Technology and Investment, 2026, 17(4), 309-324
https://www.scirp.org/journal/ti
ISSN Online: 2150-4067
ISSN Print: 2150-4059

Issue and Integrative Framework Cs-Lr Model

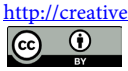
Mamadou Salla Gueye

Department of Tronc Commun, Ecole Polytechnique Thiès (EPT), Thiès, Senegal
Email: msgueye@ept.edu.sn

How to cite this paper: Gueye, M. S. (2026). Issue and Integrative Framework Cs-Lr Model. *Technology and Investment, 17,* 309-324.
https://doi.org/10.4236/ti.2026.174017

Received: August 17, 2026
Accepted: November 1, 2026
Published: November 4, 2026

Copyright © 2026 by author(s) and Scientific Research Publishing Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/



Open Access

Abstract

The article focuses on the nature transformation of the model: observation is no longer merely evoked as a future methodological perspective, but as a constituent component of the CS-LR. The declarative informs perceptions; observation informs behavioral and organizational manifestations. The two levels are articulated, without confusing perception, behavior and performance. The CS-LR model extends (Gueye, 2023) the CS-L (Confidence-Satisfaction-Loyalty (Gueye et al., 2020a)) kernel into a behavioral architecture explicitly integrating Risks and Hazards (R). This version of the framework goes further: it does not simply measure relational variables in the light of the statements of the actors. It includes the observation of behaviors, interactions, events, control practices, incidents and organizational manifestations associated with the studied constructs. This change changes the methodological status of the model: trust, satisfaction and loyalty are no longer understood exclusively as declared states but as latent constructs whose expression can be triangulated by declarative and observational data. The article reviews the progress made by the model since previous empirical work on confidence, satisfaction and loyalty in the Senegalese insurance market, including the State PhD thesis defended in 2007 at the Cheikh Anta Diop University in Dakar (Gueye, 2007) and subsequent publications. This version proposes an original contribution: the integration of a multimodal architecture, where the declarative accounts for perception and subjective evaluation, and where observation captures the actual manifestations of behaviors and organizational processes. The model retains its articulation with microeconomics—augmented production function, θ efficiency multiplier, primal and dual programs—and with management sciences, agency theory, transaction costs and behavioral economics. But it adds an essential methodological link between latent constructs and observable manifestations. CS-LR is therefore presented as a dynamic and falsifiable behavioral framework. It does not claim that all proposed relationships are already statistically validated. However, it can no longer be described as a model based solely on self-reporting: its measurement logic is now based on convergence, diver-

gence and complementarity between what actors report and what they do or what the organization allows to observe.

Keywords

CS-LR, Trust, Satisfaction, Loyalty, Risks, Observation, Declarative, Triangulation, Organizational Behavior, Efficiency, Transaction Costs, MES, Behavioral Economics

1. Introduction: A Change in the Model

Current organizations operate in contexts where performance is no longer measured solely by the amount of resources implemented. It also depends on the quality of interactions, the reliability of commitments, cooperation, adaptability and risk management. Classical economic models are well suited to representing resource allocation and constrained optimization, but they are less able to account for how relational and behavioral variables actually influence organizational processes.

It is in this articulation zone that the CS-LR model was built. It is based on four pillars: Confidence (C), Satisfaction (S), Loyalty (L) and Risks or Hazards (R) (Gueye, 2023; Gueye et al., 2020a). Already, the initial model is no longer limited to the linear relationship C → S → L: it proposes a dynamic loop in which experiments, relationships and environmental disturbances can successively modify behavioral states.

However, there remains a methodological difficulty: a variable such as trust can be declared by an actor without this declaration corresponding perfectly to his practices. An actor can declare himself confident while strengthening his controls, declare himself satisfied while multiplying complaints, or declare himself loyal while effectively reducing his cooperation. Conversely, some observable behaviors may reflect a relational stability that questionnaires imperfectly capture.

This is where the major CS-LR mutation comes in. Observation is no longer an adjunct to further research. It becomes a second knowledge register integrated into the construction, measurement and interpretation of the variables of the model. This development is consistent with the orientation already present in the first version, which identified the declarative-observational combination as a means of overcoming the bias of the declarative alone.

In the previous version, the observation was expressed as a methodological perspective. In the new version, it becomes a constituent dimension of the model: the CS-LR is now designed to link declared states, observed behaviors, organizational events and performance.

This transformation leads to a reformulation of the scientific question. It is no longer just a question of whether C, S and L influence R or efficiency. We must also ask ourselves how these constructs translate into behaviors and how the con-

frontation between perception and observation makes it possible to improve their measurement.

So the crux of the problem is this: by integrating both reported perceptions and observable manifestations of trust, satisfaction, loyalty, and risk, how does such modeling enable a more rigorous representation of the behavioral dynamics of organizational efficiency?

The article has four objectives: 1) to reconstruct the theoretical and empirical path of the model; 2) to explain its observational mutation; 3) to propose a measurement architecture integrating two data sources; 4) to show how this architecture is articulated with microeconomic optimization and systemic modeling.

2. From CS-L to CS-LR: Conceptual and Empirical Trajectory

2.1. The Confidence-Satisfaction-Loyalty Core

Previous work in the research program forms the basis of the CS-L core. The doctoral thesis defended at UCAD in 2007 (Gueye, 2007) on customer confidence, satisfaction and loyalty in the Senegalese insurance market offers a first empirical anchor. With the data included in this review, we tested the hypotheses relating to the direct effects of confidence and satisfaction on fidelity on large samples, with two collection times and more than 250 questionnaires processed for each of the two devices mentioned.

The following publications have deepened this journey. The work carried out in 2020 focused on trust-loyalty, satisfaction-loyalty relationships and trust-satisfaction-loyalty interdependencies in the Senegalese insurance market (Gueye, 2020; Gueye et al., 2020a; Gueye et al., 2020b; Gueye, 2022). The study conducted in 2022 on the local context of trust, for its part, emphasized the multidimensional nature of the construct as well as the importance of the context in its measurement (Gueye, 2022).

These results provide an empirical basis for the relational kernel, but they should not be equated with an empirical validation of all extensions of CS-LR. This distinction must be maintained: relationships that have already been tested are attributed to the corresponding fields; new organizational relationships must be evaluated on the appropriate data.

2.2. Extended CS-L: Chain to Loop

The 2023 Extended CS-L proposal represents (Gueye, 2023) a key conceptual milestone. It introduces a dynamic in which the emergence of a need or a contingency creates a break in balance, confidence intervenes in the choice of the producer, satisfaction results from experience and fidelity is consolidated by repetition. The loop can then feedback on the trust and stability of the relationship.

The CS-LR extends this logic by explicitly integrating risks and hazards and shifting the center of gravity of the consumer to organizational and socio-technical systems. The organization becomes a system in which relations between actors can contribute to the stability of processes, while risks can degrade the rela-

tional dynamics.

This evolution does not therefore consist simply in adding a letter R to an acronym. It transforms the model into a systemic architecture: C, S, L and R are interdependent variables whose manifestations can be understood at several levels (Gueye, 2023).

2.3. Observational Change

The observational mutation is the most important change in this version. In a strictly declarative approach, trust, satisfaction and loyalty are mainly inferred from the responses of the actors. In the observational CS-LR, these responses are still necessary, but they are no longer the only gateway to the constructed (Gueye, 2023).

The declarative mainly informs: what the actor thinks, perceives, evaluates, anticipates or affirms. Observation mainly provides information on: what the actor does, how he acts, the interactions in which he participates, the controls he mobilizes, the commitments he respects or not and the events that occur in the system. Finally, organizational data provide information on the objectifiable consequences of these dynamics.

This distinction makes it possible to design three levels:

Perceptual level: statements, assessments, expectations and judgments.

Behavioral level: conduct, interactions, decisions, cooperation or control practices.

Organizational level: incidents, deadlines, control costs, breaks, renewals, quality, performance and other observable events.

The scientific value of this architecture does not come from the fact that the observation would necessarily be truer than the declarative. It comes from the possibility of confronting the two sources. Convergence enhances the coherence of interpretation; divergence itself becomes analytical information that may reveal a gap between perception, behavior and organization.

3. Theoretical Foundations

3.1. Agency Theory

In the principal-agent relationship, information asymmetry and moral hazard make it necessary to establish control mechanisms. Jensen and Meckling (1976) and Laffont and Martimort (2002) provide a classic base. The CS-LR does not remove this problem; it proposes that trust and loyalty can change the conditions under which control is needed.

The integration of observation reinforces this proposal. It becomes possible to compare declared trust with actual control practices, cooperative behaviors and agency events. The hypothesis of substitution or complementarity between relationship and control can then be examined instead of simply postulated.

3.2. Transaction Costs

Williamson (1985, 2010) shows that economic coordination generates ex ante and

ex post costs. The SC-LR proposes to examine whether stabilized relationships can reduce certain monitoring, negotiation or arbitration costs.

Observation makes the mechanism more concrete: frequency of checks, number of checks, requests for justification, coordination delays, disputes, business resumption or hierarchical interventions can constitute organizational traces of the relationship between trust and cost of control.

3.3. Behavioral Economics and Relational Capital

Simon's (1997) limited rationality leads to the view that decisions are made in incomplete environments and under cognitive constraints. Experimental economics work on trust and reciprocity, including Berg, Dickhaut, and McCabe (1995), shows the value of studying actual behavior rather than just theoretical postulates.

The CS-LR adopts this orientation by considering trust, satisfaction and loyalty as constructs that can be apprehended simultaneously by perception and behavior. Observation thus becomes a bridge between behavioral economics and management sciences.

4. Conceptual Architecture of the Observational CS-LR

The model can be represented by a main loop:

Perceptions (C, S, L) → relational behaviors → coordination → performance/risk events → new perceptions (C, S, L).

R acts both as a disruptor and as a variable that can be influenced by organizational behaviors. The loop becomes:

$C_t + S_t + L_t \rightarrow behaviors_t \rightarrow \theta_t \rightarrow performance_t$; $R_t \rightarrow performance_t$ and $C_{\{t+1\}}$, $S_{\{t+1\}}$, $L_{\{t+1\}}$.

This representation makes it possible to distinguish the latent states from the observable manifestations. Variables C, S and L are not directly visible as such; they are inferred from declarative and behavioral indicators. R may, depending on its nature, be directly observed by events or approached by perceptions of probability and severity.

Table 1 becomes the methodological core of the CS-LR: a variable is no longer considered sufficiently documented by a single statement when a behavioral or organizational manifestation can be observed (Gueye, 2023).

- **Data convergence and divergence**

Triangulation should not be seen as an obligation of perfect convergence. Three configurations are possible. Firstly, convergence: the actor declares himself confident and the behavior observed actually shows stable cooperation and limited control. Secondly, the divergence: the actor declares a strong confidence but the practices reveal a multiplication of controls. Thirdly, the lack of systematic correspondence: the two sources can measure different dimensions of the same construct.

The model must therefore avoid mechanically merging the two sources into a

single score. A more rigorous strategy is first to keep the perceptual and behavioral indicators separately and then to study their relationship. Aggregation should only take place after verification of their theoretical and empirical consistency.

Table 1. Multimodal operationalization.

Variable	Declarative	Observation	Integrated Interpretation
Confidence (C)	Credibility, reliability, competence, transparency, predictability	Compliance, information sharing, decrease/increase in controls, cooperation	Perceived state of trust when confronted with reliability behaviors
Satisfaction (S)	Service evaluation, adequacy to expectations, fairness, utility	Complaints, requests for correction, continuity of use, cooperation, supportive behavior	Subjective assessment against actual reactions
Loyalty (L)	Intention to maintain, commitment, willingness to continue	Renewal, voluntary compliance, repeated cooperation, support	Declared disposition confronted with behavioral persistence
Efficiency (θ)	Perceived performance versus observable results.	Perception of organizational effectiveness Time, resources mobilized, quality, productivity, coordination costs.	Perceived performance versus observable results.

5. Mathematical Modeling: From Behavior to Efficiency

5.1. Increased Production Function

The model retains the enhanced production function of the first version:

$$Q = \theta(C, S, L, R)f(T, K)$$

where T represents labor, K capital and θ organizational efficiency. This notation avoids the earlier confusion between L, loyalty, and L, work. The first version made θ a multiplier positively associated with C, S and L and negatively associated with uncontrolled risk.

In the observational version, however, θ should not be constructed solely from perceptions. It can be estimated from a set of observable organizational indicators, while C, S, L and R are themselves fed by the two measurement sources.

5.2. Behavioral Specification

A conceptual form can be written:

$$\theta_t = \varphi\left(C_t^D, S_t^D, L_t^D, C_t^O, S_t^O, L_t^O, R_t^O, X_t\right)$$

Exhibitors D and O distinguish declarative and observational information, respectively. X represents the control variables.

This formulation marks the mutation of the model: the behavioral block is no longer only a vector of perceptions. It becomes a multimodal measurement system.

5.3. Primary Program

The primary program maintains the objective of maximizing production:

$$\max_{\{T,K\}} Q = \theta \cdot f(T,K), \text{ under stress}: aT + bK \le B.$$

The Lagrangian is:

$$\mathcal{L} = \theta f(T, K) + \lambda(B - aT - bK).$$

The mathematical resolution shows the consequences of a variation of θ under the usual assumptions. It does not, on its own, demonstrate that observed behaviors increase θ: this relationship is based on the empirical hypothesis of the model.

5.4. Dual Program

The dual program aims to achieve a Q0 target production at the lowest cost:

$$\min_{\{T,K\}} aT + bK, \text{under stress}: \theta \cdot f(T,K) \ge Q0.$$

An observed increase in θ, all other things being equal, can then be associated with a decrease in the inputs necessary to reach Q0. The interest of dual formulation is to translate a behavioral dynamic as a testable economic consequence.

While the mathematical modeling developed in this section provides the necessary analytical foundations of behavioral efficiency, transitioning from theoretical constructs to empirical evaluation requires a structured operational framework. Consequently, the following section first delineates the foundational observational CS-LR assumptions that ground this model, and subsequently expounds upon the formal methodology employed to validate its empirical robustness.

6. Empirical Framework: Assumptions and Validation Methodology

To operationalize the mathematical formulations established in the previous section, this chapter constructs a rigorous empirical framework designed to test the model's validity. This process is divided into two operational stages. First, Section 6.1 delineates the core observational CS-LR assumptions required to ground the analysis. Second, Section 6.2 expounds upon the formal validation methodology used to evaluate the model's empirical robustness.

6.1. Observational CS-LR Assumptions

The following hypotheses are formulated to distinguish the relationships already supported by the prior empirical trajectory from the extensions specific to the CS-LR model.

H1—Declared trust is positively associated with observable patterns of cooperation and compliance.

H2—Self-reported satisfaction is positively associated with observable manifestations of relationship continuity.

H3—Declared loyalty is positively associated with the behavioral persistence of cooperation.

H4—Convergence between declarative and observational indicators provides a more robust measure of relational constructs than either source alone.

H5—The cooperative and reliable behaviors associated with C and L are negatively associated with some manifestations of operational risk.

H6—Risk events observed at t negatively affect perceptions of trust, satisfaction and loyalty at $t+1$.

H7—C-S-L multimodal relational quality contributes positively to organizational efficiency θ.

H8—An improvement of θ makes it possible, under constant technological assumptions, to achieve a given production with a smaller quantity of inputs.

H9—The effect of C-S-L on control costs is conditioned by the behaviors actually observed.

H10—Divergences between declarative and observational are analytical signals for identifying areas of fragility, concealment, misperception or relational transformation.

6.2. Validation Methodology

The methodology is no longer designed as a 'questionnaire + possible future observation'. It becomes a protocol integrated with two sources, with observation as a constituent register.

The empirical strategy is based on a structured triangulation. The first register is declarative: questionnaires to measure the perceptions of the actors. The second is observational: observation of behaviors, interactions, events and processes. The third can be organizational: performance data and administrative records available.

The two historical samples of more than 250 questionnaires processed for each of the two devices constitute an important methodological achievement for the anterior empirical nucleus. Collections at two separate periods also enhance the possibility to examine the stability of the reported relationships.

For the CS-LR itself, the observations must be temporally indexed (Gueye, 2023). Observation without temporality does not allow the loop to be reconstructed correctly. It is therefore necessary to relate, as far as possible, perceptions to t, observed behaviors to t, risk events to t and subsequent perceptions to $t+1$.

The unit of analysis must be explicitly determined according to the field: individual, dyad, team, organizational unit, entity or organization. Levels should not be mixed without justification. If several individuals evaluate the same unit, the aggregation conditions will have to be verified.

Statistical analysis can mobilize DES where data size and structure allow. PLS-SEM can be considered in a more predictive or exploratory logic, but the choice must be justified by the structure of the data. Qualitative observations can be analyzed by thematic coding, interactional analysis or sequence analysis depending on the nature of the data.

For comparative uniformity, the analysis articulates the study of an engineering

school—conceived as a complex decision-making system—and that of an industrial system composed of five autonomous entities linked by delegation. The data collection is based on the audit of incident registers and interactions within the school, on the one hand, and on the longitudinal monitoring of transactional episodes and industrial dashboards, on the other. This device makes it possible to measure the dynamic between confidence and control through the applications presented in point below.

7. Proposed Illustrative Areas of Application

The evaluation of the empirical relevance of the model is based on two distinct fields. The methodology is based on a double evaluation loop for each variable: a transactional/declarative loop and a behavioral/observational loop. The triangulation of these two loops makes it possible to scientifically measure the gap between the perceived and the organizational experience.

1) **Management of a service function in engineering school (Axis 1)**

This first field examines a higher education and research structure understood as a complex decision-making system where multiple categories of actors coexist (students, teachers, researchers, management, administrators, and partners).

Data collection applies double loop and triangulation as follows:

- The Satisfaction Loop: The declarative loop captures perceived satisfaction via conventional satisfaction surveys. The observational loop traces feedback behaviors (recurrence of complaints, abandonment rates, and requests for correction). Triangulation identifies the profiles of actors who are "silent but dissatisfied" or "chronically dissatisfied despite a compliant service".
- The Confidence Loop: The declarative loop measures interpersonal and institutional confidence through attitude questionnaires. The observational loop documents the actual use of the delegations of power, the respect of commitments (deadlines for the rendering of notes, processing of files) and the sharing of information. The triangulation objective the level of real confidence by measuring whether the acts of management corroborate the discourses.
- The Risk Loop: The declarative loop evaluates the risk aversion of school executives. The observational loop counts actual incidents, process disruptions and the activation of post-clearance checks.

2) **Functional inter-entity delegation (Axis 2)**

The second area concerns an integrated industrial system composed of five autonomous entities linked by delegation mechanisms. To circumvent the small size of the basket of entities ($N = 5$), a longitudinal and repeated observation device is deployed, breaking down the follow-up into decision and transactional episodes according to a certain periodicity (for example: 24 months).

The double loop and triangulation are modeled as follows:

- The inter-organizational satisfaction loop: It compares the satisfaction declared during the annual steering committees (declarative loop) with the real fluidity of industrial flows and operational continuity (observational loop).

Triangulation can detect latent crises masked by managerial diplomacy.

- The Confidence and Control Loop: The reporting loop captures the confidence shown by the management of the parent company towards its subsidiaries. The observational loop quantifies the actual level of supervision (frequency of audits, volume of reporting procedures imposed). Triangulation highlights situations of "false trust" (benevolent discourse but suffocating micro-management) or "forced trust" for lack of means of control.
- The Risk and Take Back Loop: It makes managers' perception of industrial risks (declarative) dialog with indicators of non-compliance, delivery delays and direct managerial take back decisions (observational).

Table 2. Triangulation et double boucle.

Dimension	Declarative Loop (Perception)	Observational Loop (Behavior)	Objective of Triangulation (Synthesis)
Satisfaction (Axis 1)	Satisfaction surveys, service evaluation questionnaires.	Volume of complaints, recurrence of support tickets, drop-out rate.	Identify gaps between formal assessment and actual behavioral irritation.
Satisfaction (Axis 2)	Management reviews, self-assessments of partnership performance.	Logistics key performance indicators (KPI) compliance rate.	Detect bias of industrial complacency or politeness in committees.
Confidence (Axis 1)	Scales of confidence in the administration/institution.	Use of collaborative tools, fluidity of spontaneous documentary sharing.	Validate whether the declared trust results in a reduction of barriers to information sharing.
Confidence (Axis 2)	Managerial confidence score assigned by the parent company to its subsidiaries.	Frequency of field audits, depth of validation workflows required.	Measure the alignment or contradiction between managerial discourse and real supervision.
Risk/Control (Axis 1)	Individual perception of data security and management risks.	Number of critical incidents recorded, triggering punitive checks.	Assess whether feelings of insecurity are correlated with observable systemic vulnerability.
Risk/Control (Axis 2)	Mapping of the risks perceived by entity directors.	Frequency of direct interventions by the parent company, emergency contractual amendments.	Analyze whether managerial takeover decisions stem from real or perceived risks.

The exploitation of this Table 2 requires a rigorous analysis of the methods of statistical treatment of the deviations and triangulation resulting from the double loop.

8. Methodological Discussion: Deviation Treatment and Estimation Models

The introduction of a double loop (declarative and observational) involves the statistical processing of heterogeneous data. The challenge is not only to validate each loop independently, but to scientifically analyze the divergence (the gap) be-

tween the declared perception and the observed behavior. Two complementary approaches are proposed to operationalize this treatment.

1) **Residue Analysis and Deviation Scores (Gap Analysis)**

To measure the alignment or decoupling within the same dimension, between the declared confidence \(\text{Trust}_{\text{decl},it}\) and the observed control \(\text{Control}_{\text{obs},it, the first step is to standardize the variables on a common scale and then model their deviation.

Two techniques are favored:

- Calculation of direct deviation score: Determined by \(\Delta_{it} = X_{\text{obs}, it} - X_{\text{decl}, it}\) significantly away from zero reveals an organizational anomaly. For example, a strongly negative score in confidence (low real supervision despite a maximum declared confidence) objective a phenomenon of "false confidence" or managerial detachment.
- Regression Residue Analysis: By regressing the observational variable on the declarative variable (\(X_{\text{obs}, i} = \beta_0 + \beta_1 X_{\text{decl}, i} + \epsilon_i\)), the \(\epsilon _{i}\), the ϵ residue captures the part of the behavior that contradicts or escapes the declared perception. These residues are then reintroduced as explanatory variables to analyze the incidents or the breakdown of the cooperation.

2) Structural Equation Modeling (SEM) with Latent Variables

In order to simultaneously address the complexity of Axis 1 (multiple actors) and the longitudinal nature of Axis 2 (repeated data), the methodology relies on structural equation models (SEM), combining factor analysis and multiple regressions (Figure 1).

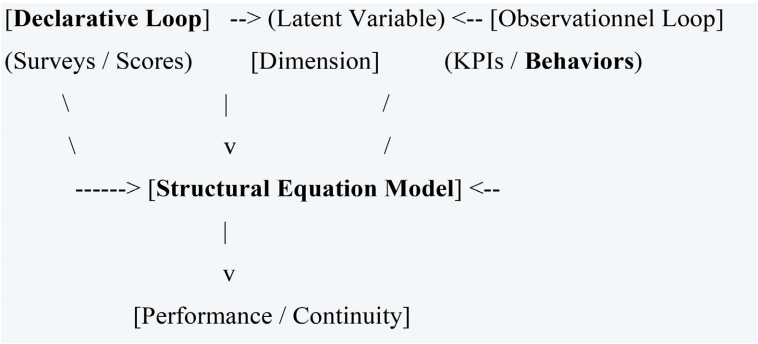


Figure 1. Structural equation models (SEM).

- Measurement model (Factor analysis): Each construct (Satisfaction, Confidence, Risk) is treated as a latent variable not directly observable. This variable is fed simultaneously by reflective indicators (responses to questionnaires in the declarative loop) and formative indicators (performance metrics and behavioral flows in the observational loop).
- Structural model (Causal relationships): Structural equations allow to test whether the impact of satisfaction or confidence on performance (or on the continuity of cooperation) is mediated by the accuracy of the alignment be-

tween the declarative and the observational. Specificity of Axis 2: Fixed-effect panel models.

For the industrial system where $N = 5$, the analysis of the classical structural equations is adapted in the form of a panel model with fixed effects. Splitting data into T periods (months, quarters) or E transactional episodes provides a sufficient sample ($N \times T$). The fixed "entity" effects make it possible to control the unobserved invariant heterogeneity (such as the culture specific to each of the 5 subsidiaries), concentrating the statistical estimation on the temporal dynamics of the interactions and on the evolution of the trade-offs between trust and real supervision.

The standardized and concise econometric formulation for the estimation of Axis 2 (Fixed Effects Panel) is as follows:

Deviation Model Specification (Axis 2)

To analyze the impact of the decoupling between discourse and facts within the $N = 5$ industrial entities observed over T periods, the econometric model in panel data is written:

$$Y_{it}=\beta_1\Delta \text{Trust}_{it}+\boldsymbol{\gamma}^{\prime}\mathbf{X}_{it}+\alpha_i+\varepsilon_{it}$$

where:

- Y_{it} (or \(Y_{it}\):): The operating performance (or incident rate) of the entity i at the period t (or \(i\) at the period \(t\)).
- \(\Delta \text{Trust}_{it}\): The standardized deviation score, calculated by the difference between the declared managerial trust and the actual supervision level (\(\text{Control}_{\text{obs}, it} - \text{Trust}_{\text{decl}, it}\)).
- X_{it}: The vector of control variables (transaction size, industry, production load).
- α_i: The individual fixed effect specific to each i entity, capturing invariant heterogeneity (corporate culture, local industrial specificities).
- ϵ_{it}: The residual error term.

Fixed-effect estimation neutralizes α_i, ensuring that β coefficients measure only the effect of temporal variations in behavioral deviations on the continuity of cooperation.

From these applications proposed below, it emerges that the empirical refoundation of the research axes, through the prism of the double loop and the methodological triangulation, endows the model with increased scientific rigor. By systematically comparing perceptual variables (declarative loop) with operational realities (observational loop), this device removes the traditional bias of self-declared data.

Whether it is to map the logics of actors within a complex decision-making system (Axis 1) or to model the confidence-control dynamics by a longitudinal approach in panel data (Axis 2), this architecture makes it possible to isolate and quantify scientifically the organizational cost of managerial distortions. The model

is no longer limited to measuring isolated psychological states or industrial outcomes; it precisely objectifies the impact of behavioral alignment on the performance and sustainability of cooperative systems.

The first version of the model already proposed a mapping linking standard theory, extended standard theory, non-standard theory and experimental economics.

The present version adds a transversal dimension: observation becomes the methodological principle allowing perception, behavior and performance to dialog (see Table 3).

Table 3. Epistemological mapping.

Current	Contribution to CS-LR	Role of observation
Standard theory	Optimization, production function, primal/dual, Lagrangian	Observation of inputs, outputs, costs and constraints
Extended Standard Theory	Agency, information asymmetry, contracts, transaction costs	Observation of control, incidents and agency behavior
Behavioral Economics	Limited rationality, perceptions, routines	Observation of behaviors and perception-action gaps
Experimental Economics	Trust, reciprocity, cooperation	Behavioral testing and observation of choices
Management Science	Steering, governance, performance	Observation of organizational processes and practices

9. Critical Perspectives: Scientific Inputs, Limitations and Scope of the CS-LR Observational Approach

The evaluation of the scientific contributions of the CS-LR model requires to put into perspective its theoretical contributions with its intrinsic limits, thus introducing a critical discussion on the real scope of the observational shift and on the methodological precautions required for its empirical deployment.

1) Discussion: what observational change really changes?

The CS-LR mutation should not be reduced to the addition of a collection technique. It modifies the very conception of the behavioral construct. In a strictly declarative model, behavioral information is mediated by the perception of the actor. In the observational CS-LR, the model distinguishes between the perceived state, the behavioral manifestation and the organizational consequence.

This distinction partly solves a classic social-science problem: the supposed equivalence between what an individual says and what he does. The model does not claim that this equivalence is false in all cases; it makes it an empirical question.

The second consequence concerns causation. A C-S-L-R loop cannot be understood solely as a succession of responses to questionnaires. Observable events and behaviors provide temporal anchors. They examine whether a change in trust precedes a change in behavior or whether, on the contrary, the behavior produces the

change in trust.

The third consequence concerns governance. Control can now be observed as organizational behavior. If an organization declares a strong trust but multiplies the controls, the contradiction becomes a scientific object. It may signal latent risk, low effective trust or an institutional policy of independent trust control.

The fourth consequence is efficiency. The θ multiplier ceases to be a simple behavioral abstraction: it can be linked to observable process indicators. This relationship remains to be estimated, but it becomes methodologically more defensible.

2) Scientific limitations and precautions

The integration of observation does not eliminate bias. The observer can influence the situation; some practices may be invisible; behaviors may vary according to the context; organizational data may be incomplete. The observation must therefore be protocolized.

Another limitation is that the observed behavior is not always a pure indicator of the latent construct. Control can result from mandatory regulation rather than from a lack of trust. A claim may be related to a one-time anomaly rather than structural dissatisfaction. The model must therefore incorporate context variables.

Finally, triangulation must not become rhetoric. To be scientifically useful, each source must be defined, coded and linked to a specific analytical question. The mere coexistence of questionnaires and observations does not in itself constitute validation.

3) Scientific contribution of CS-LR

The model's contribution can be summarized in five levels.

A conceptual contribution: extension of the CS-L kernel by explicit integration of risks and hazards.

A dynamic contribution: transition from a linear relation to a retroactive loop.

A methodological contribution: transition from declarative alone to a declarative-observational architecture.

An economic contribution: integration of behavioral variables into an increased production function and into the primal and dual programs.

A systemic contribution: articulation of perceptions, behaviors, events, coordination, risks and performance.

The original character of this version therefore lies less in the addition of a collection instrument than in the transformation of the observation logic into a component of the model itself.

10. General Conclusion

The CS-LR model has reached an important conceptual milestone. It can no longer be properly described as a mere declarative extension of the triptych Trust-Satisfaction-Loyalty. Its evolution leads to an architecture in which declared perceptions and observable manifestations are two complementary paths of access to behavioral dynamics.

This mutation responds directly to a fundamental difficulty of behavioral models: a declared perception is not necessarily equivalent to an observed behavior. CS-LR does not seek to choose between the two. He connects them.

The model retains the achievements of its previous trajectory. Empirical work on the Senegalese insurance market provided a foundation for the C-S-L core; the Extended CS-L proposal introduced dynamics and contingencies; the CS-LR now extends this architecture to organizational functioning and observational measurement. Elements related to this trajectory are documented in the materials of this revision.

From a microeconomic point of view, the function $Q = \theta \cdot f(T, K)$, the primal program and the dual program remain formal translation instruments. Behaviorally, C, S, L and R become constructs whose measurement can combine perceptions and manifestations. At the systemic level, the time loop makes it possible to study the reciprocal effects between relationship, behavior, risk and performance.

The major scientific consequence is that the CS-LR should no longer be presented as a model that « proves » a priori that trust, satisfaction or loyalty maximize efficiency. It must be presented as a framework that makes these relationships observable, measurable and testable. Mathematical formalization establishes the logical consequences of certain assumptions; declarative and observational data must empirically establish whether these assumptions hold.

Thus conceived, the CS-LR becomes a true integrative research framework [it links perception and behavior, individual and organization, relationship and risk, microeconomics and management, optimization and observation. Its strength lies not in its claim to universality, but in its ability to organize multiple registers of evidence around the same systemic dynamic.]

The main scientific implication is that the CS-LR should no longer be offered as a model that "demonstrates" a priori that trust, satisfaction or loyalty are the factors that most enhance efficiency. It should be presented as a framework that allows these relationships to be observed, measured, and tested. Our results support the work of Ostrom (2010) by demonstrating that the combination of the variables CSLR prevents the failure of unilateral governance by promoting trust and reciprocity among stakeholders.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Berg, J., Dickhaut, J., & McCabe, K. (1995). Trust, Reciprocity, and Social History. *Games and Economic Behavior, 10,* 122-142. https://doi.org/10.1006/game.1995.1027

Gueye, M. S. (2007). *Confiance, satisfaction et fidélité de la clientèle dans le marché sénégalais des assurances*. Thèse de doctorat d'État, Université Cheikh Anta Diop de Dakar.

Gueye, M. S. (2020). Conception d'un modèle d'analyse de la clientèle du marché des assurances pour la perception de la confiance dans le contexte sénégalais et son effet sur le

comportement de fidélité. *International Journal of Current Research, 12,* 11390-11396.

Gueye, M. S. (2022). The Influence of the Local Context on the Measurement of Customer Confidence in the Insurance Market. *International Journal of Education, Business and Economics Research, 2,* 223-239.

Gueye, M. S. (2023). Proposal for an Extended CS-L Model. *International Journal of Engineering Technologies and Management Research, 10,* 22-31. https://doi.org/10.29121/ijetmr.v10.i4.2023.1310

Gueye, M. S., Fall, M. F. M., Sarr, N., & Ly, I. (2020a). Analyse de l'interdépendance confiance-satisfaction-fidélité du client dans les relations client-vendeur sur le marché de l'assurance au Sénégal. *Sumerianz Journal of Business Management and Marketing, 3,* 124-132.

Gueye, M. S., Ly, M. B., Sarr, N., Badji, M., & Ly, I. (2020b). Study of the Perception of Satisfaction on Behavior of Auto Accident Insurance Customers in Dakar, Senegal. *International Journal of Social Science and Economic Research, 5,* 3878-3895. https://doi.org/10.46609/ijsser.2020.v05i12.011

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure. *Journal of Financial Economics, 3,* 305-360. https://doi.org/10.1016/0304-405x(76)90026-x

Laffont, J.-J., & Martimort, D. (2002). *The Theory of Incentives: The Principal-Agent Model*. Princeton University Press.

Ostrom, E. (2010). Beyond Markets and States: Polycentric Governance of Complex Economic Systems. *American Economic Review, 100,* 641-672. https://doi.org/10.1257/aer.100.3.641

Simon, H. A. (1997). *Models of Bounded Rationality*. The MIT Press. https://doi.org/10.7551/mitpress/4711.001.0001

Williamson, O. E. (1985). *The Economic Institutions of Capitalism*. Free Press.

Williamson, O. E. (2010). Transaction Cost Economics: The Natural Progression. *American Economic Review, 100,* 673-690. https://doi.org/10.1257/aer.100.3.673