

From Maturity Scores to Diagnostic Configurations: A Multidimensional Kinetic Matrix for Public-Sector Digital Transformation.

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ABSTRACT

Public-sector digital assessment frequently emphasizes maturity levels and aggregate rankings, while managerial intervention requires a diagnosis of uneven capabilities, reform constraints, system dependencies, and rights protection. This article develops a Multidimensional Kinetic Matrix as a complementary diagnostic artifact. Following Design Science Research, six literature-derived requirements are translated into three organizational dimensions, an interdimensional variance measure, and three distinct computational mechanisms. A reform-velocity engine relates strategic enabling capacity to residual bureaucratic friction. An interoperability-gravity engine weights digital-system capability by downstream service dependencies. An equity corrector constrains technical impact through accessibility, neutrality, and the right to redress. Analytical evaluation uses prespecified synthetic scenarios, comparative profiles, sensitivity checks, and boundary tests. Organizations with the same average score can exhibit different imbalances; the velocity function remains bounded and responds systematically to lower friction; central digital nodes can be prioritized by their dependency structure; and deficient rights protection substantially reduces adjusted impact. The combined architecture thus distinguishes where an organization stands, how balanced it is, what impedes movement, where network leverage lies, and whether anticipated technical benefits meet an explicit equity constraint. These results establish diagnostic discriminability and internal computational coherence under explicitly specified controlled assumptions, not field effectiveness. Naturalistic evaluation is the subsequent research step.

Keywords: Design Science Research; configurational diagnosis; organizational asymmetry; public value; reform dynamics; interoperability governance; non-compensatory equity.

1. Introduction

Public administrations are no longer dealing only with digitizing forms or placing services online. Reform agendas now encompass shared platforms, data governance, interoperable information systems, automated processes, and new modes of interaction with citizens. As the object of reform has expanded, so has the need to evaluate it. Governments and researchers have relied on maturity models, international indices, and institutional reviews to locate organizations on development trajectories and to compare progress across settings (Layne & Lee, 2001; Andersen & Henriksen, 2006; United Nations, 2022; OECD, 2018). These instruments answer important benchmarking questions, but benchmarking is not the same task as diagnosing the internal configuration of change.

The distinction matters in practice. Two administrations can obtain the same average while facing very different managerial problems. One may combine strong technical capability with weak legal safeguards; another may be moderately developed but internally coherent. Heavy investment can also coexist with slow implementation when procurement, governance, legacy systems, or organizational resistance create friction. In addition, information systems do not operate as isolated assets: the value of one system may depend on how many services and organizations rely on it. A final difficulty concerns legitimacy. Technical performance can improve while accessibility, neutrality, or the right to redress deteriorates. An aggregate score is not designed to preserve all of these distinctions at once.

The problem addressed here is therefore narrower than a general critique of maturity models. The objective is to design a complementary instrument for situations in which the analyst needs to see the structure of transformation, not only its overall level. Such an instrument must keep distinct dimensions visible, identify asymmetries that averaging would erase, represent the balance between reform capacity and bureaucratic resistance, account for dependencies among digital systems, and prevent high technical performance from compensating for a serious rights failure. Morocco provides the institutional setting that motivated this design problem, particularly because previous policy analysis has documented simultaneous organizational, governance, and interoperability challenges (OECD, 2018). It is not treated as an empirical validation sample in this article.

The study is guided by the following question: how can a multidimensional and dynamic diagnostic artifact represent an organization's position, internal imbalances, and main transformation levers while yielding information that an aggregate maturity score necessarily loses?

Design Science Research (DSR) is used because the research problem is constructive: the intended output is an artifact with explicit design rules and testable behavior. The proposed Multidimensional Kinetic Matrix combines a three-dimensional organizational position, a dispersion indicator, and three mechanisms for reform velocity, interoperability gravity, and equity adjustment. Its evaluation is intentionally analytical. Controlled synthetic cases are defined in advance, together with acceptance criteria, sensitivity tests, and boundary conditions. The paper does not use interviews, questionnaires, organizational observations, or a real-administration dataset as evidence of effectiveness. Maintaining that boundary is methodologically important: evidence used to motivate a design problem should not be recycled as independent proof that the resulting artifact works.

The article makes a linked set of contributions rather than four separate claims. It reframes assessment from a single maturity position toward a configuration of non-substitutable dimensions; it adds movement and interdependence to what is usually a static representation; and it embeds an equity constraint directly in the computational architecture. In March and Smith's (1995) terms, the result is both a model and a method. For decision makers, the practical implication is equally specific: the diagnostic is meant to show where imbalance lies, what is slowing reform, which system has the greatest network leverage, and whether apparent technical gains remain compatible with public-sector rights and legitimacy.

2. Literature Review and Research Gap

2.1. What existing digital-government assessment frameworks measure

The best-known maturity models describe digital government as a sequence of increasingly sophisticated states. Layne and Lee (2001), for example, move from catalogue-type presence to vertical and horizontal integration, while Andersen and Henriksen (2006) revise the progression by separating customer orientation from technical integration. Their strength is

precisely this ordered logic: a complex transformation is made legible through a limited number of stages.

Composite indices answer a related but different question. Instruments such as the United Nations E-Government Development Index combine several national-level dimensions into a comparable measure (United Nations, 2022). Institutional reviews operate differently again: the OECD Digital Government Review of Morocco, for instance, provides a qualitative diagnosis and policy recommendations rather than a single maturity stage (OECD, 2018). None of these approaches is rejected here. The limitation arises only when an analyst tries to use an aggregation-oriented instrument for a configurational task that requires internal imbalances and dependencies to remain visible.

Table 1. Existing framework families and coverage of dynamic diagnostic needs

Framework family	Primary object	Non-compensation	Dynamics	Interdependencies	Formalized equity
Sequential maturity models (Layne & Lee; Andersen & Henriksen)	Development stage	No	No	No	No
Composite indices (United Nations)	Aggregated national level	No	No	Partial (infrastructure)	No
Institutional reviews (OECD)	Qualitative dimensions	Partial	No	Recommendations	General principles
Multidimensional Kinetic Matrix	Organizational configuration	Yes (dispersion)	Yes (force/friction)	Yes (dependency-weighted)	Yes (rights constraint)

Source: Author's elaboration.

2.2. Multidimensionality and non-compensation

Treating digital transformation as a purely technical phenomenon misses the organizational conditions through which technology becomes consequential. Systems are introduced into rule structures, routines, professional cultures, and distributions of power that shape adoption and use (Weber, 1922; Crozier & Friedberg, 1977). Neo-institutional research adds another complication: organizations may adopt visible structures because they are legitimate or expected, while operational practices remain only partially coupled to them (Meyer & Rowan, 1977; DiMaggio & Powell, 1983). A digitally sophisticated façade can therefore coexist with limited organizational transformation.

For measurement, the implication is straightforward but demanding. If legally, organizationally, and technically distinct dimensions are averaged, a very high value on one dimension can offset a critical weakness on another. Composite-indicator methodology has long recognized that compensation is a substantive assumption, not a neutral mathematical choice (Nardo et al., 2008). In public-sector digital transformation, there is little justification for assuming that weak legal safeguards can simply be traded against stronger infrastructure, or that technical capability can substitute without limit for organizational capacity.

2.3. Dynamics, bureaucratic friction, and interdependence

A second problem concerns time and movement. Maturity models usually show where an organization is positioned at a given moment; they say less about why two organizations at similar positions may move at very different speeds. Dynamic-capability theory draws attention to the capacity to reconfigure resources as conditions change (Teece, Pisano, & Shuen, 1997). Organizational sociology, meanwhile, treats resistance as more than individual reluctance: routines, institutional rigidity, and protected zones of uncertainty can create durable friction (Merton, 1940; Crozier & Friedberg, 1977). A dynamic diagnostic therefore needs some representation of both enabling force and resistance.

The third problem is relational. Public digital systems derive part of their value from the network in which they sit. An identity service, master-data register, or exchange platform may matter less because of its stand-alone functionality than because multiple services depend on it (Barney, 1991; Fountain, 2001). Network-externality theory further suggests that value may

rise non-linearly as connections and compatible uses accumulate (Katz & Shapiro, 1985). Evaluating each system independently can therefore obscure which modernization decision has the largest system-wide consequence.

2.4. Public value, legitimacy, and equity

Efficiency is also an incomplete criterion for public-sector transformation. Public value involves effectiveness, accessibility, legitimacy, and fair treatment, not only technical throughput (Moore, 1995). This becomes especially consequential when digital processes classify, prioritize, or automate administrative decisions. A system may be fast and technically reliable while remaining inaccessible to some users, reproducing biased patterns, or offering no meaningful mechanism for contestation (O’Neil, 2016). Equity and rights must therefore enter the assessment logic as constraints, not as a qualitative afterthought (Dunleavy et al., 2006; Janowski, 2015).

Across these literatures, four requirements recur. A useful configurational diagnostic must resist inappropriate compensation across dimensions, represent the balance between reform forces and organizational friction, recognize interdependencies among digital assets, and discount technical performance when core rights are not adequately protected.

2.5. Research gap and design requirements

The gap addressed in this paper is not a shortage of maturity measures. It is the lack, across the representative framework families reviewed here, of an integrated, explicitly formalized diagnostic that retains several different managerial signals without reducing them to one overall maturity number. Each signal has a non-interchangeable function: the three axes locate capability and institutional conditions; their variance identifies uneven development that an average conceals; the velocity relation distinguishes weak enabling force from residual obstacles; gravity reveals which digital nodes support critical downstream services; and the equity coefficient prevents technical performance from being interpreted in isolation from fundamental rights. Combining these components is necessary because an administration can be advanced on one register yet constrained on another, so no single output reliably substitutes for the others. The additional value is a traceable route from the observed configuration to differentiated intervention priorities, as demonstrated analytically in Section

5. The instrument therefore complements, rather than displaces, maturity rankings, composite indices, and institutional reviews. Because the research question concerns constructing an artifact, the literature is translated into design requirements rather than causal hypotheses.

Table 2. Design requirements derived from the literature

Requirement	Literature problem	Theoretical grounding	Design choice	Artifact component
DR1 Multidimensionality and constrained compensation	Averages can conceal structural imbalance	DiMaggio & Powell (1983); Nardo et al. (2008)	Keep three axes separate and retain dispersion	X, Y, Z; Atomic Stability
DR2 Reform force and friction	Static maturity does not represent movement	Merton (1940); Teece et al. (1997)	Model enabling force relative to bureaucratic friction	Reform Velocity Engine
DR3 Interdependence and priority	Systems are often assessed as stand-alone assets	Fountain (2001); Katz & Shapiro (1985)	Weight digital mass by downstream dependency	Interoperability Gravity Engine
DR4 Equity and legitimacy	Technical performance can coexist with exclusion	Moore (1995); O'Neil (2016)	Apply a non-compensatory rights coefficient	Equity Corrector
DR5 Decision usefulness	A diagnosis should differentiate intervention choices	van Aken (2004)	Link profile states to distinct managerial responses	Topological interpretation
DR6 Traceability	Design logic must be inspectable and reproducible	Hevner et al. (2004)	State equations, domains, and decision rules explicitly	Formal specification

Source: Author's elaboration.

3. Methodology

3.1. Design Science Research positioning

DSR is appropriate when the research objective is not only to describe a problem but to construct and evaluate an artifact intended to address it (Simon, 1996; Hevner et al., 2004). The study follows that logic pragmatically: rigor concerns the traceability of the design choices and the internal behavior of the artifact, whereas relevance concerns the class of managerial problems the artifact is intended to support (van Aken, 2004). The sequence broadly follows Peffers et al. (2007): problem identification, requirement derivation, design, demonstration, evaluation, and communication.

Under March and Smith's (1995) taxonomy, the Multidimensional Kinetic Matrix is both a model and a method. In Gregor and Hevner's (2013) terms, it is positioned as an improvement contribution. The problem—limitations of aggregate assessment for certain diagnostic decisions—is already established; the proposed novelty lies in the way non-compensatory dimensions, reform dynamics, dependency structure, and equity are assembled into a single decision architecture.

The evaluation strategy follows the artificial-evaluation logic of FEDS (Venable, Pries-Heje, & Baskerville, 2016) and the iterative build-evaluate view discussed by Sonnenberg and vom Brocke (2012). One methodological separation is maintained throughout: contextual evidence explains why the artifact may be needed, whereas evaluation evidence examines whether the artifact behaves as designed. Moroccan institutional observations belong to the first category. They are not reused as validation results. Accordingly, this paper makes no claim based on a human sample, field intervention, longitudinal administrative dataset, or naturalistic deployment.

3.2. Analytical evaluation protocol

The analytical protocol is deliberately simple enough to be falsifiable. For each property claimed by the design, an expected behavior is stated before the scenario is run. Synthetic inputs are then used to challenge that property. A test is recorded as concordant only when the output matches the pre-specified criterion. If the expected behavior is not observed, the result is treated as a design failure to be revised, not as an outcome to be reinterpreted after the fact.

Table 3. Analytical evaluation battery and a priori criteria

Component	Test	A priori criterion
Matrix	Two profiles with the same mean but opposite dispersion	Contrasting diagnoses
Velocity	Friction reduction versus force increase	Increasing marginal gains on the friction side
Velocity	Friction near lower bound	Velocity remains bounded; no divergence
Gravity	Star-shaped dependency topology	Central node identified as priority
Equity	Absence of effective redress	Equity coefficient sharply collapses

Source: Author's elaboration.

4. Artifact Design: The Multidimensional Kinetic Matrix

4.1. Three-dimensional organizational position

The core representation locates a public organization on three distinct axes: Cognitive Capacity (X), Institutional Fluidity (Y), and Structural Stability (Z). Each is scored on a bounded 1.0–5.0, positively oriented maturity scale: 1 indicates very weak or absent capability and 5 indicates strong capability relative to the defined rubric. Every subdimension must be supported by a consistent scoring justification. A low score is still a measurable organizational condition, not mathematical absence. The position is represented as:

$$P(X, Y, Z), \quad X, Y, Z \in [1, 5] \quad (1)$$

Each coordinate is the arithmetic mean of its own conceptually homogeneous subdimensions:

$$A = \frac{1}{N_A} \sum_{i=1}^{N_A} S_i \quad (2)$$

For an axis $A \in \{X, Y, Z\}$, S_i denotes the positively oriented 1–5 score for subdimension i and N_A is the number of subdimensions composing that axis. Arithmetic averaging is confined to items within the same conceptually homogeneous axis. The design does not then average X, Y, and Z into one diagnostic score; a cross-axis average is used below only as the reference needed to compute dispersion.

Table 4. Axes and subdimensions of the Multidimensional Kinetic Matrix

Axis	Meaning	Illustrative subdimensions	Theoretical anchoring
X – Cognitive Capacity	Technical ability to deploy and evolve digital systems	Infrastructure; data governance; automation; application interoperability	Williamson (1975); Barney (1991)
Y – Institutional Fluidity	Organizational and cultural ability to absorb change	Leadership; change management; user-centered design; digital literacy	Schein (1985); Davis (1989); Hiatt (2006)
Z – Structural Stability	Legal and ethical robustness of digital transformation	Legislation; cybersecurity; ethics of automation	Weber (1922); constitutional obligations

Source: Author's elaboration.

4.2. Atomic Stability: detecting interdimensional imbalance

Atomic Stability is the label given to the assessment of cross-axis balance, operationalized here by population variance across the three axis scores. In this specification the numerical output is dispersion, not a direct stability index: lower variance indicates greater balance, whereas higher variance indicates greater internal asymmetry. For $x_i \in \{X, Y, Z\}$, define the cross-axis mean as $m = (X + Y + Z)/3$ and let $N = 3$:

$$m = \frac{X+Y+Z}{3}, \quad \sigma^2 = \frac{1}{3} \sum_{i=1}^3 (x_i - m)^2 \quad (3)$$

Variance preserves information about profile shape that would disappear in an aggregated maturity measure. A high value identifies divergence among axes, including cases where strong digital capability coexists with weak legal and ethical safeguards. The label “Atomic Stability” should therefore be read as the name of the diagnostic module; high σ^2 means low interdimensional balance, not high stability. The associated categories (from harmonized to fractured) are transparent, heuristic interpretation rules rather than empirically estimated cut-offs. Since dispersion alone does not impose a mathematical veto, non-compensatory protection of fundamental rights is separately introduced through the Equity Corrector.

4.3. Reform Velocity Engine

The Reform Velocity Engine is an indicative index of movement potential rather than an observed speed or causal forecast. It expresses reform-enabling capacity relative to residual bureaucratic friction:

$$v = \frac{\kappa F_s}{\mu_b} \quad (4)$$

In Equation (4), v is indicative reform velocity, F_s is Strategic Force, μ_b is residual Bureaucratic Friction, and κ is a dimensionless systemic adjustment factor fixed at 1.0 in this analytical demonstration. κ is not presented as an empirically estimated parameter. Strategic Force combines positively oriented 1–5 capability scores for leadership commitment (L^c), procurement agility (P^d), and innovation support (I^s). Weights w_1 , w_2 and w_3 are non-negative and normalized within this component:

$$F_s = w_1 L^c + w_2 P^d + w_3 I^s, \quad \sum_{i=1}^3 w_i = 1 \quad (5)$$

The denominator captures residual friction, but its input scores must not be confused with direct measurements of obstacles. T^l , C^m and L^f are positively oriented 1–5 maturity ratings for the ability to manage technical debt, mitigate resistance to change, and adapt legal and administrative procedures, respectively. Thus, a high T^l means strong technical-debt management, not high debt; the same convention applies to C^m and L^f . Each capability score S is converted to a residual-obstacle score by $f = 6 - S$. A higher capability rating therefore produces less residual friction. Weights w_4 , w_5 and w_6 are non-negative and sum to one within the friction component:

$$\mu_b = w_4 (6 - T^l) + w_5 (6 - C^m) + w_6 (6 - L^f), \quad \sum_{i=4}^6 w_i = 1 \quad (6)$$

This distinction between input maturity and transformed friction is essential. For example, a capability score of 4 corresponds to residual friction 2, whereas a capability score of 2 corresponds to residual friction 4. If an instrument instead records a direct obstacle-severity score (5 meaning severe debt or resistance), those direct values must be reoriented before applying Equation (6); otherwise the sign of the diagnosis is inverted. With F_s and μ_b in $[1,5]$, $\kappa = 1$, and the weights normalized as above, v increases with F_s and decreases with μ_b while

remaining finite ($0.2 \leq v \leq 5$). For comparative planning, the model can also express indicative time-to-value:

$$\Delta t = \frac{\|D\|}{v} \quad (7)$$

Here $\|D\|$ denotes a non-negative normalized distance to a declared target configuration and Δt is an indicative relative effort-to-target quantity, not elapsed calendar time. Comparisons assume the same distance convention across cases. Neither v nor Δt has been calibrated against observed administrative completion dates.

4.4. Interoperability Gravity Engine

The Interoperability Gravity Engine addresses a relational decision: which digital node creates the greatest system-level leverage because critical services depend on it? For each digital system k , its digital mass M_k combines three positively oriented 1–5 scores: interface interoperability (IA_k), master-data management (MDM_k), and legal authorization for data exchange (LA_k). The node-level mass is:

$$M_k = \frac{IA_k + MDM_k + LA_k}{3} \quad (8)$$

A capable system is not necessarily a high-leverage one: its downstream service dependencies also matter. Let S_k be the set of services depending on node k , and let $q_{kj} \in [0,1]$ be the separately documented criticality weight of dependent service j . These service-criticality weights are deliberately denoted by q to distinguish them from the normalized component weights w used in the velocity model. The resulting gravity proxy is:

$$G_k = M_k \sum_{j \in S_k} q_{kj}, \quad q_{kj} \in [0,1] \quad (9)$$

The service weights q_{kj} are additive rather than constrained to sum to one, so G_k may exceed the mass of an individual node when several critical services rely on it. Greater G_k indicates greater potential system-level leverage or exposure; it is a prioritization input, not an automatic instruction to intervene regardless of documented failure, cost, or legal requirements. The gravitational analogy does not assert a physical law. A usable ranking requires a defensible dependency graph and documented weights; where either is unavailable, outputs remain conditional.

4.5. Non-compensatory Equity Corrector

The Equity Corrector introduces a rights-related constraint that cannot be replaced by a high technical score. I_t denotes an unadjusted, non-negative technical impact proxy and I_s the same proxy after explicit equity adjustment; ε is a unitless coefficient in $[0,1]$:

$$I_s = I_t \varepsilon, \quad \varepsilon \in [0,1] \quad (10)$$

The coefficient ε aggregates three normative dimensions: universal accessibility (E_a), algorithmic neutrality (E_β), and effective right to redress (E_r). All three must first be normalized on the same scale before entering the geometric mean:

$$\varepsilon = (E_a E_\beta E_r)^{1/3} \quad (11)$$

For each rights-related raw maturity rating $S \in [1,5]$, the normalized input is $E = \max\{0.01, (S - 1)/4\}$. Thus E_a , E_β and E_r each lie in $[0.01,1]$, with a higher value indicating stronger protection. The geometric mean limits compensation: a near-zero value on one right substantially reduces ε even if the other two reach 1. The 0.01 computational floor creates a quasi-veto rather than a strict zero veto, a distinction retained in the test results and managerial reading. No empirical welfare effect is inferred from this illustrative coefficient.

4.6. Integrated decision logic

The components are used as complementary views of one diagnostic case, not merged into another composite score. The three coordinates and Atomic Stability flag uneven organizational development; the Reform Velocity Engine separates insufficient strategic force from residual friction; the Interoperability Gravity Engine ranks potential system leverage within documented dependency networks; and the Equity Corrector checks whether projected technical impact remains defensible under rights-related constraints. Reading all four outputs is necessary to distinguish intervention types. The sequence from input collection to corrective action is described in Section 6.2.

5. Analytical Evaluation Results

5.1. Discriminability at identical aggregate scores

The first test was designed to reproduce the situation in which averaging is least informative. Organization A is assigned $X = 4.5$, $Y = 4.0$, and $Z = 1.0$. The mean is 3.167 (3.17 after rounding), but the variance is 2.39. Organization C receives $X = Y = Z = 3.167$. Its mean is identical and its variance is zero. A conventional average therefore treats the two cases as equivalent. The proposed diagnosis does not: A is classified as fractured because a very weak structural-stability score sits beside strong technical and organizational scores, whereas C represents a balanced, intermediate configuration. The example does not prove empirical superiority; it demonstrates that the artifact preserves information the mean necessarily discards.

Table 5. Equal mean, different configuration: synthetic discriminability test

Profile	X	Y	Z	Mean	Variance	Kinetic interpretation
Organization A	4.50	4.00	1.00	3.17	2.39	Fractured: advanced capability with minimal structural stability
Organization C	3.167	3.167	3.167	3.17	0.00	Balanced: homogeneous intermediate development

Source: Author's elaboration from controlled synthetic scenarios.

5.2. Sensitivity and robustness of the velocity engine

The velocity test uses already transformed residual-friction values μ_β , not the original positively oriented capability scores T^l , C^m and L^f . Holding Strategic Force $F_s = 3.0$ and $\kappa = 1.0$, reducing μ_β from 4.5 to 3.5 raises v from 0.667 to 0.857 (gain 0.190). Reducing μ_β to 2.5 raises v to 1.200 (additional gain 0.343), and reducing it to 1.5 raises v to 2.000 (additional gain 0.800). These changes in μ_β can be induced, for example, by higher positively oriented maturity scores after the 6 – S recoding. By contrast, at fixed $\mu_\beta = 4.5$, a one-point increase in F_s adds $1/4.5 = 0.222$ to v ; that marginal change depends on the fixed friction level. This comparison demonstrates convex response to equal reductions in residual friction along the specified path, not universal superiority of all friction-reduction actions. In the same illustration, increasing v from approximately 0.67 to 1.50 is attainable by reducing μ_β from 4.5

to 2.0 at $F_s = 3.0$, whereas keeping $\mu_\beta = 4.5$ would require $F_s = 6.75$, outside the stated scale. Within the admissible inputs, the function remains continuous, monotonic, and bounded.

5.3. Interoperability prioritization

The interoperability test uses a synthetic star-shaped dependency network. For nodes with comparable M_k , the center with the largest sum of documented downstream criticality weights is expected to have the highest G_k . Equation (9) reproduces that ordering by construction. The result demonstrates internal consistency with the stated prioritization rule, not empirical proof that the selected weights or dependencies are correct. In practice, administrative system inventories, interface maps, service ownership information and criticality assessments would be required before turning this output into an investment priority.

5.4. Adversarial equity test

The equity mechanism is tested adversarially by holding technical impact constant while degrading rights-related inputs. With raw impact fixed at 100, a configuration scored at 4.5 for accessibility, 4.0 for neutrality, and 4.2 for redress yields $\varepsilon = 0.807$ and an adjusted impact of 80.7. A technically identical configuration scored at 2.0, 1.5, and 1.0 respectively yields $\varepsilon = 0.068$ and an adjusted impact of 6.8. The contrast is intentional: it checks whether technical strength can mask a severe rights failure. It cannot. Even if accessibility and neutrality are maximized, placing redress at its floor lowers the coefficient to 0.215. The mechanism therefore behaves as a strong non-compensatory constraint within the chosen normalization rule.

Table 6. Summary verdicts of the analytical evaluation

Property tested	Observed behavior	Verdict
Discriminability at identical mean	Contrasting diagnoses for A and C	Concordant
Velocity sensitivity	Increasing marginal gains from friction reduction	Concordant
Velocity boundedness	No divergence; friction remains ≥ 1	Concordant
Interoperability prioritization	Central node identified in star topology	Concordant
Equity quasi-veto	Adjusted impact sharply reduced when redress fails	Concordant

Source: Author's elaboration.

Taken together, these tests establish a limited but useful result. Under controlled inputs, the artifact behaves consistently with the design requirements used to construct it: it preserves configurational differences, remains formally stable, identifies network leverage, and penalizes serious equity failures. The tests do not establish predictive accuracy, causal effects, organizational adoption, or effectiveness in real administrations. Those claims require a different evaluation setting.

6. Discussion

6.1. Scientific contribution

The main conceptual move is from maturity as a scalar position to transformation as a configuration. Once dispersion is retained, the diagnostic no longer treats identical averages as identical organizational states. This operationalizes a problem long recognized in institutional analysis: formal adoption and substantive organizational integration may diverge (DiMaggio & Powell, 1983). The geometry of the three-axis profile makes that divergence visible instead of burying it inside an overall score.

The methodological contribution is the articulated use of five informational registers: position, dispersion, dynamics, interdependence and equity. None of their individual operators is claimed to be new; variance, weighted sums, ratios and geometric means are established techniques. The design contribution lies in assigning each an irreducible decision function and making their interpretation traceable without collapsing them into a final average. That distinction enables targeted diagnoses for profiles that conventional aggregated scoring would otherwise classify together.

The DSR contribution is therefore a set of traceable design propositions as much as it is the matrix itself. Each problem identified in the literature is linked to a design requirement, and each requirement is linked to an observable artifact behavior. That chain makes the design open to criticism and revision. Subsequent naturalistic evaluations can challenge the thresholds, weights, and even the choice of dimensions without having to accept the artifact as a finished model.

6.2. Managerial implications

For a public manager, the matrix is intended to convert heterogeneous evidence into a transparent sequence of diagnostic decisions. First, define the administrative unit, the evaluation period and an assessment rubric, then gather documentary and operational evidence for each subdimension from service inventories, process descriptions, governance documents, accessibility audits and legal-compliance records. The analyst assigns positively oriented 1–5 scores, records the evidence and scorer for each entry, and calculates X , Y , Z and σ^2 . Second, scores of reform-enabling capabilities and capacity to control obstacles are collected separately. The latter are reversed into residual-friction values using $f = 6 - S$ before calculating v . Third, a dependency inventory identifies nodes k , dependent services S_k and documented q_{kj} weights for gravity calculations. Fourth, accessibility, neutrality and redress are evaluated, normalized and incorporated in ε before interpreting technical impact. This operational sequence is a proposed application protocol, not a reported deployment in an administration.

The manager then reads the output in an explicit order: a highly dispersed three-axis profile calls for verification and reinforcement of the lagging dimension; low v resulting from high residual friction suggests simplifying procedures, managing legacy debt or improving coordination rather than simply increasing strategic inputs; high G_k directs a closer assessment of the shared component that supports critical services; and low ε requires corrective action on accessibility, neutrality or redress before unqualified claims of public value. Interventions are selected with their evidence, responsible unit, cost and legal constraints recorded in a decision log. Reassessment with the same rubric can then document whether the profile and its mechanisms changed. The sequence provides an auditable managerial workflow, not a promise that these interventions will be effective without naturalistic testing.

6.3. Positioning relative to prior work

Relative to prior work, the matrix extends the move away from purely sequential accounts of digital government toward more contextual and relational interpretations (Janowski, 2015). It also gives formal expression to concerns that are implicit in digital-era governance, particularly integration across organizational boundaries and the public consequences of digital infrastructures (Dunleavy et al., 2006). Following Gregor and Hevner (2013), the

contribution is best classified as an improvement: existing maturity and benchmarking frameworks remain useful for their original purposes, while the proposed artifact addresses a narrower configurational problem they were not designed to solve.

6.4. Limitations and future naturalistic validation

The present study has five important limits. The first is evidentiary: the artifact has not yet been evaluated naturalistically, so no claim of real-world effectiveness is warranted. Second, κ , several component weights, stability thresholds, and classification boundaries are heuristic choices rather than parameters estimated from observed administrative data. Third, the quality of the output cannot exceed the quality of the input; ordinal self-assessments may be affected by desirability bias or inconsistent scoring practices. Fourth, the 0.01 normalization floor makes the equity rule a near-veto rather than an absolute veto. Fifth, reducing organizational transformation to three axes is necessarily selective and leaves aside dimensions that may matter in specific settings, including financial capacity, territorial variation, and environmental effects.

The next research cycle should therefore move from analytical behavior to naturalistic evaluation. Applying the artifact across heterogeneous public organizations would allow the provenance of each score to be documented, real dependency graphs to be reconstructed, and changes in configuration to be followed over time. Field use should also test whether decision makers interpret the outputs consistently and whether the thresholds and weights remain defensible outside the synthetic cases used here. Expert review can improve conceptual relevance and intelligibility, but it should be treated as one source of design feedback, not as evidence of causal or predictive validity.

7. Conclusion

This paper developed a Multidimensional Kinetic Matrix as a complement to aggregate maturity assessment in public-sector digital transformation. The design keeps three organizational dimensions separate, uses variance to retain information about imbalance, represents reform movement through a force-friction relation, ranks interdependent systems through a network-weighted gravity mechanism, and adjusts technical impact through a non-compensatory equity coefficient. The analytical tests support the internal logic of those choices: equal averages can conceal different organizational states, the velocity function remains bounded within its stated domain, structurally central nodes receive higher priority, and a severe rights failure materially reduces adjusted impact. That is the extent of the present claim. The matrix has shown analytical coherence, not field effectiveness. Its value as a management instrument now depends on naturalistic evaluation in real public organizations, where the model's calibration, usability, and explanatory usefulness can be tested against observed reform trajectories.

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