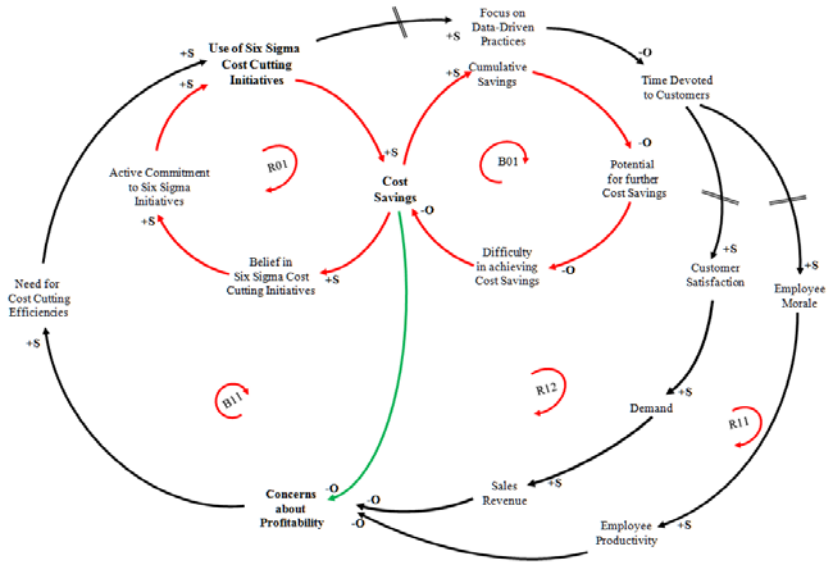
the unintended consequences of worsening profitability concerns in the longer term, if the emphasis is taken away from staff (reducing morale and productivity – Loop R11) or customers (depleting the sales base - Loop R12) -

Figure 2: Six Sigma - reflected as the *Fixes that Fail* archetype



We note that Figures 1 and 2 also share common variables, in particular, the *use of six-sigma cost cutting initiatives* and *cost savings*, which again provide the basis for dynamic interaction between the loops. Whereas the early dominance of Loop R01 gives way to the constraining Loop B01, in Figure 2, the early phase dominance of the problem fixing Loop B11 is replaced by the later dominance of Loops R11 and R12 that make the situational concerns worse in the longer term. The interplay of these loops, and an analysis of their evolving interaction, may be more easily understood through the extended representation in Figure 3.

Figure 3: Six Sigma - reflected as the *Limits to Growth* and *Fixes that Fail* archetypes

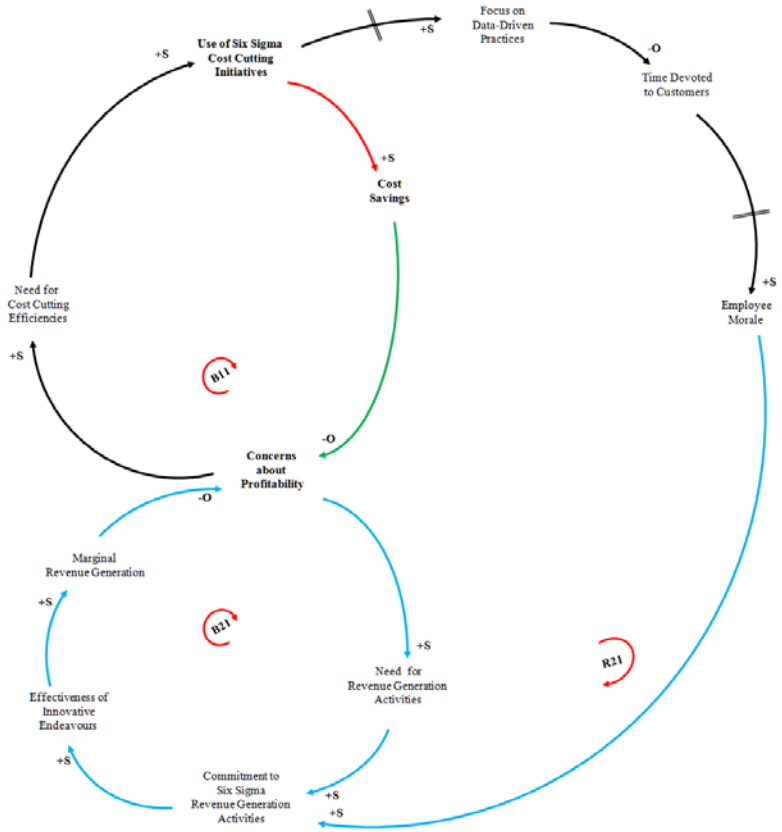


Quality Improvement Initiatives and Side-Effects that Undermine Alternative Initiatives

The CLD, shown as Figure 4, embraces several of the variables found in the prior scenarios in Figures 1, 2 & 3.

However, what can be interpreted from the Figure 4 system representation is that whilst the *use of six-sigma cost-cutting initiatives* (Loop B11) may considered as an appropriate means of addressing ailing financial performance, and may be dominant in early phases of implementation, the unintended consequence (Loop R21) of undermining an alternative means of addressing ailing performance (Loop B21) may be dominant in later phases.
In particular, the suggestion, here, is that, for example, adverse impacts may arise as the consequence of diverting workers' attention away from customer interaction to data-driven technical activities. Such adverse impacts may relate to a lowering of worker morale, the lowering of customer satisfaction, both of which may subsequently impact adversely on sales. As such, any sales growth initiatives (Loop B21) that may be deployed to complement the cost-cutting initiatives would be undermined. Such a scenario can be identified as reflecting the *Shifting the Burden* (StB) systems archetype – recognising the unfortunate side-effect that one fix, often the quick fix, will undermine the use or effectiveness of an alternative fix, perhaps forcing ever-more reliance on the *quick fix* that has diminishing impact. In essence, the more we resort to the quick fix, the more dependent we become on it, and the more we undermine our ability to put in place a long term solution..

Figure 4: Six Sigma - reflected as the *Shifting the Burden* archetype

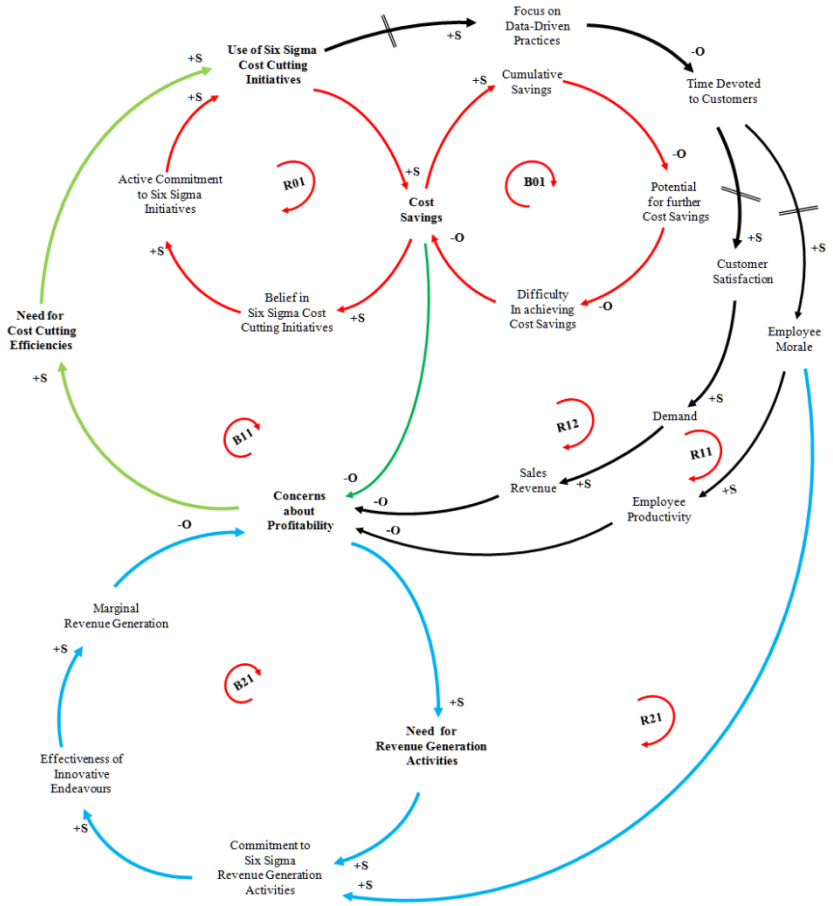


The Complete CLD

Figure 5 embeds the systemic relationships embedded in Figures 1-4, and provides a more comprehensive representation of the wider problem situation, and of course, represents considerable complexity in terms of the multitude of variables, relationships, mutual dependencies etc that are captured. However, such complexity is very much reduced when sub-systems structures are identified as causal loops or systems archetypes.
Indeed, we see the benefit of causal loop representations as leading to effective analysis, that is, reductionist analysis in the first instance, identifying cause-effect relationships, and the identification of mutual relationships between pairs of variables and groups of variables. However, we also see the benefits of synthesis, the identification of causal loops, the identification of interacting causal loops, the identification of high level systems archetypes, and the identification of interaction between archetypes.
The whole problem space, here, may then be conceptualised as the dynamic interaction of three common and recognised systemic structures or archetypes, rather than the dynamic interaction of seven causal loops, or rather than the complex interaction of a multiplicity of variables and relationships.

For example, we note the interaction of the *Limits to Growth*, *Fix that Fails* and *Shifting the Burden* archetypes shape individual behaviours, and systems behaviours and outcomes. We also note how the relationships and dynamics of Loop R01 in a first phase may influence the dynamics within Loop B11, which in turn, influence the later phase dynamics of Loops R01, R11, 12 and then Loop R21.

Figure 5: Six Sigma – reflected as the complete CLD



In illustrative interpretation, we note how, starting with Loop R01, growing *concerns about profitability* generate a greater need for *cost cutting efficiencies* which in turn promotes the *use of cost cutting initiatives* leading to increases in *cost savings* and hopefully diminished *concerns about profitability*.

However, increased *use of cost cutting initiatives* heightens the *focus on data-driven practices*, undermining *employee morale* (Loop R11), and consequently lessening the *commitment to six-sigma revenue generation activities* (Loop R21) that would be necessary to boost *revenue generation* (Loop B21) and address *concerns about profitability* in the longer term.

In particular, we recognise that some outcomes are not merely the consequences of individual behaviour or a single cause. They may be unintended or unwanted, and they may be consequence of systems behaviour, systemic interaction, and such outcomes may therefore be described as the emergent properties of the wider system. As such, the "system" cannot be managed as a collection of individual entities. The problem situation or system needs to be managed as a set of interacting entities.

If so, points of intervention to address unwanted consequences must be identified, and such points of intervention or leverage points should be chosen where they may have appropriate impact. For instance, addressing *employee morale* can be seen to have impact within Loops R11 and R21. In Loop R11, lifting *employee morale* positively impacts *employee productivity* and thus would lessen *concerns about profitability*. At the same time, in Loop R21, lifting *employee morale* raises the level of *commitment to six-sigma revenue generation initiatives.* So, *employee* morale is an important point of intervention, or leverage point. Indeed, in seeking to impact *employee morale* with other positive initiatives, we seek to modify what is represented as a closed system creating unwanted outcomes and systems behaviours, with action that generates positive outcomes and systems behaviours.

SUMMARY

We note that such insight about intervention and leverage would not be so readily recognised without the systems representation. However, such insights are given face validity when we reflect on Lewin's steps or phases [7] for the effective management of change: the need to unfreeze beliefs about the existing situation, the value of the active leadership role of helping individuals to recognise and accept the need for change, buy into change, be receptive to change, to want to change and to support change - thus increasing the chances of a successful change process. Then as Lewin suggests, it is beneficial to guide or lead people in a manner that creates and maintains effective engagement in change, that builds a sense of involvement, and that makes apparent the benefit from change or from involvement and participation in that change.

We also note face validity arising from Bradford and Cohen's [1] notion of transformational leadership, as it relates, for example, to creating a shared vision, unfreezing the problematic situation, reducing resistance to change, and cementing commitment from people for what they have helped to create, and for what they see as creating personal and organisational benefit. If as Burns [2] claims, leadership is also about developing individual and organisational capability, then intervention that diverts people away from their perceived areas of competence, and from areas of personal growth or interest, will only serve to lower morale, individual and organisational productivity, and commitment to other proposed changes.

The paper demonstrates how, in the context of a change initiative, a complex of individual actions, cause-effect relationships, mutual dependencies etc can not only impact the behaviour of individuals and groups, but effect behaviours and outcomes at the level of the wider system in unintended and unanticipated ways that may be described as the emergent properties of the system. The paper has sought to show how recognition and understanding of systemic structure may elevate anecdote to insight, and also convey insight and meaning. It has done so by demonstrating how the recognition of embedded common systems structures, that is systems archetypes, such as Senge's *Limits to Growth*, *Fixes that Fail* and *Shifting the Burden*, may elevate understanding to a meta-level involving interacting systemic structures rather than the interaction of multiple individual variables.

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