

# Bottom-Up Makes Top-Down (May 2026)

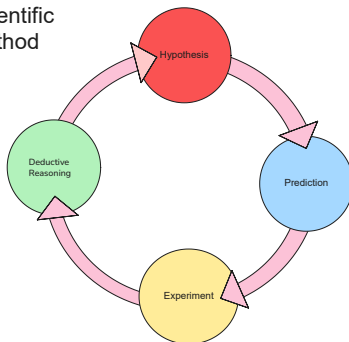
## Why Bottom-Up?

### 1. Introduction: The Problem of Organisational Design in a Complex World

Across contemporary political, economic, and social landscapes, we see institutions struggling to cope with the complexity of the environments in which they operate. Political systems fail to address entrenched social issues; public services buckle under the weight of competing demands; businesses oscillate between over-centralised control and chaotic decentralisation. These failures are not simply the result of poor leadership or inadequate resources. They reflect a deeper problem: **our dominant models of organisational design are mismatched to the complexity of the world they attempt to govern** (Davies 2024).

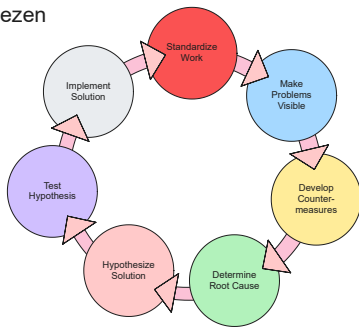
For more than a century, organisational design has been dominated by **top-down, model-driven approaches**. These approaches assume that leaders can conceptualise the organisation as a whole, define its desired end state, and then impose a structure that will reliably produce that outcome. This logic is deeply embedded in Western managerial culture, drawing on the hypothetico-deductive reasoning that underpins the scientific method (Popper, 1959). *The scientific method* involves making a *hypothesis* that *predicts* an outcome, conducting an *experiment*, and then learning about the *hypothesis* through the experiment's results. Its origins lie at the birth of science, in the work of Roger Bacon (1267), Galileo(1623), Descartes (1637), Francis Bacon (1620) and Comte, and it still dominates much of our thinking. It is a reasoning that now comes naturally to people and appears as a '*common sense approach*' due to the strength of the culture that has developed around it.

Scientific Method

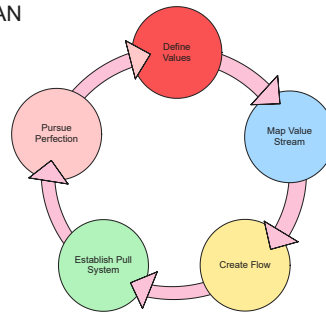


It is a worldview that privileges abstraction over experience, prediction over adaptation, and control over emergence and its influence is still felt today in most managerial solutions.

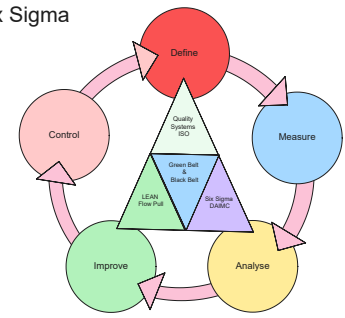
Kiezen



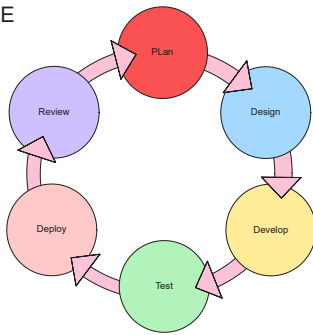
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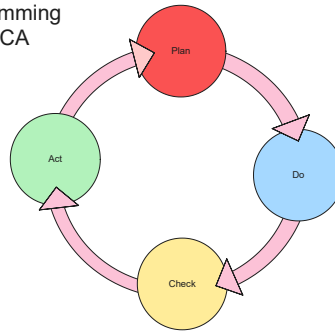
Six Sigma



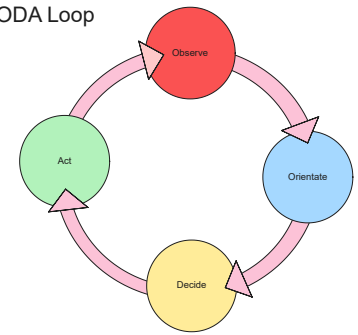
AGILE



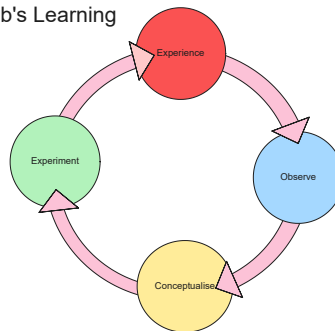
Demming PDCA



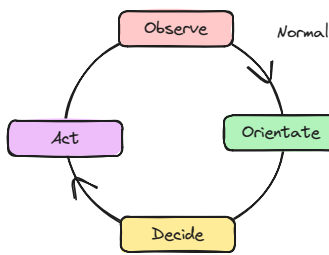
OODA Loop



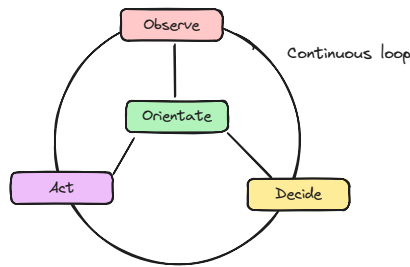
Kolb's Learning



Yet, as Stafford Beer famously observed, "the purpose of a system is what it does" POSIWID (Beer, 1979). What an organisation *does* is not determined by the elegance of its conceptual model but by the interactions, behaviours, and sense-making of the people who constitute it. The lived reality of organisational life is messy, dynamic, and emergent. It is shaped by local knowledge, informal networks, tacit understanding, and the continuous interplay between individuals and their environment. These are precisely the elements that top-down design struggles to capture. The Scientific Model and each of the methodologies in the diagram above are poor models of real systems, the rigid circular relationships between the components do not show the full range of relationships that are available. Take for instance the OODA loop which can be re-configured in the following formats (Venkatesh Rao 2024) ; and compare the above models to the connections in the Viable Systems Model (bottom of drawing).

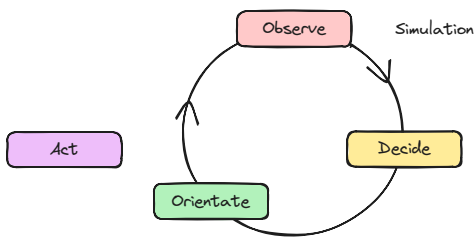


Normal



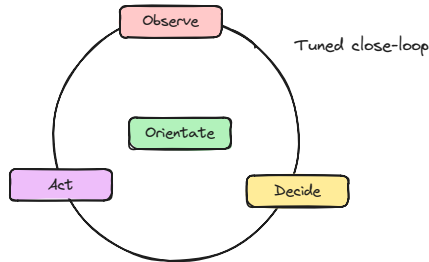
Continuous loop

Monitor and continuous closed-loop orientation



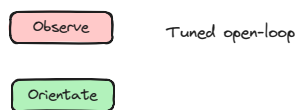
Simulation

Action consequences deduced from orientation



Tuned close-loop

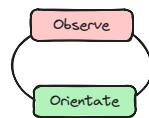
Groove or rut - re-orientation taken off-line  
higher risk - lower cost



Tuned open-loop



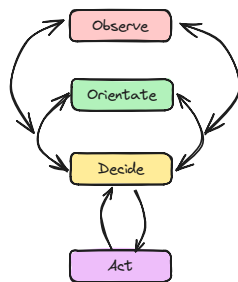
Automation with observation taken off-line  
higher risk lower cost



Situation tracking



Trying to keep up as a spectator  
(risk of falling behind due to unfocused learning)



Viable System  
situation tracker &  
Autonomy &  
Observation &  
Continuous closed loop

A viable system consists of multiple open-loops  
'Observe' balances the activities of 'orientate' and 'decide'  
to maintain system identity and 'act' therefore is always  
maintaining system viability

In contrast, **bottom-up approaches** begin not with a conceptual model but with action. They recognise that understanding emerges through doing, that structure grows out of interaction, and that shared values and beliefs develop through participation rather than prescription. Bottom-up approaches are inherently enactivist: they assume that cognition is not a detached process of representation but an embodied, situated activity that arises through engagement with the world (Varela, Thompson & Rosch, 1991). They are also aligned with grounded theory, which holds that concepts and categories should emerge from data rather than being imposed in advance (Glaser & Strauss, 1967).

This paper argues that **bottom-up processes are not merely an alternative to top-down design; they are the necessary foundation for it.** Top-down functions — strategic direction, identity, coherence, coordination — cannot be meaningfully imposed from above unless they are grounded in the lived experience and shared meaning generated from below. In other words, **bottom-up makes top-down.**

To make this argument, we must first examine the assumptions and limitations of top-down design, then explore the strengths and challenges of bottom-up approaches, and finally show how the Viable System Model (Beer, 1972, 1979)

provides a framework for integrating the two. Along the way, we will draw on insights from cybernetics, enactivism, organisational psychology, sociotechnical design, and complexity theory.

The goal is not to dismiss top-down thinking entirely. As we will see, there are contexts — particularly in high-reliability and safety-critical environments — where top-down structures are essential (Perrow, 1984; Reason, 1990; Weick & Sutcliffe, 2001). Rather, the goal is to show that **top-down functions must emerge from bottom-up processes**, not precede them. Only then can organisations maintain requisite variety (Ashby, 1956), adapt to their environments, and remain viable over time.

With this context established, we now turn to the foundational question: **what do we actually mean by “top-down” and “bottom-up”?**

## **2. What We Mean by Top-Down and Bottom-Up**

The terms *top-down* and *bottom-up* are used frequently in organisational discourse, yet they are often invoked without precision. Before we can meaningfully compare them, we must define them clearly and examine the assumptions embedded in each. These assumptions shape not only how organisations are designed but how they understand themselves, how they act, and how they adapt.

### **2.1 Top-Down: The Primacy of the Conceptual Model**

Top-down design begins with a conceptualisation of the organisation or project. A small group — typically senior leaders, consultants, or planners — constructs a model of how the organisation *ought* to function. This model includes the desired end state, the structure required to achieve it, the processes to be followed, and the allocation of resources. Once the model is defined, it is communicated downwards for implementation.

As we have seen this approach is rooted in a long intellectual tradition of the hypothetico-deductive reasoning that underpins the scientific method (Popper, 1959). In organisational terms, the hypothesis is the conceptual model; the predictions are the plans; the test is implementation. The assumption is that if the model is sound and the plan is followed, the desired outcome will be achieved.

This logic is appealing. It promises clarity, coherence, and control. It allows leaders to articulate a vision, align activities, and coordinate large numbers of people. It provides a sense of order in a world that often feels chaotic. And, as its defenders rightly point out, top-down design is indispensable in certain contexts. High-reliability organisations — such as aviation, nuclear power, and emergency response — depend on standardisation, procedural discipline, and centralised oversight (Perrow, 1984; Reason, 1990; Weick & Sutcliffe, 2001). In these environments, deviation from established procedures can be catastrophic. Top-down structures provide the stability and predictability required to manage tightly coupled, high-risk systems.

However, these contexts are the exception rather than the rule. Most organisations operate in environments characterised by complexity, uncertainty, and rapid change. In such environments, the assumptions of top-down design become liabilities. The belief that planners can accurately model the organisation and its environment, anticipate future states, and design structures that will remain effective over time is increasingly untenable. As we will see, the limitations of top-down design are not merely practical; they are epistemological.

### **2.2 Bottom-Up: The Primacy of Action and Interaction**

Bottom-up design begins from a different premise. Rather than starting with a conceptual model, it starts with action. People engage in small, manageable tasks; they collaborate, experiment, and respond to the immediate demands of their environment. Through these interactions, patterns begin to emerge. Shared values and beliefs develop. Structures form organically as the group gains experience and encounters new situations.

This approach is grounded in **enactivism**, which holds that cognition is not a detached process of representation but an embodied, situated activity that arises through engagement with the world (Varela, Thompson & Rosch, 1991). We do not first construct a model of the world and then act; rather, we act, and through action we bring forth a world. Understanding emerges from doing.

Bottom-up design is also aligned with **grounded theory**, which argues that concepts and categories should emerge from data rather than being imposed in advance (Glaser & Strauss, 1967). In organisational terms, this means that structure should emerge from the lived experience of the workforce rather than being dictated by planners.

Finally, bottom-up design is consistent with **Ashby's Law of Requisite Variety**, which states that only "variety can absorb variety" (or to put it another way "Only complexity can absorb complexity") (Ashby, 1956). A system must possess at least as much behavioural flexibility as the environment it seeks to regulate. Bottom-up systems maintain close coupling with the environment because they grow through interaction with it. They develop new behaviours as needed. They expand their variety only when they have the competence to do so.

## **2.3 The Misconception That Bottom-Up Is "Unstructured"**

A common misconception is that bottom-up approaches are inherently chaotic or unstructured. This is not the case. Bottom-up systems can be highly structured, but their structure is emergent rather than imposed. It arises from the interactions of the system's components rather than from a pre-defined model.

Indeed, bottom-up systems often exhibit a form of *natural coherence*. Because they are grounded in action and experience, they tend to develop structures that are well-adapted to their environment. They avoid the "I would not start from here" problem that plagues top-down design, where planners imagine a future state that bears little resemblance to the present.

However, bottom-up systems are not without challenges. Without mechanisms for cohesion, communication, and shared purpose, they can fragment (Weick, 1976; March, 1991). Groups may drift, duplicate effort, or pursue conflicting aims. This is where the Viable System Model becomes essential. Beer's VSM recognises that every viable system requires meta-systemic functions — coordination, control, intelligence, and identity — to integrate autonomous activities into a coherent whole (Beer, 1972, 1979). These functions cannot be meaningfully imposed from above unless they are grounded in the lived experience and shared meaning generated from below.

## **2.4 Why This Distinction Matters**

The distinction between top-down and bottom-up is not merely a matter of managerial preference. It reflects fundamentally different assumptions about how organisations function, how people learn, and how systems adapt. Top-down assumes that understanding precedes action; bottom-up assumes that action precedes understanding. Top-down assumes that structure can be designed in advance; bottom-up assumes that structure must emerge from interaction. Top-down assumes that coherence can be imposed; bottom-up assumes that coherence must be cultivated.

These assumptions have profound implications for organisational viability. As we will see in the sections that follow, top-down design struggles to cope with complexity because it relies on prediction, abstraction, and centralised control. Bottom-up approaches, grounded in action and experience, maintain requisite variety, adapt continuously, and allow structure to emerge organically. But bottom-up alone is not enough. It must generate the conditions for shared values, identity, purpose, cohesion, and strategic awareness. These are the top-down functions — the meta-system — but they must emerge from bottom-up activity, not be imposed upon it.

With these definitions in place, we can now examine the limitations of top-down reasoning in more detail.

# **3. The Limits of Top-Down Reasoning**

If top-down design continues to dominate organisational thinking despite its well-documented failures, it is not because it works well in complex environments. It is because it is culturally intuitive. It aligns with the way we have been taught to think: that understanding precedes action, that planning precedes doing, and that the world can be shaped according to a conceptual model. These assumptions are deeply embedded in Western epistemology, management education, and the scientific worldview. Yet they are precisely the assumptions that collapse under the weight of real-world complexity.

To understand why top-down reasoning fails, we must examine its intellectual foundations, its cognitive vulnerabilities, and its practical consequences.

## **3.1 The Hypothetico-Deductive Trap**

At the heart of top-down design lies the hypothetico-deductive method: the belief that one can begin with a hypothesis, derive predictions, and then test them through action (Popper, 1959). This method has been extraordinarily successful in the natural sciences, where controlled experiments and stable conditions allow hypotheses to be tested with precision. But organisations are not laboratories. They are complex, adaptive systems embedded in dynamic environments. They are composed of autonomous agents whose behaviour cannot be fully predicted or controlled.

Despite this, most organisational methodologies — Waterfall, Lean, Six Sigma, Agile, PDCA, OODA — follow a similar logic. They begin with a conceptualisation of the problem, proceed through a sequence of planning stages, and culminate in implementation. Even when they incorporate feedback loops, they retain the assumption that thinking precedes action and that the system can be understood from above.

This assumption is flawed. As Venkatesh Rao (2024) has shown in his analysis of the OODA loop, the relationships between observation, orientation, decision, and action are far more complex than the linear or cyclical diagrams suggest. The OODA loop is often misrepresented as a simple sequence, when in reality it is a tangled web of simultaneous processes, feedbacks, and contextual influences. Simplifying these relationships into a neat diagram may be pedagogically convenient, but it is epistemologically misleading.

The Viable System Model (Beer, 1972, 1979) exposes the inadequacy of such simplifications. Unlike the linear or cyclical models of organisational action, the VSM depicts a network of continuous interactions between operational units, coordination mechanisms, control functions, intelligence processes, and identity structures. There is no privileged starting point, no fixed sequence, no assumption that cognition precedes action. Instead, the VSM recognises that viable systems must engage in simultaneous monitoring, adaptation, and self-regulation across multiple levels of recursion. It is a model that reflects the complexity of real organisational life rather than imposing a simplified abstraction upon it.

### 3.2 The Cognitive Vulnerabilities of Top-Down Planning

Even if top-down models were conceptually adequate, they would still be undermined by the cognitive limitations of the humans who construct them. Planning requires accurate forecasting, realistic self-assessment, and an ability to anticipate the behaviour of complex systems. Unfortunately, decades of research in cognitive psychology show that humans are systematically biased in ways that make accurate planning extremely difficult.

The **Dunning–Kruger effect** leads individuals to overestimate their competence, particularly in domains where they lack expertise (Kruger & Dunning, 1999). **Confirmation bias** causes planners to seek information that supports their assumptions while ignoring contradictory evidence. **Outcome bias** leads them to judge decisions based on results rather than the quality of the decision-making process. **Fundamental attribution error** causes them to attribute others' failures to character flaws while attributing their own failures to external circumstances.

Perhaps most damaging is **loss aversion** (Kahneman & Tversky, 1979), which causes individuals to weigh potential losses more heavily than potential gains. This bias leads to risk-averse behaviour, reluctance to change, and a tendency to cling to existing models even when they are failing. Combined with the **planning fallacy** — the systematic underestimation of time, cost, and difficulty (Buehler et al., 1994) — these biases create a perfect storm of overconfidence, unrealistic expectations, and resistance to adaptation.

Top-down planning amplifies these biases because it isolates decision-makers from the lived reality of the organisation. Planners operate at a distance from the environment they are attempting to model. They rely on abstractions, reports, and assumptions rather than direct experience. As a result, their models are often elegant but wrong — coherent on paper but disconnected from the complexity of the real world.

### 3.3 The “I Would Not Start From Here” Problem

One of the most persistent failures of top-down design is its inability to connect the conceptual model to the present reality of the organisation. Planners often imagine a future state that is desirable but unattainable given the organisation's current capabilities, culture, and environment. They design structures that assume behaviours the organisation has not yet developed, skills it does not yet possess, and conditions that do not yet exist.

This leads to what might be called the “I would not start from here” problem. The conceptual model may be coherent in itself, but it does not provide a realistic path from the present to the future. It is as if the planners have drawn a map of a destination without acknowledging the terrain that must be crossed to reach it.

Enactivism provides a powerful explanation for this failure. According to enactivist theory, cognition arises through action and sensorimotor engagement with the world (Varela, Thompson & Rosch, 1991). We do not first construct a model of the world and then act; rather, we act, and through action we bring forth a world. Understanding emerges from doing. This means that new behaviours cannot be designed in advance; they must be enacted through practice. Top-down design attempts to reverse this order, imposing conceptual models on systems that have not yet developed the behaviours required to realise them.

Beer's "Heisenberg Principle" of planning captures this dynamic succinctly: the act of planning changes the environment in which the plan must operate (Beer, 1979). The longer the planning process, the more likely it is that the environment will shift, competitors will adapt, or internal dynamics will change. Plans become obsolete before they are implemented. The belief that one can design a stable structure in a dynamic environment is an illusion.

### **3.4 The Problem of Emergence**

Perhaps the most fundamental limitation of top-down reasoning is its inability to account for emergence. Emergent properties arise from the interactions of autonomous subsystems. They cannot be predicted from the properties of the parts alone (Holland, 1998; Goldstein, 1999). In organisations, emergence manifests in culture, informal networks, tacit knowledge, and collective behaviour. These phenomena cannot be designed in advance; they arise through interaction.

Top-down designers attempt to anticipate emergence by constructing detailed models of how the organisation should function. But these models are inevitably incomplete. They cannot capture the full range of interactions, feedback loops, and contextual influences that shape organisational behaviour. As a result, top-down designs often fail to anticipate the emergent consequences of their own interventions. They create unintended side effects, distort incentives, and trigger adaptive responses that undermine the original plan.

Beer recognised that every viable system requires a meta-system capable of observing and interpreting emergent behaviour (Beer, 1972). But this meta-system cannot be fully designed in advance. It must emerge through interaction, reflection, and shared meaning. Top-down design attempts to impose the meta-system prematurely, before the organisation has developed the shared experience and collective understanding required to sustain it.

### **3.5 Why Top-Down Persists Despite Its Failures**

Given these limitations, one might wonder why top-down design remains so dominant. The answer lies in its psychological and cultural appeal. Top-down design offers the illusion of control in a world that feels increasingly uncontrollable. It provides a sense of order, clarity, and authority. It aligns with hierarchical power structures and reinforces the status of those who occupy them. It is easier to draw a diagram than to engage in the messy, unpredictable work of bottom-up sense-making.

But the persistence of top-down design does not make it effective. It simply reflects our reluctance to confront the complexity of the systems we inhabit. As we will see in the next section, bottom-up approaches offer a more realistic foundation for organisational viability — not because they are simpler, but because they embrace complexity rather than denying it.

## **4. The Strengths and Challenges of Bottom-Up Approaches**

If top-down design falters because it attempts to impose conceptual order on a reality it does not fully understand, bottom-up approaches succeed because they begin where the organisation actually is. They start with lived experience, not abstraction; with action, not prediction; with interaction, not representation. Yet bottom-up approaches are not a panacea. They bring their own challenges, and they require specific conditions to flourish. To understand why bottom-up is essential — and why it must be paired with appropriate meta-systemic functions — we must examine both its strengths and its vulnerabilities.

### **4.1 Requisite Variety and Environmental Coupling**

One of the most powerful arguments for bottom-up approaches comes from cybernetics, specifically Ashby's Law of Requisite Variety. Ashby (1956) argued that a system must possess at least as much behavioural flexibility as the environment it seeks to regulate. In other words, only variety can absorb variety. A system that lacks sufficient variety will be overwhelmed by environmental complexity; a system that possesses too much variety without coordination will collapse into chaos.

Bottom-up systems maintain requisite variety because they grow through interaction with their environment. They do not attempt to anticipate all possible future states; instead, they respond to the present, learn from experience, and develop new behaviours as needed. Their variety expands organically, in proportion to their competence. This is precisely what makes them adaptive.

Top-down systems, by contrast, reduce variety. They impose simplified models on complex realities, constrain behaviour through rigid procedures, and centralise decision-making in ways that disconnect leaders from the environment. They attempt to control complexity by suppressing it, rather than by engaging with it. This makes them brittle. When the environment shifts — as it inevitably does — top-down systems struggle to adapt because they lack the behavioural flexibility required to absorb the change.

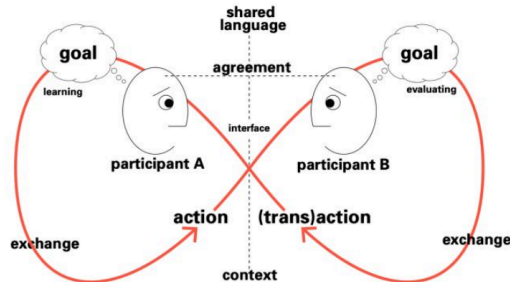
Bottom-up systems, grounded in action and experience, maintain a dynamic coupling with their environment. They sense changes early because they are close to the ground. They adapt quickly because they do not rely on centralised decision-making. They develop new behaviours incrementally, through practice rather than prescription. This is why bottom-up approaches are so effective in complex, uncertain environments.

## 4.2 Cohesion, Shared Meaning, and the Need for Second-Order Observation

However, bottom-up approaches face a challenge that top-down systems do not: the challenge of cohesion. When structure emerges from local interactions rather than being imposed from above, there is a risk that different parts of the organisation will drift in different directions. Without mechanisms for communication, coordination, and shared purpose, bottom-up systems can fragment (Weick, 1976; March, 1991). They may develop local optima that conflict with the needs of the whole. They may duplicate effort, compete for resources, or pursue incompatible goals.

To avoid fragmentation, bottom-up systems require what Beer (1972, 1979) called a Meta-System that can perform a **second-order observation** — the ability to step back from immediate action and reflect on the patterns emerging from collective behaviour. This is not a top-down imposition of structure but a bottom-up cultivation of shared meaning. It requires transparency, communication, trust, and a willingness to engage in collective sense-making.

Shared meaning is not a luxury; it is a necessity. Without it, bottom-up systems cannot coordinate their actions or align their efforts. Shared meaning provides the glue that holds the organisation together. It allows individuals to understand how their actions contribute to the whole. It enables the emergence of identity, purpose, and direction. Shared meaning is created through interaction between participants and is shown in Pask's Conversation Theory (Pask, 1976), where participants are constantly sharing explanations and understanding until they achieve shared meaning.



*Pangaro*

This is where the Viable System Model becomes indispensable. The VSM recognises that every viable system requires meta-systemic functions — coordination (System 2), control (System 3), intelligence (System 4), and identity (System 5) — to integrate autonomous activities into a coherent whole. These functions do not suppress autonomy; they enable it. They provide the conditions under which bottom-up activity can flourish without fragmenting.

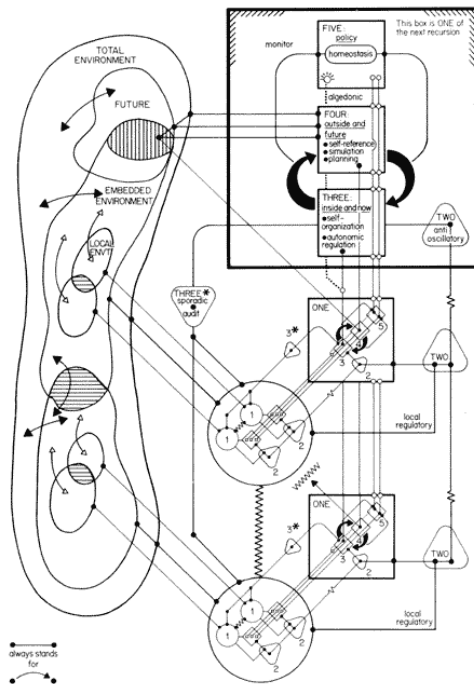
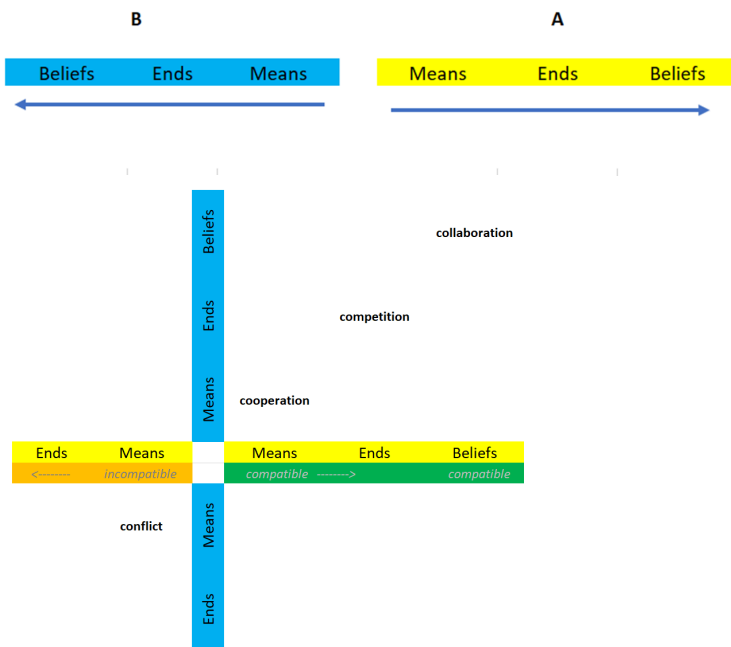


FIGURE 37 THE VIABLE SYSTEM - Stafford Beer

### 4.3 Shared Values and Beliefs

This single most important factor creating cohesion in an organisation is *shared values and beliefs*. To understand why they provide such a powerful force in organisational development and success let us look at how they create an environment of collaboration.



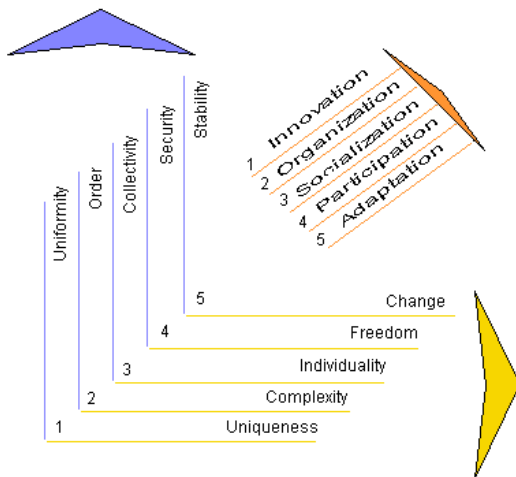
Dialectic starts as *conflict* but creates an environment where we can *collaborate* : to try to find SHARED BELIEFS (the ENDS), through compatibility of MEANS (talk, doing, acting) to achieve COOPERATION & COMPETITION

A dichotomy frames opposing arguments as an either-or choice, forcing solutions into a narrow band of extremes (top diagram above). When issues are treated as a linear clash of opposing tendencies, outcomes simply oscillate between poles. If one side wins, the problem is “solved”—but only by suppressing the other side, leaving underlying tensions intact. If they compromise, the issue is “resolved”—yet usually through a lowest-common-denominator fix that satisfies neither side. If they ignore their differences, the problem is “absolved”—which merely postpones conflict. The ideal is if they remove the causes and the problem is “dissolved”—but this is rare and often impractical for complex social or organisational issues (Ackoff, 1981).

Gharajedaghi (1983) suggests the use of a dialectic to turn the linear 'either' 'or' solutions into a 'and' solution that combines the best aspect of each tendency, he explains how a dichotomy between two opposing tendencies can be turned on its head through the 'differentiation' and 'integration' of the opposing viewpoints (see lower diagram above). If they agree on the means but not the ends they may agree to *cooperate*, each hoping that they will get what they want in the end. If they agree on the ends but not the means, they may enter into *competition*. If, however, they have shared beliefs they will seek the same ends and means and agree to *collaborate*.

Gharajedaghi suggests a dialectic, creates a positive environment for change, innovation, adaptation, socialisation, and organisation when people 'collaborate' and when there is a positive 'competition' for ideas but not power. The need for individuals to agree the way forward and collaborate on the solutions is dependent on them coming to the same set of beliefs that tie ends and means together.

The mechanisms that an organisation uses to achieve this is fundamental to its viability.



#### 4.4 Learning New Behaviours: The Recursions of Power

Another strength of bottom-up approaches is their ability to learn new behaviours realistically. Beer's "recursions of power" illustrate that while we have full control over simple actions — such as wiggling our fingers — we lack requisite variety when attempting new behaviours. We cannot simply decide to perform a complex action we have never practiced. We must learn it through repeated engagement with the environment.

Top-down planners often assume that new behaviours can be willed into existence. They design structures that require capabilities the organisation does not yet possess. They assume that people can adopt new roles, follow new procedures, or embrace new values simply because they are told to do so. This assumption is false. New behaviours must be enacted, not decreed.

Bottom-up systems learn new behaviours incrementally. They experiment, receive feedback, and adjust. They develop competence through practice. They build new capabilities from the ground up. This is why bottom-up approaches are so effective at fostering innovation, adaptability, and resilience.

#### 4.5 The Ethical Dimension of Bottom-Up Design

Bottom-up approaches also have an ethical dimension. They respect the autonomy, agency, and lived experience of the people who constitute the organisation. They recognise that individuals are not passive recipients of instructions but active participants in the creation of meaning. They value local knowledge, tacit understanding, and the wisdom that emerges from practice.

Top-down approaches, by contrast, often treat individuals as components of a machine. They assume that people can be controlled through incentives, procedures, and oversight. They prioritise compliance over creativity, predictability over participation, and control over collaboration. This can lead to alienation, disengagement, and a loss of intrinsic motivation.

Bottom-up approaches foster a sense of ownership, belonging, and purpose. They create conditions in which people can contribute meaningfully to the organisation's development. They align with democratic values and support the emergence of ethical, participatory forms of governance.

## 4.6 The Risk of Fragmentation and the Need for Meta-Systemic Integration

Despite these strengths, bottom-up approaches are not sufficient on their own. Without meta-systemic integration, they can fragment. They require mechanisms for coordination, coherence, and strategic awareness. They need ways to align local actions with global goals, to integrate diverse perspectives, and to maintain a sense of identity and purpose.

This is why bottom-up must be paired with top-down — but not the top-down of traditional management. The top-down functions of the VSM — Systems 2, 3, 4, and 5 — must emerge from bottom-up activity. They must be grounded in the lived experience and shared meaning generated from below. They must be participatory, reflective, and adaptive.

In other words, **bottom-up makes top-down**. The meta-system is not imposed; it is cultivated. It is not a structure that constrains; it is a structure that enables. It is not a hierarchy of control; it is a hierarchy of learning.

## 5. De Sitter's Design Rules and Organisational Complexity

If bottom-up approaches offer a more realistic foundation for organisational viability, it is not simply because they are more adaptive or more democratic. It is because they align with the structural principles that make complex systems workable. One of the clearest articulations of these principles comes from the sociotechnical design tradition, particularly the work of L. U. de Sitter and his colleagues. De Sitter's insights provide a powerful complement to Beer's cybernetic perspective, revealing why bottom-up emergence is not merely preferable but structurally necessary for viable organisational design.

### 5.1 Simple Organisations with Complex Jobs

De Sitter argued that viable organisations should strive to be “simple organisations with complex jobs” (de Sitter, den Hertog & Dankbaar, 1997). This phrase captures a profound insight: complexity should reside in the *work*, not in the *structure*. When individuals or small groups are given integrated tasks — tasks that include planning, execution, coordination, and regulation — they develop a holistic understanding of their work. They become capable of responding to variation, solving problems, and adapting to new circumstances. They embody requisite variety.

This is precisely what happens in bottom-up systems. Early participants naturally take on integrated roles. They handle finances, operations, communication, strategy, and problem-solving because there is no one else to do it. They develop a rich, embodied understanding of the system because they are the system. Their jobs are complex, but the organisation remains simple. There are few layers, few handoffs, few bureaucratic constraints. Information flows freely because it does not need to pass through intermediaries. Decisions are made close to the point of action because that is where the knowledge resides.

This structure is not only efficient; it is resilient. When individuals possess integrated capabilities, the organisation can adapt to change without requiring extensive reconfiguration. People can shift roles, take initiative, and respond to emerging challenges because they understand the whole, not just a fragment. This is the essence of sociotechnical design: aligning the structure of the organisation with the nature of the work.

### 5.2 Complex Organisations with Simple Jobs

Top-down design tends to produce the opposite: “complex organisations with simple jobs.” In these systems, work is fragmented into narrow tasks. Planning is separated from execution; operations are separated from regulation; communication is centralised; decision-making is hierarchical. Each individual performs a small part of the whole, often without understanding how their work fits into the larger system. Their jobs are simple, but the organisation becomes complex — not in the sense of being adaptive, but in the sense of being bureaucratic.

This fragmentation creates a host of problems. Because no one has a holistic view of the work, coordination becomes difficult. Information must travel through multiple layers, creating delays, distortions, and bottlenecks. Decision-makers are removed from the point of action, leading to poor judgement and unrealistic expectations. The organisation becomes rigid, slow, and vulnerable to disruption.

A pothole-repair example illustrates this dynamic vividly. A simple task — filling a pothole — becomes entangled in a web of approvals, handoffs, and procedural requirements. The work itself is straightforward, but the organisational structure is labyrinthine. This is not an accident; it is the predictable consequence of top-down design. When planners attempt to impose order from above, they often create structures that are more complex than the work they are meant to support.

### 5.3 The Cost of Functional Interdependence

De Sitter identified functional interdependence — the degree to which different parts of the organisation depend on one another to complete a task — as a key driver of organisational complexity. High functional interdependence requires extensive coordination, communication, and oversight. It increases the likelihood of delays, errors, and conflicts. It creates a need for managers, supervisors, and coordinators whose primary role is to manage the complexity created by the structure itself.

Bottom-up systems minimise functional interdependence because they integrate tasks at the level of the work group. They reduce the number of handoffs, simplify communication, and allow decisions to be made locally. This reduces the need for managerial oversight and increases the organisation's capacity to adapt.

Top-down systems, by contrast, often increase functional interdependence by fragmenting tasks and centralising control. They create silos that must be coordinated, procedures that must be enforced, and hierarchies that must be maintained. The result is an organisation that spends more time managing itself than engaging with its environment.

### 5.4 The Alignment of De Sitter and Beer

What makes De Sitter's work so valuable in this context is its alignment with Beer's Viable System Model. Although they come from different traditions — sociotechnical design and cybernetics — their insights converge on a common principle: **viability requires distributed autonomy supported by integrative meta-systemic functions.**

De Sitter emphasises the need for integrated jobs and minimal functional interdependence. Beer emphasises the need for autonomous operational units (System 1) supported by coordination (System 2), control (System 3), intelligence (System 4), and identity (System 5). Both recognise that autonomy without integration leads to fragmentation, while integration without autonomy leads to rigidity. Both argue that structure must emerge from the nature of the work and the dynamics of the environment, not from abstract models imposed from above.

This convergence is not accidental. Both traditions are grounded in a deep understanding of complexity. Both recognise that organisations are not machines but living systems. Both reject the idea that structure can be designed in advance. And both argue that viable systems must balance autonomy and cohesion through recursive, participatory processes.

### 5.5 Why Bottom-Up Aligns with Sociotechnical Principles

Bottom-up approaches naturally align with De Sitter's design principles because they begin with the work itself. They do not fragment tasks artificially; they allow roles to emerge organically. They do not impose functional interdependence; they minimise it by integrating tasks at the level of the work group. They do not create bureaucratic structures; they allow structure to emerge from interaction.

This alignment is not merely theoretical. It is observable in practice. Start-ups, community organisations, grassroots movements, and early-stage projects often exhibit the characteristics of simple organisations with complex jobs. They are adaptive, resilient, and capable of rapid learning. As they grow, however, they often succumb to the pressures of top-down design. They fragment tasks, create silos, and centralise control. They become complex organisations with simple jobs — and they lose the very qualities that made them viable in the first place.

The challenge, then, is not simply to adopt bottom-up approaches but to preserve them as the organisation grows. This requires a deliberate effort to maintain integrated roles, minimise functional interdependence, and cultivate meta-systemic functions that support autonomy rather than suppress it. It requires a commitment to participatory governance, continuous learning, and reflective practice. It requires an understanding that structure must emerge from the work, not from the imagination of planners.

## 6. Emergence and the Meta-System Problem

If De Sitter helps us understand why bottom-up structures are more workable at the level of day-to-day operations, the concept of **emergence** helps us understand why top-down structures cannot be meaningfully designed in advance. Emergence is not a managerial buzzword; it is a fundamental property of complex systems. It describes the way new patterns, behaviours, and capabilities arise from interactions among components — patterns that cannot be predicted from the properties of the parts alone (Holland, 1998; Goldstein, 1999). In organisations, emergence manifests in culture, identity, informal networks, tacit knowledge, and collective behaviour. These phenomena are not designed; they arise.

Top-down design fails because it attempts to anticipate emergence before the system exists. It tries to specify culture, identity, and strategic direction in advance, as if these could be engineered like a machine. But emergent properties cannot be designed; they can only be cultivated. They arise from the interactions of autonomous agents engaged in meaningful activity. They are the product of lived experience, not conceptual abstraction.

## 6.1 Why Emergence Defeats Top-Down Design

The problem is not simply that top-down planners lack information. It is that the information they need does not yet exist. Emergent properties arise only when the system is in motion. They depend on patterns of interaction that have not yet occurred. They are shaped by contingencies, feedback loops, and contextual influences that cannot be predicted in advance. To design an emergent property is to attempt to design something that has not yet come into being.

This is why top-down attempts to engineer culture so often fail. Culture is not a set of values written on a poster; it is the pattern of behaviours that emerges from the lived experience of the organisation. It is shaped by what people actually do, not by what leaders say they should do. Similarly, identity is not a branding exercise; it is the shared sense of purpose that arises from collective action. Strategic direction is not a plan; it is the pattern of choices that emerges from the organisation's engagement with its environment.

Top-down design treats these emergent phenomena as if they were variables to be controlled. It attempts to impose identity, culture, and strategy from above. But these phenomena cannot be imposed. They must emerge from below.

## 6.2 The Necessity of a Meta-System

This does not mean that organisations can function without top-down structures. On the contrary, every viable system requires what Beer (1972, 1979) called a **meta-system** — a set of functions that provide coordination, control, intelligence, and identity. The meta-system is responsible for integrating autonomous activities, monitoring performance, anticipating environmental changes, and maintaining coherence. Without a meta-system, the organisation would fragment into disconnected parts.

But — and this is the crucial point — **the meta-system cannot be designed in advance**. It must emerge from the interactions of the system's components. It must be grounded in the lived experience, shared meaning, and collective understanding generated from below. It must be built on the foundation of bottom-up activity.

This is why Beer insisted that the meta-system is not a hierarchy of control but a hierarchy of learning. It is not a structure that imposes order; it is a structure that enables the system to learn from its own behaviour. It is not a set of commands; it is a set of conversations. It is not a blueprint; it is a process.

## 6.3 The Paradox of Top-Down Emergence

This leads to a paradox that is often misunderstood: **top-down functions are essential, but they cannot be meaningfully top-down in origin**. They must emerge from bottom-up processes. They must be grounded in the organisation's lived reality. They must reflect the patterns of interaction that actually exist, not the patterns that planners imagine.

This paradox explains why so many organisational transformations fail. Leaders attempt to impose new structures, new cultures, new strategies, and new identities from above. They assume that if they can articulate the desired end state clearly enough, the organisation will follow. But the organisation cannot follow because the necessary emergent properties have not yet developed. The structure is imposed on a system that is not ready to support it.

The result is predictable: resistance, confusion, and eventual collapse. The imposed structure fails to take root because it is not grounded in the organisation's lived experience. It is a conceptual model without a behavioural foundation.

## 6.4 Emergence as a Process of Collective Sense-Making

Emergence is not magic. It is the result of collective sense-making — the process by which individuals interpret their environment, coordinate their actions, and construct shared meaning (Weick, 1995). This process cannot be designed, but it can be supported. It requires transparency, communication, trust, and opportunities for reflection. It requires mechanisms for feedback, dialogue, and learning. It requires a culture of participation, not compliance.

Bottom-up approaches create the conditions for collective sense-making because they engage people directly in the work. They allow individuals to experience the consequences of their actions, reflect on those consequences, and adjust their

behaviour accordingly. They create opportunities for shared experience, which is the raw material of shared meaning. They foster the emergence of identity, purpose, and direction.

Top-down approaches, by contrast, often suppress collective sense-making. They impose structures that limit autonomy, constrain communication, and reduce opportunities for reflection. They treat individuals as instruments of a plan rather than as participants in a process. They undermine the very conditions required for emergence.

## 6.5 The Meta-System as an Emergent Phenomenon

The meta-system — the set of functions that provide coordination, control, intelligence, and identity — must therefore be understood as an emergent phenomenon. It is not a structure that can be designed and imposed; it is a pattern of relationships that arises from the organisation's engagement with its environment. It is the product of collective sense-making, not the cause of it.

This is why bottom-up makes top-down. The meta-system emerges from the interactions of the system's components. It is grounded in the lived experience of the organisation. It reflects the patterns of behaviour that have developed through practice. It is not a conceptual model imposed from above; it is a behavioural reality that arises from below.

This insight has profound implications for organisational design. It means that top-down structures must be cultivated, not engineered. They must be allowed to emerge, not forced into existence. They must be grounded in the organisation's lived reality, not in the imagination of planners. They must be participatory, reflective, and adaptive.

In short, **the meta-system is not the starting point of organisational design; it is the outcome.**

## 7. When Top-Down Is Necessary

Up to this point, the argument has focused on the limitations of top-down design and the strengths of bottom-up emergence. But to present bottom-up as universally superior would be misleading. There are contexts in which top-down structures are not only useful but essential. Recognising these contexts does not weaken the argument for bottom-up; it strengthens it. It shows that the goal is not to replace top-down with bottom-up, but to understand the conditions under which each is viable — and, crucially, the order in which they must appear.

### 7.1 High-Reliability and Safety-Critical Environments

In high-reliability organisations (HROs) — aviation, nuclear power, air-traffic control, emergency medicine — the cost of error is catastrophic. These systems are tightly coupled (Perrow, 1984): a failure in one part can propagate rapidly through the whole. In such environments, improvisation is dangerous. Deviation from established procedures can lead to cascading failures. Here, top-down structures are indispensable.

HROs rely on:

- **standardised procedures,**
- **clear lines of authority,**
- **rigorous training,**
- **redundancy and fail-safes,**
- **formalised communication protocols,**
- **centralised oversight,**
- **and strict regulatory compliance.**

These features are not optional; they are the conditions that make high-risk systems safe. Reason's "Swiss Cheese Model" (1990) illustrates how layers of procedural and structural defences prevent accidents. Weick and Sutcliffe (2001) show that HROs succeed because they maintain a disciplined attentiveness to operations, anomalies, and weak signals. In these contexts, top-down structures provide the stability required to prevent disaster.

But even here, bottom-up learning is essential. HROs are not rigid machines; they are adaptive systems. They rely on the expertise, judgement, and situational awareness of frontline operators. They depend on the ability of individuals to recognise anomalies, report near-misses, and adjust behaviour in real time. They require a culture of mindfulness, not blind obedience. In other words, **top-down procedures succeed only because they are grounded in bottom-up expertise.**

## 7.2 Crisis Response and Emergency Coordination

In crises — natural disasters, pandemics, military engagements, large-scale system failures — time is compressed, uncertainty is high, and coordination is critical. In such situations, decentralised experimentation can be dangerous. There is often a need for rapid, decisive action, clear command structures, and centralised coordination.

But again, the effectiveness of top-down command depends on bottom-up competence. Emergency responders must be able to improvise within the boundaries of protocol. They must be able to adapt to local conditions, interpret ambiguous information, and coordinate with others in real time. Command structures provide direction, but frontline actors provide the intelligence that makes direction meaningful.

## 7.3 Technical Systems with Tight Coupling

Some technical systems — power grids, rail networks, telecommunications infrastructure — require centralised coordination because their components are tightly interdependent. A failure in one part can destabilise the whole. In such systems, top-down oversight is necessary to maintain stability, allocate resources, and manage interdependencies.

But even here, bottom-up processes are essential for long-term viability. Operators must learn from experience, adapt to changing conditions, and develop new capabilities. Maintenance crews, engineers, and technicians possess tacit knowledge that cannot be captured in procedures. Their insights are critical for system improvement, risk mitigation, and innovation.

## 7.4 The Limits of Top-Down Even in Top-Down Contexts

The key point is this: **top-down structures are necessary in certain contexts, but they are never sufficient.** They provide stability, but not adaptability. They provide control, but not learning. They provide coordination, but not meaning. They prevent disaster, but they do not generate innovation.

Even in the most top-down environments, bottom-up processes are essential for:

- detecting anomalies,
- reporting weak signals,
- identifying emerging risks,
- adapting procedures,
- improving systems,
- and maintaining situational awareness.

This is why HROs invest heavily in training, debriefing, simulation, and continuous learning. They recognise that expertise resides at the frontline, not at the top. They understand that procedures must evolve through practice, not through abstraction.

## 7.5 Why This Does Not Undermine the Argument for Bottom-Up

Acknowledging the necessity of top-down structures in certain contexts does not undermine the argument for bottom-up. On the contrary, it reinforces it. It shows that:

1. **Top-down structures are context-dependent, not universal.**
2. **Top-down structures require bottom-up competence to function.**
3. **Top-down structures must be grounded in bottom-up learning.**
4. **Top-down structures cannot be designed in advance; they must emerge.**

In other words, even where top-down is necessary, **bottom-up still comes first.**

This is the central insight of the Viable System Model. The meta-system — the top-down functions of coordination, control, intelligence, and identity — is essential for viability. But it cannot be meaningfully imposed from above. It must emerge from the interactions of autonomous operational units. It must be grounded in lived experience, not conceptual abstraction. It must be cultivated, not engineered.

Thus, the question is not whether top-down is ever necessary. It is. The question is **how top-down functions come into being.** And the answer is clear: **they emerge from bottom-up processes.**

## 8. Conclusion: Why Bottom-Up Makes Top-Down

If we step back from the detailed arguments of the previous sections, a simple pattern emerges. Top-down design fails not because it is inherently misguided, but because it is chronologically misplaced. It attempts to appear at the beginning of organisational life, when it can only meaningfully appear at the end. It tries to impose coherence before coherence exists, to prescribe behaviours before behaviours have developed, and to define identity before identity has emerged. It attempts to design the meta-system before the system itself has taken shape.

Bottom-up approaches succeed because they reverse this order. They begin with action, not abstraction. They allow structure to emerge from interaction. They cultivate shared meaning through participation. They generate the raw material — experience, competence, relationships, tacit knowledge — from which top-down functions can be constructed. They create the conditions under which coordination, control, intelligence, and identity can emerge organically.

This is the central insight of the Viable System Model. The VSM does not reject top-down functions; it insists on them. But it also insists that these functions cannot be meaningfully imposed from above. They must be grounded in the lived reality of the organisation. They must emerge from the interactions of autonomous operational units. They must be built on a foundation of bottom-up learning, not on a foundation of conceptual abstraction.

Enactivism reinforces this insight. It tells us that cognition arises through action, that understanding emerges from doing, and that meaning is constructed through engagement with the world (Varela, Thompson & Rosch, 1991). It tells us that we cannot design new behaviours in advance; we must enact them. It tells us that identity is not a concept but a practice. It tells us that the world we inhabit is not given but brought forth through our interactions with it.

Sociotechnical design reinforces it as well. De Sitter's principle of "simple organisations with complex jobs" (de Sitter et al., 1997) shows that viable structures emerge when individuals are given integrated tasks and autonomy to act. It shows that fragmentation creates complexity, while integration creates adaptability. It shows that structure must follow work, not the other way around.

Complexity theory reinforces this understanding. Emergence cannot be predicted or engineered; it can only be cultivated (Holland, 1998; Goldstein, 1999). Attempts to design emergent properties in advance are doomed to fail because the information required to do so does not yet exist. Emergence is the product of interaction, not intention.

Organisational psychology enhances it. Cognitive biases — overconfidence, confirmation bias, loss aversion, the planning fallacy — distort top-down planning (Kahneman & Tversky, 1979; Buehler et al., 1994). These biases are mitigated when learning is grounded in real outcomes rather than imagined futures.

High-reliability theory confirms it. Even in the most top-down environments, bottom-up expertise is essential for detecting anomalies, reporting weak signals, and adapting procedures (Weick & Sutcliffe, 2001). Top-down structures succeed only because they are grounded in bottom-up competence.

Across all these traditions, the same pattern appears: **bottom-up is the generative process; top-down is the emergent structure**. And in all these there is one overriding factor - the importance of shared values and beliefs in an organisation creates a powerful dynamic holding the organisation together and encouraging not just coordination or competition but collaboration.

This is why bottom-up makes top-down.

It is not that top-down is unnecessary. It is that top-down cannot be the starting point. It must be the outcome of a process of collective sense-making, grounded in action, experience, and interaction. It must emerge from the system's engagement with its environment. It must be cultivated, not imposed.

**This insight has profound implications for organisational design, governance, and technology. It suggests that the role of leadership is not to design the organisation from above but to create the conditions under which bottom-up emergence can flourish. It suggests that the role of technology is not to enforce compliance but to support participation, reflection, and learning. It suggests that the role of structure is not to constrain behaviour but to enable it.**

**Most importantly, it suggests that viable organisations are not built; they grow. They evolve through practice, not through planning. They develop identity through shared experience, not through branding exercises. They achieve coherence through interaction, not through imposition. They become viable not because they are designed to be, but because they learn to be.**

Bottom-up makes top-down.

And only when we understand this can we begin to design organisations that are truly capable of thriving in a complex world.

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