THE MATHEMATICS OF WORKFORCE PERFORMANCE

An Organizational Design Framework for Human Capability, Performance Efficiency, and Value Realization

Andrew Thillainathan

Economics Frontier

Oct. 2026

Abstract

Employee performance is typically evaluated through goals, competencies, behaviors, and observed outcomes. Yet performance management can also be viewed as a dynamic system: organizations establish role requirements, observe realized performance, identify meaningful gaps, and apply feedback intended to improve outcomes.

The economic implications of unrealized workforce contribution can be substantial. *Gallup* estimates that employees who are not engaged or actively disengaged account for approximately $2 trillion annually in lost U.S. workplace productivity. While disengagement and underperformance are not synonymous, the magnitude of this estimate illustrates the organizational value potentially associated with unrealized employee contribution.

This paper approaches workforce performance as an organizational design and value-realization problem. It develops a systems-oriented mathematical framework for examining how effectively designed workforce capability is converted into realized performance under established role requirements and corrective-feedback mechanisms. The framework then extends the analysis to corrective-management burden, second-order organizational effects, and their resulting impact on collective organizational efficiency.

For the purposes of this framework, **workforce capability** refers to the productive capacity an organization designs and expects from its workforce under role requirements and operating conditions. A **workforce unit** refers to a group of roles evaluated collectively, such as a project team, department, business function, or entire organization.

Keywords

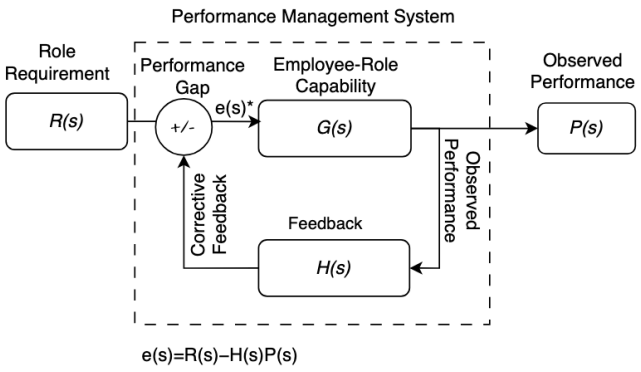
Organizational Design; Workforce Efficiency; Human Capital; Value Realization; Performance Management; Feedback Control; Systems Thinking; AI-Enabled Workforce.

1 Employee Performance as a Feedback System

Employee performance management is fundamentally a process of comparison and adjustment. Organizations establish expectations for a role, observe realized performance, identify meaningful gaps, and use feedback, coaching, training, or other management interventions to improve outcomes. Viewed through a systems lens, this process resembles a closed-loop feedback system in which observed performance is compared with a defined performance requirement.

Figure 1 illustrates the performance-management process as a closed-loop feedback system. The role requirement R(s) represents the expected level of performance, established through organizational expectations, professional standards, and appropriate peer benchmarks. Observed performance P(s) represents the performance demonstrated within the prevailing role and operating environment.

Figure 1. Performance Management Feedback System



The difference between required and observed performance produces a performance gap e(s). The feedback mechanism H(s) represents how observed performance P(s) is measured and returned to the comparison process, enabling corrective intervention intended to reduce the gap:

$$e(s) = R(s) - H(s)P(s) \quad (1)$$

The forward component G(s) represents employee-role capability: the capacity of an employee operating within a particular role and organizational environment to translate requirements and corrective intervention into observed performance. It does not represent an individual's intrinsic ability, intelligence, worth, or ultimate potential.

Throughout this paper, the term *employee-role system* refers to the employee operating within a specific role and organizational environment. The term is intentionally broader than the individual employee because observed performance reflects not only individual capability, but also role requirements, organizational structure, resources, processes, and prevailing operating conditions. This perspective is consistent with *Campbell and Wiernik (2015)*, who examine the multidimensional and dynamic nature of work performance, including adaptation to changing role requirements.

The feedback mechanism H(s) is not costless. Sustaining corrective feedback consumes organizational resources, while persistent performance gaps may create secondary effects elsewhere in the organization. These consequences are incorporated later in the model as corrective-feedback burden kH_T and secondary organizational effects E.

Within this framework, three broad performance conditions may emerge. First, observed performance may consistently exceed the defined role requirement (P > R), in which case corrective feedback becomes minimal and management attention can shift toward development and expanded contribution. Second, performance may initially fall below requirements but respond to corrective feedback and progressively **converge toward R**. Third, performance may remain persistently below the role requirement despite reasonable and sustained corrective intervention, resulting in a **non-convergent performance response**. The present framework focuses on performance gaps and their organizational consequences.

The distinction between the latter two conditions is central to this paper. Both employees may begin with similar performance gaps and receive comparable management intervention. What differentiates them is the **trajectory of performance in response to feedback**. A convergent system progressively closes the performance gap. A non-convergent system may initially improve but eventually approach an observed performance ceiling below the role requirement.

The framework does not prescribe a universal period for performance correction. Organizations differ in their tolerance for sustained performance gaps and in the time they permit corrective feedback to produce sustained improvement. The economically sustainable **performance runway** may also vary with the operating model. Where employee output is closely associated with revenue, billable capacity, margin, service delivery, or material operational risk, the cost of prolonged non-convergence may be considerably higher.

The central question examined in this paper is therefore:

> *What happens to organizational value when increasing corrective feedback no longer produces sustained improvement in employee performance?*

2 Performance Response to Corrective Feedback

A performance gap alone does not establish that an employee-role system is ineffective. Performance may temporarily fall below a defined role requirement and subsequently improve through coaching, clarification, training, or other corrective intervention. The more informative question is therefore not simply whether a performance gap exists, but how observed performance responds to corrective feedback over successive observation cycles.

In the closed-loop system introduced in Figure 1, H(s) represents the feedback mechanism through which observed performance is compared with role requirements. For the remainder of the analysis, *H* denotes the relative intensity of corrective intervention, including coaching, monitoring, clarification, training, and other management actions intended to close performance gaps. As intervention continues across observation cycles or multiple employee-role systems, its cumulative organizational burden becomes economically relevant.

H = corrective feedback intensity

Two additional parameters provide useful anchors for understanding differences in employee-role performance:

a = original employee-role capability

b = responsiveness to corrective feedback *(H)*

The parameter *a* represents the original capability of the employee-role system relative to the requirements of the

role. The parameter *b* represents the degree to which observed performance responds when corrective feedback is applied. Together, *a* and *b* help explain why employee-role systems with similar observed performance gaps may follow materially different trajectories under corrective intervention.

For example, an employee-role system with sufficient underlying capability and strong responsiveness to *H* may progressively close an observed performance gap. Another system may initially improve but demonstrate progressively weaker responsiveness as corrective intervention increases, eventually approaching a performance ceiling below the role requirement. The distinction is therefore not simply where performance begins, but how the employee-role system responds as *H* is applied over time.

Importantly, *a* and *b* characterize the employee-role system rather than the intrinsic ability, intelligence, worth, or ultimate potential of an individual. The same individual may exhibit different performance characteristics under different role requirements, organizational structures, or operating environments.

2.1 Performance Convergence

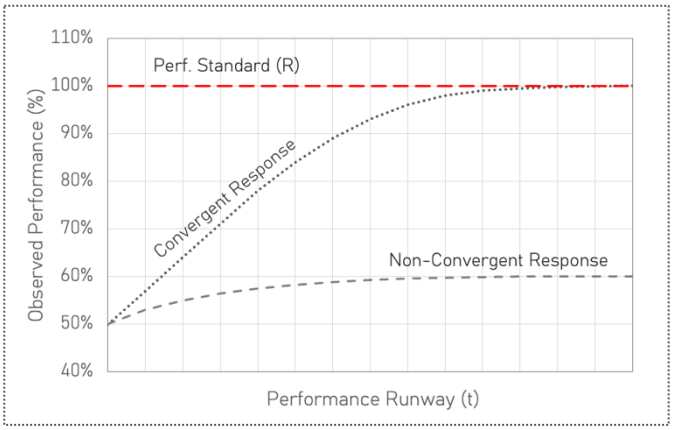
A convergent performance response occurs when corrective feedback progressively closes the gap between observed performance, *P*, and the role requirement, *R*. In this condition, the employee-role system demonstrates sufficient baseline capability, *a*, and responsiveness, *b*, for corrective feedback *H* to move performance toward the required level.

Research on feedback interventions demonstrates that feedback does not uniformly improve performance. *Kluger and DeNisi (1996*) found substantial variation in feedback effectiveness, including instances in which feedback reduced performance. This reinforces the importance of evaluating performance trajectories rather than assuming that additional corrective intervention necessarily produces improvement.

Figure 2 illustrates two employee-role systems beginning with the same normalized performance gap. The convergent response progressively approaches the role requirement, while the non-convergent response initially improves but approaches an observed performance ceiling below R.

As the convergent response approaches *R*, the need for corrective intervention should ordinarily decline. A particularly important indicator of stabilization is whether improved performance can be sustained as H is subsequently reduced. If performance remains near the role requirement with less corrective intervention, the feedback process has produced a more stable employee-role performance condition.

Figure 2. Illustrative Performance Convergence and Non-Convergence.



Observation cycles are used rather than a prescribed unit of time because organizations may differ in their performance-management cadence and tolerance for sustained performance gaps. The relevant consideration is the **trajectory toward convergence**, rather than a universal correction period.

2.2 Feedback Dependence, Diminishing Returns, and the Performance Ceiling

Not all performance improvement produces the same system outcome. An employee may initially respond to corrective feedback but require progressively greater intervention to produce smaller increments of improvement. In other cases, observed performance may approach the role requirement while remaining dependent on elevated corrective intervention.

As corrective feedback increases, a diminishing-return condition may emerge:

$$\frac{dP}{dH} > 0 \quad while \quad \frac{d^2P}{dH^2} < 0 \qquad (2)$$

Performance is still improving, but each additional increase in H produces less incremental improvement. This condition does not establish that the employee cannot meet the role requirement. Rather, it indicates that responsiveness to additional corrective intervention is weakening.

If this pattern continues, the employee-role response may eventually approach an observed performance ceiling.

Eventually, more feedback may stop producing meaningful improvement even though performance remains below the role requirement:

$$\frac{dP}{dH} \rightarrow 0 \quad while \quad P \rightarrow Pmax < R$$

In practical terms**, H continues to increase, but P has effectively stopped moving toward R.**

Where this condition persists across an organizationally appropriate observation period, the employee-role system may be considered non-convergent.

Importantly, an observed performance ceiling does not represent an individual's intrinsic capability or ultimate potential. It represents the highest sustained performance observed within the prevailing role and operating environment. Persistent non-convergence may therefore indicate a potential role-capability mismatch under prevailing conditions, rather than a generalized limitation of the individual.

From an organizational-design perspective, the significance of this condition is that corrective intervention may continue consuming organizational capacity even as its marginal performance benefit approaches zero. The question therefore begins to shift from whether additional *H* can improve performance to whether the continuing cost of intervention remains justified.

Within the framework, *a* and *b* therefore help explain the trajectory that ultimately produces observed performance *P*. Baseline employee-role capability *a* establishes the initial performance condition, while responsiveness *b* influences the degree to which corrective feedback *H* changes that condition over successive observation cycles. The resulting level of *P*, rather than *a* or *b* independently, becomes the performance input to the organizational-efficiency analysis developed later in the paper.

2.3 The Cost of Performance Runway

The period during which an organization continues corrective intervention while evaluating whether performance will converge can be viewed as performance runway.

Some performance runway is necessary. Organizations require sufficient observation to distinguish temporary performance variation from a persistent performance gap and to determine whether corrective feedback is producing sustained improvement. In a convergent employee-role system, this runway represents a productive investment: performance approaches the role requirement and the need for corrective intervention eventually declines.

The economic consequence changes when performance begins exhibiting diminishing returns or approaches a persistent ceiling. Corrective intervention may continue consuming management time, development resources, peer capacity, or other organizational resources even as the incremental performance benefit of additional *H* declines. This accumulated resource burden provides the basis for the corrective-feedback cost term kH_T introduced in the organizational-value model that follows.

The relevant management question therefore becomes:

> *Is the observed performance trajectory producing sufficient evidence of convergence to justify the continuing cost of performance runway?*

There is no universal optimal runway. The appropriate duration depends upon organizational culture, operating requirements, role criticality, and the economic exposure associated with a continuing performance gap. A professional-services or consulting organization, for example, may have considerably less tolerance for prolonged performance gaps when employee capacity is directly connected to billable revenue, client delivery, or margin.

Team structure also matters. A persistent performance gap in one role represents a larger proportion of designed workforce capacity in a five-person team than in a fifty-person organization. Similarly, a highly interdependent or critical role may create effects beyond its individual contribution by shifting work, management attention, or delivery risk to others.

Performance runway is therefore not solely a performance-management consideration. It is also an organizational-design variable. As the marginal benefit of corrective feedback declines, organizations must consider not only whether further improvement remains possible, but whether the resources required to sustain the intervention continue to produce sufficient organizational value.

This leads to the broader question examined in the next section:

> *How should organizations design and manage workforce capacity so that human capability is converted into the greatest sustainable organizational value?*

3 Workforce Performance as an Organizational Design Problem

Individual performance does not occur in isolation. Organizations create roles, assign capacity to those roles, establish performance requirements, and invest management resources in converting that designed capability into realized business value. The collective performance of these employee-role systems therefore becomes an organizational design and workforce efficiency problem.

This consideration is increasingly important across different operating models. Startups and emerging organizations have an opportunity to design workforce structures from the beginning. Professional-services firms and profit centers must closely connect workforce capacity to revenue, margin, and delivery commitments. Large

enterprises may instead face the challenge of redesigning established workforce structures whose roles, processes, and performance systems evolved under different operating conditions.

Artificial intelligence adds another dimension to this challenge. As AI automates tasks, augments human capability, and changes the composition of traditional roles, organizations may increasingly need to reconsider not simply how many employees are required, but how workforce capability should be structured and how effectively that capability is converted into sustainable organizational value.

3.1 From Designed Capability to Realized Value

An organization may design a workforce with sufficient theoretical capability to meet its objectives, yet realize materially less value in operation. Performance gaps represent one source of this difference. Corrective-management burden and secondary effects on surrounding employees, workflows, or customers may reduce realized value further.

These additional effects extend the employee-level feedback system introduced in *Figure 1* to the organizational level. Corrective feedback H improves performance when the employee-role system is responsive, but sustaining that intervention requires organizational resources. Across the relevant workforce unit and observation period, aggregate corrective-feedback intensity is represented by H_T. If k represents the organizational cost associated with sustaining each unit of corrective-feedback intensity, the resulting corrective-feedback burden is:

$$C_H = kH_T \quad (3)$$

Persistent performance gaps may also generate effects beyond the direct feedback process, including rework, redistributed workload, workflow disruption, delivery delays, or other organizational consequences. These secondary effects are represented by E.

The relationship can be represented conceptually as:

$$V_{net} = V_{cap} \times \sum(w_i \times p_i) - kH_T - \mathrm{E} \quad (4)$$

Net Value = Realized Workforce Capability – Cost of Corrective Feedback – Secondary Effects

where:

$\boldsymbol{V_{cap}}$ = designed workforce capability
$\boldsymbol{w_i}$ = relative capability weight of role *i*
$\boldsymbol{p_i}$ = realized performance vs. role requirement
$\boldsymbol{H_T}$ = aggregate corrective-feedback intensity
$\boldsymbol{k}$ = organizational cost per unit of corrective-feedback intensity
$\boldsymbol{kH_T}$ = total corrective-feedback burden
$\boldsymbol{E}$ = secondary organizational effects
$\boldsymbol{V_{net}}$ = net realized organizational value

The first component $\boldsymbol{Vcap} \times \boldsymbol{\Sigma}(\boldsymbol{w_i} \times \boldsymbol{p_i})$, represents the portion of designed workforce capability realized through employee-role performance. The relationship $\boldsymbol{w_i} \times \boldsymbol{p_i}$ determines the realized contribution of each role or organizational component within the system.

For example, consider a workforce unit in which a role represents 20% of designed capability ($\boldsymbol{w_i}$=0.20) and is operating at 80% of its established performance standard ($\boldsymbol{p_i}$ =0.80). The realized contribution of that role is therefore $0.20 \times 0.80 = 0.16$, or 16% of designed workforce capability. The role's 20% performance shortfall translates into a 4-percentage-point loss of total designed workforce capability:

$$w_i(1 - p_i) = .20(1 - 0.8) = .04$$

The term $\boldsymbol{kH_T}$ extends the corrective-feedback mechanism from *Figure 1* into the organizational-value model by capturing the resources consumed in sustaining corrective intervention. The term E captures secondary organizational effects not represented by the employee's direct performance shortfall or the corrective-feedback burden, such as redistributed workload, rework, workflow disruption, delivery delays, or other organizational consequences.

The model does not assume that every role contributes equally. In a simple equally weighted team, each employee-role system may represent approximately the same proportion of designed capability. In the more general model, i identifies a specific employee-role system or organizational component within the workforce system being analyzed, and w_i represents its relative direct capability weight. The weight may reflect factors such as role criticality, revenue contribution, scarce expertise, decision authority, or other organizational-design considerations. Effects that propagate from one component into other parts of the system are treated separately through E.

This distinction separates direct contribution from system propagation. A role with a relatively high w_i may create substantial direct capability loss when its realized performance p_i falls below the established performance standard. Conversely, a role with a relatively modest w_i may still generate substantial secondary effects E if its performance affects highly interdependent workflows or other organizational components. For example, a project-management role may represent a relatively modest share of direct workforce capability while still generating substantial secondary effects if performance gaps disrupt coordination across Engineering, Risk, Product, and Quality Assurance.

3.2 Organizational Efficiency

Net realized value can then be compared with the workforce capability the organization originally designed and funded:

$$\eta_{org} = \frac{V_{net}}{V_{cap}} \quad (5)$$

where η_{org} represents organizational workforce efficiency.

An η_{org} of 100% represents the conceptual condition in which designed workforce capability is fully converted into realized organizational value without material performance leakage or corrective-management burden. Values below 100% represent increasing separation between what the workforce was designed to deliver and what the organization ultimately realizes.

This distinction is important because workforce headcount alone provides limited information about organizational capacity. Two teams with the same number of employees may possess similar nominal capacity while producing materially different realized value because of differences in role alignment, performance, corrective-feedback requirements, and secondary organizational effects.

Team size further changes the consequence of an individual performance gap. In a small team, a single role may represent a substantial proportion of designed workforce capability. As team size increases, the direct proportional effect of any one equally weighted role decreases, although highly weighted or interdependent roles may continue to create disproportionate organizational consequences.

The organizational-design objective is therefore not simply to maximize individual performance or minimize corrective feedback. It is to configure workforce capability so that the greatest sustainable proportion of designed capability is converted into realized value without imposing excessive organizational cost.

4 Performance-Gap Concentration and Organizational Efficiency

Section 3 established a framework for evaluating how designed workforce units convert their capability into realized organizational value. Building on this framework, *Section 4* examines how the concentration of performance gaps affects workforce efficiency across workforce units of different sizes.

For example, two employees operating below the performance standard, represent 40% of a five-person team (2÷5) but only 4% of a fifty-person workforce (2÷50). The employee-level performance condition may be identical, but its significance to the organization can be very different.

This relationship can be captured through a performance-gap concentration coefficient (What proportion of workforce roles is affected):

$$C_g = \frac{m}{N} \quad (6)$$

where m is the number of performance-gap roles and N is the total number of roles in the workforce unit.

The coefficient represents the proportion of the workforce occupied by performance-gap roles. As performance-gap concentration (C_g) increases, a greater proportion of workforce roles is affected. Under equal capability weights, this also represents a greater proportion of designed workforce capability exposed to performance loss, potentially reducing overall workforce efficiency.

Table 1 illustrates how concentration changes as workforce-unit size increases while the number of affected roles remains constant.

Table 1. Performance-Gap Concentration Across Workforce Unit Sizes

Performance Gap Roles (m)	Workforce Unit Size (N)	***Concentration*** (C_g)
2	5	40%
2	10	20%
2	20	10%
2	50	4%

While performance-gap concentration (C_g) measures the proportion of workforce roles operating below expected standards, it does not capture the magnitude of those gaps. For example, two workforce units may have the same concentration of performance gaps, yet experience different capability losses if affected roles operate at 90% of expected performance in one unit and only 60% in the other.

Under the assumption of equally weighted roles, direct capability loss depends on both the proportion of affected roles (C_g) and their average realized performance ($\hat{p}$). Combining these measures gives the **Simplified Concentration Model:**

$$L = C_g(1 - \hat{p}) \quad (7)$$

where ($\hat{p}$) represents average realized performance among affected roles only.

For example, in a ten-person workforce unit, if two equally weighted roles operate at 60% performance:

$$L = \frac{2}{10} \times (1 - 0.6) = 0.08 = 8\%$$

The workforce therefore realizes 92% of its designed capability before corrective-feedback burden and secondary organizational effects.

In practice, however, not all roles contribute equally to workforce capability. A performance gap in a highly weighted role may therefore produce a greater direct capability loss than the same gap in a less heavily weighted role. The **General Weighted Model** accounts for these differences:

$$L = \sum_{i=1}^{n} w_i(1 - p_i) \tag{8}$$

When roles are equally weighted (w_i=1/N), the General Weighted Model reduces to the Simplified Concentration Model.

Practical Applications of the Two Models

The Simplified Concentration Model is particularly useful for startups and organizations designing new workforce structures, where equal capability weights provide a practical starting assumption for evaluating team size and performance-gap concentration.

The General Weighted Model is more appropriate when roles have differing capability contributions, as commonly found in established or highly specialized organizations. Both models can be applied regardless of organizational maturity, with the simplified model representing a special case of the general framework.

4.1 From Performance Gap to Organizational Value

Section 3 established that realized workforce capability depends on the relative capability weight (w_i) and performance (p_i) of each role. Section 4 introduced direct capability loss (L), representing the proportion of designed capability that remains unrealized.

This section brings these relationships together to quantify gross workforce efficiency and determine how corrective-feedback burden and secondary organizational effects further reduce net organizational value. We begin by expressing realized workforce capability as:

$$V_{realized} = V_{cap}(1 - L) \tag{9}$$

Using the General Weighted Model in Equation (8), and recognizing that the capability weights sum to one, realized workforce capability can also be expressed as:

$$V_{\text{realized}} = V_{\text{cap}} \sum_{i=1}^{N} w_i\, p_i \tag{10}$$

Both expressions calculate the same realized capability, either by subtracting losses or adding individual role contributions.

These relationships provide the basis for calculating workforce efficiency, beginning with gross efficiency.

Gross Workforce Efficiency

Gross workforce efficiency measures the proportion of designed capability realized before accounting for additional organizational costs:

$$\eta_{\text{gross}} = \frac{V_{\text{realized}}}{V_{\text{cap}}} = 1 - L \tag{11}$$

For equally weighted roles, substituting Equation (7) gives:

$$\eta_{gross} = 1 - C_g\,.(1 - \bar{p}) \tag{12}$$

Net Organizational Efficiency

Net organizational efficiency additionally accounts for corrective-feedback burden ($\boldsymbol{kH_T}$) and secondary organizational effects (**E**):

$$\eta_{\text{org}} = \frac{V_{\text{realized}} - kH_T - E}{V_{\text{cap}}} \tag{13}$$

Substituting $V_{\text{realized}} = V_{\text{cap}}\,(1 - L)$

$$\eta_{\text{org}} = 1 - L - \frac{kH_T + E}{V_{\text{cap}}} \tag{14}$$

This equation applies to both models. Direct capability loss (L) is calculated using the Simplified Concentration Model or the General Weighted Model, as defined in Equations (7) and (8), respectively.

Illustrative example:

Consider a ten-person workforce unit with equally weighted roles. Eight operate at the performance standard, while two operate at 60%.

$$L = 0.20 \times (1 - 0.6) = 0.08$$

$$\eta_{gross} = 1 - 0.08 = 92\%$$

If designed capability is 100 units and corrective-feedback burden and secondary effects consume seven additional units:

$$\eta_{\text{org}} = 1 - 0.08 - \frac{7}{100} = 85\%$$

The workforce therefore realizes 92% of designed capability before additional organizational costs, but only 85% after accounting for those costs.

4.2 The Concentration Effect Across Team Sizes

The concentration effect can be examined across workforce units of different sizes. Table 2 assumes equally

weighted roles, with each affected role operating at 60% of expected performance. Workforce-unit size and the number of affected roles are varied to illustrate their impact on gross workforce efficiency.

Table 2 *Gross Workforce Efficiency by Workforce-Unit Size and Performance-Gap Count*

Org. Units	1 Role at 60%	2 Roles at 60%	3 Roles at 60%
5	92%	84%	76%
10	96%	92%	88%
20	98%	96%	94%
50	99.2%	98.4%	97.6%

As workforce-unit size increases, a fixed number of performance-gap roles represents a progressively smaller proportion of designed capability. For example, with two roles operating at 60%, gross workforce efficiency increases from 84% in a five-person unit to 98.4% in a fifty-person unit.

Figure 3 *Workforce-Unit Size and Organizational Impact of Performance Gaps*



Figure 3 assumes a fixed number of performance-gap roles and fixed absolute corrective-feedback and secondary organizational costs as workforce size increases. However, if the proportion of affected roles scales with workforce size, the efficiency advantage disappears. For example, two affected roles in a five-person team correspond to twenty in a fifty-person workforce. Assuming equally weighted roles and the same average performance shortfall, both workforce units experience identical proportional direct capability loss, although net organizational efficiency may still differ depending on corrective-feedback and secondary organizational costs.

Taken together, the framework suggests that workforce performance should not be evaluated solely by whether an individual employee is meeting expectations. From an organizational-design perspective, leaders should also consider the severity and concentration of performance gaps, the relative capability weight of affected roles, the resources required to sustain corrective intervention, and the secondary effects propagated through the surrounding system. Workforce efficiency is therefore not simply the aggregate performance of individual employees, but an outcome of how capability is structured, managed, and converted into realized organizational value.

5 Conclusion

Workforce performance is not simply the aggregate performance of individual employees. It is also an outcome of organizational design: how human capability is structured, matched to roles, supported through feedback, and converted into realized organizational value.

This paper presents a systems-oriented mathematical framework connecting employee-role capability, corrective feedback, performance convergence, and organizational efficiency. At the employee-role level, baseline capability (a) and responsiveness (b) help explain how observed performance (P) responds to corrective feedback (H). At the organizational level, performance (p_i) and relative capability weight (w_i) determine direct capability realization, while corrective-feedback burden (kH_t) and secondary organizational effects (E) account for additional reductions in organizational value.

The framework demonstrates that the organizational impact of performance gaps depends on their concentration, severity, and relative capability weight, as well as the resources consumed through corrective intervention and effects propagated across interconnected workflows. When additional feedback produces diminishing improvement, the managerial question shifts from whether further improvement is possible to whether continued intervention generates sufficient organizational value.

These considerations become increasingly relevant as artificial intelligence and automation reshape workforce structures, role requirements, and organizational dependencies. AI may expand available capability while changing the relative contributions of human roles. Effective workforce design must therefore consider not simply headcount, but how human and technology-enabled capability can be structured to maximize sustainable organizational value.

The framework is conceptual and does not reduce complex human behavior to deterministic mathematical relationships. Performance is influenced by psychological, motivational, social, cultural, and environmental factors beyond those explicitly represented in the model. The mathematics provides a structured analytical lens for examining organizational relationships that are often evaluated qualitatively. Its purpose is to support managerial diagnosis and organizational design, not replace managerial judgment.

Appendix A

Integrated Workforce Value-Realization Example

Consider an organization developing a new product through six specialized functions: Product, Design, Engineering, Quality Assurance (QA), Risk, and Project Management. Each function contributes differently to the product-development system and is therefore assigned an illustrative relative capability weight w_i. Realized performance p_i represents performance relative to the established performance standard.

The values below are illustrative and are intended to demonstrate application of the framework rather than prescribe universal weights or performance measures.

Table A1. Illustrative Product-Development Workforce System

Organizational Component	**Capability Weight** (w_i)	**Realized Performance** (p_i)	**Realized Contribution** ($w_i p_i$)	**Direct Capability Loss** $w_i(1-p_i)$
Product	.20	.95	.190	.010
Design	.10	.90	.090	.010
Engineering	.30	.70	.210	.090
QA	.15	.85	.128	.023
Risk	.10	1.00	.100	.000
Project Management	.15	.90	.135	.015
Total	**1.00**	—	**.853**	**.147**

The total direct capability loss and net organizational efficiency are calculated using the General Weighted Model:

$$L = \sum_{i=1}^{n} w_i(1-p_i) \quad \text{equation (8)}$$

$$\eta_{\text{org}} = 1 - L - \frac{kH_T+E}{V_{\text{cap}}} \quad \text{equation (14)}$$

where (L) represents direct capability loss, (kH_T) represents corrective-feedback burden, and (E) represents secondary organizational effects. The resulting efficiency measures the proportion of designed workforce capability retained after all three sources of organizational value loss are accounted for.

The weighted system therefore $realizes\ approximately$:

$$\boldsymbol{\Sigma}(\boldsymbol{w_i p_i}) = .853$$

or 85.3% of designed workforce capability before corrective-feedback burden and secondary organizational effects are considered.

Engineering illustrates the significance of capability weighting. With $\boldsymbol{w_i} = .30\ and\ \boldsymbol{p_i} = .70$:

$$\boldsymbol{w_i}(1-\boldsymbol{p_i}) = .30(1-.70) = .09$$

Engineering therefore accounts for a 9-percentage-point direct capability loss across the product-development system. The same 70% performance in a component weighted at .10 would produce only a 3-point direct loss.

From Direct Capability Loss to Organizational Consequence

The Engineering performance gap may create organizational effects through three analytically distinct channels:

Table A2. Three Channels of Organizational Impact

Impact Channel	Model Term	Illustrative Consequence
Direct capability loss	$w_i(1-p_i)$	Engineering output below designed contribution
Corrective-feedback burden	kH_T	Additional management review, monitoring, escalation, and recovery planning
Secondary organizational effects	E	QA delays, Product replanning, Design rework, Risk timing changes, or delayed product delivery

This distinction is important because direct capability weight and system propagation are not equivalent. A component with a high $\boldsymbol{w_i}$ may create substantial direct capability loss, while a component with a smaller $\boldsymbol{w_i}$ may nevertheless generate substantial E where its work is highly interconnected with other parts of the system.

For illustration, assume designed workforce capability (V_{cap}) is normalized to 100 units. The weighted performance shown in Table A1 produces 85.3 units of directly realized capability. If corrective-feedback burden consumes 3 units and secondary organizational effects consume an additional 4 units:

$$\eta_{\text{org}} = 1 - 0.1475 - \frac{3+4}{100}$$

and therefore:

$$\eta_{org} = 78.3\%$$

The example demonstrates that organizational value loss may exceed the direct performance shortfall. The organization experiences not only capability that was not realized, but also resources consumed attempting to improve performance and consequences propagated through interconnected parts of the system.

This appendix illustrates the General Weighted Model using a workforce unit with unequal role contributions. The complementary Simplified Concentration Model, including the effects of workforce-unit size and performance-gap concentration, is examined in Section 4, particularly *Table 2* and *Figure 3*.

References

Aguinis, H. (2019). *Performance management* (4th ed.). Chicago Business Press.

Bakker, A. B., & Demerouti, E. (2007). The job demands–resources model: State of the art. *Journal of Managerial Psychology, 22*(3), 309–328. https://doi.org/10.1108/02683940710733115

Campbell, J. P., & Wiernik, B. M. (2015). The modeling and assessment of work performance. *Annual Review of Organizational Psychology and Organizational Behavior, 2*, 47–74. https://doi.org/10.1146/annurev-orgpsych-032414-111427

Kluger, A. N., & DeNisi, A. (1996). The effects of feedback interventions on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*(2), 254–284. https://doi.org/10.1037/0033-2909.119.2.254

Harter, J. (2026, July 21). Employee engagement remains flat as AI adoption accelerates. Gallup. https://www.gallup.com/workplace/712433/employee-engagement-remains-flat-adoption-accelerates.aspx

Wiener, N. (1948). *Cybernetics: Or control and communication in the animal and the machine*. MIT Press.