

Meta-Improvement: A Foundational Axiom for How Complex Systems Actually Improve

Author: Nazal Karadan

Abstract

I propose *Meta-Improvement*, a novel axiom stating that the processes by which we improve systems, designs, or functions must themselves be subject to improvement, or they will ossify into ineffective rituals. This idea builds on previous works across domains, including second-order cybernetics (von Foerster, 2003), Shewhart's iterative improvement cycle (later refined as PDSA by Deming, 1986), antifragility (Taleb, 2012), and double-loop learning (Argyris & Schön, 1978). Applications are briefly illustrated in healthcare, software, and manufacturing. To counter infinite regress, I further introduce the principle of *bounded reflexivity*: pragmatic stopping points based on diminishing returns. This paper positions meta-improvement as a foundational axiom for evolving, adaptive, and sustainable processes.

1. Introduction

Modern management processes, ranging from factories to software teams, rely on structured improvement frameworks like Lean, Agile, Six Sigma, and Total Quality Management (TQM). These frameworks, while highly beneficial, when applied dogmatically, plateau or collapse. Their effects and benefits stall over time.

On January 15, 2025, I wrote:

"Meta-improvement: Improvement is a process to improve systems, designs, or functions. Improvements don't always mean improvement. So, often the improvement process requires improvement." (Karadan, 2025)

This observation evolved into a broader axiom: improvement methodologies must themselves improve, or they risk becoming fragile dogma.

Meta-Improvement argues that no matter how effective processes are, their optimization tools are never final. The optimization tools themselves must adapt with time and must be tinkered in order to improve processes for desired results.

2. The Logic Behind Meta-Improvement

"The most dangerous phrase is: 'We've always done it that way'" — Grace Hopper

The broader philosophy behind meta-improvement — that is, the idea of continuous improvement by questioning the improvement processes themselves — is not entirely new. While it hasn't been named yet,

it has been practiced in different ways across domains, industries, and institutions. *Kaizen* is such a form. Yet, because people tend to adhere strictly to methodologies and frameworks, the idea continues to remain quite radical.

Charles Kettering is famously quoted as having said: “If you have always done it that way, it is probably wrong.” Meta-improvement isn’t insulting tradition or how things are done, but rather challenging them intellectually. The following are some common philosophical foundations we can draw from.

2.1 Second-Order Cybernetics: Von Foerster (2003) showed that observers influence the systems they observe. This insight is extended here. Improvement methodologies are not exempt from chaos. In fact, they are a part of the system, and their evaluation must be recursive.

2.2 Shewhart’s Cycle (PDCA/PDSA): The original iterative cycle — specify, produce, inspect — was introduced by Walter A. Shewhart in the 1930s and later popularized by W. Edwards Deming through what became known as the “Deming Wheel.” Deming, however, criticized the term “check” as misleading and consistently advocated for PDSA (Plan–Do–Study–Act), which he felt better captured the objective of learning and knowledge improvement. Meta-improvement improves the improvement logic.

2.3 Antifragility: Taleb (2012) distinguishes between robustness and antifragility. A fragile system breaks under stress, while a robust one resists it. But antifragile systems evolve through stress; they use stress to improve themselves. Meta-improvement could be viewed as one that enables antifragility in methodologies themselves.

2.4 Double-Loop Learning: Argyris and Schön (1978) introduced double-loop learning, which questions the assumptions behind actions. Meta-improvement resembles this, but adds a further recursion: not only revising assumptions, but actively redesigning the frameworks that shape them.

3. The Meta-Improvement Axiom

Axiom: Improvement system must be subjected to recursive evaluation and refinement. If it is not, it will ossify, and eventually produce the very inefficiency or harm it was built to prevent.

I shall now outline some principles that may be regarded as its core tenets:

- **Recursive Reflexivity:** Improvement frameworks must include audits of their own efficacy.
- **Contextual Sensitivity:** Methods must adapt to changing cultural, technical, or temporal conditions.
- **Constructive Skepticism:** All frameworks are malleable and nothing is sacred. As Popper (1962) argues, knowledge is fallible and must always remain open to refutation.

4. Practical Applications

Meta-Improvement is a systems principle for evolving processes. This would mean it is a key component of most processes we deal with, and is particularly vital to systems, designs, and functions that benefit greatly from improvement at any or all levels.

Below are three simple and concise examples, but the scope will always remain broad and universal:

4.1 Healthcare: WHO Surgical Safety Checklist's introduction was one of the vital moments in improving surgical outcomes. But research shows that its sustained success also depends heavily on local adaptation and active staff engagement to fit specific clinical workflows and cultures. We are also learning that such customizations are essential, otherwise, checklists risk becoming mere formalities rather than effective tools (Fourcade et al., 2012; Weiser & Haynes, 2018). This ongoing refinement shows meta-improvement in healthcare, where the improvement process itself needs to evolve to enhance patient safety and team collaboration.

4.2 Software Development: Spotify's Agile squads encouraged autonomy, yet they ended up reinforcing silos (Kniberg & Ivarsson, 2012). Critically examining Agile itself sparked hybrid approaches and better collaboration.

4.3 Manufacturing: COVID-19 exposed the fragility of global supply chains, proving that systems optimized purely for efficiency struggle under systemic shocks. Lean chains were already known to be vulnerable, with low redundancy and tight inventories (Christopher & Peck, 2004). Manufacturers addressed this by adding resilience and risk metrics alongside efficiency, evolving supply chain management in practice (Ivanov, 2020).

5. Bounded Reflexivity: Avoiding Infinite Regress

In any improvement process, the question always arises: when is enough enough? Improvement matters, but at some point, the process itself must be left alone. While some blindly follow frameworks, others rightly worry that meta-improvement could spiral into endless recursion. What I call *bounded reflexivity* addresses this. It sets practical stopping rules:

- **Diminishing Returns:** Stop meta-audits when the value they produce clearly and consistently falls across multiple cycles. The goal is to extract actual value from the process (inspired by Deming Institute principles).
- **Asymmetric Cadence:** Run system-level PDSA cycles regularly (monthly) but reserve meta-improvement audits for less frequent intervals, such as quarterly or annually. This asymmetric timing prevents overengineering and ensures you're improving the improvement itself, not just creating the illusion of progress.

- **Event-Triggered Reviews:** Run meta-audits when multiple KPIs drop sharply after a change. Let the data guide interventions, so meta-improvement stays focused on real outcomes, not theoretical perfection.

6. Integration with Existing Frameworks

Meta-Improvement can be layered onto existing frameworks without replacing them. Below are some examples and suggestions:

Lean: Track resilience and antifragility alongside waste-reduction metrics. For example, measure buffer capacities, recovery times, or adaptability to unexpected supply chain disruptions..

Agile: Hold quarterly retrospectives not just on the team's work, but on the Agile process itself to see which practices add value, which feel ritualistic, and where the framework could evolve.

ISO 9001: Include Meta-Improvement as part of management review and continual improvement clauses, auditing whether the improvement processes themselves are effective, not just the outputs.

TQM: Use Meta-Improvement loops in quality circles to ensure improvement methods themselves are working, and fix them when they're not.

Meta-Improvement doesn't replace these frameworks. Instead, it applies evolutionary pressure to prevent stagnation and gives practitioners real agency, letting them focus on the larger picture and use their judgment to improve the improvement process itself.

7. Conclusion

Meta-Improvement reframes progress as a recursive process embedded within the improvement process itself. It shows that systems, designs, and functions degrade not only from poor execution, but also from methods that go unchallenged. It calls for empirical validation, practical tooling, and thoughtful pedagogy. This axiom serves as both a heuristic and a lens for continuously refining adaptive, human-centered, and sustainable improvement processes across domains. Most importantly, it reminds us that even the best tools need sharpening.

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