

Embedding Learning Aids in System Archetypes

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Abstract: *This paper revisits the systems archetypes proposed in The Fifth Discipline. Authors believe there exists a framework, which explains how these archetypes arise. Besides, the framework helps integrate the archetypes and infer principles of organizational learning. It takes the system archetypes as problem archetypes and endeavors to suggest solution by embedding simple learning aids in the archetypes. Authors believe problem in the systems do not arise due to the failure of a single paramount decision-maker. More often than not the problems are manifestations of cumulative and compound failures of all players in the system. Since system dynamics does not account for the behavior of individual actors in the system and it accounts for the individual behavior only by aggregation the only way it can hope to improve the behavior of individual actors is by taking system thinking to their doorsteps.*

Key words: System archetypes, organizational learning, learning principles,

1. Introduction

The old model, “the top thinks and local acts” must now give way to integrating thinking and acting at all levels, thus remarked Peter Senge in the article ‘Leader’s New Work’ (Senge, 1990). Entire universe participates in any given event and thus entire universe is the cause of the event (Maharaj, 1973). However, we must place a boundary to carve out our *system in focus* in order to understand and solve a ‘problem’ whatever it means. But, how focused our ‘focus’ should be has always been cause of concern in system science. Holistic should not only mean that whole is more than the sum of its parts, but should also mean that no element/relationship is left out of consideration to the extent possible. This is why it is so difficult to set the boundary of a system under consideration. Meadows says in her article ‘Whole Earth Models & Systems’ (Meadows, 1982) that a corporation is a corporation even when every person and machine changes, as long as the hierarchies, purposes, and values remain the same. By saying so she highlights the importance of ‘interrelationships’ rather than elements. Corporation is the interrelationships between elements and remains the same even after elements change. Fine, but what about the

‘particular moment’ when you are seeing the system neither before nor after? That is the moment of decision. From the point of view of that moment a good decision taken is a decision, a bad decision taken is a decision and no decision taken at all is also a decision. For, every moment on the time dimension is the repository of all moments preceding it and the seed of all moments that will ever come after it. The underlying truth about ‘the moment’ is that no one can run away from the consequences of one’s actions committed at that moment. As Buddha said, “Not in the sky, not in the midst of the sea, not if we enter into the clefts of the mountain, is there known a spot in the whole world where a man might be free from an evil deed” (Macy, 1991, p.165). It is not about impossibility of hiding from evil deeds alone, but also from the good deeds as well. It is another matter that one does not need to hide from the consequences of one’s good deeds. The issue of interrelationship goes well beyond the “Sadomasochistic symbiosis” theory, which traditional psychiatry, recognizing the relational aspect, might come up with. Obscuring the important elements of causality through reductionism might lead to a formulation implying that a sadist met a masochist and they lived happily ever after because they were made for each other (Macy, 1991, p.100). To be interdependent and reciprocally affecting is to be in a process (Macy, 1991, p. 107). Not only the elements, therefore, but the interrelationships also are in constant flux of change what we call ‘processes’ where each and every moment counts. Meadows observes that every person and machine changes in corporation, but the truth is that they are merely *replaced*. Feedback is not going to play the role of detective to identify who made the decision. Decision-makers are anonymous from the point of view of feedback in organizational setting.

While there is no denying that the focus of system thinking should be interrelationships and processes rather than elements the importance of the moment of decision cannot be ignored. Therefore, each and every actor in the system counts, for, some or one of them will always be there at the decision point irrespective of his/her identity. *If one slices an organization into “moments” the people who occupy the nodes at a moment are as important as the interrelationships between the nodes, and the organization is the sum total of people, their knowledge, beliefs, culture and interrelationships comprising of roles & responsibilities and division of labor at that moment.*

‘Top thinks’ and the ‘local acts’ model assumes a single paramount decision-maker who must be discarded in favor of a system where every actor is capable of system thinking, for no one knows who will be at the decision point when the moment arrives. Since System Dynamics does not account for the behavior of the individual actors and it accounts individual behaviors only through aggregation it is all the more important that system thinking must be taken to the doorstep of all the actors in the system.

In tracing the evolution of the concept of generic structures and contour of this evolution Lane

and Smart (1996) have identified three different facets of it. First, the canonical situation models, the mathematical structures, which generate dynamic behavior. These are described to be the general models of an application domain, representing a particular case study. These are fully constructed simulation models generating different modes of dynamic behavior depending on the parameter and policies employed (Lane and Smart, 1996). Second, abstracted microstructures, which are relatively abstract pieces of system structure supporting a fully specified simulation model that generates a single commonly observed behavior mode. Third, counter-intuitive archetypes that characterize the common dysfunctions in high order dynamic systems and through an understanding of dynamic structure suggest antidotes. The nature of the dysfunctions and that of the antidote both are counter-intuitive. Structures that develop ideas to capture this counter-intuitive aspect of dynamic systems have been termed as counter-intuitive system archetype (Lane and Smart, 1996).

There are evolutions in evolution as there are theories in theory. The evolution in general of the concept of generic structure has been accompanied by evolution in particular of system archetypes. The chain of evolution began, as Lane and Smart note, when Forrester identified a number of important behavior characteristics of complex systems, which he described in *Urban Dynamics* (Forrester, 1969). These principles embody generic insights, which help people to understand the relationship between structure, behavior and policy (Richardson, 1991). Meadows (1982) represented these insights in simple causal loops and characterized them as computer-free system insights. The evolution of system archetype culminated in the work of Peter Senge when these archetypes became a part of a generic model, the final form of a series of generic structures of increasing complexity (Senge et al, 1985, Senge, 1990, Senge, 1994). System archetypes, therefore, evolved from empirical observation to dynamic structures to building blocks of all systems.

In Peter Senge's book *The Fifth Discipline* (Senge, 1990) every archetype is accompanied by a management principle, that a decision-maker is supposed to capture through his/her systemic insights. As such, these archetype are learning tools. In describing the contribution of the three interpretations of generic structures (Canonical situation models, abstracted microstructures, and Counter-intuitive system archetypes) make when applied to different activities within the field of system dynamics, Lane and Smart (1996) recount four different activities. They are -system conceptualization, formal model construction, domain understanding, and teaching. Dominant use of system archetypes, they suggest, is in the activities of system conceptualization and domain understanding. Teaching has been left out as an activity where system archetypes could find dominant use. That is because teaching refers to more formal situations of education and training. Though, Andersen and Richardson (1980) do not rule out a pedagogical approach to system dynamics in which generic structures are seen as means of teaching system

conceptualization skills. If teaching is taken in an informal sense providing awareness of systems thinking to an uninitiated person then system archetypes could be used as a vehicle. But, such a vehicle should be simple and elaborate enough to comprehend and use it.

1.1 Objective of this paper

This study has threefold objective. First, cogitating the framework of organizational learning. This is important because different archetypes came from different researchers thus entailing the need for their integration in a unified framework. Second, inferring the principles of organizational learning from the framework. Third, treating the systems archetypes based on the principles of organizational learning and thus encompassing them into the framework. Merely connecting these archetypes as given in (Braun, 2002) not only undermines the meaning these archetypes encapsulate, but also ignores patterns that create these archetypes. Wolstenholme (2003) discusses generic causal loop structures referred to as systems archetypes. It postulates that for every 'problem' archetype there exists a closed loop 'solution' archetype. Each archetype has some key characteristics that define underlying systems thinking. However, it does not propose any framework for interpreting these structures; how and why they arise and how they could be linked as problem-solution pair. Other works relevant to this discussion are Wolstenholme & Coyle (1983); Wolstenholme (1990); Wolstenholme (1993); Wolstenholme (1999).

2. Cogitation on the framework

Since systems archetypes have come from different researchers a framework is desirable to link them together. Such a framework will not only integrate the archetypes into a gestalt, but also help discover underlying learning principles which otherwise would be lost into bits and pieces of the problems. These archetypes are elements of a larger whole called organization and in order to understand the organizational dynamics these archetypes should be seen in relation with each other. Understanding of organization as a whole depends as much on these archetype as understanding of these archetypes depends upon the organization as a whole.

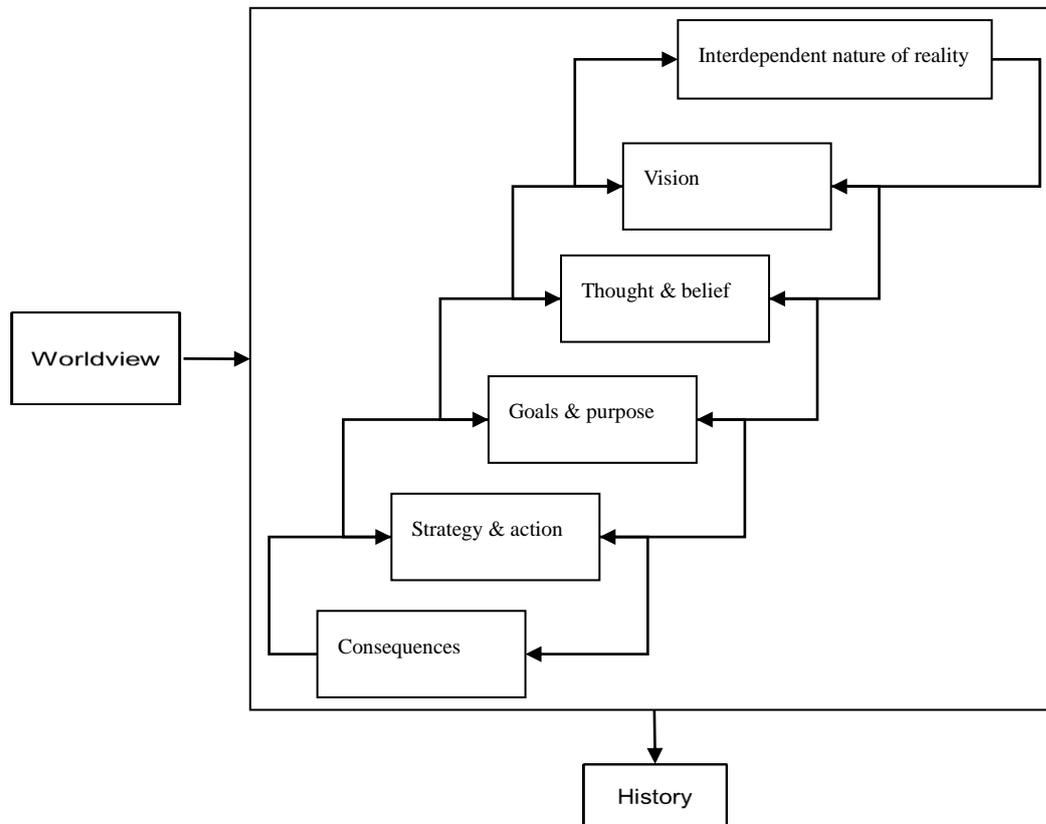


Figure 1. The learning Framework for System Archetypes

2.1 The Interdependent and process view of reality and *Dharma* of systems

It is pertinent to recount a dialogue from the famous Indian epic *Mahabharata*, in order to adequately position the framework and elucidate it. The dialogue took place between the reigning King *Dhritrashtra* and his queen *Gandhari*. The king was obsessed with love for his son whom he wanted to succeed after him ignoring the shortcomings of his son and the fact that his eldest nephew was better qualified for the throne. *Gandhari*, a noble and a just queen was frustrated of the king's obsession, for, she knew it would lead to the war of succession. She confronted the king and urged him to remember his name. "*Dhritrashtra* is your name" she tried to make the king to see the reason. *Dhri* means 'to hold' and *Rashtra* means 'the nation' and *Dhritrashtra*, therefore, means *the one who holds the nation*, she explained to the king. But, unfortunately, Your Excellency, you are holding your son instead, she protested. This blurs your vision, she continued, and therefore your thoughts are impure; your thoughts are impure, therefore, your actions are ill fated, your actions are ill fated, therefore, the nation will doom. She finally urges the king to take refuge in *dharma*, for, only *dharma* will correct your vision. Here *dharma* did not mean any divine commandment. It only meant doing what was right for the nation and not for his son alone.

In some of the archetypes particularly Eroding Goals (Senge, 1990, P.383) and Growth and Under-investment problem arises because people fail to hold the organizational vision (Senge, 1990, P.389). However, it is not made clear what to do if vision itself is not correct. Just because top management sets the vision does it mean it has to be correct? Organizational visions are usually confined to the welfare of the organizations themselves, rarely going beyond the perceived premises of the organizations. As Peter Senge remarks in *The Fifth Discipline* that vision is a familiar concept in corporate leadership today. But, when you look carefully you find that most visions are one person's (or one group's) vision imposed on an organization" (Senge, 1990, P. 206). The question therefore is who sets the vision correct? What to refer to if there is doubt pertaining to the vision? The answer is vision must follow the truth and the truth is the interdependent and process view of reality and this reality and realization of this reality is the *dharma* of systems and organizations. The word *dharma* here conveys not an essence or substance but reciprocal causality, co-dependent arising and reality as a process. The dharma does not emerge from divine commandments or from human nobility alone but instead from the fundamental causal interconnectedness of all phenomena. This interdependence sets the limit and provides the scope for our conscious participation in the reality (Macy, 1991, p. xii). Author believes that deliberation and construction of worldview from the organizational perspective helps understand the framework for organizational learning (Vidal, 2012). Construction of worldview entails answering the following questions (Vidal, 2012) - What? (Constructing the Ontology), Where it comes from? (Model of the past), Where it is going? (Prediction- model of the future), What is good? What is not good? (Theory of values), and How should we act? (Theory of action). Rai and Swaminathan, (2010) have constructed Worldview for program management. This may also entail articulating requisite system of knowledge of the domain in which organization is functioning (Rai, 2012). For instance, if an organization is functioning in IT and IT enabled service space it must understand the relevant technology landscape, business domains, customer needs and markets etc. And, how these pieces interact with each other. In the absence of this knowledge vision may not be adequately informed and clear.

3. Principles of Organizational Learning

The first principle of learning

Interdependent and process view of reality is the first and foremost source of learning

This principle states that realization of interdependence nature of reality is the first and foremost source of learning. It recursively permeates all stages and is indispensable to the understanding of the framework and organizational learning. Organizational vision depends as much on this reality as thoughts and beliefs depend upon vision and so on till consequence of action- the last stage of the framework.

The second principle of learning

Problems in a given stage are manifested in the lower stages

Lack of learning and understanding at a given stage will manifest at the lower levels. For instance, inability to understand the nature of reality will manifest itself at the level of vision and beyond. Similarly, problems in vision will be manifested at the level of thoughts and belief and so on. This pattern has been observed in software project development lifecycle as well wherein problem in a given phase of the software development lifecycle manifests itself in the next phase and the challenge is to contain the defects in a given phase and stop it from spilling over to the next phase of the lifecycle referred to as phase containment.

The Third principle of learning

Avoid fixation into a particular mode and refer to higher stages for insight.

This principle requires that one should continuously check and take a second look in whatever one is doing and refer to the higher stages if need be. It is *plan-do-check-act* (PDCA) cycle (Deming, 1993) with reference to higher stage. Fixation into the PDCA cycle is not desirable. Continuous reference to higher stages is necessary as lower stages are yet to come and when they come there will be consequences of the actions done at the previous level.

The fourth principle of learning

Solve the higher order problem first

If the system involves a problem of belief as well as of goal solve the problem of belief first.

The fifth principle of learning

At the end of consequence stage the process of unlearning and relearning begins.

It does not mean process of learning stops here. It only means that first iteration of learning has come to completion and consequences must now tell what was learnt wrong and what should be relearned. This is accomplished by feeding back the consequences.

The sixth principle of learning

The later the detection of fault in learning the more the undoing and redoing

If the fault in vision is detected at the level of strategy and action everything from vision down to strategy and action needs to be undone and redone.

The seventh principle of learning

Principle of delay: At times patience is the only prayer

Thus spoke Buddha. When delay is involved as most often it does and if it cannot be controlled and reduced then patience is called for. *Patience is the price you pay for holding your vision. Patience is an investment.*

The eighth principle of learning

Record the history of the system after every iteration- history of all decisions taken and policies implemented. History of the system cannot be ignored. History of the system co-determines its structure (Cilliers, 1998).

4. Learning Aids for System Archetypes

4.1 Balancing Process with Delay

The archetype is given in figure 2. Principle of delay holds the key to this archetype. In this system archetype there is a Micro world of delay in the Macro world of system. Mere formulating the delay in terms of order and type of delay for the simulation purpose is not enough. One must take a closer look at delays.

Delays may be categorized as follows.

1. **Natural Delays-** some delays are natural. For instance the gestation period- the amount of time taken by a fetus to grow into an organism or germination of a seed and its growth into a plant or a tree. There is nothing one can do about it unless of course one alters the genetic constitution of organism or plant, but even in that case it is a different species. In natural delays solution lies in planning according to the delay.
2. **Institutional delays-** these are man-made delays institutionalized to impose an order in the system. Design of university degree courses- four years for undergraduate and two years for graduate studies is an example of institutional delays. This delay can be reduced only by policy decision or overhauling the entire system. In some courses an institution may allow students to take more courses per semester and complete the degree in less time than normal.
3. **Management delays-** Delays are intrinsic to management processes. A number of delays are involved in taking a product from manufacturing plant to the customers. However, there are delays that results due to improper planning and inefficiency. This delay can be reduced by proper planning and process improvements.

There are only two choices in this archetype. Make the system more responsive and reduce the delay or just wait. Reduction in delay may require the decision maker or a modeler to go through the following triad.

Intelligence- in this phase delay is detected and causes of delay are identified.

Generation of choices- choices/alternatives are generated in this phase to solve the problem of delay.

Selection of choice- the optimal choice is selected for implementation to reduce the delay.

4. **Recording the history of decision-** recording the history of decision is probably the most important thing to do while balancing process with delay. A decision maker must know the decisions taken in the past so that he accounts for the delays involved in those decisions before while taking his decision.

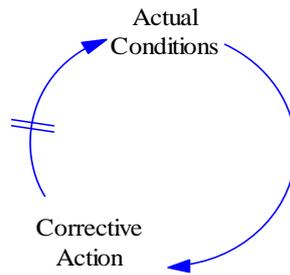


Figure 2. Balancing Process with Delay

4.2 Limits to Growth

Limiting condition is the issue of concern in this archetype. The first principle of interdependence nature of reality is involved here. Limiting conditions are produced by the system only- either due to consumption of resource or due to internal or external response to growth. *Every resource is infinite if there is no consumer.* Limiting conditions, therefore, are being produced by interdependence between resource and consumption of resource by the system. They are not given as initial conditions by nature. Limiting conditions induced by internal or external conditions are arising due to interdependence between structure of the system, behavior of the system, and the environment. The archetype is given in figure 3.

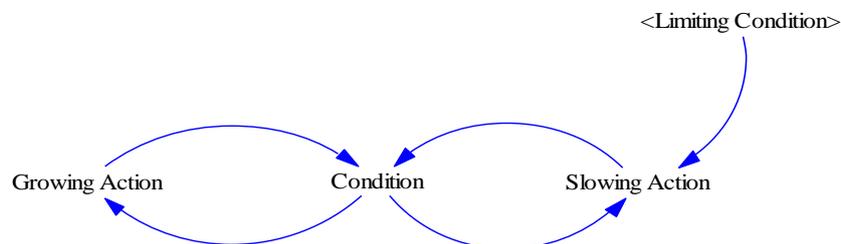


Figure 3. Limits to Growth

This archetype points out that we cannot have uninterrupted growth forever and there comes a point wherein a limiting condition of some kind will ‘push back’ the growth. However, the limiting condition need not be related to exhaustion of natural resources only.

Historically, limits to growth has been managed through:

- More output per unit of resource
- Process improvement
- Reduced wastage
- Technology improvement
- Identifying new resources when existing resource is approaching exhaustion
- Understanding the theoretical limits
- Constraining resource consumption

Observations such as Moore’s law (Moore, 1965) have addressed the same problem and stood the test of time- not for ever though. What this archetype essentially teaches us is every ‘push back’ and ‘limiting condition’ is asking for a breakthrough- breakthrough in technology, breakthrough in finding a new resource, a new methodology or a whole new paradigm altogether.

4.3 Shifting the Burden and Fixes that Fail

The archetypes ‘Fixes that fail’ and ‘Shifting the Burden’ are one and the same there is no fundamental difference between them, certainly not an archetypal difference. In both cases fundamental solution to the problem is pushed to some distant future at the expense of inadvertent consequences and creating the need for the intervener. In both cases, pressing problem is fixed with symptomatic solutions. Therefore, we treat these archetypes as one and suggest the learning aid for the decision-maker. The structure of these archetypes is made up of two balancing loops, which eventually generate the undesirable reinforcing loop.

The principle “the later the detection of fault in learning the more the undoing and redoing’ and the principle of delay are involved here. The fundamental solution is being pushed here into future to be discovered later because it involves delay. Furthermore, since symptomatic solutions are deployed frequently it suggests that people do get into a particular mode and resist coming out of it. Though, they are supposed to check continuously into whatever they are doing to see if they are doing it right. As such the third principle of organizational learning is also involved here. Decision-maker needs to learn the fundamental solution at the earliest and to exploit the delay by symptomatic solution if it is imperative. The original archetypes of “fixes that fail” and shifting the burden are given in figure 4a and 4b respectively.

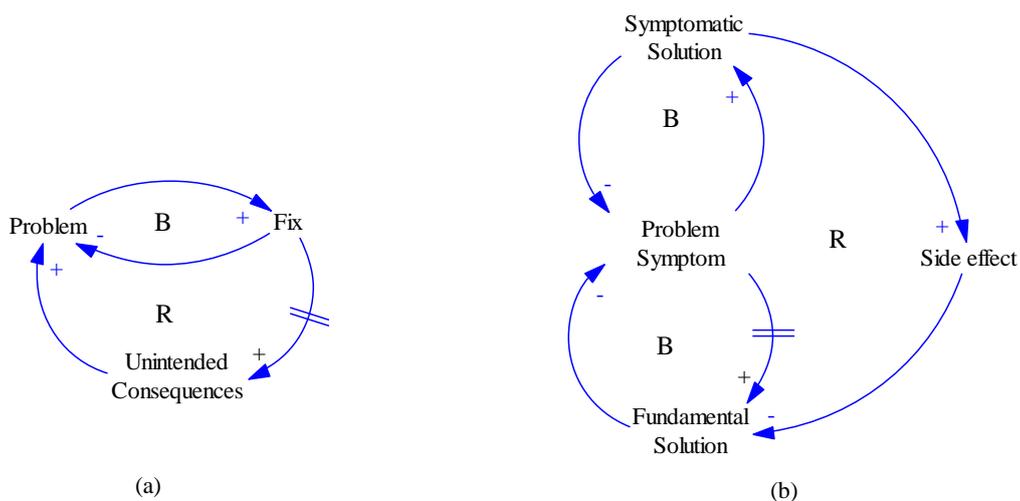


Figure 4. Fixes that Fail and Shifting the Burden

There is another way of looking at these archetypes. In domains such production support also

known as production management and IT service management ‘Quick fixing’ and shifting the burden is best practice. The IT service management domain is split into two- incident management and problem management. The goal of incident management is to fix the incident as soon as possible and make the system operational while the goal of problem management is to conduct root cause analysis and identify the problem underlying the incident / issue and resolve it so that the incident does not recur (Rai, 2013; Mehta, Rai and Roy, 2014). It is always desirable to split a system into subsystems if subsystems have to accomplish disparate goals.

4.4 Eroding Goals

In this archetype problem arises when interdependence between goal and vision is violated and goals become independent of vision. This violates the interdependence principle. Furthermore, action taken to improve the situation involves delay, which further exacerbates the problem. Therefore, it involves the principle of delay as well. *Delay is the price you pay for holding onto your vision.* Furthermore, getting typecast into short-term solution mode as in the case of “fixes that fail” and “shifting the burden” is evident here also. As such, the third principle of organizational learning is also involved here. The archetype is given in figure 5.

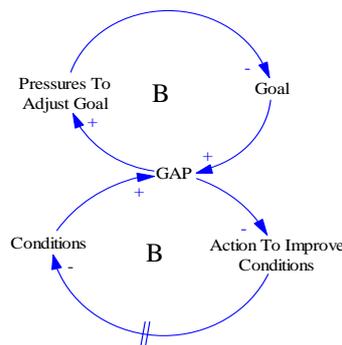


Figure 5. Eroding goals

Eroding goals archetype carries a negative connotation. Revision and downgrading of the goals are not always erosion. In project, program and portfolio management (Rai and Swaminathan, 2010; Rai *et al* 2010) governance is about steering the project or program in execution mode such that it meets its stipulated objectives. Governance also means to revisit the goals and objectives and revise them if they are not achievable with current available resources, capacity and scheduled project completion time. *Governance is an organic function rooted in reality.* Goals are set in ideal conditions based on certain assumptions. When project or program gets into execution mode in real time and space ideal conditions disappear and some of the assumptions also turn out to be unfounded. What should a project or program manager do when faced with a situation where project objectives cannot be met with prevailing conditions in the project? Should s (he) allow projects to fail or should s (he) revise the objectives and accomplish them? This is a decision project stakeholders need to take. For fear of eroding goals

projects cannot be allowed to be shelved. Partial success with revised goals could be better than complete failure.

4.5 Escalation

Realization of interdependence nature of reality is the only ideal solution of this problem. Also, getting typecast into a mode, in this case mode of escalation, is another principle involved here. This archetype is a vicious spiral of two mutually competing loops consuming themselves. Separately, they are two negative loops but combined together they are basically a positive loop leading to runaway growth or collapse.

In case of arms race, an apt example for this archetype, this escalation loop exist because of relationship between ignorance of interdependent and mutual co-existence and craving for the separate selfhood. This separate self- hood produces anxiety and greed which further distorts the view of reality thus deepening the ignorance even further (Macy, 1991, p. 98). The groups or individuals involved in escalation loop are simply playing the roles of sadist and masochist interchangeability. Both act as sadist when they think of damage they can inflict upon each other. And, as masochist in so far as they spend all their resources to this destructive game while other pressing needs die for attention. As such they simply become a pawn in the hands of ignorance of interdependence and mutual co-existence. This ignorance arises due to deep-seated assumption of separate selfhood. In the *Kutadanta sutta*, Buddha recommended to the king that instead of splurging money on performing religious rituals and sacrifices he should devote the capital to creating jobs (Macy, 1991, p.97). Some symptomatic solutions may be offered to the problem of escalation as follows.

- Perception of detrimental effect of comparison /competition
- Knowledge of one's own critical mass- the knowledge of critical mass of the extent to which one can remain in the vicious cycle of arms race.
- Knowledge of other's critical mass- the knowledge of others' critical mass, to the extent the other can remain in the vicious cycle of arms race.
- The critical mass could be either be of resource or of time. It could be the critical mass of somebody's perseverance also.
- Third party intervention- the vicious cycle is a subsystem of a larger system. For instance arms race between two countries is part of global arms race. And, the concept of Comprehensive Test Ban Treaty is the intervention from the larger system. Figure 6 shows the archetype and learning aid.
- Breaking the cocoon of separate self-hood and creating instruments and alliances that forge and promote mutual existence. Bodies like UNO (United Nations Organization), European Union, SAARC (South Asian Association of Regional Cooperation) aim to achieve this goal. Figure 6 shows the learning aid integrated within.

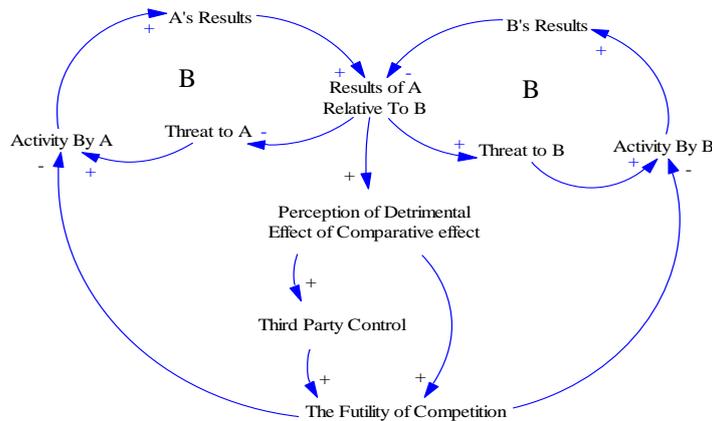


Figure 6. Learning Aids in Escalation

4.6 Success to the successful

This problem occurs when the canon of equal resource /opportunity for equal capability is either not inculcated in the organizational vision or not implemented in practice. In the first case the principle of interdependence is to be taken care of. Else, the problem will manifests at later stages i.e. the second principle. The vision of equal opportunity/resources to equal capability follows from the following observations:

- All actors in the systems have stake in the system and are interdependent upon each other for achieving the overall purpose of the system.
- Bias in favor of role of intrinsic merit in performance ignores the fact that capabilities can be enhanced through learning. Those who get the resources based on their intrinsic merit they enhance their capabilities further through learning, while other remain where they were and the gap increases and vicious cycle ensues.

Implementation strategy for judicious distribution and allocation of resources and opportunity may be modeled along deadlock prevention strategy in Computer Science. Managing a limited resource among a number of processes so that all processes get chance to use the resource and no process starves as well as efficient utilization of resource has been deliberated extensively in Computer science as the subject of deadlock characterization and prevention (Silberchatz and Peterson, 1988). This technique can be used effectively in social and managerial framework also. Besides, there are other elements of learning in this archetype.

1. Equal opportunity for equal capability/priority
2. If other activity/group/individual has been denied resource/opportunity in favor of other the discrepancy between their performance/growth is to be computed along with the resource opportunity required to fill the discrepancy. This mechanism has been shown in figure 7.

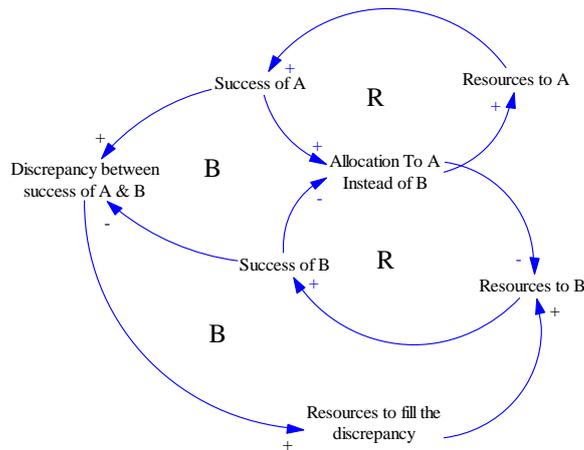


Figure 7. Learning Aid in Success to the Successful

Success to the successful archetype is also characterized by self-fulfilling prophecy (Merton, 1948). Self-fulfilling prophecy is a portending which causes itself to be true by virtue of reinforcing loop between belief and behavior. Resources are allocated to individuals based on their intrinsic merit. They perform well and they become favorite for resource allocation and they become established superior performers once and for all as a consequence. In this process contribution made by learning through experience is forgotten along with the fact that relatively less meritorious individuals could also have improved their performance and come on par with meritorious ones if equal resources and opportunities were given to them.

4.7 The Tragedy of the Commons

This archetype deals with the scenario when individuals use a common but limited resource for individual needs alone. The archetype of tragedy of commons been shown in figure 8.

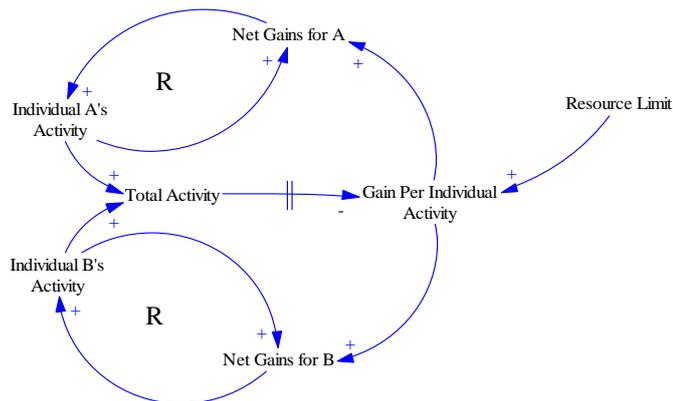


Figure 8. The Tragedy of Commons

This is a compound problem of wrong vision and wrong belief. In fact individuals in the “tragedy of commons” do not seem to have any vision at all. They could see only themselves and ignore the interdependence nature of the problem. This distorts their vision and they formulate a self-centered belief. As the principle says we need to solve the higher order problem

first. In this case individuals first need to see the interdependence, form a vision to accommodate all, and then formulate their belief and action accordingly. If this does not happen then any regulatory authority may intervene on the following basis.

The computation of optimal resource requirement: The optimal resource per individual or team can be computed with resource and number of individual. This measure will tell not only the amount of resource an individual or team can consume but also the number of individuals that may be allowed to consume the resource. *It must be noted here that tragedy results because total depletion of resource when individuals' behavior are let loose is more than the sum of individual depletions when some restriction is placed through regulation.* The optimal resource requirement can be the basis for any regulation of behavior of the individuals by any regulatory authority. To sum up the archetype the following statements can be made as elements of learning.

- This problem does not arise due to the failure of a single paramount decision-maker.
- It is a manifestations of cumulative and compound failures of all players in the system
- Depletion of common resource
- Inequitable distribution of resources

Deadlock detection and prevention (Silberchatz and Peterson, 1988) in Computer science can be adapted in this archetype also to ensure equitable distribution of resources.

4.8 Growth and Under-investment

The following observations characterize this archetype.

- Builds on the Limits to Growth archetype.
- Underlines the need for investment in resources to ensure sustained growth.
- Differs from Limits to Growth archetype due its emphasis on the need for capacity/competency investments that impact the long term growth.
- This archetype applies when growth approaches a limit that can be overcome if capacity investments are made.
- If this archetype is not recognized, the decrease in demand is often confused as a reason not to invest in the needed capacity which further deteriorates the growth in a long run
- Rai and Mehta (2012) and Rai (2011) have observed a similar archetype in IT Outsourcing domain, which is also a case of misplaced causality. In staff augmentation model of outsourcing whenever there is a decline in performance more staff is added to the project creating a resource surplus and inflating the cost of the project. Decline in performance prompts adding more resources almost as a reflex action. No causal analysis is done to ensure if there could be another reason for non-performance.

Elements of Learning:

Following are the elements of learning in this archetype. The archetype is given in figure 9.

- Vision, goals, belief and action.
- Misplaced causality- decline in growth causes the cessation of investment. *Investment is withdrawn precisely at the point where it is needed.* It should have been other way around.
- History of decisions taken.

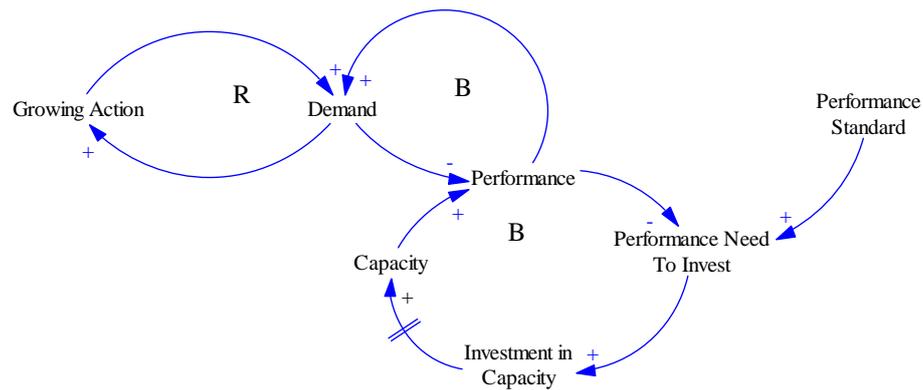


Figure 9. Growth and Under-Investment

Table 1 summarizing the archetype and principles of learning involved is shown below.

Table 1.

Archetype	Elements of Learning	Principles of Learning
Balancing with Delay	Action, Consequence	Principle 7, Principle 8
Limits to Growth	Interdependence between resource, structure of the system, behavior, and environment	Principle 1
Shifting the burden & Fixes that fail	Action, Consequence	Principle 6, Principle 3, Principle 7
Eroding Goals	Vision, Goal	Principle 1, Principle 7, Principle 3
Escalation	Vision (Self-centered)	Principle 1, Principle 3
Success to the successful	Vision (Equal opportunity to equal capability)	Principle 1
The Tragedy of the Commons	Vision	Principle 1, Principle 4
Growth and Under-	Vision, Goal, Belief,	Principle 1,

investment and Self-fulfilling Prophecy	Action,	Principle 2, Principle 4, Principle 8
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5. Conclusion

This study comes to the conclusion that the archetypes are not isolated with each other as they appear in the first glance. The absence of any integrating framework was giving the impression of them as isolated systemic problems. The framework presented in this study was derived from the elements involved in the archetypes themselves and it was not imported and implanted herein. This framework helped in deriving the principles of organizational learning. The archetypes result primarily due to some learning disability on the part of person at decision point due to his inability to see the archetypes as a part of a greater whole and learning principles and insights therein.

The principles of organizational learning do help in getting insight into the problem as they are. Firstly, by letting one see the archetype in relation with each other and secondly, by articulating the consequences of interrelationship. Thus, these principles provide a handle on the understanding and solving the archetype problems. These principles may also be used in future as guidelines for learning, unlearning and relearning.

Going forward authors believe archetypes must be revisited and reinterpreted. Knowledge of different domains must be brought in to see archetypes in new light. There should be a series of debate and articles on these archetypes. Complete understanding of archetypes goes beyond the scope and limitations of a paper and an author.

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