Beyond Descriptive Analysis: The KRIS Framework for Statistical Validation in Regulatory Comparison Research

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This study introduces the Krishnan's Risk Integration System (KRIS) Framework, a novel methodology that transforms qualitative regulatory comparison into statistically validated research. The framework addresses the core gap in regulatory analysis by balancing contextual understanding with empirical validation. Through systematic application across multiple international frameworks, the methodology demonstrates robust reliability whilst preserving interpretive richness. Key innovations include functional equivalence mapping, a six-level alignment classification system with strategic consolidation, and integrated validation protocols applicable across regulatory and compliance domains.

Keywords: Compliance Assessment, Framework Comparison, Functional Equivalence, Policy Comparison, Regulatory Analysis, Statistical Validation

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1. Introduction

The landscape of regulatory analysis has long been characterised by a fundamental tension between the need for contextual understanding and the demands of empirical validation. Traditional approaches to regulatory framework comparison have relied heavily on descriptive analysis and subjective assessment, creating significant limitations for policy development and academic research. This methodological challenge extends far beyond theoretical concerns, directly impacting the ability of regulatory authorities to benchmark their frameworks against international standards, assess compliance effectiveness, and identify meaningful enhancement opportunities.

1.1 The Methodological Challenge

Contemporary regulatory analysis faces a persistent dilemma that has constrained the field's development for decades. Existing approaches typically force researchers to choose between preserving rich contextual understanding through qualitative analysis or enabling empirical validation through quantitative methods. This either-or choice has created a significant gap in regulatory research methodology, undermining confidence in comparative studies and limiting their utility for evidence-based policy development.

The challenge becomes particularly acute when considering the diverse nature of regulatory frameworks across different domains including financial services, healthcare, environmental protection, and technology governance. These frameworks rarely use identical terminology or structural approaches, even when addressing fundamentally similar policy objectives. A purely textual comparison might miss crucial functional equivalencies, whilst a purely conceptual approach often lacks the precision necessary for meaningful systematic comparison.

The implications extend well beyond academic research. Regulatory authorities worldwide require systematic methods to evaluate how their national frameworks align with international standards. Organisations need robust methodologies to assess their internal policies against regulatory requirements. The absence of statistically validated comparative methods has consistently limited the credibility of regulatory assessments and constrained the development of evidence-based policy recommendations.

1.2 Research Questions and Objectives

This research addresses two critical questions that have emerged from extensive analysis of current methodological limitations. **How can qualitative regulatory comparison be transformed into statistically validated research without losing contextual richness?** This question gets to the heart of the methodological challenge, seeking ways to preserve the interpretive understanding that makes regulatory analysis meaningful whilst enabling the empirical validation increasingly demanded in academic and policy contexts.

What methodological framework enables systematic comparison of regulatory provisions across diverse domains and jurisdictions? This question recognises the need for universal applicability whilst maintaining analytical rigour.

The framework must work equally effectively whether comparing financial regulations, healthcare standards, environmental policies, or technology governance frameworks.

The research pursues four interconnected objectives that together establish new foundations for regulatory analysis methodology:

- **Develop Comprehensive Statistical Methodology that** transforms qualitative regulatory comparison into empirically validated research capability

- **Demonstrate Multi-Framework Validation** through systematic application across multiple comparison contexts, providing empirical evidence of methodology robustness

- **Enable Hypothesis-Driven Research** by transforming descriptive regulatory analysis into formal hypothesis testing capability

- **Establish Methodological Standards** that create replicable frameworks for regulatory compliance analysis in both academic and policy contexts

2. Literature Review

Research on regulatory compliance analysis highlights core methodological challenges hampering systematic comparison across frameworks. Many studies rely on qualitative approaches that capture rich context but lack empirical rigor necessary for evidence-based policy development (Cartwright & Hardie, 2012).

El Kharbili (2012) observes that most available research fails to offer side-by-side comparative evaluations of regulatory compliance management systems, instead describing feature sets without extracting detailed requirements for comparison. This results in lack of clarity and absence of agreed-

upon methodology for such analysis.

Recent research highlights that regulatory analysis methodologies often assume rational decision-making while failing to account for cognitive limitations affecting both analysts and policymakers, creating systematic gaps between theoretical frameworks and practical implementation (Drummond & Radaelli, 2024).

Fiene (2016) emphasizes the importance of considering regulatory provisions differently rather than treating all rules as equally impactful, arguing for comparative methods prioritizing "functional equivalence"—focusing on purpose and effectiveness rather than superficial similarities.

Radaelli and Fritsch (2012) note practical limitations of regulatory benchmarking efforts using OECD indicators, which often measure tool adoption rather than practical impact. Contemporary research stresses continuous monitoring and assessment value in complex regulatory changes (Adeniran et al., 2024).

Qualitative Comparative Analysis (QCA) and similar methods bridge qualitative insights with evidence-driven analysis, supporting causal reasoning between broad generalizations and context-specific findings. However, as Hallur et al. (2014) point out, these approaches require clear protocols ensuring consistency and validity across studies.

Gap Summary: The literature evidences clear need for robust, statistically validated approaches that systematically compare regulatory frameworks, preserve context, and generate actionable empirical insights. This gap frames the present study's motivation, proposing the KRIS Framework to address these enduring challenges.

The Knowledge-based Regulatory Integration and Standardisation (KRIS) Framework emerges from recognition that effective regulatory comparison requires sophisticated integration of interpretive analysis with statistical validation. Unlike existing approaches that force researchers to choose between contextual richness and empirical rigor, KRIS provides a structured methodology that systematically combines both capabilities within a coherent analytical framework. The KRIS Framework (Krishnan's Risk Integration System) represents the specific statistical methodology for regulatory compliance analysis developed in this study, forming part of the broader KRIS family of practitioner-oriented models.

3. Methodology

This chapter presents the Krishnan's Risk Integration System (KRIS) Framework, a novel statistical methodology for systematic regulatory compliance analysis. Building upon the initial framework development presented in Viswanathan (2024), this enhanced methodology combines interpretive mapping with statistical testing to transform qualitative regulatory comparison into empirically validated research capability.

The framework is applied to analyze the Securities and Exchange Board of India's (SEBI) Risk Management Framework for mutual funds against three international standards: ISO 31000:2018 (Risk Management), COSO Enterprise Risk Management Framework (2017), and ISO 37000:2021 (Governance of Organizations). This application demonstrates the framework's capability to enable formal hypothesis testing while preserving contextual understanding of regulatory intent and implementation approaches.

3.1 Theoretical Foundation
The KRIS Framework builds upon functional equivalence theory, prioritizing similarity of regulatory function over textual or structural similarity. This enables meaningful comparison across frameworks with different terminologies,

organizational structures, and cultural contexts while maintaining analytical rigor.

Central to the framework is recognition that regulatory frameworks embody both explicit technical requirements and implicit policy intentions that cannot be captured through purely quantitative or qualitative methods alone. The framework operationalizes functional equivalence through systematic procedures for identifying and measuring regulatory correspondence across different frameworks.

3.2 Four-Phase Methodology Architecture

3.2.1 Phase 1: Extract - Systematic Document Decomposition

The extraction phase systematically breaks down regulatory documents into discrete, analyzable elements following structured principles:

Core Principles:

- Granularity Principle: Each element represents distinct regulatory requirement
- Traceability Principle: Precise referencing enables independent verification
- Completeness Principle: Full substantive content capture without omission
- Consistency Principle: Uniform extraction criteria across all documents

Implementation Protocol:

- Sequential numbering of extracted elements
- Precise referencing using original document structure
- Complete text extraction maintaining context
- Section heading documentation for categorical analysis

3.2.2 Phase 2: Map - Conceptual Alignment Assessment

The mapping phase matches extracted elements to corresponding components in comparison frameworks, prioritizing functional equivalence over textual similarity.

Mapping Protocol:

- Primary Criterion: Functional equivalence of regulatory purpose
- Secondary Criterion: Conceptual similarity of implementation approach
- Tertiary Criterion: Alignment of expected outcomes
- Documentation Requirement: Detailed rationale for each mapping decision

3.2.3 Phase 3: Assess - Six-Level Classification System

The assessment phase employs a sophisticated six-level alignment classification system capturing nuanced degrees of regulatory correspondence while enabling quantitative analysis.

3.3 Methodological Justification: Why Six Levels Then Three?

A critical question arises: why develop six granular levels only to consolidate into three? This dual-level approach serves essential methodological purposes that cannot be achieved through direct three-level classification:

3.3.1 Information Preservation vs. Recovery Problem

Forward Information Loss: Initial broad categorization (three levels) cannot capture nuanced distinctions that emerge during detailed analysis. For example, distinguishing between provisions that align directly (ALIGN-DIRECT) versus those requiring enhancement through additional guidance (ALIGN-ENHANCED) provides crucial insights into regulatory adaptation strategies that would be lost in a simple "strong alignment" category.

Irreversible Aggregation: Once provisions are classified broadly, the granular insights cannot be recovered. The difference between ALIGN-ENHANCED (regulatory convergence with local

Table 3.1: KRIS Framework Six-Level Alignment Classification

Alignment Level	Description	Alignment Strength	Characteristics
ALIGN-DIRECT	Explicit one-to-one correspondence	0.90-1.00	Nearly identical language or requirements; Same conceptual approach
ALIGN-STRONG	High degree of conceptual overlap	0.80-0.89	Similar objectives with minor variations; Strong conceptual correspondence
ALIGN-ENHANCED	Clear relationship with value-adding elements	0.70-0.79	Basic requirements align with additional guidance; Industry-developed implementation support
ALIGN-MODERATE	Partial conceptual overlap	0.50-0.69	Different approaches to similar objectives; Requires interpretation
ALIGN-PARTIAL	Limited but identifiable connection	0.30-0.49	Addresses related but not identical concepts; Significant adaptation required
ALIGN-UNIQUE	Framework-specific elements	0.00-0.29	No meaningful correspondence; Distinctive regulatory requirements

adaptation) and ALIGN-STRONG (high conceptual overlap) represents theoretically significant patterns that disappear in initial three-level coding.

3.3.2 Coding Quality Enhancement

Analytical Rigor: Six-level classification forces careful consideration of regulatory correspondence nuances, improving decision quality compared to broader initial classifications. Coders must distinguish between "high conceptual overlap" and "identical functional application," leading to more precise analysis.

Decision Transparency: Granular classification provides detailed audit trail of analytical decisions, enabling other researchers to understand and potentially challenge specific alignment judgments.

3.3.3 Cross-Framework Validation Requirements

Pattern Detection: Six levels enable identification of regulatory adaptation patterns across different international standards. For instance, consistent presence of ALIGN-ENHANCED provisions across

Table 3.2: Three-Level Strategic Classification

Strategic Level	Components	Alignment Range	Strategic Significance
STRONG ALIGNMENT	ALIGN-DIRECT + ALIGN-STRONG + ALIGN-ENHANCED	0.70-1.00	Clear alignment needing minimal adaptation; Shows regulatory convergence
MODERATE ALIGNMENT	ALIGN-MODERATE + ALIGNPARTIAL	0.30-0.69	Basic alignment with notable differences; Opportunities for improvement
UNIQUE ALIGNMENT	ALIGN-UNIQUE only	0.00-0.29	Elements unique to one framework; Framework-specific innovations

multiple frameworks suggests systematic regulatory enhancement practices.

Comparative Analysis: Detailed classification allows meaningful comparison of how different regulatory frameworks adapt international standards, revealing jurisdiction-specific innovation patterns.

3.3.4 Statistical and Practical Optimization
Statistical Power: Three-level consolidation ensures adequate cell sizes for robust chi-square testing and binomial hypothesis testing, meeting statistical requirements for empirical validation.

Stakeholder Communication: Three levels provide clear, actionable categories for policy makers (maintain current approach, enhance alignment, evaluate uniqueness) while preserving analytical depth.

Academic Standards: Dual-level approach satisfies both detailed research requirements and practical policy applications, meeting peer-review standards while maintaining utility.

This methodological design optimizes both analytical precision (six levels) and practical application (three levels), enabling the framework to serve detailed research and strategic policy purposes simultaneously without sacrificing either objective.

3.4 Human Judgment Protocol
The KRIS Framework depends on informed human judgment rather than automated analysis. This interpretive approach is essential because regulatory frameworks express similar concepts through different structures, terminologies, and cultural contexts that no algorithm can capture.

Understanding Context: Each alignment decision requires understanding regulatory intent, practical implementation implications, local market conditions, and philosophical differences between principle-based and rule-based approaches.

Making Classification Judgments: Assigning alignment levels involves systematic interpretation considering whether concepts are "similar enough" for strong alignment, when adaptation requirements reduce alignment strength, and how to weigh multiple factors for numerical alignment strengths.

Ensuring Consistency: While individual decisions involve interpretation, the framework ensures reliability through consistent application of judgment criteria, cross-checking similar provisions, and complete documentation allowing others to understand the judgment process.

3.5 Analytical Dimensions for Statistical Testing
To enable systematic hypothesis testing, the KRIS Framework categorizes each regulatory provision across multiple analytical dimensions that reveal underlying regulatory philosophies and approaches.

3.5.1 Operational vs Strategic Orientation
Operational Provisions: Focus on specific procedures, immediate implementation requirements, detailed processes, and day-to-day compliance activities. Examples include reporting timelines, documentation requirements, specific risk measurement techniques, and procedural steps.

Strategic Provisions: Address high-level principles, long-term objectives, governance philosophy, and organizational direction. Examples include framework objectives, senior management responsibilities, board oversight requirements, and strategic risk appetite statements.

This categorization reveals whether regulatory frameworks emphasize detailed implementation guidance (operational) versus broad directional principles (strategic), indicating different regulatory philosophies and implementation approaches.

3.5.2 Structural vs Cultural Emphasis

Structural Provisions: Establish formal organizational arrangements, defined roles and responsibilities, reporting lines, documentation requirements, and systematic processes. These provisions can be implemented through organizational changes and formal procedures.

Cultural Provisions: Address behavioral expectations, values, attitudes, organizational mindset, ethical considerations, and informal practices. These provisions require changes in organizational culture and employee behavior rather than just structural modifications.

This distinction reveals whether frameworks rely primarily on formal organizational mechanisms (structural) versus behavioral and cultural transformation (cultural) to achieve regulatory objectives.

3.5.3 Mandatory vs Recommendatory Classification

Mandatory Provisions: Use directive language requiring specific actions, establishing binding obligations, and specifying compliance requirements with clear consequences for non-compliance.

Recommendatory Provisions: Suggest best practices, provide guidance, offer optional approaches, and present recommendations without binding enforcement mechanisms.

This categorization reveals regulatory approach preferences—prescriptive enforcement versus flexible guidance—indicating different philosophies about regulatory effectiveness and market intervention.

3.5.4 Flexibility in Analytical Dimensions

The analytical dimensions presented here (Operational vs Strategic, Structural vs Cultural, Mandatory vs Recommendatory) are illustrative examples based on this study's research objectives. The KRIS Framework is flexible and can accommodate any analytical dimensions relevant to the researcher's specific purpose.

Depending on the research questions and regulatory domains being compared, researchers may define alternative or additional dimensions such as principles-based vs rules-based approaches, preventive vs corrective measures, quantitative vs qualitative requirements, or domain-specific categorizations. The choice of analytical dimensions should align with the research objectives and the nature of the regulatory frameworks being compared.

3.6 Statistical Analysis Framework

3.6.1 From Interpretive Mapping to Statistical Testing

While interpretive mapping provides essential foundational classifications, rigorous statistical analysis transforms qualitative insights into statistically validated findings meeting doctoral-level research standards using JASP (Jeffreys's Amazing Statistics Program).

Binomial Proportion Tests:
- **Null Hypothesis:** H_0: $\pi = 0.50$ (balanced emphasis between compared analytical dimensions)
- **Alternative Hypothesis:** H_1: $\pi \neq 0.50$ (significant deviation from balance)
- **Test Type:** Two-tailed binomial exact test
- **Significance Level:** $\alpha = 0.05$

Chi-Square Independence Tests:
- **Test Type:** Pearson chi-square test of independence
- **Null Hypothesis:** Analytical dimension patterns are independent of alignment strength
- **Effect Size:** Cramer's V for association strength measurement

3.6.2 Combining Interpretive and Statistical Approaches

The research deliberately combines qualitative interpretation and quantitative statistical testing to achieve comprehensive analytical coverage:

Interpretive Mapping (KRIS Framework):

• **Purpose:** Captures nuanced regulatory relationships and contextual meaning

• **Strength:** Handles complexity where automated analysis fails

• **Output:** Detailed alignment classifications with explanations for all provisions

Statistical Testing (JASP Analysis):

• **Purpose:** Provides empirical validation using objective statistical criteria

• **Strength:** Delivers reproducible, hypothesis testing results

• **Output:** Formal statistical evidence with established confidence levels

3.7 Scope Definition and Applicability Boundaries

The KRIS Framework is designed for systematic comparison of regulatory, policy, and compliance documents with specific structural requirements for optimal effectiveness:

3.7.1 Optimal Application Structure

The framework works most effectively when at least one document in the comparison represents an authoritative standard, guideline, or requirement that provides normative benchmarks for functional equivalence assessment. Both documents can be authoritative (as demonstrated in the SEBI-ISO comparison), or one can be authoritative while the other is more flexible.

3.7.2 Effective Comparison Types

• **Regulatory Standards vs. Internal Policies:** Statutory regulations (authoritative) compared against organizational policies (varying authority levels)

• **International Standards vs. National Regulations:** ISO, NIST, COSO, COBIT standards and such other frameworks (authoritative), compared against national regulatory requirements (authoritative) - as demonstrated in this study

• **Industry Guidelines vs. Company Procedures:** Industry best practices (authoritative) compared against internal operating procedures

• **Supervisory Guidance vs. Organizational Frameworks:** Central bank circulars (authoritative) compared against institutional risk frameworks

• **Cross-Domain Standards:** Healthcare regulations (e.g., HIPAA), environmental standards, data protection frameworks compared against organizational compliance policies

3.7.3 Why Authoritative Benchmarks Work Best

When at least one document provides authoritative guidance, the framework enables:

• Clear normative benchmarks for alignment assessment based on established standards

• Meaningful identification of compliance gaps and enhancement opportunities

• Practical utility for organizations seeking to align with recognized standards

• More objective functional equivalence judgments anchored to established practices

3.7.4 Universal Application Scope

The framework can be applied across any domain where authoritative standards exist, including financial services, healthcare, information technology, environmental protection, data privacy, manufacturing, and quality management. Examples include (but are not limited to) HIPAA for healthcare, SOX for financial reporting, GDPR for data protection, or industry-specific standards compared against organizational policies.

Suitable Applications:

• Formal laws, regulations, international standards (e.g., ISO, NIST, COSO, COBIT), supervisory

circulars
- Organizational compliance policies, risk management frameworks
- Internal procedures benchmarked against statutory regulations or industry standards

Less Suitable Applications:
- Informal Guidance Comparisons: When both documents lack clear structure or authoritative foundation
- Purely Aspirational Documents: Policy statements without specific implementation guidance

Data Requirements:
- Larger documents allow full statistical testing
- Smaller documents can use three-level consolidation system
- Domain expertise required for correct functional equivalence mapping
- At least one document should provide clear normative benchmark for comparison

3.8 Reliability and Validity Framework

Having established the theoretical foundation and methodological framework for the KRIS approach, this chapter now presents the empirical validation of the framework through systematic application across three international standards. The results demonstrate both the methodology's reliability and its capability to generate statistically validated insights about regulatory alignment patterns.

3.8.1 Reliability Measures

Internal Consistency: Stable patterns across frameworks confirmed by replication of strong alignment proportions across three international standards (74.6%, 80.8%, 75.1%).

Coverage Completeness: All regulatory provisions captured with no missing values across 575 mapping decisions (193 provisions × 3 frameworks).

Test-Retest Reliability: Reapplication produced consistent distributions across multiple validation cycles.

3.8.2 Validity Assessment

Content Validity: Ensured by exhaustive extraction with traceability to original texts and systematic coverage of all substantive regulatory provisions.

Construct Validity: Grounded in functional equivalence theory providing clear conceptual basis for alignment assessment methodology.

Criterion Validity: Demonstrated through consistent results across COSO ERM, ISO 37000, and other international framework comparisons, showing methodological stability.

3.8.3 Future Research Directions

Inter-Rater Reliability: Multi-expert coding protocols should calculate appropriate statistical measures of agreement in future applications to establish inter-coder consistency and strengthen methodological credibility.

4. Results and Analysis

This section presents comprehensive validation evidence for the KRIS Framework through systematic application to SEBI's Risk Management Framework compared against three international standards. The analysis demonstrates the framework's methodological reliability while revealing significant patterns in regulatory alignment that inform both theoretical understanding and practical policy development.

4.1 Methodological Validation Evidence

Application of the KRIS Framework across three international standards provides compelling evidence of methodological reliability and demonstrates the framework's capability to handle comprehensive regulatory analysis without data loss or analytical gaps. The validation process involved systematic application to ISO 31000 (Risk

Management), COSO ERM (Enterprise Risk Management), and ISO 37000 (Governance), representing diverse regulatory approaches and philosophical foundations.

The validation demonstrates several critical methodological capabilities that establish the framework's reliability for regulatory analysis. **Complete coverage** was achieved across all framework comparisons, with 193 extracted provisions successfully classified in each application, resulting in zero missing values across 579 total classifications. This comprehensive coverage confirms the framework's ability to handle complete regulatory document analysis without encountering insurmountable analytical challenges.

Pattern consistency emerged across different comparison contexts, with the framework successfully identifying systematic regulatory relationships whilst demonstrating adaptability to different regulatory terminologies and structural approaches. All analytical dimensions were successfully measured using binomial proportion tests and chi-square independence tests, validating the statistical integration capability across diverse regulatory contexts.

4.2 Cross-Framework Validation Results

Table 4.1: Cross-Framework Validation Evidence

Validation Metric	ISO 31000	COSO ERM	ISO 37000	Overall
Provisions Successfully Classified	193/193 (100%)	193/193 (100%)	193/193 (100%)	579/579 (100%)
Missing Values	0	0	0	0
Statistical Tests Completed*	8/8	8/8	8/8	24/24
Significant Patterns Detected**	All dimensions	All dimensions	All dimensions	Consistent across frameworks

*Refers to application of Binomial and Chi-square tests to 4 hypotheses in each framework – therefore 8 tests per framework
**Refers to analytical dimensions outlined in Section 3.4: Operational vs Strategic, Structural vs Cultural, and Mandatory vs Recommendatory classifications

4.2.1 Framework-Specific Pattern Analysis

Primary Emphasis	ISO 31000	COSO ERM	ISO 37000	Overall Pattern
Strategic/Operational Focus	Operational (77.7%)	Operational (72.0%)	Operational (66.3%)	Operational Dominance
Structural/Cultural Focus	Structural (91.7%)	Structural (91.2%)	Structural (98.4%)	Strong Structural Emphasis
Language Style	Prescriptive (69.4%)	Prescriptive (69.4%)	Adaptive (81.3%)	Mixed Approaches

The declining operational percentages across frameworks (77.7% → 72.0% → 66.3%) reveal important insights about SEBI's regulatory composition. When compared against pure risk management standards (ISO 31000), SEBI appears highly operational, but governance-focused comparisons (ISO 37000) reveal more strategic elements within the framework. Most significantly, the language style shows dramatic context sensitivity - SEBI employs prescriptive language (69.4%) when addressing risk management concerns but adopts predominantly adaptive language (81.3%) for governance-related provisions. This pattern demonstrates the framework's sophisticated regulatory approach, tailoring language and emphasis to specific regulatory domains rather than applying uniform requirements across all areas.

Application of the KRIS Framework across three international standards demonstrates robust methodological reliability and universal applicability across diverse regulatory contexts.

4.2.2 Validation Evidence Summary

The validation demonstrates three critical methodological capabilities:

Coverage Completeness: Zero missing values across 579 total classifications (193 provisions across three frameworks) confirms the framework's ability to handle comprehensive regulatory document analysis without data loss or systematic gaps.

Statistical Integration Success: Successful completion of binomial proportion tests and chi-square independence tests across all framework comparisons validates the transformation from qualitative interpretation to quantitative analysis while preserving contextual understanding.

Pattern Detection Reliability: All analytical dimensions produced statistically significant patterns across different international standards, supporting the framework's effectiveness for systematic regulatory analysis and demonstrating sensitivity to detect different regulatory emphases.

4.2.3 Key Methodological Insights

The cross-framework validation reveals several important findings:

1. **Universal Applicability:** The KRIS Framework successfully classified all provisions across three distinct regulatory domains (risk management, enterprise risk management, and governance) without encountering analytical limitations.

2. **Consistent Pattern Detection:** Despite different regulatory philosophies and implementation approaches, the framework consistently identified meaningful patterns across all three analytical dimensions.

3. **Operational Focus Consistency:** All three frameworks show a predominant operational orientation (66.3%-77.7%), indicating that SEBI RMF emphasizes implementation-focused requirements regardless of the comparison standard.

4. **Structural Dominance:** The consistently high structural focus (91.2%-98.4%) across all frameworks suggests SEBI RMF prioritizes systems, processes, and controls over cultural or behavioral aspects.

5. **Language Style Variation:** The shift from prescriptive language in ISO 31000 and COSO ERM to more adaptive language in ISO 37000 demonstrates the framework's sensitivity to detect different regulatory communication styles.

4.2.4 Statistical Robustness Indicators

The validation provides multiple indicators of methodological robustness:

- **100% Classification Success Rate:** No provisions remained unclassifiable across any framework

- **Zero Data Loss:** Complete analytical coverage without missing values

- **24/24 Statistical Tests Completed:** Full statistical validation protocol implementation

- **Cross-Framework Pattern Consistency:** Reliable detection of systematic differences between regulatory approaches

This comprehensive validation establishes the KRIS Framework as a reliable, universal methodology for systematic regulatory comparison analysis.

4.3 Framework-Specific Insights and Methodological Capabilities

Each international framework comparison revealed distinct characteristics whilst demonstrating the methodology's universal applicability:

4.3.1 ISO 31000 (Risk Management) Analysis

The comparison demonstrated the framework's sensitivity to detecting significant structural variations across alignment categories, revealing specialised risk management implementation requirements that distinguish sectoral adaptation from generic regulatory application. The analysis consistently identified systematic patterns in risk-specific regulatory language and implementation approaches.

4.3.2 COSO ERM (Enterprise Risk Management) Analysis

This comparison showed the framework's ability to identify balanced compliance orientation, indicating how enterprise-wide regulatory considerations become visible through systematic methodology rather than subjective assessment. The analysis revealed particular strengths in detecting integrated approaches spanning multiple organisational functions.

4.3.3 ISO 37000 (Governance Standards) Analysis

The evaluation highlighted the framework's sensitivity to regulatory language functions, detecting adaptive characteristics that emerge specifically in governance contexts. This comparison revealed how governance principles translate into operational requirements through different linguistic and structural mechanisms.

4.4 Statistical Testing Outcomes

Statistical testing consistently revealed significant deviations from balanced distributions across all framework comparisons, enabling rejection of null hypotheses and supporting empirical conclusions about regulatory alignment patterns with established confidence levels.

Key Statistical Results:

- **Binomial tests** demonstrated alignment proportions significantly differ from theoretical baselines ($p < 0.001$)
- **Chi-square independence tests** identified meaningful associations between alignment categories and regulatory characteristics
- **Effect sizes** measured through Cramer's V showed moderate to strong associations (V ranging from 0.24 to 0.31)
- **Confidence intervals** consistently excluded null hypothesis values, providing statistical precision for regulatory assessment

5. Discussion

5.1 Methodological Advancement and Contributions

The evolution from percentage-based to statistical analysis transforms KRIS Framework from exploratory tool to rigorous research methodology. This advancement enables formal hypothesis testing capability, ensures peer review standards compliance, and provides replicable statistical protocols with empirical validation evidence.

The framework contributes to regulatory analysis theory through integration of interpretive and statistical approaches, functional equivalence operationalisation, multi-framework validation methodology, and statistical rigour in qualitative assessment. These innovations address critical gaps in regulatory comparison methodology that have constrained the field for decades.

5.2 Practical Applications and Policy Implications

The framework's universal applicability creates significant opportunities across multiple stakeholder contexts. For regulatory authorities, it provides systematic benchmarking capabilities against international standards with statistical validation. For academic researchers, it offers rigorous methodology meeting publication standards whilst generating practically relevant insights. For organisations, it enables systematic compliance assessment with statistical confidence supporting evidence-based decision-making.

5.3 Limitations and Future Research Directions

Current implementation reveals several limitations requiring future attention. Single-expert implementation may introduce subjective bias despite comprehensive statistical validation protocols. Resource intensity involves substantial effort in systematic document decomposition, potentially limiting feasibility in constrained research settings. Cross-cultural applicability requires further testing beyond financial governance contexts.

Priority future research directions include:

- Inter-rater reliability testing across multiple regulatory domains
- Cross-jurisdictional application to diverse regulatory areas (healthcare, environmental policy, technology governance)
- Technology integration exploring AI-assisted text mining to reduce subjectivity
- Policy research applications for regulatory impact assessment and international cooperation

6. Conclusions

This research introduces the KRIS Framework as a methodological advancement that addresses longstanding limitations in regulatory comparison analysis. Through systematic validation across multiple international standards, the framework demonstrates the feasibility of combining interpretive understanding with statistical rigor. The following conclusions summarize the key contributions, implementation guidance, and broader implications for regulatory analysis methodology.

6.1 Key Contributions

This research establishes the KRIS Framework as a significant advancement in regulatory analysis methodology, successfully addressing fundamental limitations that have constrained the field's development. The key contributions include:

1. **Statistical Methodology Development:** Transformation of descriptive regulatory comparison into empirically validated research capability enabling formal hypothesis testing

2. **Universal Framework Design:** Creation of methodology applicable across regulatory domains and jurisdictions whilst maintaining analytical consistency

3. **Reliability Evidence:** Establishment of cross-framework consistency metrics through comprehensive validation across 575 provisions

4. **Practical Policy Tools:** Integration of interpretive richness with statistical rigour for evidence-based regulatory development

6.2 Strategic Implementation Recommendations

For Academic Researchers:

- Conduct power analysis for appropriate sample sizing
- Implement multiple-coder validation where feasible
- Document all mapping decisions for transparency
- Apply statistical protocols consistently across comparisons

For Policy Makers:

- Consider both statistical significance and practical effect sizes
- Acknowledge contextual factors in cross-jurisdictional application
- Integrate quantitative findings with qualitative expert judgement
- Monitor regulatory evolution for continued relevance

6.3 Final Observations

The KRIS Framework establishes a robust foundation for evidence-based regulatory analysis that combines methodological rigour with practical applicability. As regulatory coordination becomes increasingly important in interconnected global governance systems, methodologies enabling systematic, empirically validated comparison become essential tools for evidence-based policy

development.

The framework's universal design, demonstrated reliability, and theoretical contributions position it to make lasting contributions to regulatory analysis methodology whilst supporting the development of more effective, evidence-based regulatory systems worldwide.

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