# The Great Ashby

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**Abstract**

For practitioner/scholars Action Research (AR) involves multiple reflective cycles. Each cycle has three steps that are iterative, recursive and cumulative. One step involves the definition and explanation of theories broadly dominated by inductive inference. A second step involves a broad emphasis on deductive inference whereby theories are arranged into coherent action principles. A third step involves hypotheses developed broadly through abductive inference and contextual action. An emergent AR intervention is described which relies heavily on cybernetics, Beer's Viable Systems Diagnosis and Ashby's Law of Requisite Variety. The paper makes two conclusions. The first is that Ashby's Law is an 'inbuilt' and undeniable feedback mechanism in AR. The second is that by exerting itself irrespective of the theories and AR practices involved Ashby is at the heart of AR. Through interplay of induction and deduction Ashby's Law is a root cause of abduction in AR.

**Keywords**: Action Research, Stafford Beer - Viable Systems Diagnosis, Ross Ashby - Law of Requisite Variety

## Introduction

This paper takes the view that for practitioner/scholars, managers who employ problem solving methods while working and learning within their workplace at the same time (Stephens 2007), Action Research (AR) involves multiple reflective learning perspectives that move toward the creation of 'a distinctive way of thinking rather than a specific concrete subject' (Bateson 2000/1964). In that regard, reflective thinking often involves phases such as planning, doing, checking and acting. Deming (1982), Dewey (1943), and Senge (1990) cite not dissimilar models and others including Kolb (1984), Revans (1982), Weinstein (1995) and Flood (1999) consider knowledge creation via various action-learning perspectives.

But in looking for distinctive ways of thinking we believe that early on in 'messy' situations (Ackoff 1978; Mitroff and Linstone 1993) practitioner/scholars are provided with enabling conditions for AR interventions, initially through the raising of anxiety levels. Here, despite having no critical or immediate impact, unsettling patterns of events arouse concerns. In this context, novice practitioner/scholars are often attracted to various problem solving methods (Flood and Jackson 1995). For example, Haslett, Stephens et al.(2002) have found that Checkland's (1985) FMA action-research template underpins a simple and popular method for use in AR interventions. However while the early engagement of various problem solving methods may infer building requisite (necessary) variety into AR processes, our experience is that at this time, specific awareness of Ashby's (1956: 207) Law of Requisite Variety (LRV) 'only variety can destroy variety' is highly improbable. We expand on Ashby's LRV later but here it is sufficient to say that the LRV exerts itself *regardless* of the methods and operational templates introduced into AR interventions (Beer 1979).

Here we are going to consider the employment of Checkland's template in a specific AR intervention to illustrate our argument that distinctive ways of thinking may emerge from messy situations, because of Ashby's Law. Checkland's (1985) FMA action-research template underpins one problem solving method that is strongly supported by many of our practitioner/scholar colleagues (Haslett 2005). While other methods have similar interrelated and iterative parts Checkland's template involves a framework of ideas 'F', a methodology 'M' and an area of application 'A'. Thereby a chosen 'M' has the potential to promote change in each and all of 'F', 'M' and 'A', with a primary objective to ameliorate 'A'. In this light, we concur with Checkland and Howell's (1998a) view that AR needs to be conducted in such a way that the whole AR process is

subsequently recoverable by anyone interested in critically scrutinising the research. In regards messy situations, we believe that at the start, distinctive ways of thinking proceed with a relative *tabula rasa* background of the chosen method, reflective learning perspectives and theories of management. And while Checkland (2000: S42) says AR requires 'declaring explicitly, at the start of the research the intellectual frameworks and the process of using them which will be used to define what counts as knowledge' it is our view that for initial AR cycles 'finding a way forward' generates knowledge during the processes that determine the parts (in this case, 'F', 'M' and 'A'). In the case at hand, that led to cybernetics, Beer's Viable Systems Diagnosis and Ashby's Law of Requisite Variety. The paper goes on to discuss the way in which three methods of inference (induction, deduction and abduction) may be tied back to a chosen problem solving method, the development of knowledge and the need to make AR processes recoverable.

**Finding a way forward**

Our experience (Stephens and Haslett 2002 a; 2005 a; 2005 b) is that finding a way forward in AR interventions involves inductive, deductive and abductive inferences that (a) occur before and during the process of determining 'F', 'M' and 'A', and (b) are associated with definite stages within the process.

We define Inductive Inference *(II)* as; Statement [X] is true because it has observable supporting data. Statement [Y] must be true because it results from [X]. Hence it can be concluded that [X] causes [Y]. For example, in a particular messy situation (Stephens 2007), the observable data supported the inductive contention 'the company follows cyclical boom and bust financial periods' - is a true statement [X]. 'The company's finances are about to turn' - [Y] must then be true because this statement results from [X]. Conclusion or theory; bust will follow the current boom causing financial disaster. Actually, the pending financial disaster was aligned with theory about changing environmental factors. So for the purposes of this discussion, we take the broad view that inductive inference may be aligned with theory and the formation of hypotheses via the determination and explanation of observable data involving messy situation. In other words, very broadly, we start with some observations and we end up with a theory (about the mess). This provides the basis for deciding on 'M' (methodology) and the specific 'A' (Area for action) for a first AR cycle.

Progression of this messy situation will next involve Deductive Inference *(DI)*. Deductive inference is acknowledged as a popular and rigorous form of argument and

we define deduction as; [X] is true because its theory is well established. If [X] is true, [Y] is true. Therefore [Y] must be true. For example, based on the mathematical theory of sine curves 'bust follows boom' [X] pattern and given current boom-times, then bust will follow. This argument may be followed by 'that depends on what we do' and the consideration of action principles that may prevent the bust. So again for the purposes of this discussion, we take the broad view that deductive inference derived from the earlier inductive phase, may refocus that set of ideas or principles into a new set of action principles about the 'mess'. In other words, very broadly we start with theory and from it we synthesise a set of action principles (about the mess).

Finally, abductive inference *(AI)* is what Churchman describes as Singer's process of 'sweeping in' (Barton and Haslett 2007: 151). The 'sweeping in' process develops multiple perspectives of the 'mess' and attempts their synthesis. While Barton and Haslett suggest abduction is the least rigorous form of inference, they also say it is the only form of inference that can generate new knowledge. We define abduction as: [Y] an outcome is true. Our understanding is that [X] causes [Y]; hence we assume [X] is true. In our example, the boom is a current outcome [Y]. Our understanding is that 'cyclical boom and bust' has been demonstrated. We therefore assume that without contextual action, pending 'bust' - is true. But we have taken contextual action based on the successive development of inductive and deductive inferences. Thus as a final component of this process, we take the broad view that abductive inference implies the formation of hypotheses that promote contextual action. This hypothesis is tested in the next cycle of action where information on the success (or otherwise) of the hypothesis is collected. In other words, we broadly look at multiple perspectives of dealing with the 'mess' (theory and action principles) and we set about doing things to 'right the mess' (contextual action). This is where the 'sweeping in' process of abductive inference allows for the results of contextual actions to deal with the boom bust cycle to be integrated into the boom bust hypothesis. It is at this point in the AR process where the 'F' (Frameworks) of the FMA are revised, that the potential for the development of recoverable hypotheses exists.

Our hypothesis is that the processes of inductive, deductive and abductive inferences are central to the conduct of AR and the development of recoverable knowledge. We are indicating that from our experience, finding a way forward involves these types of inferences and that the subsequent consideration of theory, a coherent set of action principles and contextual action are integral to the determination of 'F', 'M' and 'A'. To illustrate this point we cite some salient points from our AR intervention cycles.

**Cycle One**

With the value of hindsight, this first AR intervention might now be described as crude and elementary. In that regard we do however briefly highlight the sort of messy situation we are talking about, the preparatory nature of this first cycle, the likelihood of 'failure' and the need to get smarter when working in AR. From this overall AR intervention, we now believe that getting smarter in managing the variety exposed in AR projects means designing attenuators and amplifications (Beer 1985) in terms of inductive, deductive and abductive inferences.

[Table One about here]

In that light, one of the long-term objectives of the project was to change the ways in which new board members were elected. The principle had been for many years 'once you are in you are in forever'. There was a perceived need to begin electing people to the board based on the skills they brought rather than their longevity.

The results of this first AR intervention were not immediately encouraging. The initial inductive inference, 'people can be taught to do things better' had been incomplete at best and deeply flawed at worst. The data from this first cycle was that there had been little behavioural change and little or no progress towards some key organisational goals. During the reflective process, it was decided that 'nothing never happens' and that this cycle needed to be viewed as creating the prepared mind. One critical piece of data was that there appeared to be little inclination within the organisation to change decision-making processes and strategies. A different approach was needed. It was decided that instead of adopting a 'this is where we want you to be with your decision-making' approach, a 'let's take you from where you are with your decision making' approach would be used. This approach also involved treating the participants' current decision-making processes as strengths to be built on, rather than changed.

**Cycle Two**

In briefly considering cycle two from an AR learning perspective we highlight (a) the development of theory and (b) the introduction of action principles and their consequences for contextual action - in simple or Ashbean terms, we got smarter. We were now able to deduce that some approaches (Checkland's 'M') had not worked. We also deduced that the 'A' (area of action) needed to be changed from a directive approach to a self-development approach.

[Table Two about here]

The second cycle was far more successful in terms of outcomes in the form of election results but also in the form of the Boards participation in the process and an increased willingness to participate in change.

In the light of cycles one and two, three very important markers had emerged to signify the broadening of our thinking. We recognised that a new learning framework had evolved. The framework revealed; our somewhat idiosyncratic continuous reading/reflective approach to AR, the need for greater attention to inductive, deductive and abductive inferences and the consequential impact of theory, a coherent set of action principles and contextual action as integral parts of our thinking. That smarter approach now encompassed an ardent cognitive focus, the employment of a designated template to focus the direction of the AR intervention and a realization that AR was indeed a difficult task. Nonetheless a fundamental view on the nature of AR *(Diagram Three)*, 'a distinctive way of thinking rather than a specific concrete subject' had emerged.

[Figure One about here]

Our view on the nature of AR is that cycles of AR each have three iterative, recursive and cumulative steps. We have labelled them as steps one, two and three but believe that their relative influence is incommensurable. Here step one involves the definition and explanation of research theory broadly dominated by analysis and inductive inference. A second step involves a broad emphasis on synthesis and deductive inference whereby the theory is arranged into coherent action principles. A third step then involves hypotheses developed broadly through abductive inference and contextual action. Hence this cumulative synthesis of 'what is true' may push the practitioner/scholar towards the construction of a primary 'thesis' whereby further development via experimentation and/or contextual action may further progress the distinctive way of thinking.

**Cycle Three**

[Table Three about here]

Reflection via inductive, deductive and adductive inference during cycle two had led to our awareness that we needed to become smarter in managing the variety exposed in the AR intervention. This meant strengthening the Frameworks within the FMA template.

There had been a strong emphasis on the development of 'M' and 'A' in cycles one and two but the theoretical frameworks needed to be further developed for continuing progress to be made in the improvement of the AR process. The work in cycles one and two had been based implicitly on the theory of building requisite (necessary) variety into the decision processes of the Board without us having a detailed understanding of Ashby's (1956) views on cybernetics and specifically his Law of Requisite Variety (LRV). The fundamental hypothesis was 'that the success of theory-based management methods is reliant on their application within emergent action-learning frameworks'. The emphasis thus now needed to be on 'raising the bar' in relation to managing the variety exposed in the AR intervention via the development of knowledge about appropriate theory bases. This would again occur through designing attenuators and amplifications in terms of inductive, deductive and abductive inference. Fundamentally this involved Ashby's Law of Requisite Variety (LRV).

Ashby's (1956: 207) LRV states that 'only variety can destroy variety'. The importance of requisite variety as a learning principle should not be trivially understated as the LRV exerts itself *regardless* of the operational formats that may be followed. Further, Beer (1979: 89 our emphasis) profoundly states that [Ashby's Law] stands in 'the same relation to management as the law of gravity stands to Newtonian physics'. As such we believe it is absolutely central to a coherent account of complexity control in AR interventions and for that matter, organisations.

This principle was now made explicit in a theory of the development of organisational capability that would be progressed as part of the ongoing AR project. Hence to this point, in finding a way forward we had created a distinctive way of thinking rather than a specific concrete subject in our AR. Our distinctive thinking involved the identification of messy situations, engagement of problem solving methods, identification of inductive, deductive and abductive inference to manage the variety exposed and fundamentally, the importance of Ashby's inbuilt and undeniable feedback mechanism to AR.

**The Development of a Requisite Variety Model of Management**

To finish up, we now briefly describe how this distinctive way of thinking led to the development of a requisite variety model of management which is based on Stafford Beer's (1972, 1979, 1985) original drawings. Thus the paper ties the three methods of inference (induction, deduction and abduction) back to the

chosen problem solving method (Checkland's FMA), the subsequent development of knowledge and the need to make AR processes recoverable.

[Figure Two about here]

As managers move from a relatively closed system view of the relationship between Management and the organisation to an open systems view (Emery and Trist 1965; Emery 2000), the question that will arise is 'How do I, as a manager, interact with the organisation?' and then 'How does the organisation interact with me?' This is recognition of the need to 'absorb the (lack of) variety' (Beer 1974: 30 our emphasis) of managers, by improving their skills and capabilities in both domains and also by recognising that management is a symbiotic relationship. In learning about open systems, the relationship between the Manger and the organisation expands to recognise that the relationship with the 'external' environment needs to be included in the model.

[Figure Three about here]

The newer model therefore assumes that the interrelationships between the three elements of the model operate in an open system, in theory, if not in practice.

[Figure Four about here]

That only variety can destroy variety or 'you need to become smarter than the system you are managing' (Barton 2002) is shown in the inter-relations of the system. Both the manager and the organisation need the variety to manage each other. Both manager and organisation need the variety to manage the 'external' environment.

The final diagram shows the specific development of this model for Greyhound Racing Victoria. It includes our concept of a 'Variety Dial' (Stephens and Haslett 2003; 2005 a) which is turned up or down to attenuate or amplify the signals between the elements in the model.

[Figure Five about here]

**Conclusion**

This paper is the first stage of a discussion of the manner in which inferential reasoning has formed the basis for the development of a major AR project. It also begins the discussion of the development of the application of Ashby's (1956) LRV in project. We make two conclusions here. The first is that Ashby's LRV is the 'inbuilt' and

undeniable feedback mechanism that is pivotal to all AR cycles. The second is that by exerting itself, irrespective of the theories or the AR practices involved, Ashby is at the heart of cyclical learning schemes. Because it causes the interplay of induction and deduction, Ashby's Law is a root cause of abduction in AR. A subsequent paper will demonstrate the application of the organisational structures that follow as a consequence of this and demonstrate how it is applied to the strategic planning process. As such the Great Ashby 'stands in the same relation to management as the law of gravity stands to Newtonian physics' (Beer 1979: 89).

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Table One

Features from the cycle one intervention

| **Framework of Ideas (F)** | **Methodology (M)** | **Area of Application (A)** |
|---|---|---|
| **THEORY**: Cause and effect thinking:<br><br>If I do this (present the data) then that (positive action) will follow | Action Research using Checkland's template:<br><br>Determination of F, M and A | Business stagnation in respect to responding to concerning 'boom and bust' data |
| **ACTION PRINCIPLES**: Presentation of:<br><br>Computer simulation<br>Discussion papers<br>Internal search<br>External search<br>Left-field search<br>Proposal for election | **CONTEXTUAL ACTION**: Reflective analysis of:<br><br>Rationality and decision making of Board and CEO | **RESULT**: abject failure<br><br>Progression to cycle two |

Table Two

Features from the cycle two intervention

| **Framework of Ideas (F)** | **Methodology (M)** | **Area of Application (A)** |
|---|---|---|
| **THEORY**: Systems Thinking, Motivation, Models of Learning , SSM, Learning Styles | Action Research | Business stagnation in respect to 'getting smarter' |
| **ACTION PRINCIPLES**: Presentation of:<br><br>Theory-based Diagnostic methodologies<br>Consideration of Journal documents<br>Proposal for election | **CONTEXTUAL ACTION**: Reflective analysis of:<br><br>The role of the Action Researcher<br>Individual and Group cognition, defence mechanisms, single and double loop learning | **RESULT**:<br><br>Success at the election<br><br>A distinctive way of thinking<br><br>Theory based methods 'help'<br><br>Action principles 'help'<br><br>Reflection is important<br><br>A template is handy<br><br>This is tough stuff<br><br>Getting smarter is important |

Figure One

Our view on the nature of Action Research

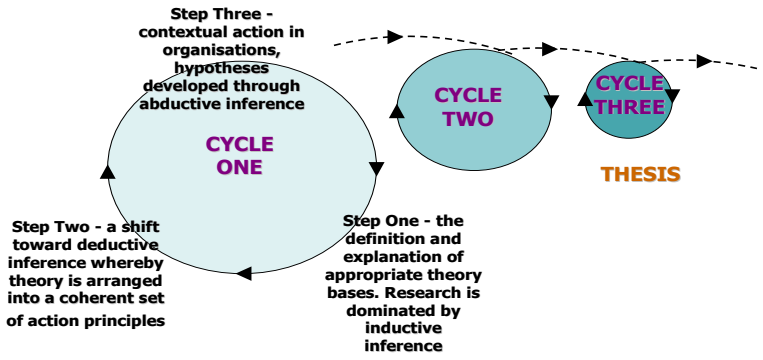


Table Three

Features from the cycle three intervention

| **Issue** | **Inductive Inference Define and explain theory about** | **Deductive Inference Arrange the theory into a coherent set of action principles involving** |
|---|---|---|
| Juggling the best you can | Management | Management science<br>Cybernetic Theory (VSD) |
| Keeping operations under control | Homeostasis or organisational equilibrium | General Systems Theory |
| 'Internal' environments have to cope with unpredictable 'external' environments | Environmental complexity (variety) - Open and closed org. systems | Open Systems Theory<br>Socio – Technical Theory |
| Sub-systems need to be able to talk to each with common understanding | Recursion | Set Theory |
| How a manager might become smart enough to 'turn up' or 'turn down' operational variety | Variety dial | Ashby's - Requisite Variety<br>Conant- Ashby - Residual Variety |

Figure Two

Managers aim to Manage (M) some sort of Operation (O)

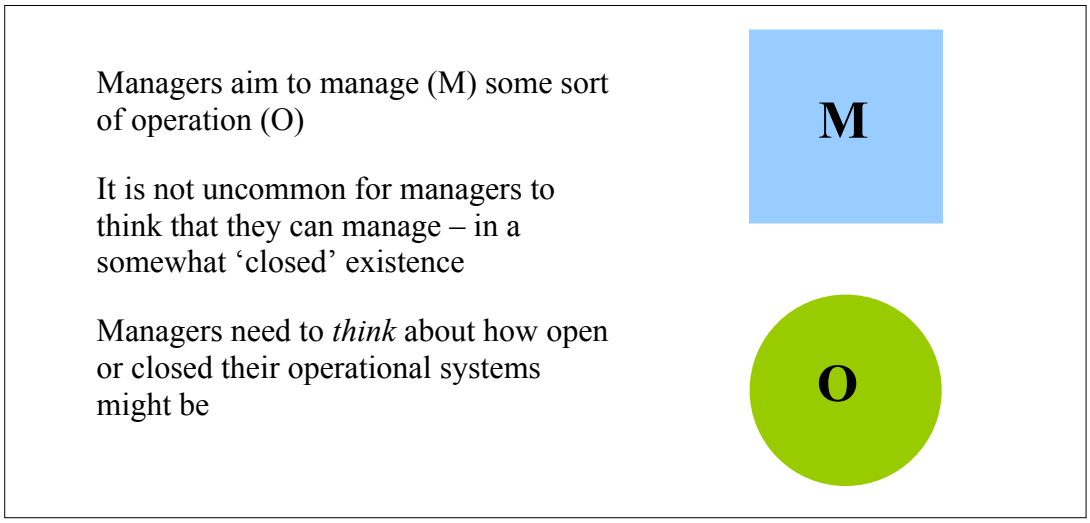


Figure Three

Tension, confusion and environmental disturbances

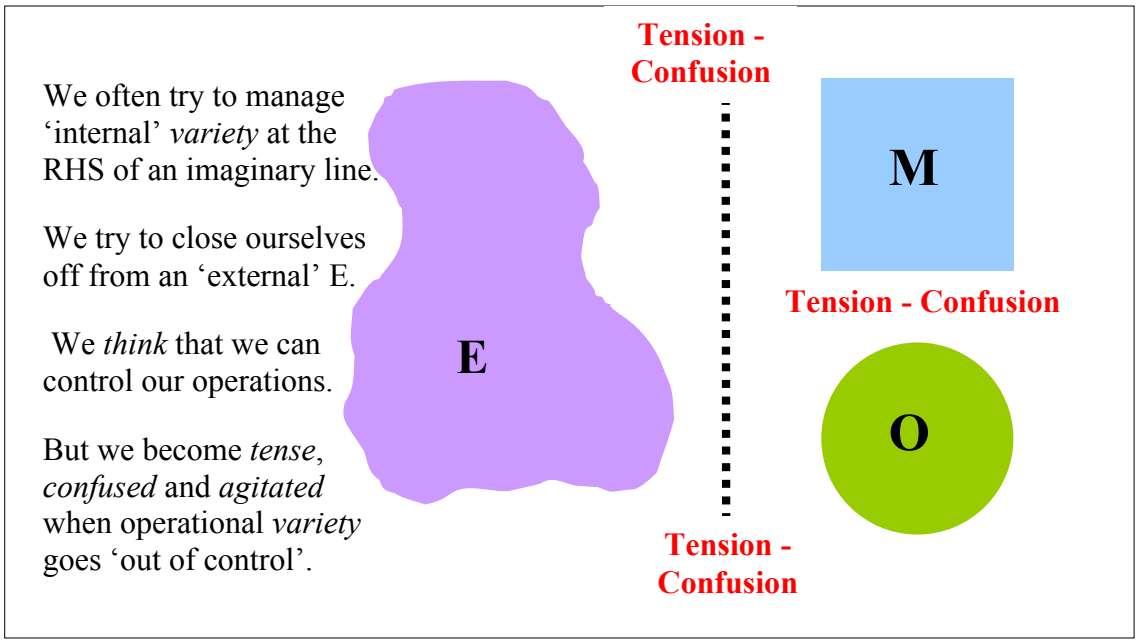
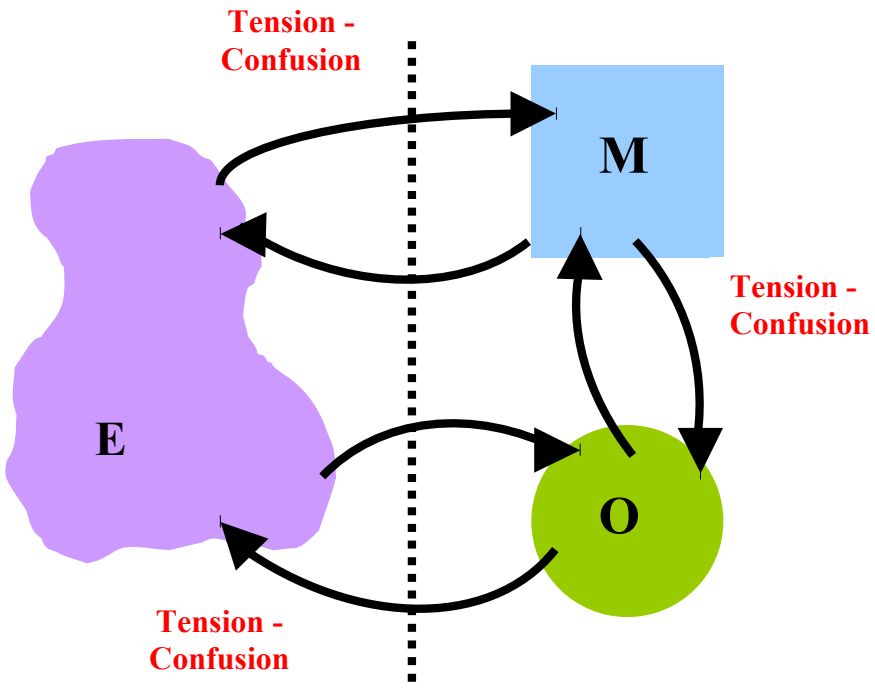


Figure Four

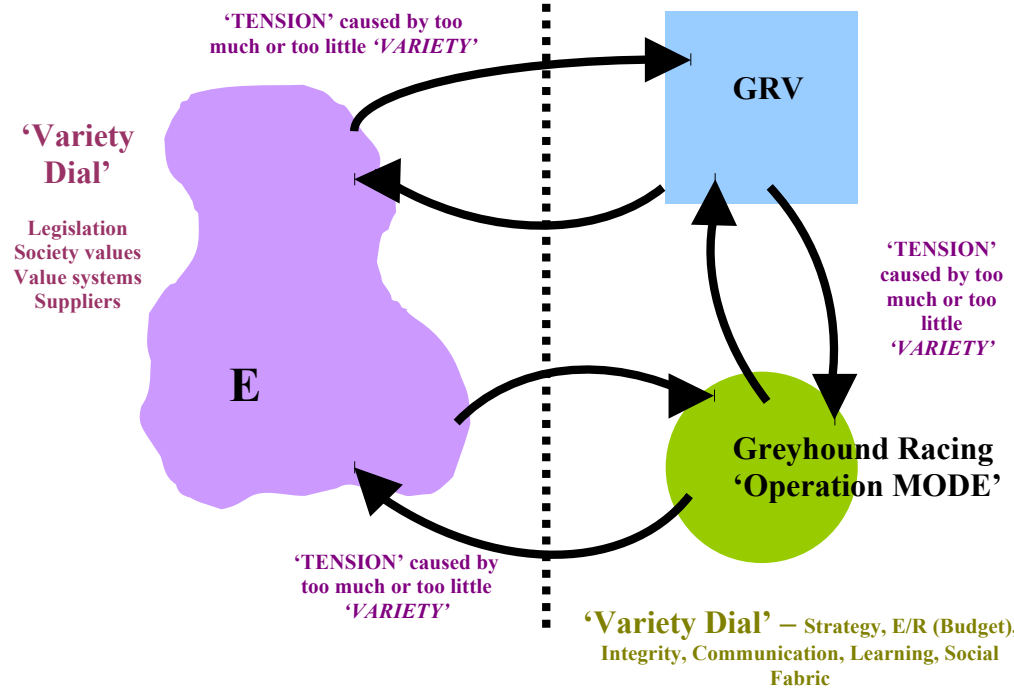
The interconnectiveness of tension, confusion and environmental disturbances




A question becomes - how might a manager might become smart enough to 'turn up' or 'turn down' tension and confusion emanating from operational variety?

Figure Five

A Cybernetic model for homeostatic management




We impose conditions from *strategic planning* and *budget* to take *variety* out of our operations. The environment provides us with intelligence that influences our behaviours