

# **The Marres–Ramjet Fusion Model:**

An Interpretable Strategic Allocation Framework

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## Abstract

Firms allocate finite strategic resources under conditions of incomplete visibility, uneven operational readiness, varying propagation efficiency, and decaying accumulated goodwill. Existing allocation frameworks frequently treat marketing activation, operational capacity, and long-term organizational memory as partially disconnected systems, while many contemporary predictive approaches sacrifice interpretability for optimisation flexibility.

The Marres–Ramjet Fusion Model proposes an interpretable strategic allocation framework integrating structural investment, activation dynamics, absorptive capacity, propagation effects, market visibility, and intertemporal goodwill persistence within a unified state-dependent system. Observable and proxy-derived organizational conditions are mapped into dynamic strategic regimes including structure-starved, jet-starved, atmosphere-limited, and balanced states.

Within the framework, activation effectiveness is constrained by absorptive readiness rather than assumed to scale indefinitely with expenditure. Accumulated goodwill evolves through realized strategic lift and decay dynamics, introducing path dependence into organizational growth behaviour. The canonical specification further introduces an identifiable reparameterisation of the atmosphere expansion system designed to improve calibration stability while preserving behavioural coherence.

Validation experiments demonstrate stable parameter recoverability, bounded degradation under noise, and coherent emergence of distinct allocation regimes. Historically anchored demonstrations further illustrate coherent allocation responses and goodwill trajectories under differing strategic conditions.

The framework is designed not as a deterministic forecasting engine, but as an interpretable strategic simulation system for allocation reasoning, organizational diagnostics, sensitivity analysis, and inspectable modelling under partial observability.

**Keywords:** strategic allocation, interpretable simulation, systems dynamics, absorptive constraints, goodwill dynamics, market power, organizational growth, state-dependent optimization, strategic regimes, computational strategy, AI-assisted interpretation

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# 1 Purpose and Scope

Firms allocate finite strategic resources under conditions of incomplete visibility, varying operational readiness, uneven propagation efficiency, and decaying accumulated goodwill. Traditional allocation models often separate marketing activation, operational capacity, and long-term strategic memory into disconnected systems.

The Marres–Ramjet Fusion Model proposes an integrated allocation framework in which growth emerges from the interaction between:

- structural investment,
- activation investment,
- absorptive capacity,
- referral propagation,
- market visibility,
- accumulated goodwill.

The framework is designed to convert observable or proxy-derived organizational conditions into interpretable strategic-state approximations and dynamic allocation behaviour.

The model is not intended as a deterministic forecasting engine. Instead, it provides:

- structured allocation reasoning,
- regime classification,
- sensitivity analysis,
- inspectable organisational estimates.

The canonical specification introduces an identification correction to the structural expansion function, improving calibration stability while preserving behavioural dynamics.

## 1.1 Interpretive Position

The framework prioritizes interpretability and explicit state representation over purely predictive optimisation. The objective is not to eliminate strategic judgement, but to transform qualitative organizational conditions into transparent allocation dynamics.

Canonical terminology throughout the paper uses operational language such as “activation investment,” “structural investment,” and “goodwill stock.” Earlier metaphorical terminology, including “jet,” “structure,” and “memory,” is retained only as shorthand and internal explanatory language.

## 1.2 Canonical Scope

The canonical framework consists of:

- observable-state assignment,
- strategic allocation dynamics,
- atmosphere formation,
- effective activation constraints,
- goodwill accumulation and decay,
- regime classification,
- identifiable calibration structure.

Subsequent overload penalties, nonlinear fragility mechanisms, and advanced operationalization layers are treated as research extensions rather than canonical requirements of the base model.

## 1.3 Historical Lineage and Conceptual Origins

The conceptual origins of the present framework emerged from earlier applied research investigating customer retention, experiential branding, operational readiness, and strategic imbalance within specialty food-and-beverage markets [3].

In particular, prior thesis work examining retention asymmetries, service elasticity, propagation dynamics, and atmosphere-driven customer behaviour within Indonesia’s premium tea market revealed recurring patterns of constrained organizational growth under conditions of partial observability [3].

Several interpretive components of the present framework — including visibility imbalance, propagation-sensitive growth behaviour, absorptive constraints, and persistent goodwill dynamics — were initially observed in applied empirical form prior to their later formalisation into the canonical Marres–Ramjet specification.

The present paper substantially extends and restructures these earlier foundations into a generalized interpretable allocation framework with explicit state-dependent elasticities, atmosphere-constrained activation dynamics, and intertemporal goodwill persistence.

# 2 Canonical Allocation Framework

## 2.1 Budget Constraint

Let total deployable strategic expenditure be denoted by  $B$ . The model allocates this budget between structural investment  $R$  and activation investment  $J$ :

$$R + J = B, \tag{1}$$

subject to:

$$R \geq 0, \quad J \geq 0. \tag{2}$$

Structural investment represents expenditures that expand absorptive readiness, operational resilience, conversion capacity, or long-term strategic infrastructure.

Activation investment represents expenditures intended to generate immediate visibility, traffic, demand generation, or audience activation.

## 2.2 Observable Strategic State Variables

The framework models firm behaviour using a partially observable strategic state vector:

$$x = (C, V, R_m, L), \tag{3}$$

where:

- $C \in [0, 1]$  denotes conversion capacity,
- $V \in [0, 1]$  denotes visibility gap,
- $R_m \geq 0$  denotes referral propagation efficiency,
- $L \in [0, 1]$  denotes market power.

These variables are not treated as perfectly measurable latent truths, but as interpretable strategic approximations derived from observable or proxy-supported organizational indicators.

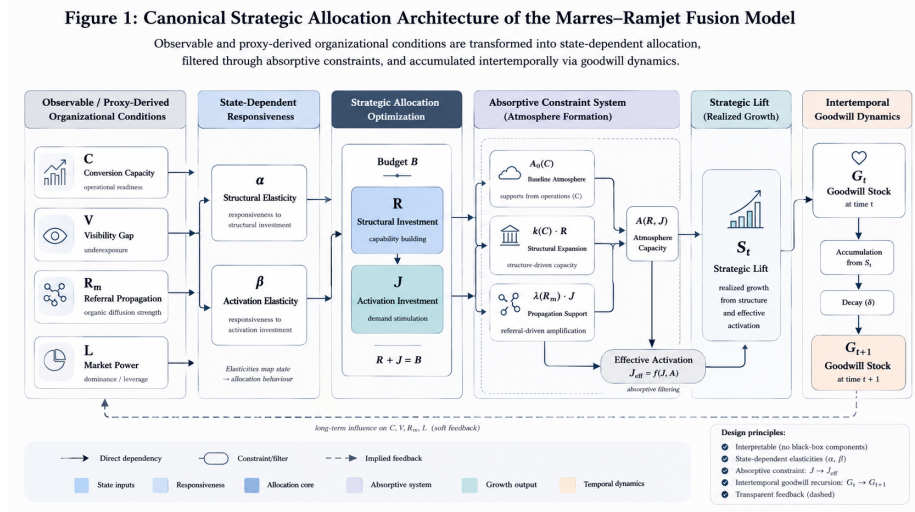


Figure 1: Canonical strategic allocation architecture of the Marres–Ramjet Fusion Model.

## 2.3 Conversion Capacity

**Definition 1.** *Conversion capacity represents the firm’s ability to absorb demand, retain customers, and convert activation into realised value.*

Let  $D_i \in [0, 10]$  denote observable domain scores and let  $e_i > 0$  denote domain elasticities.

Normalized elasticity weights are defined as:

$$w_i = \frac{e_i}{\sum_j e_j}. \quad (4)$$

Conversion capacity is then defined as:

$$C = \frac{\sum_i w_i D_i}{10}. \quad (5)$$

Interpretation:

- $C \approx 0$ : weak operational conversion capability,
- $C \approx 1$ : strong operational conversion capability.

## 2.4 Visibility Gap

**Definition 2.** *Visibility gap measures relative underexposure between organizational capability and observable market awareness.*

Let  $x_{b,i}$  denote observable network metrics such as followers, reviews, mentions, locations, or distribution nodes.

Normalized network visibility is defined as:

$$N_b = \sum_i w_i \cdot \frac{\log(1 + x_{b,i})}{\log(1 + x_{\max,i})}. \quad (6)$$

The visibility gap is then:

$$V = 1 - N_b. \quad (7)$$

Interpretation:

- high  $V$ : underexposed or hidden firm,
- low  $V$ : already highly visible firm.

## 2.5 Referral Propagation

**Definition 3.** *Referral propagation measures the efficiency with which existing organizational activity generates additional organic expansion.*

Referral propagation is defined as:

$$R_m = \frac{\text{referral conversions}}{\text{active customers}}. \quad (8)$$

Where sufficient data are available, an optional decomposition is:

$$R_m = \left( \frac{\text{invites}}{\text{customers}} \right) \left( \frac{\text{conversions}}{\text{invites}} \right). \quad (9)$$

## 2.6 Market Power

**Definition 4.** *Market power represents pricing strength, network dominance, or default-choice advantage relative to competing firms.*

Network share is defined as:

$$N_{\text{share}} = \frac{N_b}{\max_j N_{b,j}}. \quad (10)$$

Revenue share is defined as:

$$Y_{\text{share}} = \frac{\text{firm revenue}}{\max_j \text{competitor revenue}_j}. \quad (11)$$

Hybrid market power is then defined as:

$$L = \rho N_{\text{share}} + (1 - \rho) Y_{\text{share}}, \quad (12)$$

where  $\rho \in [0, 1]$  controls the relative weighting between network dominance and revenue dominance.

If revenue data are unavailable:

$$L = N_{\text{share}}. \quad (13)$$

## 2.7 Origins of Market Power

Earlier developmental formulations of the framework operationalized market power using Lerner-style pricing power approximations derived from classical industrial organization economics.

In its canonical form, the framework generalizes this interpretation into a broader market power proxy capable of incorporating not only pricing strength, but also network dominance, revenue concentration, distribution reach, and default-choice advantage under partially observable organizational conditions.

This generalization was adopted to improve operational flexibility across heterogeneous organizational environments in which direct marginal-cost estimation may be unstable, unavailable, or conceptually insufficient for capturing strategic dominance dynamics.

Accordingly, the canonical framework treats market power as an interpretable state-dependent organizational condition rather than a strictly singular economic quantity.

Nevertheless, the earlier Lerner-style interpretation remains conceptually relevant to the framework’s elasticity structure. Firms possessing stronger pricing leverage, competitive insulation, or dominant strategic positioning are assumed to exhibit greater structural compounding efficiency and reduced marginal dependence on activation expenditure.

The present formulation therefore preserves the economic intuition underlying earlier Lerner-inspired interpretations while extending the operationalization layer toward broader operating approximation under incomplete information conditions.

## 2.8 Parameter Mapping

The observable strategic state variables are mapped into allocation elasticities that determine the relative effectiveness of structural and activation investment within the growth system.

### 2.8.1 Structural Elasticity

Structural elasticity is defined as:

$$\alpha = \text{clamp}(L, \alpha_{\min}, \alpha_{\max}), \quad (14)$$

where:

- $L \in [0, 1]$  denotes market power,

- $\alpha_{\min} > 0$  prevents structural irrelevance,
- $\alpha_{\max} < 1$  prevents complete structural dominance.

Interpretation:

- higher market power increases the effectiveness of structural investment,
- dominant firms benefit more strongly from reinforcing existing organizational infrastructure,
- lower market power reduces the compounding efficiency of structural allocation.

### 2.8.2 Activation Elasticity

Activation elasticity is defined as:

$$\beta = \text{clamp}(V(1 - \eta L), \beta_{\min}, \beta_{\max}), \quad (15)$$

where:

- $V \in [0, 1]$  denotes visibility gap,
- $\eta \in [0, 1]$  denotes activation dampening sensitivity,
- $\beta_{\min} > 0$  prevents activation irrelevance,
- $\beta_{\max} < 1$  prevents complete activation dominance.

Interpretation:

- activation effectiveness increases under higher visibility gaps,
- strong market power dampens the marginal effectiveness of additional activation,
- firms with low visibility but strong conversion capacity tend toward activation-heavy allocation regimes.

### 2.8.3 Role of Elasticities

The elasticities  $\alpha$  and  $\beta$  do not represent immutable economic constants. Instead, they function as interpretable strategic responsiveness parameters derived from observable organizational conditions.

The framework therefore treats allocation behaviour as state-dependent rather than universally fixed. Changes in visibility, market power, or organizational readiness alter the relative effectiveness of structural and activation expenditure over time.

## 2.9 Atmosphere Formation

**Definition 5.** *Atmosphere capacity represents the firm's absorptive ceiling: the maximum activation intensity that can be operationally sustained without severe inefficiency or overload.*

Atmosphere capacity is defined as:

$$A(R, J) = A_0(C) + k(C)R + \lambda(R_m)J, \quad (16)$$

where:

- $A_0(C)$  denotes baseline absorptive readiness,
- $k(C)R$  represents structurally generated atmosphere expansion,
- $\lambda(R_m)J$  represents propagation-assisted activation support.

### 2.9.1 Baseline Atmosphere Capacity

Baseline atmosphere capacity is defined as:

$$A_0(C) = B \cdot \sigma(\gamma(C - \tau_C)), \quad (17)$$

where:

- $\sigma(\cdot)$  denotes the sigmoid function,
- $\gamma > 0$  controls transition steepness,
- $\tau_C \in [0, 1]$  denotes the absorptive threshold parameter.

Interpretation:

- low conversion capacity suppresses baseline absorption,
- high conversion capacity increases sustainable activation capacity,
- the sigmoid structure produces gradual rather than discontinuous transition behaviour.

### 2.9.2 Structural Expansion Efficiency

Structural expansion efficiency is defined as:

$$k(C) = k_{\text{floor}} + k_{\text{scale}}(1 - C), \quad (18)$$

where:

$$k_{\text{floor}} = 0.05 \quad (19)$$

is treated as a fixed identification convention.

Interpretation:

- low conversion capacity increases the marginal effectiveness of structural investment,
- high conversion capacity reduces additional structural responsiveness,
- $k_{\text{floor}}$  preserves minimum structural responsiveness even under highly mature operational states.

### 2.9.3 Propagation Efficiency

Propagation efficiency is defined as:

$$\lambda(R_m) = \lambda_{\max} (1 - e^{-R_m}), \quad (20)$$

where:

- $\lambda_{\max}$  denotes the maximum propagation efficiency ceiling,
- $R_m$  denotes referral propagation efficiency.

Interpretation:

- stronger referral propagation increases activation sustainability,
- propagation support exhibits diminishing marginal amplification,
- propagation-assisted atmosphere expansion remains upper bounded.

### 2.9.4 Interpretive Implication

The atmosphere system introduces an absorptive constraint absent from standard allocation frameworks.

Activation effectiveness is therefore treated as operationally conditional rather than infinitely scalable. Structural investment, conversion readiness, and propagation efficiency jointly determine the firm's sustainable activation boundary.

## 2.10 Effective Activation

**Definition 6.** *Effective activation represents the realizable component of activation expenditure after absorptive constraints are applied.*

Effective activation is defined as:

$$J_{\text{eff}} = \min(J, A(R, J)). \quad (21)$$

Interpretation:

- if  $J \leq A(R, J)$ , activation remains fully absorbable,
- if  $J > A(R, J)$ , excess activation becomes operationally inefficient,
- activation effectiveness is therefore bounded by atmosphere capacity rather than raw expenditure alone.

### 2.10.1 Operational Interpretation

The framework assumes that visibility generation alone does not guarantee proportional realized growth.

Under insufficient absorptive readiness:

- operational bottlenecks may emerge,
- conversion efficiency may deteriorate,
- customer experience may weaken,
- and marginal activation productivity may decline.

Effective activation therefore represents activation that can be operationally sustained and converted into realized strategic lift.

### 2.10.2 Interpretive Implication

Standard allocation systems frequently assume that activation scales monotonically with expenditure.

The present framework instead treats activation as conditionally effective. Growth is therefore constrained not only by expenditure magnitude, but by the interaction between structural readiness, propagation efficiency, and absorptive capacity.

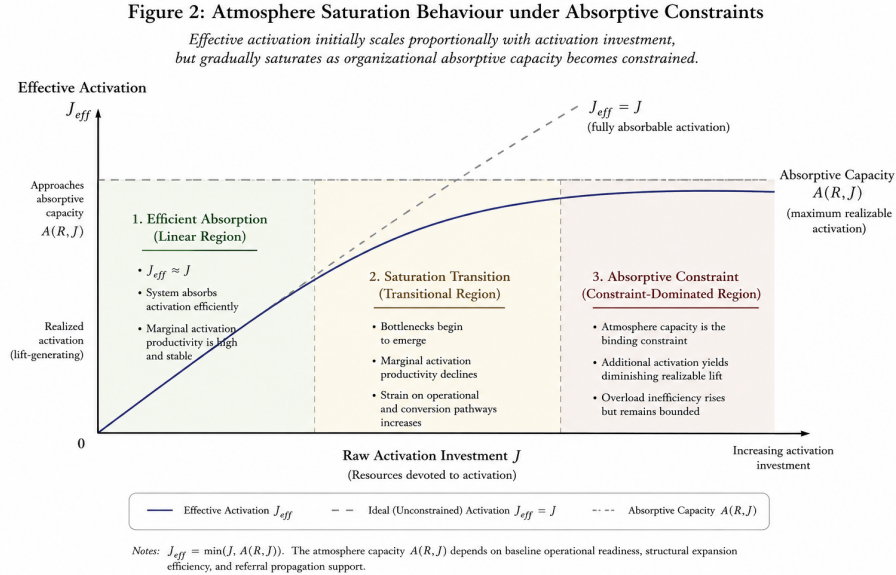


Figure 2: Atmosphere saturation behaviour under absorptive constraints.

## 2.11 Growth Function

**Definition 7.** *Strategic lift represents realized growth generated through the interaction between structural investment, effective activation, and strategic state conditions.*

### 2.11.1 Canonical Deployment Form

The canonical deployment form is defined as:

$$S_t = \phi \cdot [\log(1 + R_t)]^\alpha [\log(1 + J_{\text{eff},t})]^\beta, \quad (22)$$

where:

- $S_t$  denotes realized strategic lift at time  $t$ ,
- $\phi > 0$  denotes global scaling efficiency,
- $\alpha$  denotes structural elasticity,
- $\beta$  denotes activation elasticity.

Interpretation:

- structural and activation investment interact multiplicatively,
- both components exhibit diminishing marginal returns,
- realized activation is constrained through  $J_{\text{eff}}$ ,
- growth therefore depends on both expenditure magnitude and absorptive feasibility.

### 2.11.2 Analytical Approximation

For analytical tractability, a Cobb–Douglas approximation may also be used:

$$S_t = R_t^\alpha J_{\text{eff},t}^\beta. \quad (23)$$

This approximation preserves the multiplicative interaction structure while simplifying optimization analysis.

### 2.11.3 Interpretive Implication

The growth system assumes that realized strategic lift emerges from the interaction between:

- operational structure,
- activation intensity,
- absorptive readiness,

- and strategic state conditions.

The framework therefore rejects purely linear expenditure assumptions. Additional investment produces progressively smaller marginal lift under increasing deployment scale.

## 2.12 Optimization Problem

The framework allocates strategic expenditure between structural investment and activation investment in order to maximize realized strategic lift.

The canonical optimization problem is:

$$\max_{R, J \geq 0} S(R, J) \quad \text{subject to} \quad R + J = B. \quad (24)$$

Substituting the canonical deployment form:

$$\max_{R, J \geq 0} \phi \cdot [\log(1 + R)]^\alpha [\log(1 + J_{\text{eff}})]^\beta, \quad (25)$$

subject to:

$$J_{\text{eff}} = \min(J, A(R, J)), \quad (26)$$

and:

$$R + J = B. \quad (27)$$

### 2.12.1 Structural Connotations

The optimization system does not assume that immediate activation expenditure is universally optimal.

Instead, optimal allocation depends on:

- absorptive readiness,
- conversion capacity,
- propagation efficiency,
- visibility conditions,
- and diminishing marginal returns.

Under weak absorptive conditions, structural investment may dominate despite lower short-term visibility generation.

Under high conversion capacity and large visibility gaps, activation-heavy allocation may become optimal.

### 2.12.2 Conditional Allocation Behaviour

The optimization system therefore produces state-dependent allocation behaviour rather than fixed expenditure ratios.

Changes in visibility, conversion capacity, propagation efficiency, or market power alter the relative productivity of structural and activation investment over time.

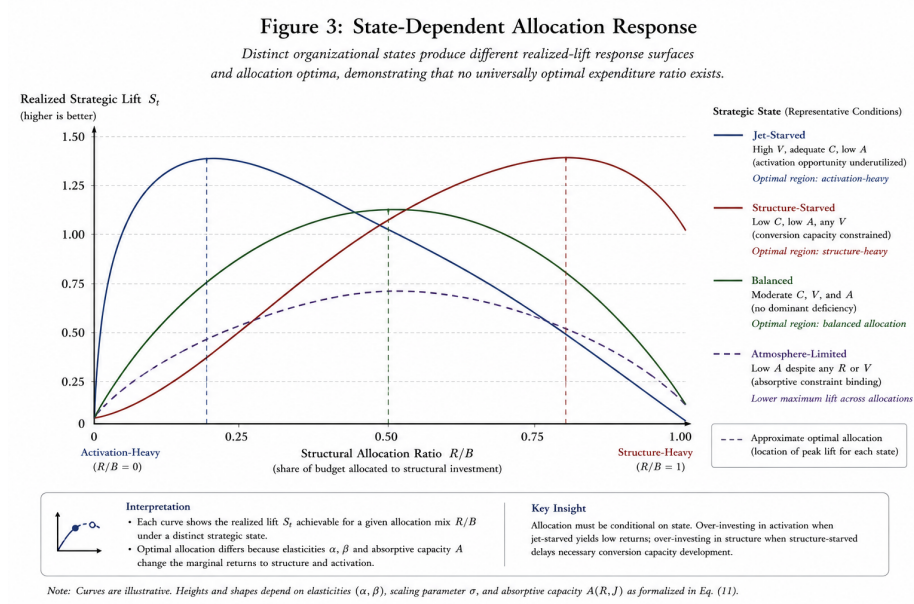


Figure 3: State-dependent allocation response behaviour under differing organizational conditions.

## 2.13 Strategic Regimes

**Definition 8.** *Strategic regimes represent emergent allocation states produced by interactions between visibility conditions, absorptive readiness, propagation efficiency, and optimization behaviour.*

The framework does not assume a universally optimal allocation ratio. Instead, distinct strategic regimes emerge under different observable-state configurations.

### 2.13.1 Activation Utilisation

Activation utilisation is defined as:

$$U = \frac{J_{\text{eff}}}{J}. \quad (28)$$

Interpretation:

- $U \approx 1$ : activation remains largely absorbable,
- $U \ll 1$ : substantial activation inefficiency emerges.

### 2.13.2 Atmosphere-Limited Regime

The atmosphere-limited regime occurs when activation exceeds sustainable absorptive capacity:

$$J > A(R, J). \quad (29)$$

Characteristics include:

- declining marginal activation productivity,
- operational bottlenecks,
- weakened conversion realization,
- and increasing activation inefficiency.

Operationally, the regime reflects organizations capable of generating attention faster than they can sustainably absorb or operationalize.

### 2.13.3 Structure-Starved Regime

The structure-starved regime occurs under weak conversion capacity:

$$C < \tau_C. \quad (30)$$

Characteristics include:

- weak operational resilience,
- unstable realization capacity,
- limited absorptive readiness,
- and elevated sensitivity to overload.

Under this regime, structural investment frequently dominates activation expenditure despite weaker short-term visibility generation.

#### 2.13.4 Jet-Starved Regime

The jet-starved regime occurs when visibility remains substantially below operational readiness:

$$V > \tau_V \quad \text{and} \quad C \geq \tau_C. \quad (31)$$

Characteristics include:

- underutilized operational capacity,
- unrealized market reach,
- suppressed growth visibility,
- and strong responsiveness to activation expenditure.

Under this regime, activation-heavy allocation frequently becomes optimal.

#### 2.13.5 Balanced Regime

The balanced regime occurs when visibility, absorptive readiness, and activation intensity remain broadly aligned.

Characteristics include:

- relatively stable allocation behaviour,
- reduced overload sensitivity,
- sustainable activation absorption,
- and moderate structural responsiveness.

#### 2.13.6 Interpretive Implication

The regime system converts continuous optimization behaviour into state estimates classifications.

The framework therefore treats organizational dynamics not as static categories, but as evolving allocation conditions shaped by observable strategic state variables.

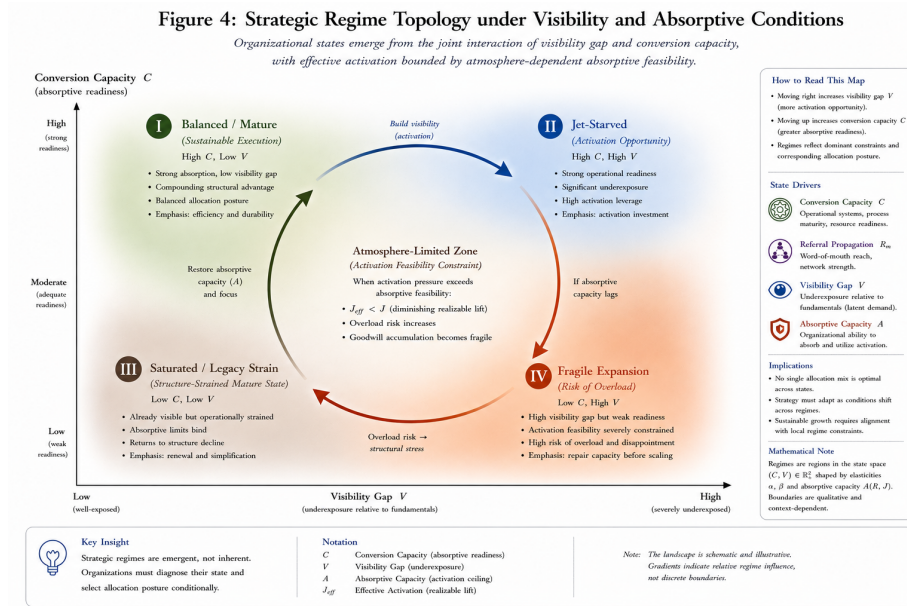


Figure 4: Strategic regime topology under differing visibility and absorptive conditions.

### 2.13.7 Behavioural Expectations

The canonical framework is constructed around several expected behavioural tendencies emerging from the interaction between absorptive readiness, visibility conditions, propagation efficiency, and state-dependent allocation dynamics.

These expectations are not treated as deterministic universal laws. Instead, they represent anticipated regime behaviours implied by the mechanical structure of the allocation system.

#### • Structure-Starved Allocation Behaviour

Organizations exhibiting weak conversion capacity are expected to allocate a greater proportion of strategic expenditure toward structural investment rather than activation expenditure.

Under low absorptive readiness, additional activation intensity is expected to produce declining realized effectiveness relative to operational repair or reinforcement.

#### • Jet-Starved Allocation Behaviour

Organizations exhibiting high visibility gaps under adequate absorptive conditions are expected to exhibit elevated responsiveness to activation investment.

Under such conditions, additional activation expenditure is expected to generate comparatively strong realized strategic lift.

- **Atmosphere-Constrained Activation Behaviour**

Activation expenditure exceeding sustainable atmosphere capacity is expected to exhibit diminishing marginal effectiveness.

Under atmosphere-limited conditions, increases in raw activation intensity may fail to generate proportional realized strategic lift due to operational bottlenecks, weakened conversion realization, or absorptive overload.

- **Propagation-Amplified Growth Behaviour**

Organizations possessing strong referral propagation efficiency are expected to exhibit increased activation sustainability and stronger realized strategic lift under equivalent activation expenditure conditions.

The framework therefore anticipates that propagation-efficient systems may achieve disproportionate expansion relative to direct activation intensity alone.

- **Decay-Driven Goodwill Fragility**

Organizations exhibiting elevated goodwill decay rates are expected to experience weaker persistence of accumulated strategic lift despite strong short-term activation or propagation dynamics.

Under such conditions, rapid expansion may coexist with unstable long-term goodwill retention and accelerated post-peak deterioration.

The subsequent behavioural demonstrations evaluate whether the canonical framework generates qualitatively coherent allocation behaviour consistent with these expected regime tendencies under differing strategic-state conditions.

## 2.14 Intertemporal Goodwill Dynamics

**Definition 9.** *Goodwill stock represents accumulated strategic memory generated through prior realized strategic lift.*

The framework models goodwill as an intertemporal state variable that evolves through accumulation and decay dynamics.

Goodwill evolution is defined as:

$$G_{t+1} = (1 - \delta)G_t + S_t, \quad (32)$$

where:

- $G_t$  denotes goodwill stock at time  $t$ ,
- $\delta \in [0, 1]$  denotes goodwill decay rate,
- $S_t$  denotes realized strategic lift.

Interpretation:

- realized strategic lift contributes to accumulated organizational memory,
- goodwill partially persists across periods,
- decay prevents unlimited accumulation,
- and insufficient realized lift eventually produces goodwill erosion.

#### 2.14.1 Decay Structure

The decay parameter  $\delta$  controls the persistence of accumulated goodwill over time.

Interpretation:

- low  $\delta$ : highly persistent organizational memory,
- high  $\delta$ : rapidly eroding strategic memory,
- $\delta = 1$ : fully memoryless system,
- $\delta = 0$ : permanent goodwill accumulation.

The framework therefore permits heterogeneous persistence behaviour across industries, organizational structures, and competitive environments.

#### 2.14.2 Interpretive Implication

The goodwill system introduces temporal persistence into the allocation framework.

Strategic allocation therefore affects not only immediate realized lift, but also the future state of accumulated organizational advantage.

The framework consequently treats growth as partially path-dependent rather than purely memoryless across periods.

### 2.15 Notation Summary

Table 1 summarizes the primary variables and parameters used throughout the canonical framework.

| Symbol                 | Interpretation                                    |
|------------------------|---------------------------------------------------|
| $B$                    | Total strategic expenditure budget                |
| $R$                    | Structural investment                             |
| $J$                    | Activation investment                             |
| $J_{\text{eff}}$       | Effective activation after absorptive constraints |
| $U$                    | Activation utilisation ratio                      |
| $C$                    | Conversion capacity                               |
| $V$                    | Visibility gap                                    |
| $R_m$                  | Referral propagation efficiency                   |
| $L$                    | Market power                                      |
| $\alpha$               | Structural elasticity                             |
| $\beta$                | Activation elasticity                             |
| $\eta$                 | Activation dampening sensitivity                  |
| $\phi$                 | Global scaling efficiency parameter               |
| $A(R, J)$              | Atmosphere capacity                               |
| $A_0(C)$               | Baseline atmosphere capacity                      |
| $k(C)$                 | Structural expansion efficiency                   |
| $k_{\text{floor}}$     | Fixed structural responsiveness floor             |
| $k_{\text{scale}}$     | Structural responsiveness scaling parameter       |
| $\lambda(R_m)$         | Propagation efficiency function                   |
| $\lambda_{\text{max}}$ | Maximum propagation efficiency ceiling            |
| $\gamma$               | Sigmoid steepness parameter                       |
| $\tau_C$               | Absorptive threshold parameter                    |
| $\tau_V$               | Visibility-gap threshold parameter                |
| $S_t$                  | Strategic lift at time $t$                        |
| $G_t$                  | Goodwill stock at time $t$                        |
| $\delta$               | Goodwill decay rate                               |

Table 1: Canonical notation summary.

### 3 Calibration and Operationalization

#### 3.1 Assignment Philosophy

The Marres–Ramjet Fusion Model is not designed around the assumption that all strategic state variables are directly observable or perfectly measurable.

Instead, the framework adopts a structured operationalization philosophy in which latent organizational conditions are approximated using:

- direct observable data,
- proxy-derived estimation,
- and constrained inference judgement.

The objective is not exact reconstruction of latent strategic reality, but reproducible approximation of strategic-state conditions sufficient for interpretable simulation, allocation reasoning, and sensitivity analysis.

Accordingly, the framework prioritizes:

- transparency of assumptions,
- reproducibility of assignments,
- calibration stability,
- and auditable workflow.

## **3.2 Variable Assignment Hierarchy**

Variables are assigned using a three-tier hierarchy:

1. direct observable assignment,
2. proxy-derived estimation,
3. structured inference assessment.

### **3.2.1 Direct Observable Variables**

Direct observable variables are quantities measurable from public, operational, or internally available data sources.

Examples include:

- revenue,
- active customers,
- referral conversions,
- follower counts,
- retention metrics,
- and distribution presence.

These assignments require minimal interpretive inference.

### **3.2.2 Proxy-Derived Variables**

Proxy-derived variables represent latent organizational conditions inferred from observable indicators.

Examples include:

- visibility gap inferred from normalized network visibility,

- market power inferred from revenue or network share,
- conversion capacity inferred from operational performance indicators,
- goodwill persistence inferred from post-peak retention behaviour.

Proxy assignment is treated as approximate rather than exact reconstruction of latent organizational states.

### 3.2.3 Structured Qualitative Assessment

Certain strategic conditions may remain partially unobservable despite extensive proxy data.

In such cases, structured non-deterministic assessment is permitted under explicit documentation of:

- assignment rationale,
- supporting indicators,
- confidence level,
- and alternative plausible interpretations.

The framework therefore treats strategic modelling as constrained interpretation rather than purely mechanical extraction.

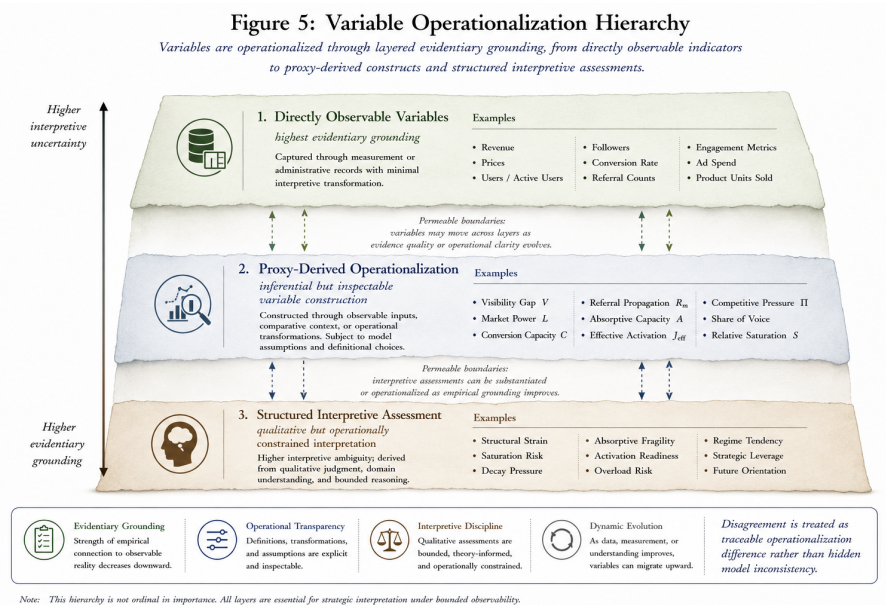


Figure 5: Variable operationalization hierarchy under partial observability.

### 3.3 Confidence Classification

Each assigned variable may optionally receive a confidence classification reflecting the strength of evidentiary support underlying the assignment process.

Confidence levels are defined as:

| Level | Interpretation                               |
|-------|----------------------------------------------|
| A     | Direct observable public or operational data |
| B     | Strong proxy-supported estimate              |
| C     | Weak proxy-supported estimate                |
| D     | Structured artificially inferred judgement   |

Table 2: Assignment confidence hierarchy.

The confidence label applies to the assignment procedure rather than the strategic importance of the variable itself.

### 3.4 Interpretive Constraints

The framework does not assume that latent organizational states possess uniquely correct numerical assignments.

Instead, operationalization is constrained through:

- explicit assignment logic,
- reproducible proxy construction,
- sensitivity analysis,
- and transparent documentation of uncertainty.

Disagreement between analysts is therefore treated as a traceable modelling difference rather than an implicit or hidden assumption.

### 3.5 AI-Assisted Inference Support

AI systems may assist operationalization by:

- aggregating weak signals,
- synthesizing dispersed qualitative indicators,
- identifying proxy inconsistencies,
- and stress-testing assignment logic.

The framework does not treat AI systems as independent arbiters of latent strategic truth.

Instead, AI assistance is treated as structured analytical support operating under explicit human supervision, declared assumptions, and documented uncertainty conditions.

### 3.6 Sensitivity and Calibration Stability

Because multiple parameter configurations may produce similar behavioural trajectories, calibration stability is treated as a primary methodological concern.

The framework therefore prioritizes:

- parsimonious parameterization,
- identifiable calibration structure,
- sensitivity testing,
- and explicit separation between canonical equations and exploratory extensions.

The objective is not unrestricted parameter fitting, but stable approximations of organisational conditions under incomplete information.

## 4 Validation, Identifiability, and Stress Testing

The canonical Marres–Ramjet specification was subjected to a staged validation and simplification process designed to evaluate:

- parameter recoverability,
- calibration stability,
- behavioural robustness under noise,
- regime reachability,
- and structural identifiability.

The objective of the validation process was not to establish deterministic forecasting precision, but to evaluate whether the framework could maintain:

- interpretable allocation behaviour,
- stable calibration dynamics,
- and coherent organisational transitions

under partially observable and noisy conditions.

## 4.1 Synthetic Parameter Recovery

Synthetic recovery experiments were conducted using simulated firms with heterogeneous operating configurations across:

- conversion capacity,
- visibility gap,
- referral propagation,
- and market power.

The validation framework evaluated whether the canonical calibration procedure could recover known underlying parameters from generated trajectory behaviour.

Across low-noise environments, the framework demonstrated strong recovery performance:

- mean trajectory fit:  $R^2 \approx 0.936$ ,
- mean goodwill fit:  $R^2 \approx 0.995$ ,
- and successful recovery of all estimable canonical parameters within acceptable relative error bounds.

The results suggest that the canonical specification preserves sufficient structural observability for stable calibration under moderate stochastic variation.

The present recovery experiments evaluate internal calibration recoverability under synthetic conditions generated by the canonical system itself rather than external empirical organizational data.

## 4.2 Noise Sensitivity and Stress Testing

The framework was subsequently evaluated under progressively increasing observational noise conditions.

As noise intensity increased, trajectory reconstruction quality degraded gradually rather than catastrophically. Mean strategic-lift trajectory fit declined from approximately:

$$R^2 \approx 0.93$$

under low-noise conditions to approximately:

$$R^2 \approx 0.63$$

under severe noise injection.

Importantly, goodwill trajectory reconstruction remained comparatively stable throughout the stress-testing process, suggesting that the intertemporal accumulation structure introduces partial smoothing and trajectory persistence even under degraded signal environments.

The framework therefore exhibits bounded degradation behaviour rather than immediate instability under noisy operational conditions.

### 4.3 Canonical Reparameterisation and Identifiability

Earlier developmental variants of the atmosphere formation system employed independent estimation of both lower and upper structural responsiveness parameters.

Subsequent validation experiments revealed that the lower structural responsiveness component exhibited weak practical identifiability under noisy conditions. In particular, multiple parameter combinations generated near-equivalent trajectory behaviour despite substantial variation in the estimated lower-bound parameter.

The issue emerged because compensatory adjustment between structural responsiveness parameters preserved observable dynamics while obscuring unique parameter recovery.

To resolve this ambiguity, the atmosphere expansion system was reformulated using the canonical specification:

$$k(C) = k_{\text{floor}} + k_{\text{scale}}(1 - C),$$

where:

$$k_{\text{floor}} = 0.05$$

is treated as a fixed identification convention rather than a free calibration parameter.

This simplification reduced parameter degeneracy while preserving behavioural trajectory equivalence across validation scenarios.

The resulting canonical structure improved:

- calibration stability,
- parameter recoverability,
- and translational transparency,

while reducing unnecessary calibration flexibility.

The simplification process therefore represents a transition from a more flexible exploratory formulation toward a more identifiable and interpretable canonical specification.

### 4.4 Regime Reachability and Behavioural Diagnostics

Validation experiments further evaluated whether the framework could generate distinct strategic allocation regimes under heterogeneous organizational conditions.

The canonical specification successfully produced transitions across:

- structure-starved states,
- jet-starved states,
- atmosphere-limited states,
- and balanced states.

These regimes emerged endogenously from the interaction between:

- visibility conditions,
- absorptive readiness,
- propagation efficiency,
- and allocation optimization behaviour.

The framework therefore does not collapse into a single universal allocation equilibrium. Instead, strategic behaviour remains conditional upon observable-state configuration and absorptive feasibility.

This behavioural diversity supports the practical objective of the framework: transforming organizational conditions into computationally inspectable strategic conditions rather than purely black-box predictive outputs.

## 4.5 Interpretive Implication

The validation process suggests that the canonical Marres–Ramjet specification preserves a workable balance between:

- interpretability,
- calibration stability,
- behavioural flexibility,
- and computational tractability.

Importantly, the simplification and canonicalization process was itself treated as part of the research contribution.

Rather than maximizing parameter freedom, the framework intentionally prioritized identifiable structure, constrained elasticity behaviour, and operational inspectability.

Accordingly, the final canonical specification should be interpreted not as the most flexible possible formulation, but as the most stable and interpretable formulation identified throughout the validation process.

## 5 Behavioural Demonstrations

### 5.1 Experimental Objective

The objective of the following demonstrations is not empirical validation, exact historical reconstruction, or deterministic forecasting accuracy.

Instead, the demonstrations function as coherent behavioural examples designed to evaluate whether distinct state configurations generate qualitatively coherent allocation behaviour under the canonical framework.

The demonstrations are therefore intended to assess:

- regime differentiation,
- allocation response behaviour,
- goodwill persistence dynamics,
- and sensitivity to strategic-state conditions.

The experiments use historically informed but partially simplified organisational assignments derived from publicly observable indicators, proxy-supported estimates, and structured approximate judgement.

The resulting simulations are treated as behavioural approximations rather than empirical claims of uniquely correct organizational reconstruction.

Goodwill persistence dynamics as mentioned above is elucidated through the illustration below.

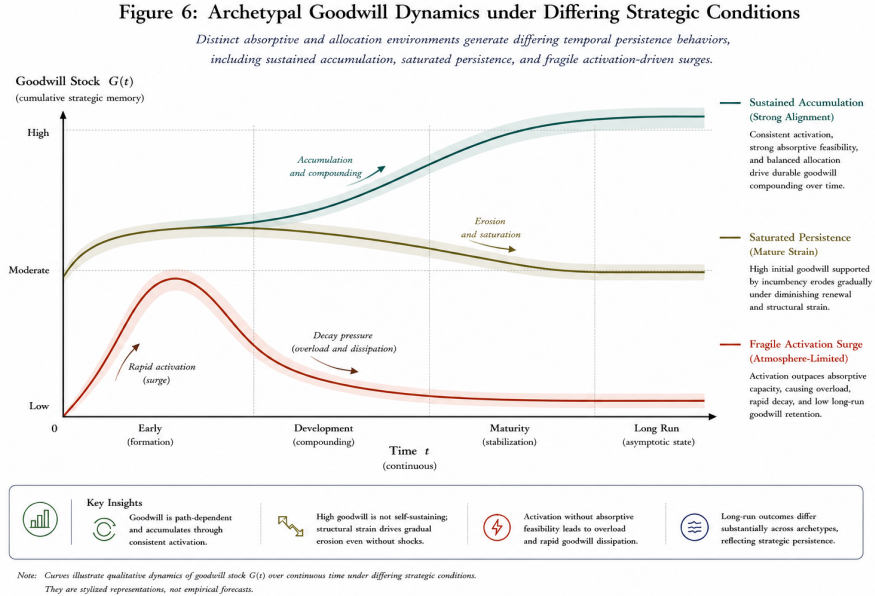


Figure 6: Archetypal goodwill dynamics under differing strategic conditions.

## 5.2 Experimental Structure

Three illustrative cases are examined:

1. Starbucks (2008),
2. Dropbox (2010),
3. Clubhouse (2021).

The selected cases represent distinct state profiles:

- operational deterioration under strong market presence,
- underexposed viral expansion,
- and hype-driven growth fragility.

Each case is evaluated using:

- observable organisational assignment,
- canonical allocation optimization,
- regime classification,
- and intertemporal goodwill trajectory analysis.

## 5.3 Theoretical Position

The experiments are not intended to demonstrate universal predictive validity.

Instead, the objective is to evaluate whether the framework produces internally coherent strategic behaviour under distinct organizational conditions.

Particular emphasis is placed on whether:

- structure-starved systems prioritize structural allocation,
- jet-starved systems prioritize activation allocation,
- and high-decay systems exhibit goodwill instability despite elevated activation intensity.

The framework is therefore evaluated primarily through internally consistent behaviour, interpretability, and regime consistency rather than point-estimate forecasting precision.

Alternative operating assignments would produce differing allocation trajectories, regime transitions, and goodwill dynamics. The demonstrations are therefore intended to evaluate behavioural coherence conditional upon the illustrative assignments rather than to establish uniquely correct historical reconstruction.

## 5.4 Historically Anchored Behavioural Demonstrations

### 5.4.1 Starbucks (2008)

The Starbucks 2008 case was selected as a preliminary historical anchoring exercise because it represents a widely documented large-scale turnaround driven primarily by operational and structural repair rather than awareness acquisition.

The purpose of the exercise was not to reconstruct the firm's exact internal state, but to test whether the framework could generate a historically plausible structure-heavy allocation regime under transparent variable assignment assumptions.

The following qualitative and observable characteristics informed assignment:

- globally dominant consumer brand;
- extensive physical distribution network;
- high accumulated customer familiarity;
- operational deterioration during rapid expansion;
- declining same-store sales during the crisis period;
- strategic restructuring under renewed leadership emphasis.

These observations suggested:

- high inherited goodwill stock;
- high market power;
- low visibility gap;
- weakened operational readiness;
- moderate-to-elevated goodwill decay pressure.

Assignments were performed using observable indicators, proxy-supported estimation, and structured expert judgement.

Market power was inferred from:

- global brand recognition;
- pricing resilience;
- international scale;
- market familiarity;
- category dominance.

The assignment therefore treated Starbucks as possessing high default-choice strength.

$$L = 0.75$$

Confidence classification:

$$\text{Confidence}(L) = B+$$

because the assignment is strongly proxy-supported, though not directly measured using a formal market concentration model.

Visibility gap was interpreted as relative underexposure.

Because Starbucks already possessed extensive visibility, distribution reach, and customer familiarity, the firm was assigned a low visibility gap.

$$V = 0.20$$

Interpretation:

- low  $V$  does not imply weak brand strength;
- low  $V$  implies that additional activation may experience diminishing returns relative to structural repair.

Confidence classification:

$$\text{Confidence}(V) = A-$$

because visibility dominance is strongly observable.

Operational readiness was inferred from:

- operational dilution during expansion;
- declining store experience quality;
- restructuring behaviour;
- performance deterioration indicators.

However, the firm was not interpreted as operationally collapsed. The assignment therefore reflects weakened but still functional absorptive capacity.

$$C = 0.45$$

Confidence classification:

$$\text{Confidence}(C) = B$$

because the assignment is proxy-derived rather than directly measurable. Referral propagation was interpreted conservatively.

Starbucks possesses substantial word-of-mouth strength, but was not treated as a hyperviral referral-driven platform.

$$Rm = 0.45$$

Confidence classification:

$$\text{Confidence}(Rm) = C+$$

because direct referral propagation data were unavailable.

Initial goodwill stock was treated as accumulated strategic memory and inherited brand inertia.

Assignment considered:

- historical brand persistence;
- global customer familiarity;
- scale of installed customer base;
- accumulated market mindshare.

The variable was therefore assigned as a large absolute stock:

$$G_0 = 350$$

The value should not be interpreted as a literal financial quantity, but as a relative strategic-memory magnitude calibrated against the simulator's internal lift and decay scales.

Confidence classification:

$$\text{Confidence}(G_0) = B$$

because the assignment remains heuristic but historically grounded.

Decay was inferred from:

- declining same-store sales;
- operational dissatisfaction;
- erosion of customer experience quality;
- strategic urgency of the turnaround period.

However, the brand was not interpreted as undergoing catastrophic collapse. The decay rate was therefore assigned at a moderate level:

$$\delta = 0.15$$

Approximate goodwill half-life:

$$t_{1/2} = \frac{\ln(0.5)}{\ln(1 - \delta)} \approx 4.3 \text{ months}$$

Confidence classification:

$$\text{Confidence}(\delta) = B -$$

because decay is indirectly inferred from observed deterioration patterns.

The intervention budget was interpreted as strategic deployment scale, not merely advertising expenditure.

The assignment therefore conceptually included:

- operational restructuring;
- systems repair;
- experience restoration;
- organisational intervention capacity;
- activation expenditure.

A large-scale deployment assumption was used:

$$B = 300,000,000$$

This value was treated as a calibration-scale approximation rather than a direct accounting reconstruction.

Confidence classification:

$$\text{Confidence}(B) = B -$$

The simulation produced:

- strongly structure-heavy allocation recommendations;
- low activation emphasis;
- persistent but slowing goodwill erosion;
- no major overload penalty;
- classification within the structure-starved regime.

The resulting trajectory was considered historically plausible relative to the qualitative narrative of the Starbucks 2008 turnaround period.

The Starbucks calibration process was not purely deductive.

Assignments were iteratively refined through:

- observable historical indicators;

- proxy-supported interpretation;
- cross-variable coherence checks;
- trajectory sanity evaluation against known historical behaviour.

The procedure is therefore better described as:

*historically anchored abductive proxy calibration*

rather than direct latent-state measurement.

The illustrative strategic-state assignment corresponding to the Starbucks 2008 case produces a structure-starved organizational state characterized by strong market presence but weakening operational absorption dynamics during large-scale overexpansion and restructuring.

The illustrative assignment used for the simulation was:

| Variable | Assigned Value |
|----------|----------------|
| $B$      | 300,000,000    |
| $C$      | 0.45           |
| $V$      | 0.20           |
| $R_m$    | 0.45           |
| $L$      | 0.75           |
| $G_0$    | 350            |
| $\delta$ | 0.15           |

Table 3: Illustrative strategic-state assignment for Starbucks (2008).

The framework classified the system as structure-starved and allocated a majority of expenditure toward structural investment.

Observed behavioural characteristics included:

- elevated structural allocation,
- suppressed activation prioritization,
- declining but stabilizing goodwill trajectory,
- and limited activation responsiveness despite strong market presence.

Consequently, the simulation approximates organizational conditions in which operational rehabilitation dominates aggressive expansion behaviour.

#### 5.4.2 Dropbox (2010)

The illustrative strategic-state assignment corresponding to the Dropbox 2010 case produces a jet-starved organizational state characterized by strong product functionality, high referral propagation, and substantial underexposure relative to operational readiness.

The Dropbox 2010 case was selected as an illustrative example of a high-propagation, underexposed organizational state in which activation and referral amplification dominate structural repair requirements.

The objective of the exercise was not exact historical reconstruction, but evaluation of whether the framework could coherently generate activation-heavy allocation behaviour under conditions of:

- strong referral propagation,
- substantial visibility gap,
- functional operational readiness,
- and comparatively weak market dominance.

The following historical characteristics informed assignment:

- rapid user growth from approximately 100,000 users to several million users;
- highly successful referral-based expansion;
- strong product-market fit;
- comparatively limited early market dominance;
- underexposure relative to operational capability;
- high organic propagation efficiency.

The case was therefore interpreted as:

- operationally functional;
- highly propagation-efficient;
- visibility-constrained rather than structurally constrained;
- and strategically activation-responsive.

Assignments were performed using observable growth indicators, proxy-supported interpretation, and structured strategic-state estimation.

Market power was inferred from:

- relatively early-stage competitive positioning;
- limited incumbent dominance at the time;
- comparatively small market share relative to later platform scale;
- and absence of strong default-choice status during the examined period.

Although Dropbox exhibited strong growth, the firm was not interpreted as possessing dominant market power in 2010.

$$L = 0.20$$

Confidence classification:

$$\text{Confidence}(L) = B -$$

because the assignment is proxy-supported but not directly estimated using formal concentration metrics.

Visibility gap was interpreted as the degree to which organizational capability exceeded market awareness.

The assignment considered:

- rapid adoption despite relatively limited public visibility;
- strong user conversion behaviour;
- large remaining addressable awareness gap;
- and evidence of underexposure relative to product utility.

The firm was therefore assigned a high visibility gap:

$$V = 0.85$$

Interpretation:

- the product was operationally capable;
- but market awareness had not yet saturated.

Confidence classification:

$$\text{Confidence}(V) = B$$

because visibility conditions were strongly inferable from historical growth dynamics.

Operational readiness was inferred from:

- successful onboarding and retention behaviour;
- scalable file synchronization functionality;
- sustained user adoption;
- and absence of major operational collapse during rapid expansion.

However, the organization was still relatively early-stage and therefore not interpreted as possessing fully mature enterprise-scale operational robustness.

$$C = 0.65$$

Confidence classification:

$$\text{Confidence}(C) = B$$

because the assignment is based primarily on behavioural operational indicators rather than direct internal operational metrics.

**Referral Propagation ( $Rm$ )** Referral propagation was the strongest directly observable component within the Dropbox case.

Assignment considered:

- documented referral-driven growth;
- invite-based expansion mechanics;
- storage incentives tied to referrals;
- and extremely strong organic propagation behaviour.

The firm was therefore assigned very high propagation efficiency:

$$Rm = 1.20$$

Interpretation:

- existing users generated substantial secondary expansion;
- activation was strongly amplified through referral behaviour.

Confidence classification:

$$\text{Confidence}(Rm) = A-$$

because the referral-centric growth structure is historically well documented. Initial goodwill stock was treated as accumulated strategic memory prior to the examined acceleration phase.

The assignment considered:

- relatively early organizational maturity;
- limited inherited market inertia;
- strong but still emerging brand familiarity;
- and comparatively small installed strategic memory relative to mature incumbents.

The system was therefore assigned a comparatively low initial goodwill stock:

$$G_0 = 18$$

The value should not be interpreted as a literal financial quantity, but as a relative strategic-memory magnitude calibrated against the simulator’s internal scaling dynamics.

Confidence classification:

$$\text{Confidence}(G_0) = B-$$

because the assignment remains heuristic and trajectory-calibrated.

Decay was inferred from:

- strong retention characteristics;
- persistent utility value;
- continued user engagement;
- and relatively durable organizational persistence dynamics.

The firm was therefore interpreted as possessing comparatively persistent goodwill accumulation.

$$\delta = 0.06$$

Approximate goodwill half-life:

$$t_{1/2} = \frac{\ln(0.5)}{\ln(1 - \delta)} \approx 11.2 \text{ months}$$

Confidence classification:

$$\text{Confidence}(\delta) = B-$$

because persistence is inferred indirectly from behavioural continuity rather than directly measured.

The intervention budget was interpreted as total strategic deployment capacity, including:

- infrastructure scaling;
- referral incentives;
- activation expenditure;
- operational support;
- and organizational expansion.

The assignment therefore used:

$$B = 5,000,000$$

This value was treated as a strategic-scale approximation rather than a direct historical accounting reconstruction.

Confidence classification:

$$\text{Confidence}(B) = C +$$

because historical deployment allocation data were incomplete.

The simulation produced:

- activation-heavy allocation;
- high activation utilization;
- strong realized strategic lift;
- persistent goodwill accumulation;
- and classification within the jet-starved regime.

The resulting trajectory was considered historically coherent relative to the qualitative narrative of Dropbox's referral-driven expansion phase.

The Dropbox calibration process combined:

- observable growth indicators;
- referral propagation evidence;
- proxy-supported strategic interpretation;
- and trajectory coherence evaluation.

The assignment process therefore reflects:

*historically anchored abductive proxy calibration*

rather than deterministic latent-state reconstruction.

The illustrative assignment used for the simulation was:

The framework classified the system as jet-starved and allocated a majority of expenditure toward activation investment.

Observed behavioural characteristics included:

- activation-heavy allocation,
- strong realized strategic lift,
- persistent goodwill compounding,
- and high activation utilization.

As such, the simulation approximates organizational conditions in which operational readiness exceeds market visibility, producing strong responsiveness to activation expenditure and referral amplification.

| Variable | Assigned Value |
|----------|----------------|
| $B$      | 5,000,000      |
| $C$      | 0.65           |
| $V$      | 0.85           |
| $R_m$    | 1.20           |
| $L$      | 0.20           |
| $G_0$    | 18             |
| $\delta$ | 0.06           |

Table 4: Illustrative strategic-state assignment for Dropbox (2010).

#### 5.4.3 Clubhouse (2021)

The Clubhouse 2021 case was selected as a preliminary calibration example of rapid activation expansion followed by accelerated goodwill erosion under conditions of weak structural persistence.

The objective of the exercise was not exact reconstruction of the platform’s internal state, but evaluation of whether the framework could coherently generate:

- rapid early strategic lift;
- strong activation responsiveness;
- elevated goodwill decay;
- and structurally fragile long-term dynamics.

The case was therefore used as an exploratory example of hype-sensitive expansion under partial operational persistence.

The following historical characteristics informed assignment:

- explosive early adoption;
- invite-driven exclusivity dynamics;
- strong social propagation effects;
- rapid expansion in public attention;
- subsequent retention deterioration;
- competitive imitation by incumbent platforms;
- and visible post-peak engagement decline.

The case was therefore interpreted as:

- highly activation-responsive;

- propagation-efficient during early expansion;
- structurally fragile under sustained engagement requirements;
- and highly sensitive to decay pressure.

Assignments were performed using observable adoption dynamics, proxy-supported interpretation, and trajectory-oriented calibration reasoning.

Market power was inferred from:

- relatively limited durable platform dominance;
- dependence on novelty and exclusivity effects;
- vulnerability to incumbent replication;
- and comparatively weak long-term ecosystem lock-in.

Although Clubhouse achieved substantial short-term visibility, the platform was not interpreted as possessing strong durable market power.

$$L = 0.35$$

Confidence classification:

$$\text{Confidence}(L) = C +$$

because long-term competitive resilience remained partially speculative during the examined period.

Visibility gap was interpreted as relative underexposure during the early growth phase.

Assignment considered:

- invite scarcity;
- strong unmet public curiosity;
- rapid adoption acceleration;
- and substantial untapped awareness during the early viral cycle.

The platform was therefore assigned a high visibility gap:

$$V = 0.75$$

Interpretation:

- awareness expanded rapidly,
- but exposure initially remained constrained relative to demand intensity.

Confidence classification:

$$\text{Confidence}(V) = B$$

because early underexposure dynamics were strongly observable.  
Operational readiness was inferred from:

- retention fragility;
- inconsistent long-term engagement persistence;
- limited creator monetization infrastructure;
- dependence on novelty-driven participation;
- and vulnerability under sustained scaling conditions.

However, the platform was not interpreted as operationally nonfunctional.  
The assignment therefore reflects partial but unstable absorptive capacity.

$$C = 0.35$$

Confidence classification:

$$\text{Confidence}(C) = C +$$

because the assignment relies heavily on inferred engagement durability  
rather than direct internal operational metrics.

Referral propagation was interpreted as strong but structurally fragile.  
Assignment considered:

- invite-based expansion mechanics;
- strong social sharing behaviour;
- celebrity-driven propagation;
- and rapid peer-to-peer awareness amplification.

The platform therefore received a high propagation assignment:

$$Rm = 0.90$$

Interpretation:

- activation expanded efficiently through social propagation;
- however, propagation durability was not interpreted as permanently self-sustaining.

Confidence classification:

$$\text{Confidence}(Rm) = B-$$

because propagation was observable, though long-term persistence remained uncertain.

Initial goodwill stock was treated as accumulated strategic memory during the peak expansion phase.

Assignment considered:

- massive short-term public attention;
- high social visibility;
- strong cultural novelty effects;
- and rapid temporary mindshare accumulation.

The platform was therefore assigned a substantial but unstable inherited goodwill stock:

$$G_0 = 140$$

The value should not be interpreted as a literal financial quantity, but as a relative strategic-memory magnitude calibrated against the simulator's internal lift and decay scales.

Confidence classification:

$$\text{Confidence}(G_0) = B-$$

because the assignment remains heuristic and trajectory-calibrated.

Decay was inferred from:

- visible post-peak decline;
- engagement deterioration;
- weakening exclusivity effects;
- increased competitive substitution;
- and rapid erosion of novelty-driven participation.

The platform was therefore interpreted as possessing elevated strategic-memory erosion.

$$\delta = 0.32$$

Approximate goodwill half-life:

$$t_{1/2} = \frac{\ln(0.5)}{\ln(1 - \delta)} \approx 1.8 \text{ months}$$

Confidence classification:

$$\text{Confidence}(\delta) = B$$

because the decline trajectory was highly visible despite incomplete internal metrics.

The intervention budget was interpreted as strategic deployment scale, including:

- platform scaling;
- creator incentives;
- activation expenditure;
- infrastructure expansion;
- and ecosystem development efforts.

The assignment therefore used:

$$B = 75,000,000$$

This value was treated as a strategic-scale approximation rather than a direct accounting reconstruction.

Confidence classification:

$$\text{Confidence}(B) = C +$$

because precise deployable allocation figures were not publicly observable.

The simulation produced:

- mixed structure-activation allocation;
- elevated decay dominance;
- weakening goodwill persistence;
- and classification within the structure-starved regime.

The resulting trajectory was considered historically plausible relative to the observed post-hype stabilization difficulties experienced by the platform.

The Clubhouse calibration process combined:

- observable adoption acceleration;
- engagement decline indicators;
- proxy-supported structural interpretation;
- and trajectory coherence evaluation.

The assignment process therefore reflects:

*historically anchored abductive proxy calibration*

rather than deterministic latent-state measurement.

The illustrative strategic-state assignment corresponding to the Clubhouse 2021 case produces a high-decay organizational state characterized by rapid visibility expansion, elevated referral propagation, and unstable long-term persistence dynamics.

The illustrative assignment used for the simulation was:

| Variable | Assigned Value |
|----------|----------------|
| $B$      | 75,000,000     |
| $C$      | 0.35           |
| $V$      | 0.75           |
| $R_m$    | 0.90           |
| $L$      | 0.35           |
| $G_0$    | 140            |
| $\delta$ | 0.32           |

Table 5: Illustrative strategic-state assignment for Clubhouse (2021).

The framework classified the system as structure-starved under elevated goodwill decay conditions.

Observed behavioural characteristics included:

- substantial structural allocation pressure,
- rapid goodwill erosion,
- declining net strategic accumulation,
- and limited persistence despite elevated activation intensity.

Correspondingly, the simulation approximates organizational conditions in which rapid visibility expansion outpaces long-term organizational retention and persistence capacity.

## 5.5 Observed Implications

Across the three demonstrations, the framework produced distinct allocation behaviour, regime classification, and goodwill trajectories under differing organisational conditions.

In particular:

- weak absorptive readiness increased structural allocation pressure,
- high visibility gaps increased activation prioritization,

- low decay promoted long-term goodwill accumulation,
- and elevated decay weakened persistence despite strong activation intensity.

The demonstrations therefore suggest that the canonical framework is capable of generating interpretable regime-sensitive strategic behaviour under heterogeneous organizational conditions.

The present demonstrations primarily exhibit structure-starved, jet-starved, and high-decay organizational dynamics. Explicit atmosphere-limited behaviour did not emerge prominently under the selected illustrative assignments.

This outcome is consistent with the framework’s interpretation of atmosphere limitation as a comparatively extreme absorptive condition more likely to emerge under severe activation imbalance, weak operational readiness, or exploratory overload extensions beyond the canonical demonstrations.

## 6 Interpretation

### 6.1 State-Dependent Allocation

The demonstrations suggest that optimal strategic allocation cannot be treated as a fixed ratio between structural investment and activation investment.

Instead, allocation behaviour depends on the firm’s strategic state. Weak absorptive readiness increases structural allocation pressure, while high visibility gaps increase activation responsiveness.

The framework therefore interprets strategy as conditional allocation under organizational constraints rather than as universal budget optimization.

### 6.2 Growth as Absorptively Constrained

A central implication of the framework is that visibility generation alone is insufficient to produce durable growth.

Activation investment becomes productive only when the organization possesses sufficient absorptive capacity to sustain and convert the resulting demand.

The distinction between nominal activation and effective activation therefore provides a mechanism for representing cases where attention exceeds operational readiness.

### 6.3 Goodwill and Path Dependence

The goodwill dynamics introduce temporal persistence into the framework.

Strategic lift does not disappear after a single period, but contributes to accumulated goodwill stock. Conversely, insufficient realized lift relative to decay produces erosion over time.

The model therefore treats growth as partially path-dependent: prior accumulated goodwill affects future strategic position, while decay prevents indefinite accumulation.

## 6.4 Interpretability and Inspectability

The framework prioritizes interpretability over black-box predictive optimization.

Each output can be traced back to declared variables, proxy assumptions, allocation constraints, and dynamic equations. This allows disagreement to be inspected at the level of assumptions rather than hidden inside opaque model behaviour.

The resulting system is therefore better understood as a structured reasoning framework than as an autonomous forecasting engine.

## 6.5 Human–AI Strategic Interpretation

AI-assisted interpretation may support the framework by helping synthesize weak signals, identify inconsistencies, and stress-test variable assignments.

However, AI assistance does not remove the need for human accountability. Operating assignment remains dependent on declared assumptions, evidentiary confidence, and domain judgement.

The appropriate role of AI is therefore reasoning support rather than independent strategic authority.

## 6.6 Practical Applications

Although the framework was initially motivated by problems in strategic marketing allocation and organizational growth dynamics, the canonical Marres–Ramjet specification may also be applied to a broader class of organizational systems operating under absorptive constraints, partial observability, and state-dependent allocation tradeoffs.

The framework is particularly suited to environments in which activation pressure, operational readiness, propagation dynamics, and persistence effects interact nonlinearly over time.

Potential application domains include:

- **Strategic Marketing Allocation**

The framework may assist organizations in evaluating allocation tradeoffs between awareness generation and operational reinforcement under differing visibility and conversion conditions. Potential applications include growth campaign planning, customer acquisition strategy, launch sequencing, and marketing efficiency analysis.

- **Organizational Scaling and Operational Diagnostics**

The absorptive-capacity structure permits evaluation of organizational conditions in which growth pressure exceeds sustainable operational readiness. Potential applications include scaling analysis, service bottleneck diagnosis, customer support saturation assessment, and operational stress evaluation.

- **Platform and Network Growth Systems**

The propagation and goodwill dynamics permit analysis of systems exhibiting viral expansion, referral amplification, retention fragility, and hype-sensitive adoption behaviour. Potential applications include digital platform growth analysis, creator ecosystems, social applications, and network-dependent product expansion.

- **Turnaround and Restructuring Analysis**

The framework may assist in evaluating organizations experiencing declining operational readiness, weakened absorptive capacity, or deteriorating goodwill persistence. Potential applications include turnaround diagnostics, resource reallocation analysis, and organizational recovery simulation.

- **AI-Assisted Strategic Simulation**

Because the framework prioritizes interpretable state representation and explicit allocation dynamics, it may also function as a structured substrate for human–AI collaborative strategic analysis. Potential applications include scenario exploration, sensitivity analysis, proxy-supported operationalization, and computationally inspectable strategic reasoning under partial observability.

The framework is not intended as a universal predictive system applicable to all organizational phenomena. Instead, its practical utility is expected to be strongest in environments characterized by constrained growth dynamics, allocation tradeoffs, propagation effects, and partially observable strategic conditions.

## 7 Limitations

Although, the framework prioritizes transparent and inspectable allocation reasoning, several variable assignments presently rely on proxy-supported qualitative judgement under partial observability. Consequently, assignment reproducibility and inter-rater consistency remain important areas for future empirical refinement.

### 7.1 Partial Observability

The framework does not assume that strategic organizational states are perfectly observable or uniquely measurable.

Variables such as conversion capacity, goodwill persistence, visibility gap, and market power frequently require proxy-supported estimation or structured analytical assignment.

Accordingly, the framework should be understood as an interpretable approximation system rather than a direct extraction of latent organizational truth.

## 7.2 Proxy Instability

The operationalization layer depends on the quality and stability of observable indicators used during variable assignment.

Different proxy constructions, normalization procedures, or domain-weighting assumptions may produce differing state estimates.

The framework therefore prioritizes transparency of assignment logic over claims of uniquely correct parameter reconstruction.

## 7.3 Calibration Non-Uniqueness

Multiple parameter configurations may produce similar behavioural trajectories under the canonical allocation system.

Although the canonical reparameterisation improves identification stability within the atmosphere formation subsystem, the framework does not eliminate the broader possibility of partial calibration non-uniqueness.

The model should therefore be interpreted as a structured behavioural approximation framework rather than a uniquely identifiable economic reconstruction system.

## 7.4 Simplified Organizational Dynamics

The framework intentionally abstracts away many real-world organizational dynamics, including:

- internal organizational politics,
- competitor adaptation,
- macroeconomic shocks,
- regulatory intervention,
- stochastic crises,
- and nonlinear behavioural feedbacks.

The canonical system consequently prioritizes interpretability and strategic inspectability over exhaustive organizational realism.

## 7.5 Behavioural Approximation Rather Than Deterministic Prediction

The behavioural demonstrations are not intended to establish universal predictive validity or exact historical reconstruction.

Instead, the framework is evaluated primarily through:

- regime coherence,

- allocation sensitivity,
- goodwill trajectory behaviour,
- and translational consistency under differing operational conditions.

The resulting simulations should therefore be interpreted as historically anchored behavioural approximations rather than deterministic forecasting outputs.

## 7.6 Atmosphere-Limited Edge Conditions

Atmosphere-limited dynamics emerged less prominently than structure-starved or jet-starved behaviour under the selected illustrative demonstrations.

This may reflect several possibilities, including:

- comparatively rare real-world absorptive collapse conditions,
- organizational adaptation prior to severe overload,
- conservative atmosphere dynamics within the canonical formulation,
- or insufficient stress conditions within the present demonstrations.

The framework therefore treats atmosphere limitation as a comparatively extreme absorptive condition rather than a universally dominant organizational regime.

## 7.7 AI-Assisted Inference Risk

AI-assisted operationalization introduces additional epistemic risks, including:

- proxy hallucination,
- overconfident synthesis,
- latent training bias,
- and translational inconsistency across contexts.

The framework consequently treats AI systems as constrained structured support tools operating under explicit human supervision rather than autonomous strategic authorities.

## 8 Conclusion

The Marres–Ramjet Fusion Model proposes an interpretable strategic allocation framework in which organizational growth emerges from the interaction between structural investment, activation investment, absorptive readiness, propagation efficiency, visibility conditions, and intertemporal goodwill dynamics.

Rather than treating strategic allocation as a universally fixed optimization problem, the framework models allocation behaviour as conditional upon observable and proxy-derived organizational state conditions.

The canonical system introduces several central propositions:

- activation effectiveness is absorptively constrained,
- strategic allocation is state-dependent,
- organizational growth exhibits diminishing marginal responsiveness,
- and accumulated goodwill introduces partial path dependence into strategic behaviour.

The framework further prioritizes interpretability, calibration transparency, and traceability over black-box predictive optimisation.

Behavioural demonstrations using historically informed illustrative cases suggest that the framework is capable of generating coherent regime-sensitive allocation behaviour under heterogeneous organizational conditions. Distinct organisational configurations produced differing allocation priorities, goodwill trajectories, and persistence dynamics without requiring manually imposed behavioural regimes.

At the same time, the framework remains intentionally constrained in scope. The present formulation does not claim deterministic forecasting validity, uniquely correct organizational reconstruction, or exhaustive representation of real-world strategic complexity.

Instead, the model is positioned as an interpretable strategic simulation and reasoning framework intended to support structured allocation analysis under incomplete information.

Future research may explore:

- stochastic extensions,
- adaptive competitive interaction,
- endogenous regime transition dynamics,
- empirical calibration refinement,
- and expanded sensitivity analysis under multi-agent conditions.

The broader objective of the framework is therefore not to eliminate strategic judgement, but to transform partially observable organizational conditions into transparent and coherent allocation behaviour.

## 9 Related Work

The Marres–Ramjet Fusion Model does not propose an entirely isolated theoretical system. Instead, the framework synthesizes and operationalizes concepts originating from several adjacent research traditions including production economics, systems dynamics, goodwill accumulation models, diffusion theory, organizational constraint systems, and interpretable decision-support frameworks.

The primary contribution of the present framework is therefore not the invention of wholly new economic primitives, but the integration of these traditions into a unified interpretable allocation system operating under partial observability, absorptive constraints, and organisational conditions.

In particular, the framework differs from adjacent approaches through its simultaneous treatment of:

- absorptively constrained activation,
- endogenous regime-sensitive allocation behaviour,
- intertemporal goodwill persistence,
- explicitly transparent allocation logic,
- and calibration-aware canonical simplification.

### 9.1 Production and Allocation Systems

The analytical approximation presented in the framework adopts a Cobb–Douglas-style multiplicative structure in which structural investment and effective activation jointly contribute to realized strategic lift.

Unlike classical production formulations, however, activation effectiveness within the present framework is explicitly bounded through absorptive constraints and operational readiness conditions.

### 9.2 Goodwill Accumulation and Dynamic Persistence

The intertemporal goodwill formulation is conceptually adjacent to Nerlove–Arrow advertising stock models in which accumulated strategic effects partially persist across periods while undergoing gradual decay.

The framework extends this intuition beyond advertising persistence alone by treating goodwill as a broader form of accumulated strategic memory capable of influencing future organizational state conditions.

### 9.3 Systems Dynamics and Organizational Feedback

The framework is also conceptually related to systems dynamics traditions emphasizing accumulation, feedback, delayed response behaviour, and state-dependent evolution over time.

In particular, the interaction between activation intensity, absorptive constraints, goodwill persistence, and regime transitions reflects a systems-oriented interpretation of organizational growth dynamics rather than static equilibrium optimization.

#### **9.4 Diffusion and Propagation Dynamics**

The propagation subsystem exhibits conceptual similarity to diffusion-oriented growth literature in which existing organizational activity contributes to further expansion through referral or network effects.

However, the framework treats propagation efficiency not as an autonomous growth driver, but as one component interacting with visibility conditions, absorptive readiness, and strategic allocation constraints.

#### **9.5 Constraint-Oriented Organizational Growth**

The framework additionally shares partial conceptual overlap with constraint-oriented organizational theories emphasizing bottlenecks, operational throughput limitations, and saturation behaviour.

The present model extends this intuition by proposing that growth may be absorptively constrained: activation expenditure becomes conditionally effective depending on the organization’s ability to operationally sustain and convert resulting demand.

#### **9.6 Interpretable Strategic Systems**

The framework prioritizes interpretability, calibration transparency, and transparent organisation estimates over purely black-box optimization.

Accordingly, the model is positioned more closely to interpretable reasoning and decision-support systems than to opaque predictive architectures relying primarily on unrestricted parameter fitting.

The objective of the framework is therefore not autonomous strategic prediction, but structured state approximation under incomplete information conditions.

## References

- [1] Bass, F. M. (1969). *A New Product Growth Model for Consumer Durables*. Management Science, 15(5), 215–227.
- [2] Cobb, C. W., & Douglas, P. H. (1928). *A Theory of Production*. American Economic Review, 18(1), 139–165.
- [3] Doncheva, V. (2025). *Improving Customer Relations at Pahat Pahit Tea-house*. Research Report Thesis, Hanze University of Applied Sciences.
- [4] Forrester, J. W. (1961). *Industrial Dynamics*. MIT Press.
- [5] Goldratt, E. M. (1984). *The Goal*. North River Press.
- [6] Lerner, A. P. (1934). *The Concept of Monopoly and the Measurement of Monopoly Power*. The Review of Economic Studies, 1(3), 157–175.
- [7] Molnar, C. (2022). *Interpretable Machine Learning* (2nd ed.).
- [8] Nerlove, M., & Arrow, K. J. (1962). *Optimal Advertising Policy under Dynamic Conditions*. Economica, 29(114), 129–142.

## **A Glossary of Terminology**

### **A.1 Activation Investment**

Activation investment refers to expenditure intended to generate immediate visibility, demand generation, traffic acquisition, or audience activation.

Historically, this component was informally described using the metaphorical term “jet.”

### **A.2 Structural Investment**

Structural investment refers to expenditure that expands operational readiness, absorptive capacity, conversion reliability, organizational resilience, or long-term strategic infrastructure.

Historically, this component was informally described using the metaphorical term “structure.”

### **A.3 Atmosphere Capacity**

Atmosphere capacity represents the firm’s absorptive ceiling: the maximum activation intensity that can be operationally sustained without severe inefficiency or overload.

The term “atmosphere” is retained as shorthand for operational absorption dynamics.

### **A.4 Effective Activation**

Effective activation represents the realizable component of activation expenditure after absorptive constraints are applied.

Activation beyond atmosphere capacity is treated as increasingly inefficient rather than fully productive.

### **A.5 Goodwill Stock**

Goodwill stock represents accumulated strategic memory generated through prior realized strategic lift.

Historically, this component was informally described using the metaphorical term “memory.”

### **A.6 Strategic Regimes**

Strategic regimes describe emergent organizational allocation states produced by interactions between visibility, conversion capacity, propagation efficiency, and absorptive constraints.

Examples include:

- structure-starved,

- jet-starved,
- atmosphere-limited,
- balanced.

## B AIPS: AI-Assisted Inference Procedure Support

The Marres–Ramjet Fusion Model permits the use of AI-assisted assessor during operationalisation, calibration, and state estimation.

The purpose of AI assistance within the framework is not autonomous strategic decision-making, but structured support under incomplete information conditions.

Potential AI-supported functions include:

- weak-signal aggregation,
- proxy consistency checking,
- qualitative indicator synthesis,
- sensitivity exploration,
- and assignment documentation support.

The framework does not assume that AI systems possess direct access to latent organizational truth.

Instead, AI-assisted operationalisation is constrained through:

- explicit human supervision,
- declared assignment assumptions,
- confidence classification,
- transparent proxy construction,
- and inspectable calibration logic.

Accordingly, AI systems are treated as supporting instruments rather than autonomous strategic authorities.

The framework therefore maintains that organisational approximation remains dependent on evidentiary quality, operational transparency, and human accountability regardless of computational assistance level.

## B.1 Qualitative Scope Boundaries

AI-assisted interpretation within the framework remains subject to several constraints:

- incomplete or unstable proxy data,
- context-sensitive organizational interpretation,
- latent model bias,
- and non-uniqueness of strategic-state reconstruction.

The framework consequently treats AI-generated interpretations as provisional analytical support rather than deterministic strategic conclusions.

## C Validation Diagnostics

This appendix summarizes the validation diagnostics used to assess the canonical Marres–Ramjet specification. The purpose of these diagnostics is not to claim deterministic forecasting accuracy, but to evaluate whether the framework preserves calibration stability, parameter recoverability, identifiable structure, and interpretable regime behaviour under synthetic and noisy conditions.

### C.1 Synthetic Parameter Recovery

A synthetic recovery experiment was conducted using 30 simulated firms over 24 turns, with a fixed budget per turn of  $B = 10.0$ , fractional observational noise of 0.05, and seed 42. The experiment evaluates whether the calibration procedure can recover known parameters from generated trajectory behaviour.

Table 6: Synthetic recovery summary for freely estimated canonical parameters.

| Metric                                                                  | Value                                            |
|-------------------------------------------------------------------------|--------------------------------------------------|
| Estimated freely calibrated parameters recovered<br>( rel. err.  < 10%) | 7/7                                              |
| Mean absolute relative error, estimated parameters only                 | 1.13%                                            |
| Mean trajectory $R^2$ , strategic lift $S$                              | 0.9362                                           |
| Mean goodwill $R^2$ , goodwill stock $G$                                | 0.9954                                           |
| $k_{\text{floor}}$ status                                               | Fixed at 0.05<br>by identification<br>convention |

The results indicate that the estimable canonical parameters are recoverable under low-noise synthetic conditions, while  $k_{\text{floor}}$  is deliberately excluded from estimation and treated as a fixed identification convention.

Table 7: Recovered parameter values under the synthetic recovery experiment.

| Parameter              | True   | Estimated | Abs. error | Rel. error |
|------------------------|--------|-----------|------------|------------|
| $k_{\text{scale}}$     | 0.4000 | 0.4088    | 0.00878    | 2.20%      |
| $\gamma$               | 6.0000 | 5.8135    | -0.18653   | -3.11%     |
| $\tau_C$               | 0.5000 | 0.5068    | 0.00680    | 1.36%      |
| $\lambda_{\text{max}}$ | 0.3500 | 0.3478    | -0.00218   | -0.62%     |
| $\phi$                 | 1.0000 | 0.9994    | -0.00059   | -0.06%     |
| $\eta$                 | 0.6000 | 0.6025    | 0.00254    | 0.42%      |
| $\delta$               | 0.1500 | 0.1502    | 0.00017    | 0.11%      |

## C.2 Noise Sensitivity and Stress Testing

A stress-test experiment was conducted over 100 simulated firms, 24 turns, and 10 random seeds across four observational noise levels. Thirty-five percent of firms were assigned  $C < 0.35$  in order to exercise low-capacity regions of the state space.

Table 8: Trajectory and goodwill reconstruction by observational noise level.

| Noise std. | Mean $S R^2$ | Std. $S R^2$ | Mean $G R^2$ | Std. $G R^2$ |
|------------|--------------|--------------|--------------|--------------|
| 0.00       | 1.0000       | 0.0000       | 1.0000       | 0.0000       |
| 0.05       | 0.9294       | 0.0059       | 0.9966       | 0.0002       |
| 0.10       | 0.7824       | 0.0139       | 0.9865       | 0.0008       |
| 0.15       | 0.6304       | 0.0191       | 0.9697       | 0.0019       |

Table 9: Mean absolute parameter recovery error by noise level.

| Parameter              | 0.00 | 0.05   | 0.10   | 0.15   |
|------------------------|------|--------|--------|--------|
| $\gamma$               | 0.0% | 1.9%   | 3.5%   | 5.1%   |
| $\tau_C$               | 0.0% | 1.0%   | 1.8%   | 2.7%   |
| $k_{\text{min}}$       | 0.0% | 127.0% | 196.2% | 224.7% |
| $k_{\text{max}}$       | 0.0% | 3.3%   | 5.8%   | 6.9%   |
| $\lambda_{\text{max}}$ | 0.0% | 3.0%   | 6.2%   | 9.5%   |
| $\phi$                 | 0.0% | 0.1%   | 0.2%   | 0.4%   |
| $\eta$                 | 0.0% | 0.8%   | 1.6%   | 2.5%   |
| $\delta$               | 0.0% | 0.0%   | 0.1%   | 0.1%   |

The stress test shows gradual rather than catastrophic degradation in strategic lift reconstruction as noise increases. Goodwill reconstruction remains highly stable across all tested noise levels, suggesting that the intertemporal goodwill state provides smoothing and persistence even when period-level strategic lift is noisy. The major exception is  $k_{\text{min}}$ , whose recovery error becomes unstable under even moderate observational noise. This motivates the canonical reparameterisation described below.

### C.3 Identifiability and Canonical Simplification

A dedicated identifiability test evaluated the earlier two-parameter responsiveness form using 200 firms, 24 turns, 10 seeds, and noise levels  $\{0.00, 0.03, 0.05, 0.08, 0.10\}$ . The experiment used 25% coverage per conversion-capacity band to improve state-space coverage.

Table 10: Identifiability test: mean absolute parameter recovery error by noise level.

| Parameter        | 0.00 | 0.03  | 0.05  | 0.08  | 0.10   |
|------------------|------|-------|-------|-------|--------|
| $\gamma$         | 0.0% | 1.1%  | 1.8%  | 2.8%  | 3.1%   |
| $\tau_C$         | 0.0% | 0.5%  | 0.8%  | 1.5%  | 1.8%   |
| $k_{\min}$       | 0.0% | 53.3% | 69.3% | 97.7% | 105.1% |
| $k_{\max}$       | 0.0% | 2.4%  | 3.3%  | 4.9%  | 5.7%   |
| $\lambda_{\max}$ | 0.0% | 1.3%  | 2.1%  | 3.4%  | 4.2%   |
| $\phi$           | 0.0% | 0.1%  | 0.1%  | 0.2%  | 0.2%   |
| $\eta$           | 0.0% | 0.4%  | 0.6%  | 1.1%  | 1.3%   |
| $\delta$         | 0.0% | 0.0%  | 0.0%  | 0.0%  | 0.0%   |

The key result is that  $k_{\min}$  remains weakly identifiable despite improved state-space coverage, while  $k_{\max}$  and the remaining parameters remain comparatively stable. This indicates that the instability is not merely a data coverage issue. Rather, the earlier form permits compensating adjustments between the lower and upper responsiveness terms.

The canonical simplification therefore replaces the earlier two-bound form with

$$k(C) = k_{\text{floor}} + k_{\text{scale}}(1 - C),$$

where

$$k_{\text{floor}} = 0.05$$

is fixed as an identification convention. This reparameterisation preserves the intended behavioural interpretation of structural responsiveness while reducing parameter degeneracy and improving calibration inspectability.

Table 11: Effect of fixing  $k_{\min}$  on selected recovery errors.

| Noise | $k_{\max}$ free | $k_{\max}$ fixed | $k_{\min}$ | $\gamma$ free | $\gamma$ fixed | $k_{\min}$ |
|-------|-----------------|------------------|------------|---------------|----------------|------------|
| 0.03  | 2.4%            |                  | 1.0%       | 1.1%          |                | 0.9%       |
| 0.05  | 3.3%            |                  | 1.9%       | 1.8%          |                | 1.6%       |
| 0.08  | 4.9%            |                  | 3.3%       | 2.8%          |                | 2.5%       |
| 0.10  | 5.7%            |                  | 4.2%       | 3.1%          |                | 2.8%       |

Fixing the lower responsiveness term does not degrade the recovery of the remaining parameters. In the tested settings, it modestly improves  $k_{\max}$  recovery and leaves other parameters effectively unchanged. The simplification

is therefore not merely aesthetic; it removes an empirically unstable degree of freedom while preserving trajectory behaviour.

## C.4 Adversarial and Prior-Sensitivity Checks

Additional adversarial validation evaluated whether the  $k_{\min}$  instability was structural, a parameterisation artifact, or a self-consistency artifact of the simulator. The validation record classified the primary verdict as a parameterisation artifact: the coupled form  $k(C) = k_{\min} + (k_{\max} - k_{\min})(1 - C)$  creates a flat loss valley under noise. Reparameterising the function as  $k(C) = k_{\text{floor}} + k_{\text{scale}}(1 - C)$ , with  $k_{\text{floor}}$  fixed, resolves the instability without requiring a redesign of the canonical model.

A Bayesian prior sweep further supported this interpretation. Across prior scales and noise levels, weighted strategic-lift and goodwill fits remained unchanged relative to the fixed- $k_{\text{floor}}$  convention. The posterior uncertainty around  $k_{\text{floor}}$  therefore did not translate into material forecast variation, supporting the interpretation that the parameter is weakly identifiable but predictively benign.

Table 12: Bayesian prior sweep summary for representative prior scales.

| Prior $\sigma$ | Noise | $k_{\text{floor}}$ | mean   | $k_{\text{scale}}$ | mean   | $S R^2$ | $\Delta S R^2$ |
|----------------|-------|--------------------|--------|--------------------|--------|---------|----------------|
| 0.005          | 0.03  |                    | 0.0501 |                    | 0.4023 | 0.9868  | 0.00000        |
| 0.005          | 0.05  |                    | 0.0501 |                    | 0.4033 | 0.9643  | 0.00000        |
| 0.005          | 0.08  |                    | 0.0500 |                    | 0.4061 | 0.9134  | 0.00000        |
| 0.025          | 0.03  |                    | 0.0520 |                    | 0.4000 | 0.9868  | 0.00000        |
| 0.025          | 0.05  |                    | 0.0513 |                    | 0.4019 | 0.9643  | 0.00000        |
| 0.025          | 0.08  |                    | 0.0509 |                    | 0.4047 | 0.9134  | 0.00000        |
| 0.050          | 0.03  |                    | 0.0633 |                    | 0.3863 | 0.9868  | 0.00000        |
| 0.050          | 0.05  |                    | 0.0638 |                    | 0.3868 | 0.9643  | 0.00000        |
| 0.050          | 0.08  |                    | 0.0624 |                    | 0.3911 | 0.9134  | 0.00000        |

## C.5 Regime Reachability

A regime reachability diagnosis evaluated whether all theoretically defined strategic regimes are reachable under the canonical allocation and classification logic. Across 96,000 turn-level classifications in the stress-test setting, the system produced all four strategic regimes rather than collapsing into a single dominant state.

A separate grid diagnosis found that, under the then-current classification variant, atmosphere-limited behaviour reached approximately 20.99% of grid points. A structure-only variant raised this to approximately 27.02%, indicating that the activation-supported atmosphere term  $\lambda J$  partially suppresses atmosphere-limited classification when activation itself contributes to absorptive support.

Table 13: Turn-level regime distribution across all stress-test runs.

| <b>Regime</b>      | <b>Total turns</b> | <b>Fraction</b> |
|--------------------|--------------------|-----------------|
| Structure-starved  | 27,244             | 28.38%          |
| Jet-starved        | 24,172             | 25.18%          |
| Atmosphere-limited | 22,652             | 23.60%          |
| Balanced           | 21,932             | 22.85%          |

This result is important for interpretation. It suggests that atmosphere limitation is not mathematically unreachable, but its apparent frequency depends on whether classification is based on full atmosphere capacity or structural capacity excluding activation-supported propagation. The model equations need not change; the issue concerns regime classification and approximate diagnostics.

## C.6 Classifier Revision and Structural Utilisation

A subsequent classifier validation tested a structural-utilisation regime classifier. The recommended revision classifies atmosphere limitation using structural atmosphere capacity rather than the full atmosphere expression, thereby separating genuine structural absorptive capacity from atmosphere temporarily supported by activation.

The validation record recommended adoption of the structural classifier because it increased atmosphere-limited reachability from approximately 20.83% to 27.70%, with most atmosphere-limited points lying well inside the regime rather than only near the boundary. The revision is classifier-only: it leaves growth  $S$ , goodwill  $G$ , and effective activation  $J_{\text{eff}}$  mathematically invariant.

## C.7 Fringe-Case Atmosphere Reachability

Because the paper identifies atmosphere limitation as a theoretically possible but potentially rare strategic state, a fringe-case reachability experiment was used to test whether atmosphere-limited behaviour emerges under extreme but interpretable state configurations.

The fringe-case experiment used 2,000 simulated firms and evaluated both optimal allocation and forced high-activation allocation. Under optimal allocation, atmosphere-limited behaviour appeared in 40.15% of firms. Under forced activation with  $J/B = 0.90$ , atmosphere-limited behaviour appeared in all tested firms. This indicates that atmosphere limitation is not merely a formal possibility; it can emerge under plausible combinations of weak conversion capacity, high visibility incentive, and strong referral propagation.

The atmosphere-limited cases are characterized by lower conversion capacity, higher visibility gap, stronger referral propagation, lower market power, and higher activation share. This is theoretically coherent: firms with strong visibility incentives and propagation effects may optimally push activation toward or

Table 14: Condition differences associated with atmosphere-limited outcomes in the fringe-case experiment.

| Variable            | Atmosphere-limited mean | Other-regime mean | Difference |
|---------------------|-------------------------|-------------------|------------|
| $C$                 | $0.284 \pm 0.086$       | $0.329 \pm 0.107$ | -0.045     |
| $V$                 | $0.750 \pm 0.114$       | $0.709 \pm 0.148$ | +0.041     |
| $R_m$               | $1.261 \pm 0.226$       | $1.018 \pm 0.422$ | +0.243     |
| $L$                 | $0.322 \pm 0.124$       | $0.429 \pm 0.190$ | -0.107     |
| $f^*$               | $0.518 \pm 0.069$       | $0.470 \pm 0.092$ | +0.048     |
| $U_{\text{struct}}$ | $0.755 \pm 0.023$       | $0.912 \pm 0.075$ | -0.157     |
| $A_{\text{struct}}$ | $0.391 \pm 0.051$       | $0.453 \pm 0.081$ | -0.062     |
| $\lambda$           | $0.248 \pm 0.023$       | $0.212 \pm 0.057$ | +0.036     |
| $\beta$             | $0.607 \pm 0.116$       | $0.537 \pm 0.172$ | +0.070     |

beyond structurally sustainable absorption, especially when conversion capacity remains weak.

Table 15: Fringe-case atmosphere limitation by conversion-capacity band.

| $C$ band     | $n$ | Atmosphere-limited % | Mean $f^*$ | Mean $U_{\text{struct}}$ |
|--------------|-----|----------------------|------------|--------------------------|
| [0.10, 0.25) | 580 | 50.00%               | 0.416      | 0.8401                   |
| [0.25, 0.35) | 741 | 43.30%               | 0.475      | 0.8368                   |
| [0.35, 0.45) | 511 | 36.40%               | 0.569      | 0.8413                   |
| [0.45, 0.55) | 168 | 3.60%                | 0.564      | 0.9560                   |

Table 16: Fringe-case atmosphere limitation by referral-propagation band.

| $R_m$ band | $n$ | Atmosphere-limited % | Mean $f^*$ | Mean $\lambda$ |
|------------|-----|----------------------|------------|----------------|
| [0.0, 0.5) | 168 | 0.00%                | 0.490      | 0.1134         |
| [0.5, 0.9) | 406 | 11.60%               | 0.489      | 0.1785         |
| [0.9, 1.2) | 452 | 59.10%               | 0.454      | 0.2280         |
| [1.2, 1.5) | 718 | 55.00%               | 0.493      | 0.2592         |
| [1.5, 1.8) | 256 | 36.70%               | 0.541      | 0.2825         |

The fringe-case results support the inclusion of atmosphere limitation as an interpretable regime. The regime should not be described as universally common in ordinary operating conditions, but neither is it merely theoretical. It becomes especially relevant in firms with low-to-moderate conversion capacity, high visibility incentive, and strong propagation dynamics.

## C.8 Excluded Exploratory Branches

The validation archive also contains exploratory tests of post-overload readiness erosion and bounded convex overload penalties. These branches are intentionally excluded from the present canonical appendix because they are not

part of the canonical specification analysed in the main paper. They may be treated as future extensions concerning nonlinear overload, fragility, and saturation dynamics, but they should not be interpreted as components of the present canonical Marres–Ramjet framework.

## D Canonical Deployment Reference

This appendix provides a compact implementation reference for the canonical Marres–Ramjet Fusion Model. It is intended as an engineering-oriented summary of the core equations, variable ranges, and simulation sequence described in the main body of the paper.

The reference below does not introduce additional theoretical claims. Instead, it restates the canonical framework in a condensed form suitable for software implementation, reproducibility checks, and independent inspection.

### D.1 Canonical Inputs

The canonical model requires the following observable or proxy-derived strategic state variables:

| Symbol   | Range        | Interpretation                     |
|----------|--------------|------------------------------------|
| $B$      | $B \geq 0$   | Total strategic expenditure budget |
| $C$      | $[0, 1]$     | Conversion capacity                |
| $V$      | $[0, 1]$     | Visibility gap                     |
| $R_m$    | $R_m \geq 0$ | Referral propagation efficiency    |
| $L$      | $[0, 1]$     | Market power                       |
| $G_0$    | $G_0 \geq 0$ | Initial goodwill stock             |
| $\delta$ | $[0, 1]$     | Goodwill decay rate                |

Table 17: Canonical deployment inputs.

### D.2 Budget Constraint

Total strategic expenditure is divided between structural investment  $R$  and activation investment  $J$ :

$$R + J = B,$$

subject to:

$$R \geq 0, \quad J \geq 0.$$

### D.3 State-Dependent Elasticities

Structural elasticity is defined as:

$$\alpha = \text{clamp}(L, \alpha_{\min}, \alpha_{\max}).$$

Activation elasticity is defined as:

$$\beta = \text{clamp}(V(1 - \eta L), \beta_{\min}, \beta_{\max}).$$

These elasticities represent state-dependent strategic responsiveness rather than fixed universal constants.

### D.4 Atmosphere Capacity

Atmosphere capacity is defined as:

$$A(R, J) = A_0(C) + k(C)R + \lambda(R_m)J.$$

Baseline atmosphere capacity is:

$$A_0(C) = B \cdot \sigma(\gamma(C - \tau_C)).$$

Structural expansion efficiency is:

$$k(C) = k_{\text{floor}} + k_{\text{scale}}(1 - C),$$

with the canonical identification convention:

$$k_{\text{floor}} = 0.05.$$

Propagation efficiency is:

$$\lambda(R_m) = \lambda_{\max}(1 - e^{-R_m}).$$

### D.5 Effective Activation

Effective activation is the absorbable portion of activation expenditure:

$$J_{\text{eff}} = \min(J, A(R, J)).$$

### D.6 Strategic Lift

The canonical deployment form of strategic lift is:

$$S_t = \phi [\log(1 + R_t)]^\alpha [\log(1 + J_{\text{eff},t})]^\beta.$$

For analytical approximation, the simplified Cobb–Douglas form may be used:

$$S_t = R_t^\alpha J_{\text{eff},t}^\beta.$$

## D.7 Goodwill Dynamics

Goodwill evolves intertemporally according to:

$$G_{t+1} = (1 - \delta)G_t + S_t.$$

## D.8 Activation Utilisation

Activation utilisation is defined as:

$$U = \frac{J_{\text{eff}}}{J}.$$

Values near one indicate that activation expenditure remains largely absorbable. Values substantially below one indicate absorptive constraint or overload risk.

## D.9 Canonical Simulation Sequence

A minimal implementation of the canonical model proceeds as follows:

1. Assign  $B$ ,  $C$ ,  $V$ ,  $R_m$ ,  $L$ ,  $G_0$ , and  $\delta$ .
2. Compute  $\alpha$  and  $\beta$  from the state-dependent elasticity rules.
3. Allocate  $B$  between  $R$  and  $J$  subject to  $R + J = B$ .
4. Compute atmosphere capacity  $A(R, J)$ .
5. Compute effective activation  $J_{\text{eff}}$ .
6. Compute realized strategic lift  $S_t$ .
7. Update goodwill stock using  $G_{t+1} = (1 - \delta)G_t + S_t$ .
8. Classify the resulting strategic regime.
9. Repeat across time periods if intertemporal simulation is required.

## D.10 Regime Classification Conditions

The canonical regime classifications are summarized as follows:

| Regime             | Indicative Condition             | Interpretation                                         |
|--------------------|----------------------------------|--------------------------------------------------------|
| Atmosphere-limited | $J > A(R, J)$                    | Activation exceeds absorptive capacity                 |
| Structure-starved  | $C < \tau_C$                     | Operational readiness is weak                          |
| Jet-starved        | $V > \tau_V$ and $C \geq \tau_C$ | Visibility is below operational readiness              |
| Balanced           | Otherwise stable alignment       | Visibility and absorptive capacity are broadly aligned |

Table 18: Canonical strategic regime conditions.

## **D.11 Canonical Scope and Future Research Extensions**

The canonical model includes state-dependent elasticities, atmosphere capacity, effective activation, strategic lift, goodwill decay, and regime classification.

Future research extensions may include overload penalties, nonlinear fragility mechanisms, Markov-switching dynamics, Monte Carlo uncertainty layers, and multi-agent DMDU simulation environments. These extensions are not required for canonical deployment and should be treated as subsequent research layers rather than components of the base specification.