The Dynamics of the Eroding Goals Archetype

Bill Braun
Cleveland Clinic
1950 Richmond Road/TR16
Lyndhurst, OH 44124
216.297.8894
braunw1@ccf.org

Abstract

Various attempts have been made to construct dynamic simulation models of the system archetypes. This paper undertakes modeling the Eroding Goals archetype and hypothesizes that achieving classical archetypal behavior over time requires the inclusion of structures that are technically outside the common description/definition of the archetype. Four dimensions of managerial decision-making sensitivity are introduced into the model in order to achieve the expected dynamic behaviors described in the literature.

Key Words: eroding goals, system archetypes, simulation, dynamic

The System Archetypes

The system archetypes have a rich history in systems thinking and in system dynamics. While they have evolved over a long period of time, they are commonly known as the eight archetypes that appeared in The Fifth Discipline (Senge, 1990); Limits to Growth, Shifting the Burden, Success to the Successful, Eroding Goals, Growth and Underinvestment, Escalation, Fixes that Fail, and Tragedy of the Commons. More recently, Wolstenholme (2003) suggested that these eight are more accurately semi-generic archetypes, and proposed a reduced set of four (truly) generic problem and four (truly) generic solution archetypal structures; Underachievement, Out of Control, Relative Achievement, and Relative Control.

Dynamic Archetypes

Various efforts have been made to develop simulation models of the qualitative systems archetypes (Kim 2000, Dowling and MacDonald 1995, Bourguet-Diaz and Perez-Salizar 2003, and Hines[1]). Such efforts have both their advocates and critics. Lane and Smart (1996) offer a cautionary note on inferring that archetypes are useful for discerning deep dynamic structures. References to using the archetypes as conceptual foundations for modeling (Morecroft and Sterman, 1994) are fairly common. Wolstenholme

[1] A proper citation for the simulation models developed in Vensim by Jim Hines is not known.

(2003 and 2004) while finding significant value in archetypes as adjuncts to the modeling process in turn cites Homer (1996) and Forrester (1994) who challenge the ability of the archetypes to dynamically display the behavior attributed to them.

The Dynamic Archetype Challenge

This author reviewed the models that have been constructed by Kim, Dowling and MacDonald, Bourguet-Diaz and Perez-Salizar, and Hines. All are similar in that they produce the most commonly described behavior over time graphical representation of dynamic behavior depicted in the literature (Anderson and Johnson 1997, Kim 1993, Kim 1994, and Kim and Anderson 1998).

The aforementioned models, while producing the most commonly described behavior are not capable of producing all of the behaviors associated with the archetypes. Kim and Anderson (1998) describe a broad array of behaviors that could be expected from the system archetypes under various conditions. None of the aforementioned models could produce all of these behaviors over time without some reformulation of their equations.

This author proposes that dynamic archetypes ought to include a robust set of variables that connect to a larger set of managerial activities and decisions and offer a context in which the principles of the archetype would be applied. That is, the model should include more structure than that which is minimally required to produce an approximation of the commonly represented behavior over time.

Additionally, the following criteria are proposed for constructing dynamic archetypes:

- As constructed, the model runs in equilibrium
- The model responds to events (such as a STEP function)
- The model is sensitive to multiple influences to which a manager may respond, and which may be technically outside the common description of the archetype

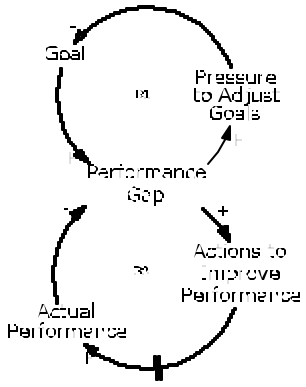
A Dynamic Model for the Eroding Goals Archetype

The Eroding Goals archetype was selected for dynamic modeling. Kim and Anderson (1998) provide a well developed description of the archetype and offer several possible behaviors that could emerge from the archetype, depending on the circumstances of the organization and upon managerial decision making.

The archetype hypothesizes that when faced with a gap between a performance goal and actual performance, there are essentially two possibilities for closing the gap; adjust the goal toward actual performance or inquire into the fundamental reasons the organization is falling short of desired performance. Additionally, it is hypothesized that over time, the organization, in light of its record of failing to meet desired goals, will set goals lower and lower in the belief that these goals will be seen as achievable, and performing to goal will be restored. Finally, it is hypothesized that as the culture of the organization accepts that it rarely reaches its goals, the need to reach them is diminished, reinforcing the

belief that failure to reaching goals has few if any consequences.

The Eroding Goals archetype has an upper loop representing the symptomatic fix and a lower loop representing the fundamental fix.



The range of behaviors over time that emerge from the archetype is in response to upper loop dominance (the symptomatic fix) or lower loop dominance (the fundamental fix). They are:

1. The performance goal seeks actual performance while actual performance remains steady (upper loop dominates, symptomatic fix)
2. Actual performance declines as the performance goal declines (upper loop dominates, symptomatic fix)
3. Actual performance grows to seek the performance goal (lower loop dominates, fundamental fix)
4. Actual performance seeks a growing performance goal (lower loop dominates, fundamental fix)

As the author developed the dynamic Eroding Goals model, it appeared unlikely that all of these behaviors could emerge from a single model without the acknowledgment of four dimensions of managerial decision making:

1. Sensitivity to exogenous demand
2. Sensitivity to the performance goal
3. Sensitivity to actual performance
4. Sensitivity to process improvement

Managers could have high or low sensitivity to these four dimensions of feedback. While it would seem obvious that they ought to be connected and interdependent, Wolstenholme (2003) has argued that organizational boundaries often result in a disjointed awareness to processes, practices, and policies in different/other parts of the organization. As such, a dynamic archetype should incorporate information from various dimensions of the organization (across its boundaries) and explore the archetype's behavior on the basis of the level of sensitivity with which managers treat feedback from each dimension.

In all there are 16 possible scenarios across the four decision-making sensitivities. In practice there are seven scenarios that explore the probable combinations of the four managerial decision-making dimensions:

Sensitivity	**1**	**2**	**3**	**4**	**5**	**6**	**7**
To Exogenous Demand	H	L	L	H	L	L	L
To Performance Goals	H	H	L	H	L	L	H
To Actual Performance	H	H	L	L	H	H	L
To Process Improvement	H	L	L	L	H	L	L

Scenario #1
If sensitivity to Exogenous Demand is high, then high sensitivity to Performance Goals is assumed. Likewise, if sensitivity to Process Improvement is high, then high sensitivity to Actual Performance is assumed.

Scenario #2
Sensitivity to Performance Goals may be high without a corresponding sensitivity to Exogenous Demand, and sensitivity to Actual Performance may be high in the absence of a high sensitivity to Process Improvement.

Scenario #3
In this scenario sensitivity to all four dimensions are low.

Scenario #4
Using the assumptions from scenario #1, sensitivity to both Exogenous Demand and Performance Goals are high; however, the sensitivity to Actual Performance and Process Improvement are low.

Scenario #5
This scenario is the reverse of #4; sensitivity to both Actual Performance and Process Improvement are high, while sensitivity to Exogenous Demand and Performance Goals is low

Scenario #6
Sensitivity to Exogenous Demand and Performance Goals is low, while sensitivity to Actual Performance is high despite low sensitivity to Process Improvement.

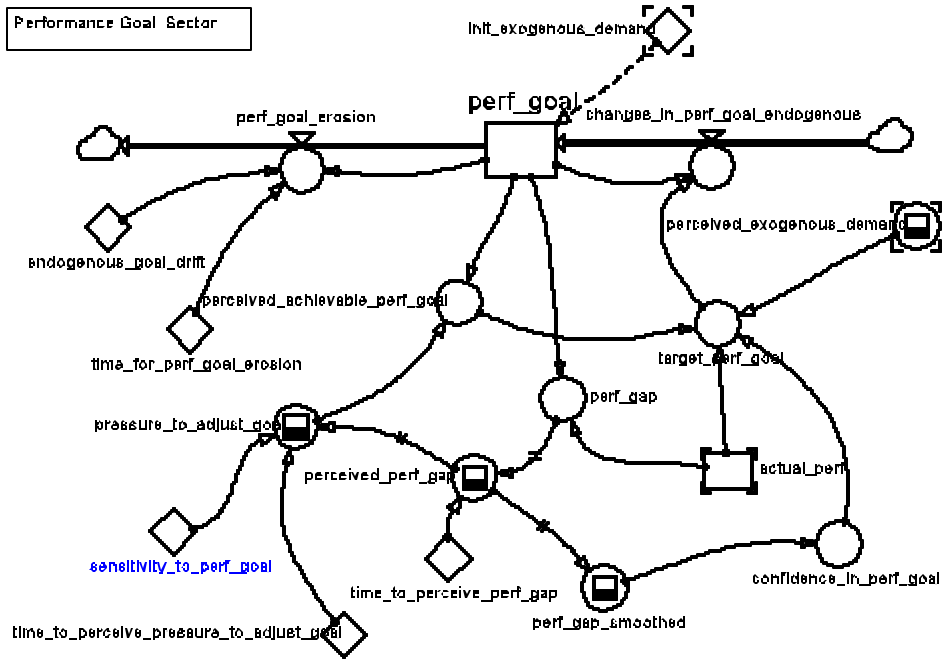
Scenario #7
Sensitivity to Actual Performance and Process Improvement is low, while sensitivity to Performance Goals is high despite low sensitivity to Exogenous Demand.

The Eroding Goals Model

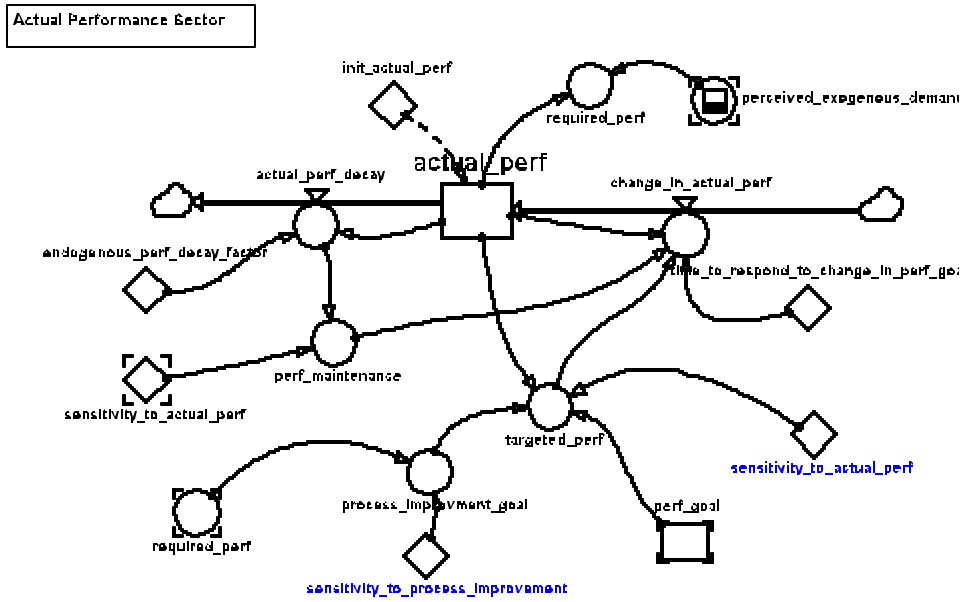
There are three sectors in the model:
- Performance goal sector
- Actual performance sector

- Exogenous demand sector

The performance goal sector is constructed to respond to a decay in the performance goal during a given planning period as well as to respond to the over all decay in setting goals as performance goals are lowered from period to period.

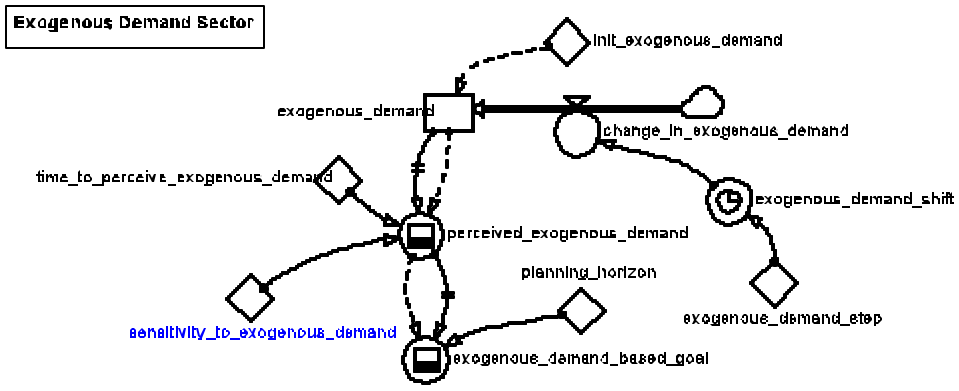


The actual performance sector is constructed to respond to the performance goal, and to initiatives in process improvement.



The exogenous demand sector includes the delays inherent in collecting data and information from the

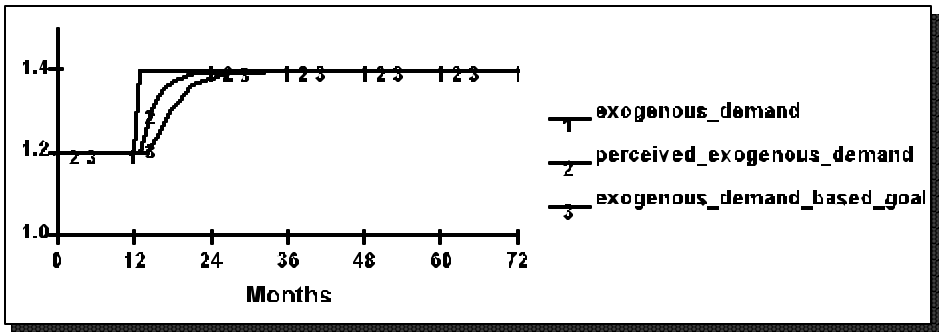
external environment.



These structures comprise the dynamic description of the Eroding Goals archetype.

Dynamic Model Behavior

The dynamic model simulates a six year period; at the beginning of the second year, the exogenous demand increases by 20%. All other dynamic behavior is generated from the beginning of the simulation.



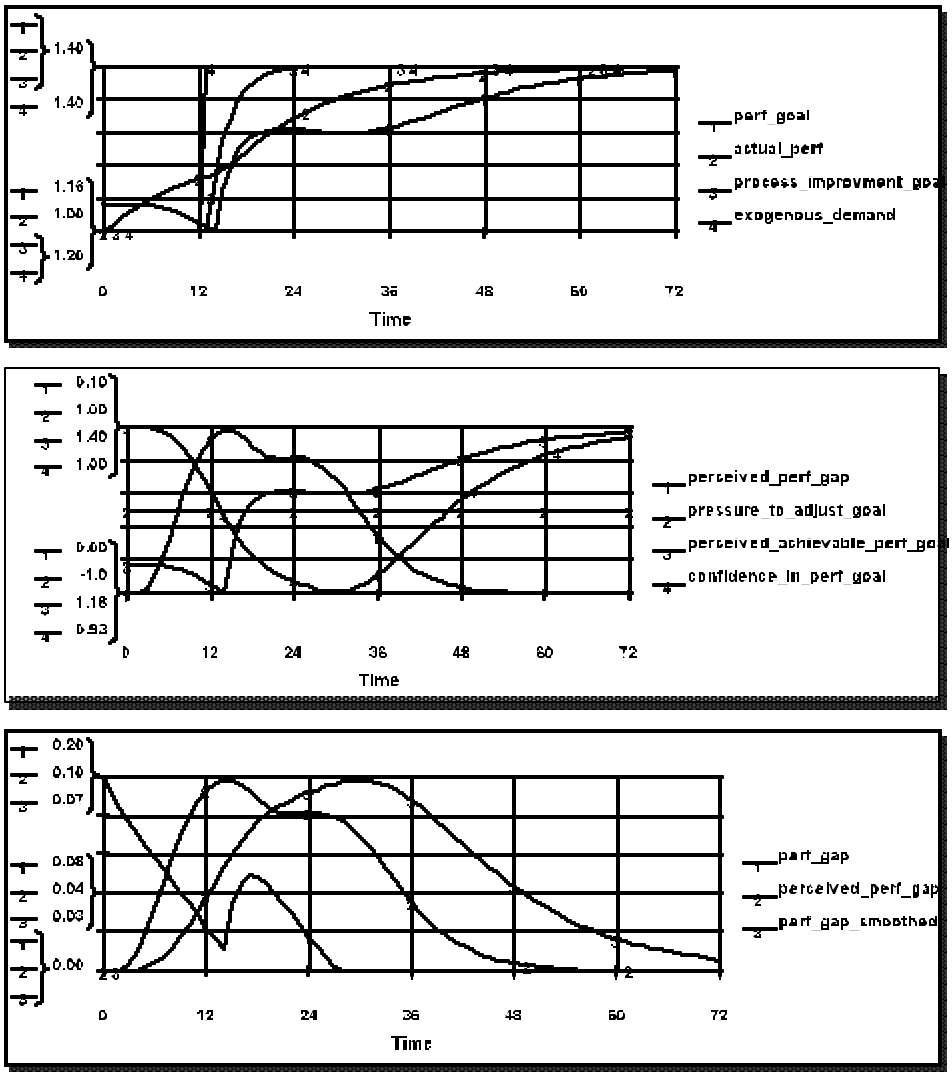
Scenario #1

Sensitivity to exogenous demand . . . . . High
Sensitivity to the performance goal . . . . . High
Sensitivity to actual performance . . . . . High
Sensitivity to process improvement . . . . . High
Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

This scenario characterizes a management team that balances an internal and external focus. Performance Goals are adjusted as a response to Exogenous Demand (and/or external benchmarks).

Actual Performance is monitored as a function of Performance Goals, and Process Improvement is undertaken as needed.

Scenario #1



The performance goal responds to the change in exogenous demand. As the processes improve in response to a rise in the performance goal, actual performance likewise improves.

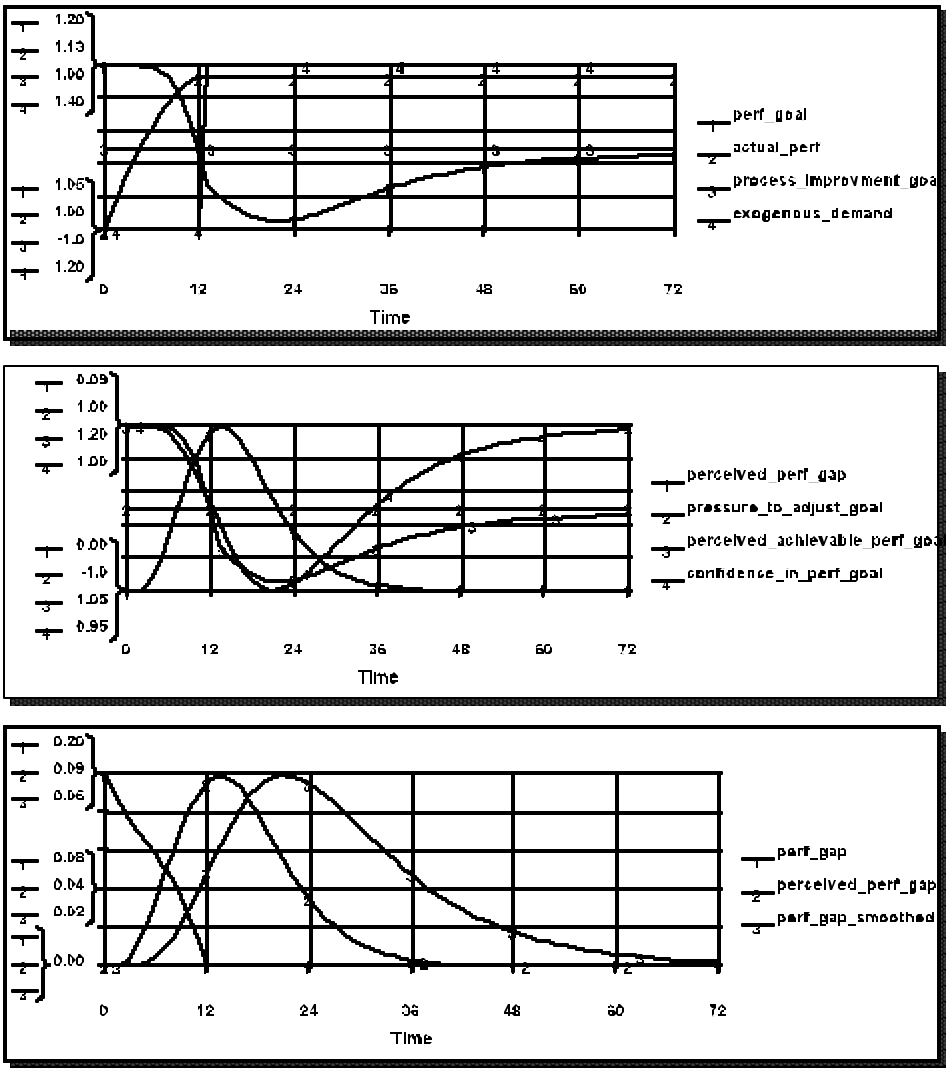
Scenario #2

Sensitivity to exogenous demand . . . . . Low
Sensitivity to the performance goal . . . . . High
Sensitivity to actual performance . . . . . High
Sensitivity to process improvement . . . . . Low
Initial Actual Performance 1.0

Initial Exogenous Demand/Performance Goal 1.2

In this scenario, the management team does not monitor the external environment but it is sensitive to the current performance goal (however it was originally established). Correspondingly, attention is given to current actual performance (i.e., maintains the status quo) without engaging in process improvement.

Scenario #2



Although there is high sensitivity to the performance goal, the model hypothesizes that the gap between exogenous demand and the performance goal erodes confidence that the goal can actually be achieved. In time, confidence rebounds and the performance goal likewise rebounds.

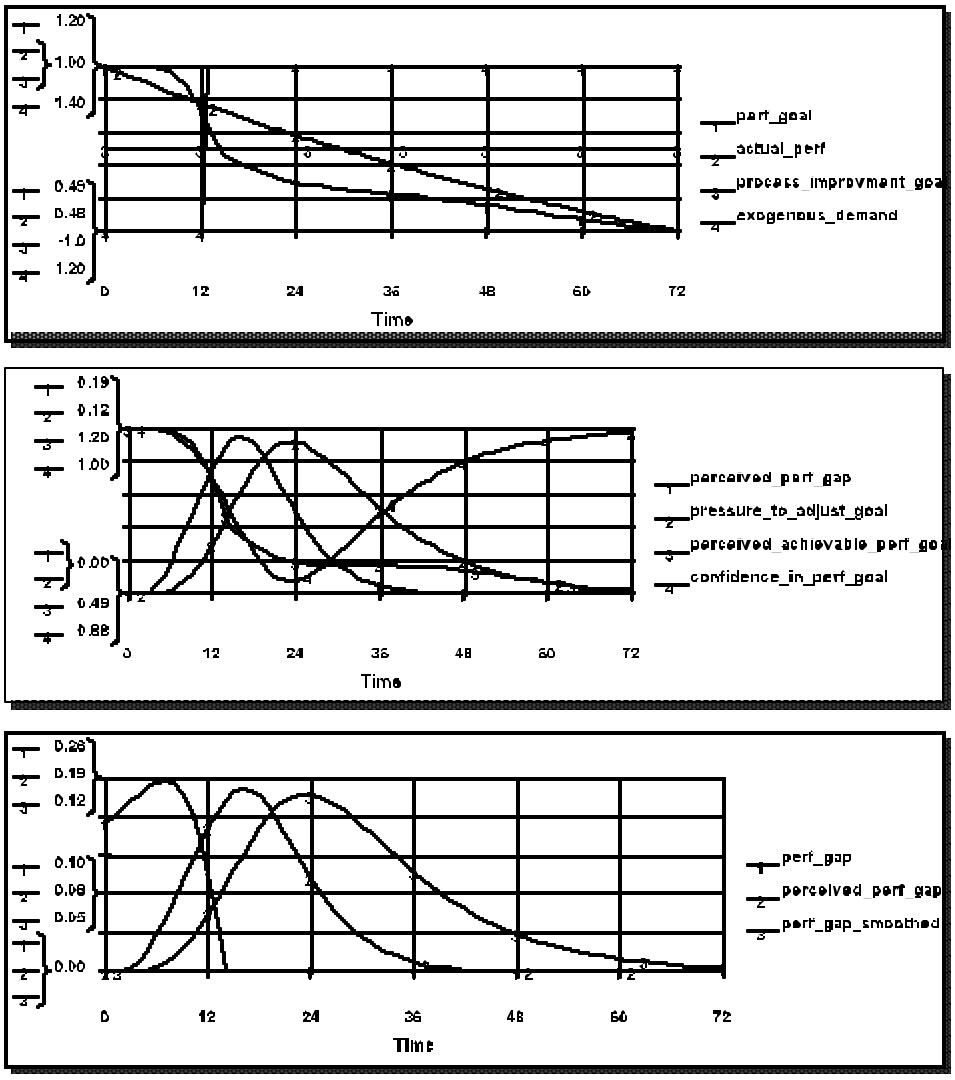
Scenario #3

Sensitivity to exogenous demand . . . . . Low
Sensitivity to the performance goal . . . . . Low
Sensitivity to actual performance . . . . . Low
Sensitivity to process improvement . . . . . Low

Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

In this scenario the management team is fast asleep. Nowhere in the organization is there any activity in response to changing exogenous demand.

Scenario #3



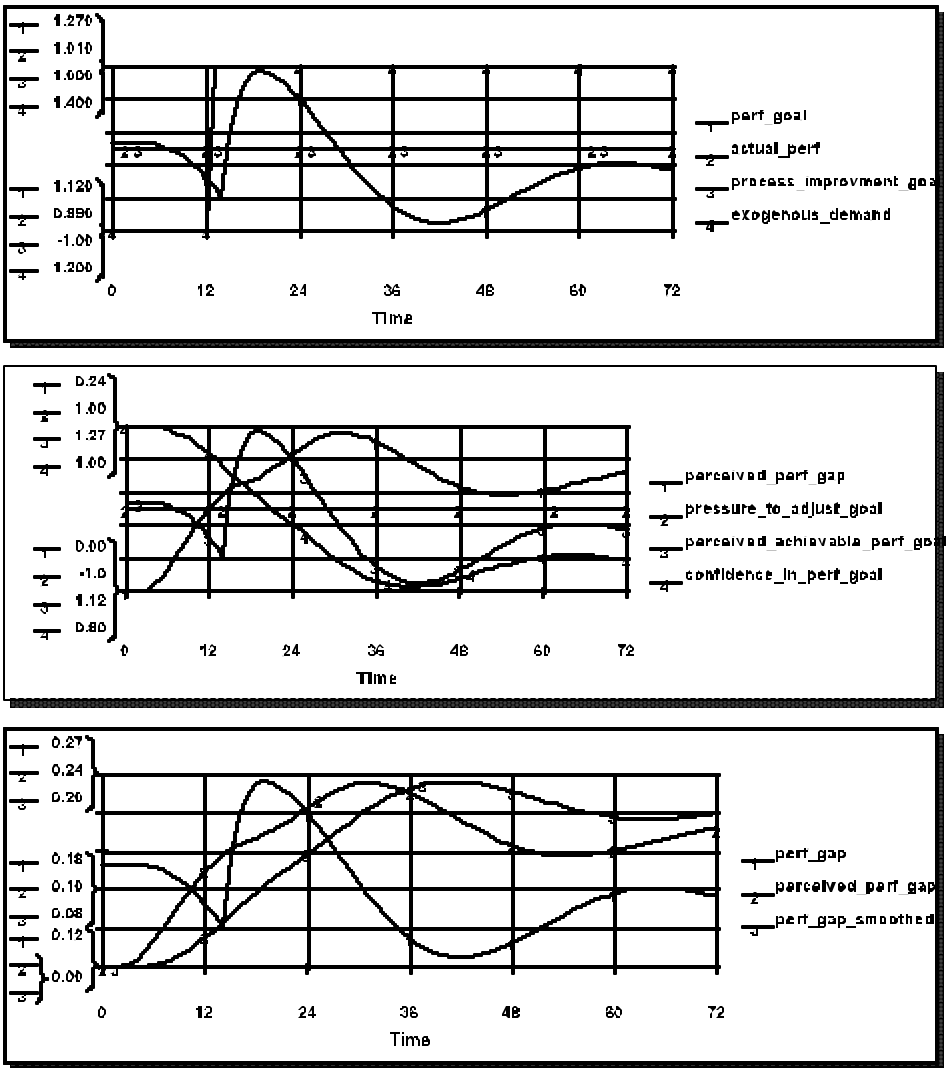
With no sensitivity to any of the decision variables, the performance goal and actual performance drift.

Scenario #4

Sensitivity to exogenous demand . . . . . High
Sensitivity to the performance goal . . . . . High
Sensitivity to process improvement . . . . . Low
Sensitivity to actual performance . . . . . Low
Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

In this scenario sensitivity to the exogenous demand and the performance goal are high, without any corresponding sensitivity to actual performance or to process improvement.

Scenario #4



Although the initial response of the performance goal is to seek out the increase in exogenous demand, it is hypothesized that the lack of sensitivity to actual performance exerts a long-term effect on the performance goal and pulls it down to actual performance.

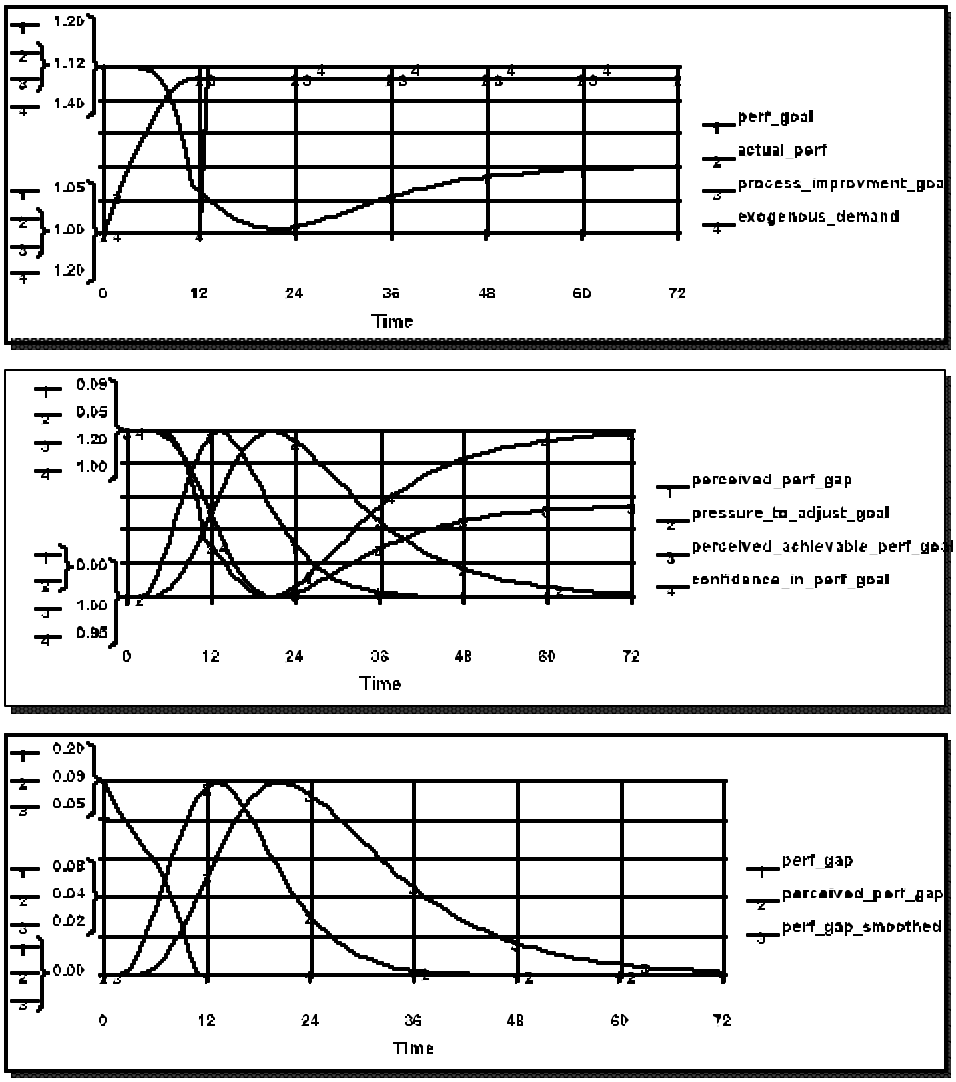
Scenario #5

Sensitivity to exogenous demand . . . . . Low
Sensitivity to the performance goal . . . . . Low
Sensitivity to process improvement . . . . . High

Sensitivity to actual performance . . . . . High
Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

This scenario is the reverse of Scenario #4.

Scenario #5



The performance goals drifts in response to low sensitivity. In response to process improvement, actual performance improves. The performance goal and actual performance eventually converge.

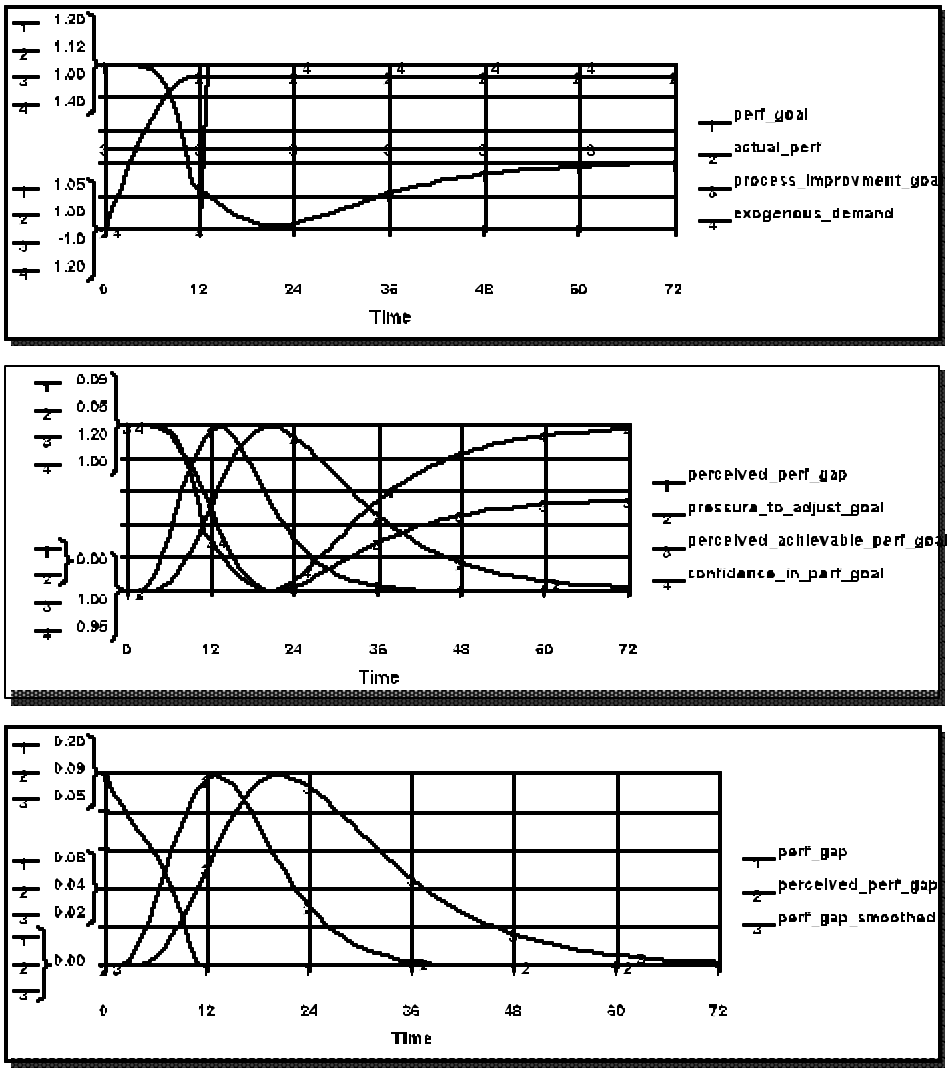
Scenario #6

Sensitivity to exogenous demand . . . . . Low
Sensitivity to the performance goal . . . . . Low
Sensitivity to process improvement . . . . . High
Sensitivity to actual performance . . . . . Low

Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

This is an unlikely scenario in reality, and would represent the actions of a severely disjointed management team.

Scenario #6



The response to this scenario is similar to Scenario #5. The sensitivity to the process improvement fails to exert influence on actual performance.

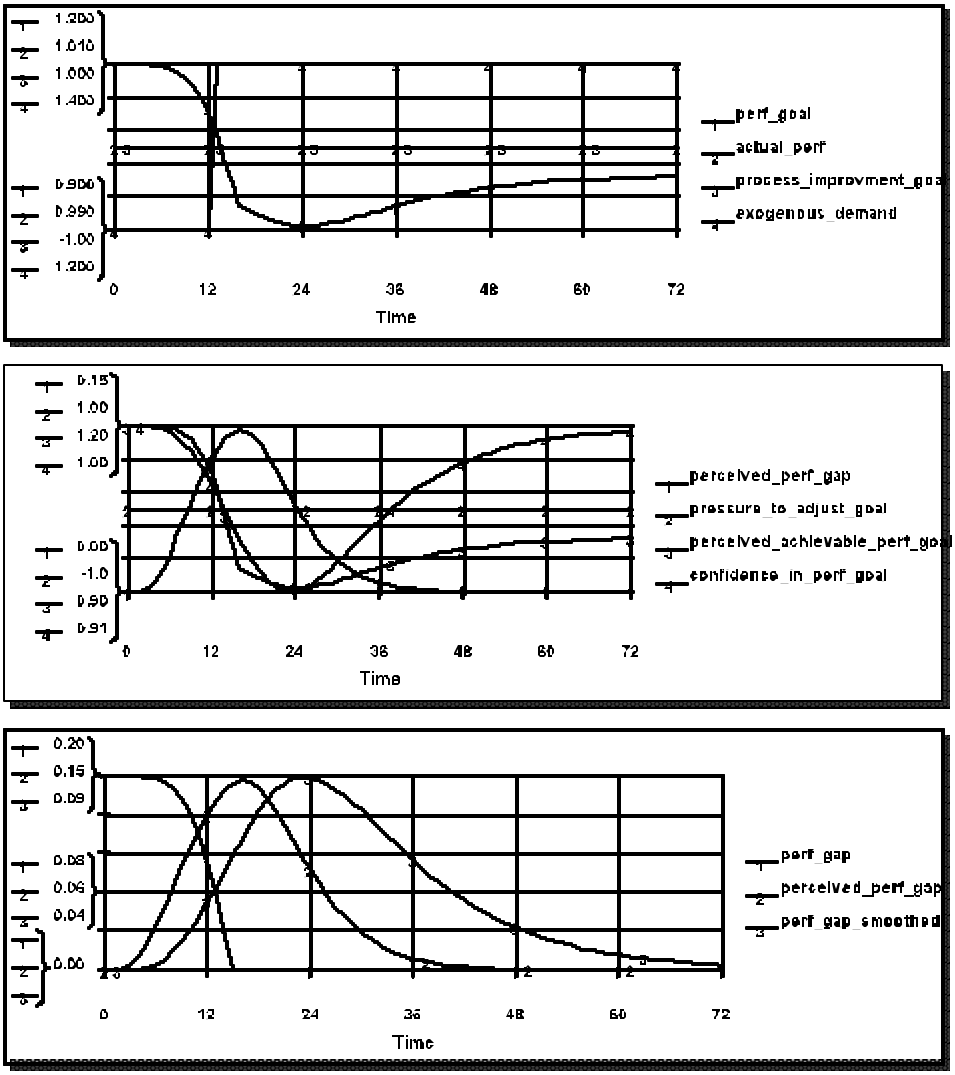
Scenario #7

Sensitivity to exogenous demand . . . . . Low
Sensitivity to the performance goal . . . . . High
Sensitivity to process improvement . . . . . Low

Sensitivity to actual performance . . . . . Low
Initial Actual Performance 1.0
Initial Exogenous Demand/Performance Goal 1.2

In this final scenario, sensitivity to the performance goal is unmatched by sensitivity to exogenous demand, process improvement, or actual performance.

Scenario #7



Similar to scenario #2, despite the sensitivity to the performance goal, the erosion of confidence has a debilitating effect on the performance goal prior to rebounding.

Open Questions, Future Work

This model was tested under a limited set of conditions. The author suspects that while it behaved as expected under the test conditions, a more rigorous testing would reveal that some of the equations

require adjustment. Specifically, the influence of an erosion of confidence as goals are missed ought to be closely examined. Additionally, the model ought to be rigorously tested for behavior when there is long-term erosion of both Actual Performance and Performance Goals in scenarios where the sensitivity to both of those managerial decision variables is low.

Conclusion

Inclusive of the Open Questions and Future Work, the behavior of this dynamic model approximates the behavior described in the qualitative literature on the Eroding Goals archetype. The model reaches beyond the basic behavior achieved in earlier attempts to model the archetype. The model suggests that the archetypes cannot be applied without tacit acknowledgment of a "meta system" of policy and decision-making and the existence of organization boundaries described by Wolstenholme (2003).

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