CONFERENCE PRESENTATION

A Systemic Study of Rate Disparity in the Hotel Industry

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Systems Thinking • Cybernetics • Soft Systems Methodology (SSM) • Design & Control Systemic Methodology (DCSYM) • Causal Loop Diagrams (CLDs) • System Dynamics

ROADMAP

Study Structure and Scope

1. Introduction
2. Organizational Environment
3. Systemic Approaches
4. SSM, Rich Picture & CATWOE
5. DCSYM - Current State Analysis
6. DCSYM - Transformed State
7. CLDs & Stock-Flow Modelling
8. Technological and Organizational Architecture
9. Conclusions and Implications

INTRODUCTION

Problem Statement, Research Purpose and Motivation

1

Problem Description

The persistent occurrence of multiple prices for the same hotel room across different distribution channels, frequently beyond the direct control of the accommodation provider. This phenomenon is closely linked to price leakage from B2B distribution networks into B2C marketplaces.

2

Research Purpose

Identifying the structural and operational determinants of rate disparity, evaluate its impact on hotel distribution ecosystems and propose a practically applicable intervention framework based on SSM, DCSYM and System Dynamics.

3

Research Motivation

The growing dependence on OTAs and intermediary distributors, combined with AI-driven repricing mechanisms, highlights the need for transparency, enhanced governance and systemic intervention rather than isolated corrective actions.

Methodological Approach and Data Sources

A multi-layered approach combining systemic methodologies, strategic analysis tools and dynamic behavioral modelling.

Published Evidence

International literature addressing OTA practices, B2B distribution networks, price leakage phenomena and the role of metasearch platforms in shaping market dynamics.

Operational Insights

Empirical observations from professional experience in comparable operational environments, revealing 41 communication flows and 15 control mechanisms among PMS, CRS, Channel Managers, OTAs and B2B networks.

Research Assumptions

The numerical values employed in the DCSYM, CLD and Stock-Flow models are exploratory and intended solely for dynamic analysis. They do not represent actual measurements from any specific hotel property.

ORGANIZATIONAL ENVIRONMENT

The Hotel Industry and the Greek Market

Hotel Industry

- A key pillar of the Greek economy, contributing significantly to GDP and employment.
- Characterized by strong seasonality and dependence on international tourism demand.
- Comprises a broad spectrum of businesses ranging from family-owned hotels to multinational chains.
- Room distribution increasingly relies on OTAs, metasearch platforms and B2B bedbanks.

Market Analysis

- Sustained long-term growth despite economic crises, the pandemic and geopolitical developments.
- Greece maintains a strong international position among leading tourism destinations.
- Growing competitive pressure from emerging destinations and short-term rental platforms.
- Increasing dependence on digital distribution channels and online booking ecosystems.

SWOT ANALYSIS

SWOT - Greek Hotel Industry

Strengths

- Strong international destination recognition
- High-quality hospitality offering
- Consistently growing tourism demand

Weaknesses

- High seasonality
- Limited technological maturity among SMEs
- Strong dependence on OTA & B2B intermediaries leading to price leakage

Opportunities

- AI adoption in pricing, forecasting & personalization
- Direct channel growth through loyalty & CRM initiatives
- Sustainable & experiential tourism

Threats

- Competition from short-term rentals & emerging destinations
- Geopolitical & economic uncertainty
- Increasing bargaining power of OTAs & metasearch platforms

PESTEL ANALYSIS

PESTEL - External Environment

P Political

Political instability may influence tourism demand.

E Economic

Economic fluctuations affect travel expenditure & booking behavior.

S Social

Online visibility and price transparency increasingly influence consumer decision-making.

T Technological

AI, Big Data, PMS/CRS integrations and metasearch technologies increase exposure to rate leakage.

E Environmental

Growing expectations for sustainable business practices.

L Legal

GDPR, Digital Markets Act & Digital Services Act increasingly shape platform operations.

Consumer Behavior & Strategic Directions

Consumer Behavior

- Digital maturity shifts bargaining power towards consumers.
- Online reviews are frequently perceived as more trustworthy than official communication.
- Metasearch platforms amplify sensitivity to price inconsistencies.
- Loyalty and personalization lose effectiveness when lower prices are available elsewhere.

Strategic Recommendations

- Strengthen direct channels through CRM and exclusive customer benefits.
- Leverage AI for dynamic pricing and forecasting.
- Regulate parity clauses to reduce price deviations.
- Develop strategic alliances and penetrate low-season markets.

SYSTEMIC APPROACHES

Evolution of Systems Theory

1930s	1948	1961	1970s	Today
Bertalanffy	**Wiener**	**Forrester (MIT)**	**Checkland**	**DCSYM**
General Systems Theory and holistic analysis	Cybernetics and feedback as self-regulation	System Dynamics, feedback loops and delays	Soft Systems Methodology and multiple perspectives	Complexity, network governance and second-order cybernetics

Systems Theory provides the conceptual foundation for understanding the complexity of hotel distribution ecosystems.

SYSTEMIC METHODOLOGIES

The Four Methodologies Of The Study

① **Soft Systems Methodology (SSM)**

Checkland (1981) - Complex problem situations, multiple perspectives and root definitions.

② **Design and Control Systemic Methodology (DCSYM)**

Assimakopoulos & Theocharopoulos (2009) - Control structures, information flows and decision-making processes.

③ **Causal Loop Diagrams (CLDs)**

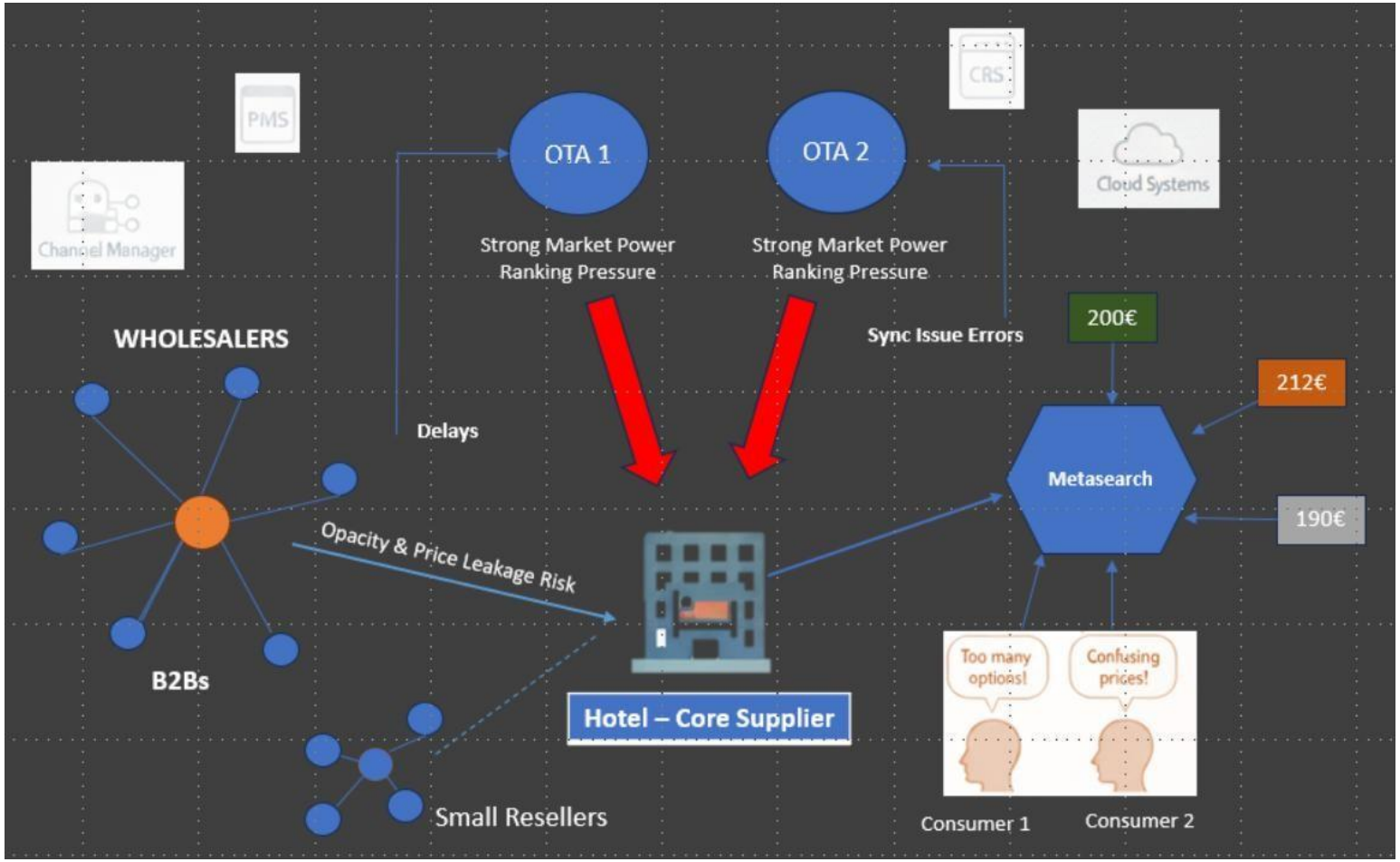
Forrester (1961)· Sterman (2000) - Reinforcing and balancing loops, leverage points and systemic behavior.

④ **CATWOE**

Checkland & Scholes (1990) - Definition of system boundaries through six analytical dimensions.

RICH PICTURE

Rate Disparity - One Room, Multiple Prices



Metasearch engines automatically compare OTA, B2B and direct prices.

Synchronization and caching delays generate inconsistencies across channels.

Opacity within intermediary networks enables price leakage.

Result: Consumer confusion ultimately undermines trust in direct booking channels

CATWOE - Defining the System

C — Customers

Travelers and hotels affected by rate disparity.

A — Actors

Hotels, OTAs, wholesalers, B2B distributors, metasearch platforms and technology providers.

T — Transformation

From controlled pricing to a network of multiple market prices.

W — Worldview

Price as an outcome of negotiation, technology and distribution complexity.

O — Owner

Hotels, major OTAs and selected wholesalers.

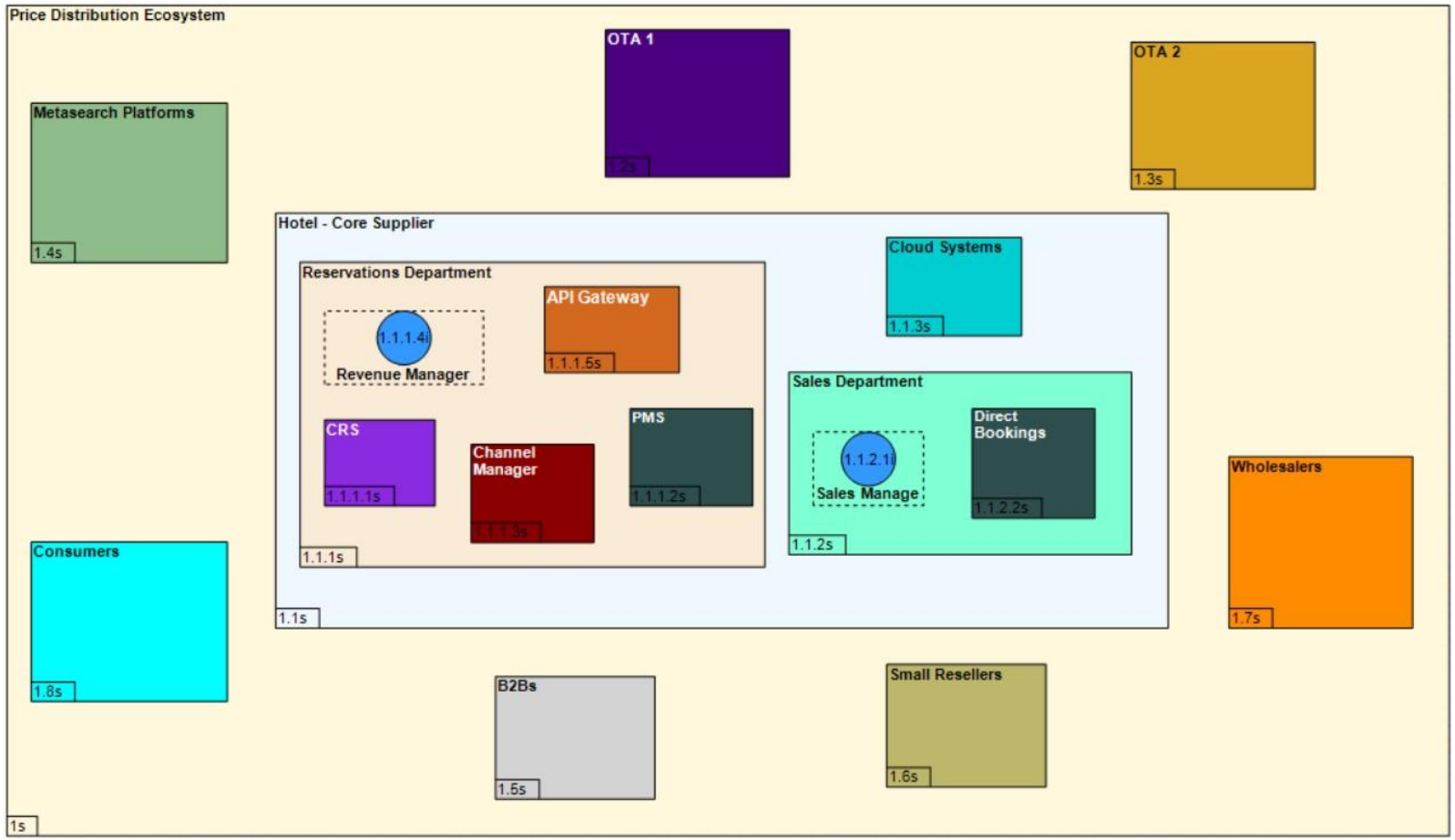
E — Env. Constraints

Technological, commercial, regulatory and behavioral limitations.

Root Definition

A system in which multiple actors interact under conditions of complexity and information asymmetry, transforming a hotel's room rate into a set of multiple and frequently divergent market prices.

Structure of the Distribution System



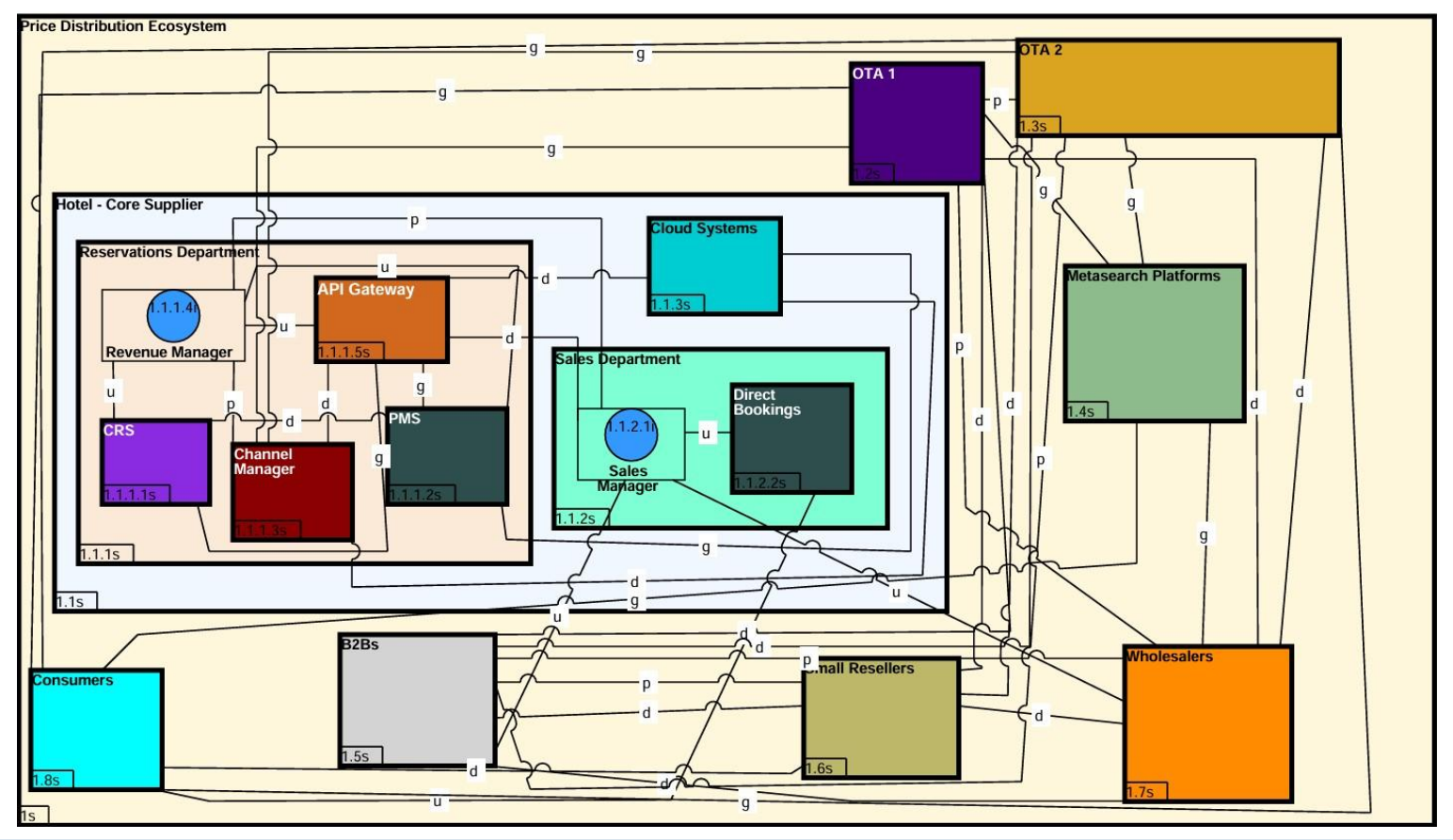
17 interconnected systems and subsystems surround the Hotel Core Supplier.

Reservation functions include CRS, PMS, Channel Manager, API Gateway and Revenue Management.

Sales Dept: Sales Manager, Direct Bookings.

External actors include OTAs, metasearch platforms, wholesalers, B2B networks, resellers and consumers

41 Communication Flows: Hyper-Complexity



G - General

13 (32%)

U - Purposeful

10 (24%)

D - Distorted

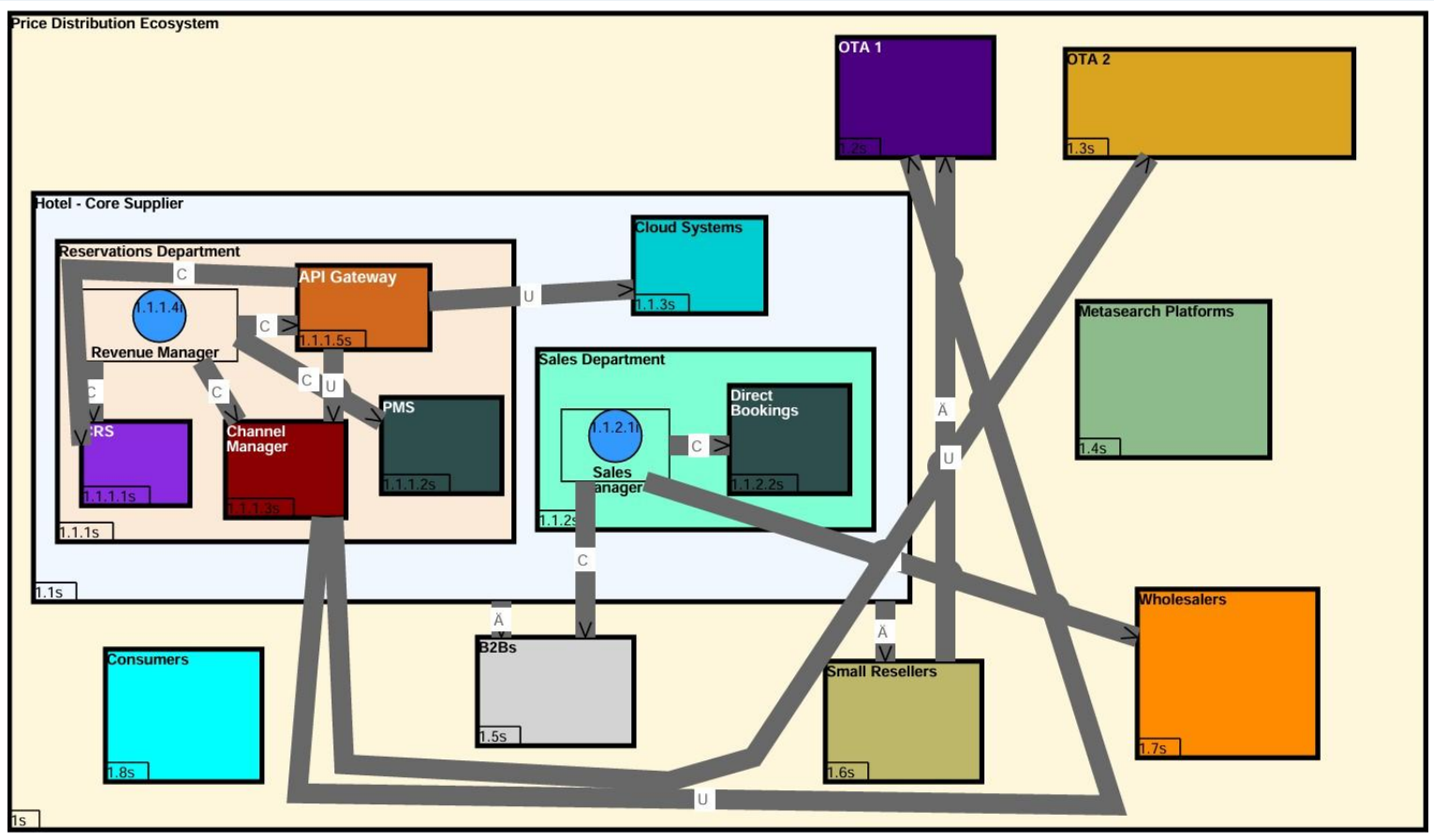
15 (36%)

P - Conflict

3 (8%)

Distorted flows exceed purposeful flows, indicating systemic overcommunication and structural inefficiency.

15 Control Mechanisms - Structural Asymmetry



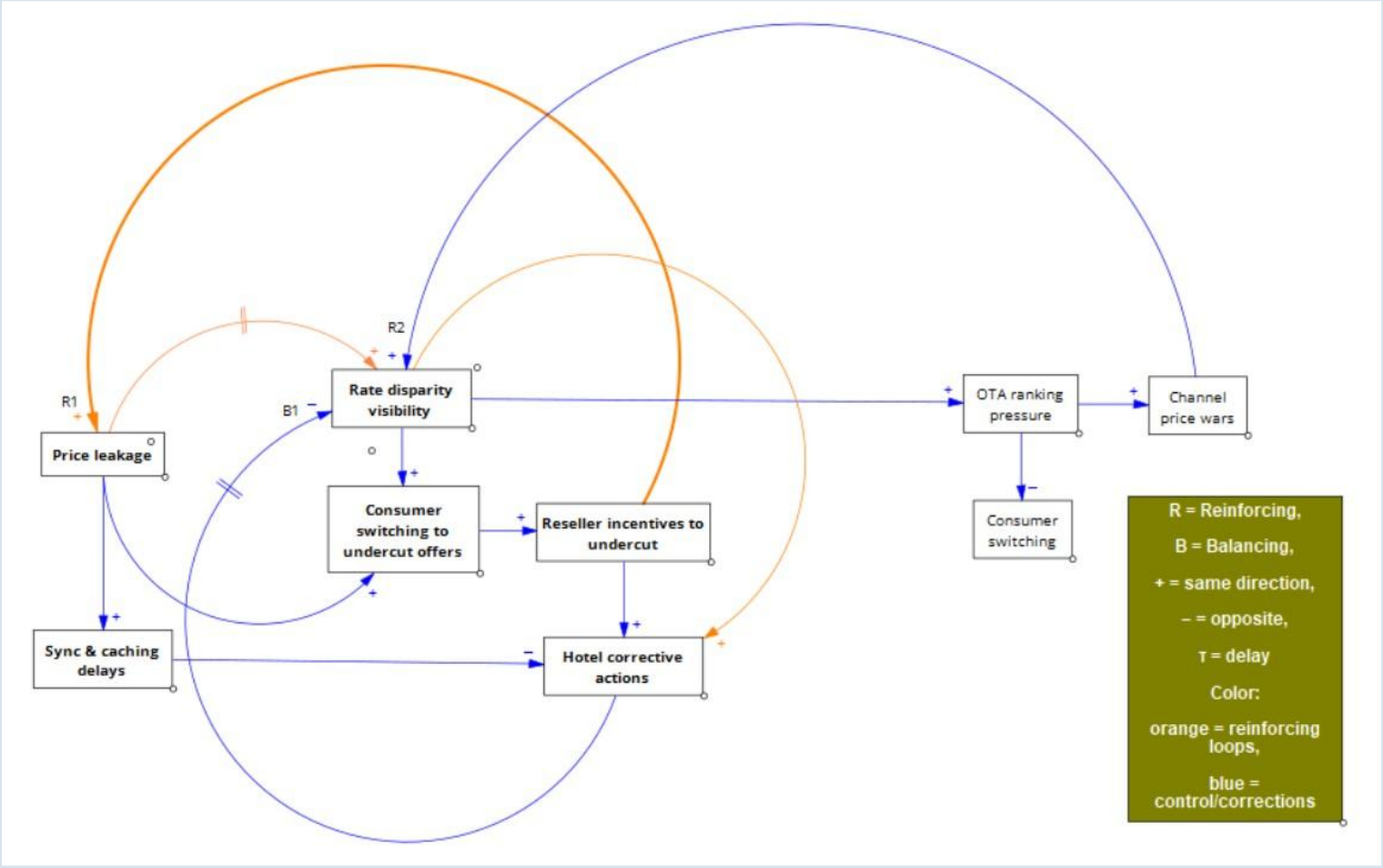
41 : 15

Communication to control ratio

Interpretation: Decision and control authority remain concentrated within the Hotel Core Supplier, while communication complexity extends across the broader ecosystem.

CAUSAL LOOP DIAGRAM - CURRENT STATE

Reinforcement Dominates Balancing



R1 - Leakage Amplifier

Price leakage → sync/caching delays → fewer corrections.

R2 - Price Disparity Visibility

Visibility→ OTA ranking pressure → channel price wars → customer switching.

B1 - Hotel Corrective Actions

The only balancing loop, weakened by synchronization delays.

TRANSFORMATION PROPOSAL

Four Complementary Interventions

1 Price Control Hub (PCH)

Unified Pricing Manager – Unifies Revenue & Sales. "Pricing-as-code," unified audit.

2 API Synchronization Engine

Event-driven, idempotent architecture. Priority queues, Error recovery

3 Distribution Monitoring System (DMS)

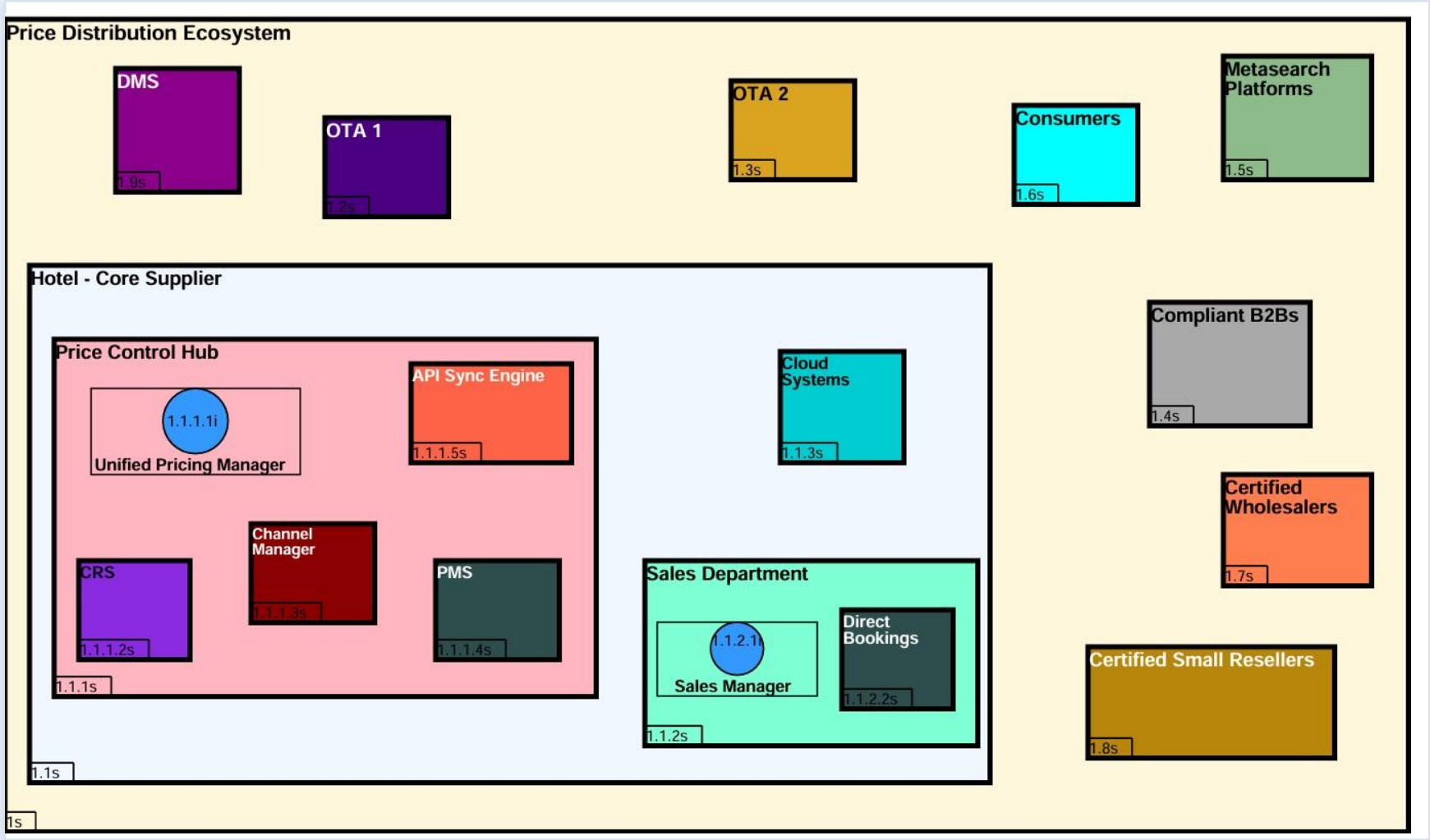
Real-time rate intelligence, Scraping/API. Early detection of deviations

4 Partner Compliance Framework (PCF)

Certification, traceability & tokenized access for B2B/Wholesalers

Objective: Transform uncontrolled complexity into manageable and governable complexity.

The New Ecosystem Model

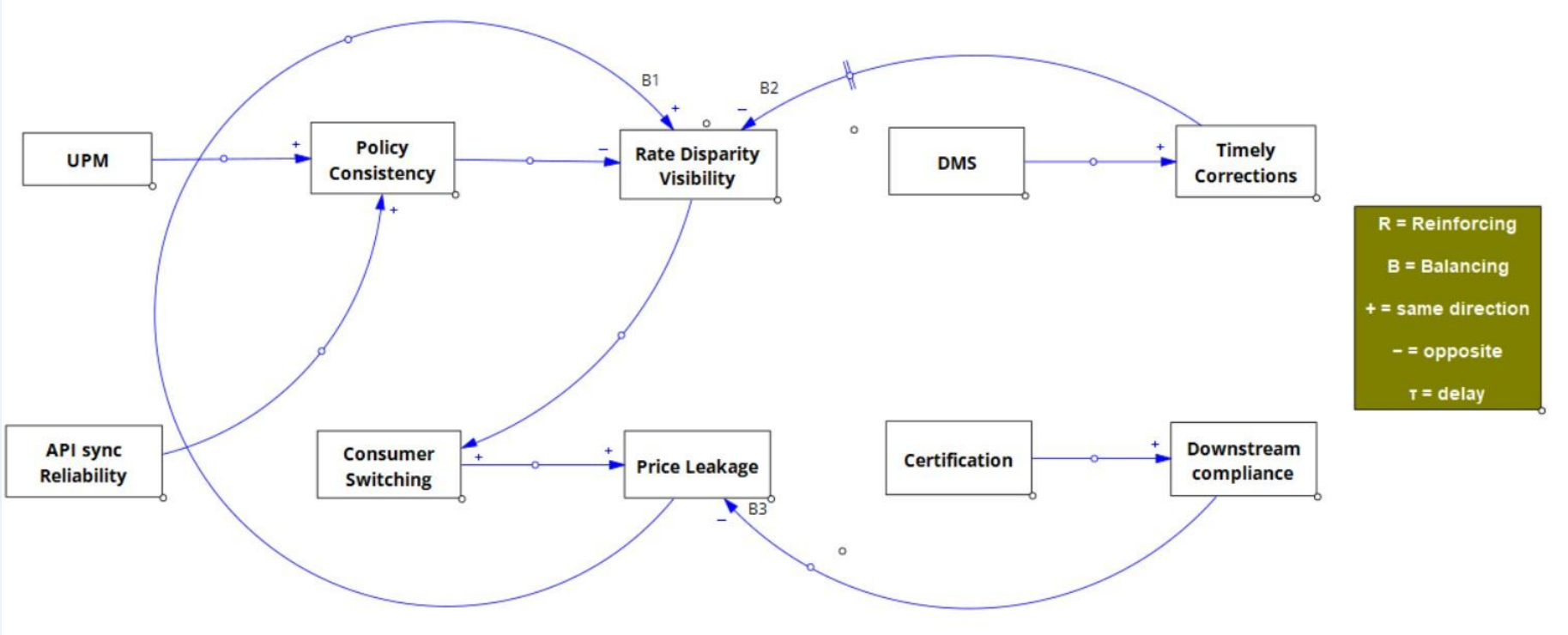


In-hotel Price Control Hub featuring a Unified Pricing Manager and API Sync Engine.

New external DMS hub monitoring OTAs and metasearch engines.

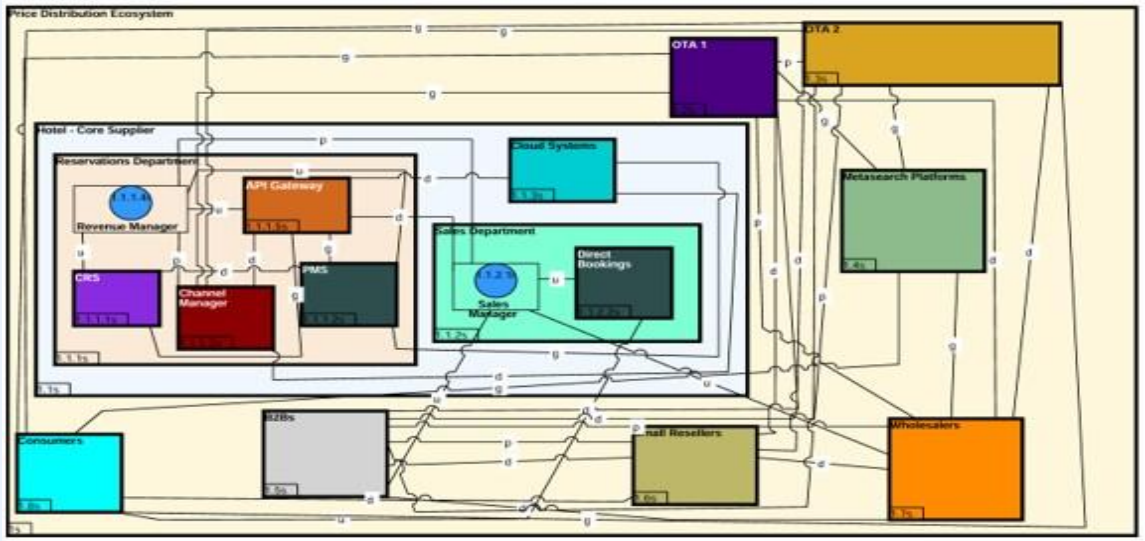
Certified wholesalers, B2Bs and small resellers via a Partner Compliance Framework.

Reinforcement Replaced by Balancing

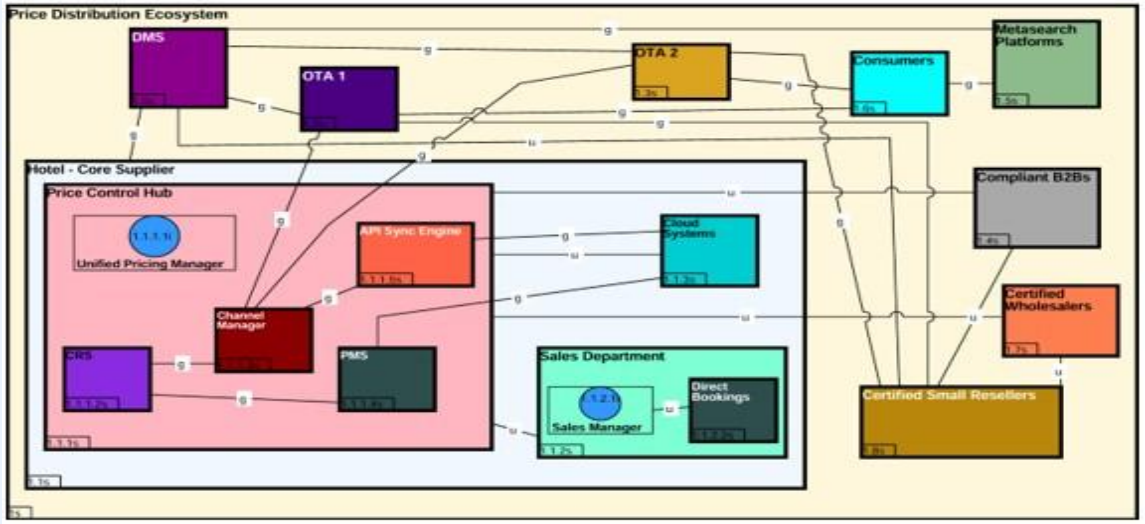


- Closed balancing feedback loop through policy consistency.
- DMS enables timely corrections.
- Certification encourages downstream compliance.
- Overall systemic stability improves.

ΥΦΙΣΤΑΜΕΝΗ ΚΑΤΑΣΤΑΣΗ – ΡΟΩΝ ΕΠΙΚΟΙΝΩΝΙΑΣ



ΜΕΤΑΣΧΗΜΑΤΙΣΜΕΝΗ ΚΑΤΑΣΤΑΣΗ – ΡΟΩΝ ΕΠΙΚΟΙΝΩΝΙΑΣ



Comparison of Communication Flows

Communication Flows - Before vs After

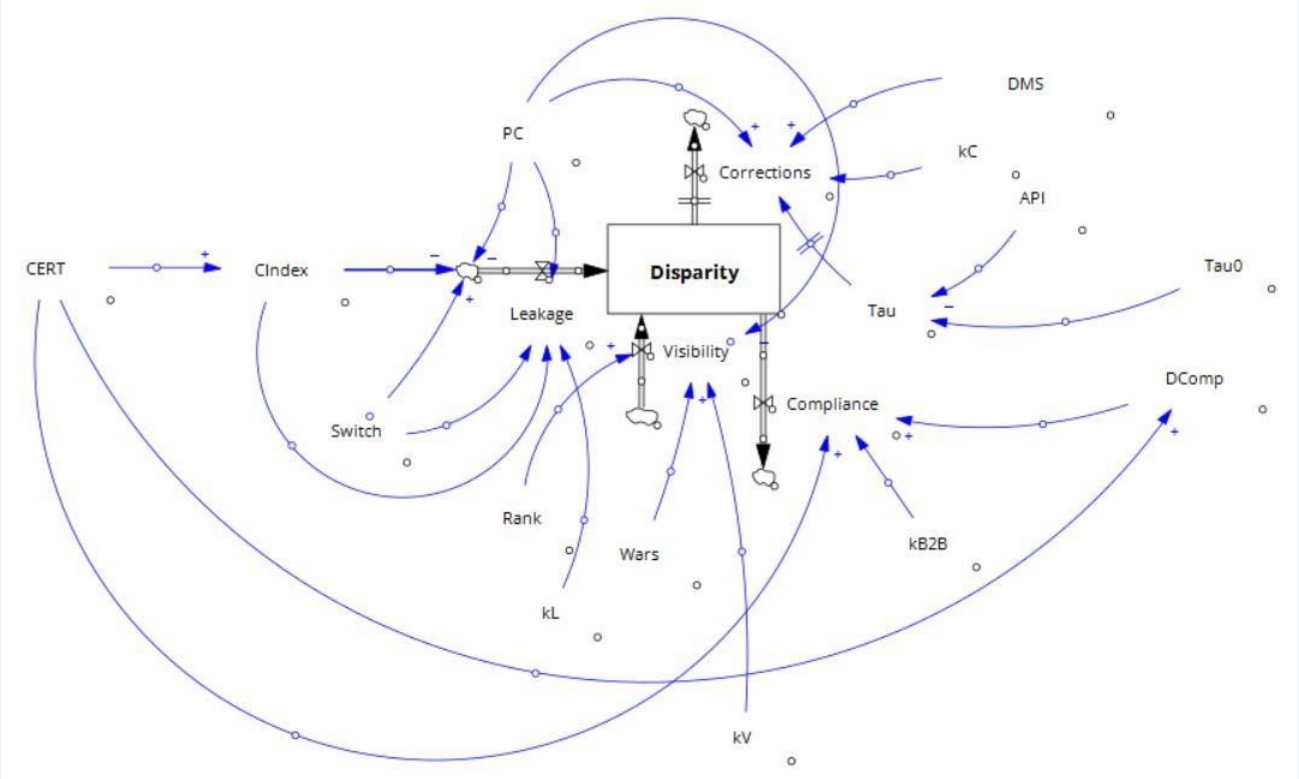
- Reduction of distorted and conflict flows.
- Increase in purposeful flows.
- Improved stability through API synchronisation.
- Previously distorted partner interactions become purposeful through certification.
- No bidirectional problematic flows remain.



Comparison of Control Flows

Control Flows - Before vs After

- DMS introduces additional monitoring capabilities.
- Internal hotel controls remain intact and are strengthened.
- Governance expands beyond organisational boundaries.

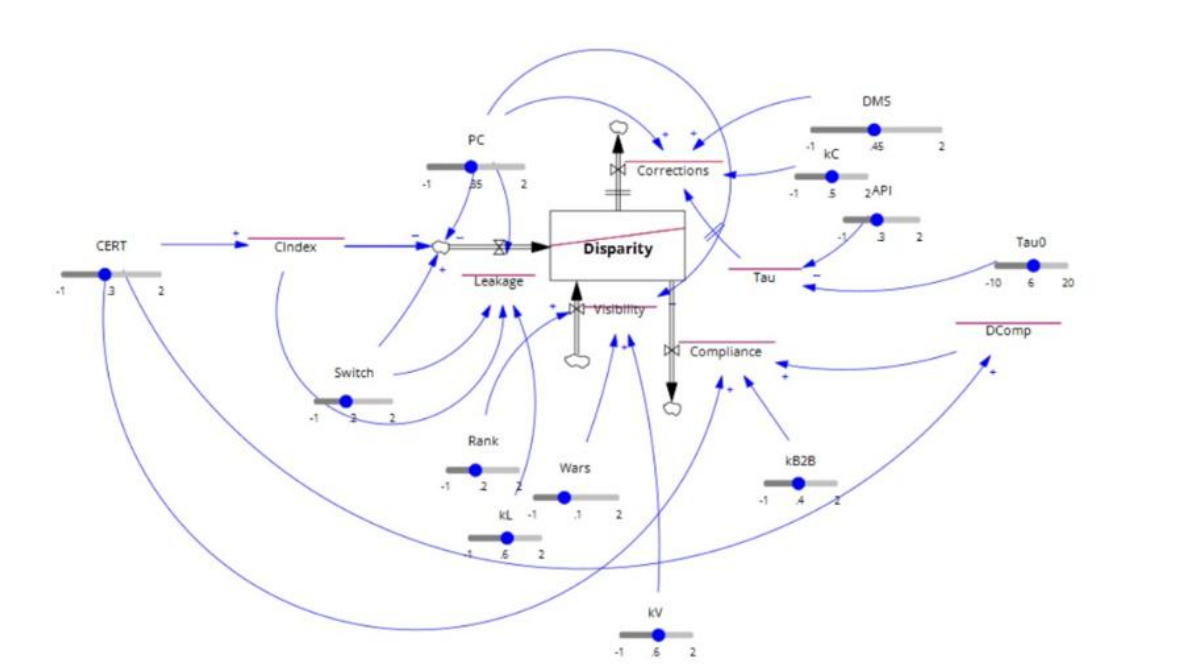


SFD Stock-and-Flow Diagram of Pricing Deviation

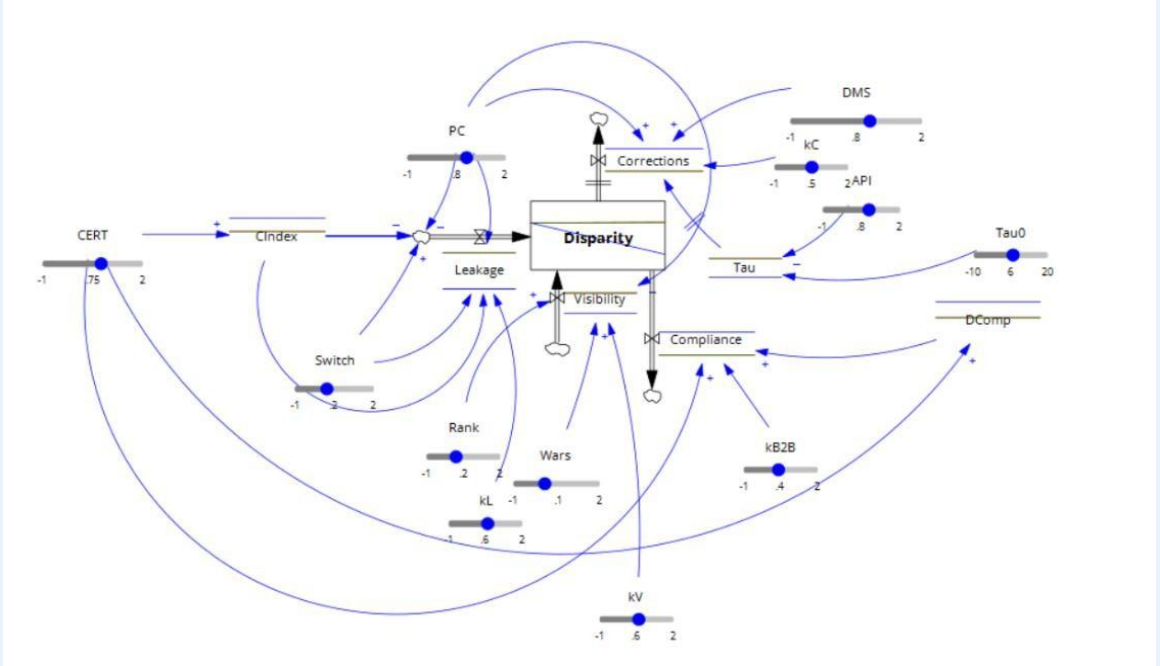
Structure of Rate Disparity Dynamics

- Disparity is modelled as a stock.
- Leakage and visibility increase disparity.
- Corrections and compliance reduce disparity.
- The resulting behaviour illustrates the dynamics of rate disparity over time.

Comparing Current and Transformed States

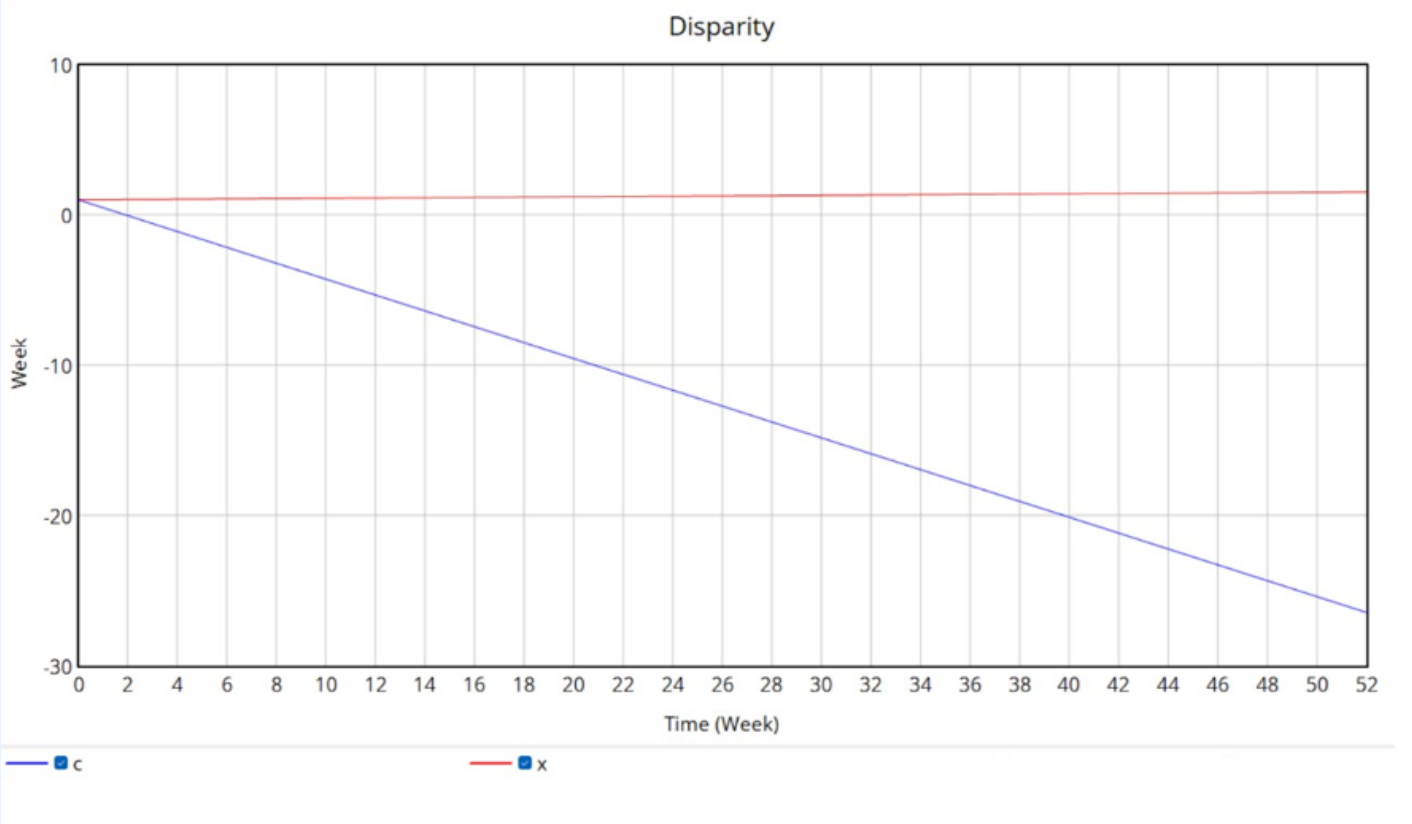


Stock-Flow Diagram in Simulation Mode: Structure and Pricing Variance Flows (Current State)



Stock-Flow Diagram in Simulation Mode: Structure and Flows of Pricing Variance (Transformed State)

Disparity Trajectory: X vs C



Disparity: X vs. C (Comparative Divergence Trajectory)

Key Finding

- Scenario C produces sustained disparity reduction.
- Scenario X remains relatively stable.
- The difference widens as the simulation horizon expands.

Key Parameter Variations (X vs. C)



Interpretation

- Visibility and price leakage reinforce disparity.
- Compliance and corrective mechanisms generate balancing effects.
- Strengthening corrective actions accelerates disparity reduction.
- *The model is exploratory and requires calibration with real-world operational data before predictive application.*

STRATEGIC LEVEL

Towards a Direct-Led Omnichannel Model

The shift from an OTA-heavy to a direct-led value model systemically weakens the incentives for third-party channels to undercut prices.

Commercial Engine (Revenue+Sales+Digital)

Dynamic Packaging & Fences

Loyalty & Personalization

Common Metrics: net RevPAR, Leakage Index, Direct Share

- Unified Commercial Engine (Revenue + Sales + Digital)
- Dynamic Packaging & Segmentation Fences
- Loyalty and Personalisation
- Shared KPIs: Net RevPAR, Leakage Index, Direct Share
- AI-supported disparity risk detection with human oversight.

CRITICAL PERSPECTIVE

Limitations and Future Research

Limitations

- Data quality constraints
- Partner compliance uncertainty
- Normalised variables
- Exclusion of seasonality and external demand shocks

Future Research

- Model calibration using operational data
- Comparative compliance policies
- Explainable AI for disparity forecasting
- Metasearch as a transparency partner.

SUMMARY

Conclusions

- Rate disparity is a systemic outcome rather than a random anomaly.
- DCSYM reveals a structural imbalance between communication and control (41:15).
- CLDs demonstrate the dominance of reinforcing mechanisms.
- The proposed transformation converts distorted flows into stable and governable processes.
- Empirical validation through pilot implementation remains necessary.