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Empirical Evaluation of Operational and Relational Determinants on Customer Satisfaction in Disaster Recovery Outsourcing: An IPA and Regression Approach

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Abstract

In today's digital ecosystem, where operational continuity is increasingly threatened by cyberattacks, data loss, and infrastructure failures, Disaster Recovery Outsourcing (DRO) has become a vital strategy for enterprises seeking to safeguard critical systems and data. This study aims to identify and analyze the key factors influencing customer satisfaction in DRO services. A structured quantitative approach was employed, involving a validated survey instrument distributed to 198 respondents across finance, healthcare, IT services, and manufacturing sectors—industries with high reliance on information resilience. The analytical framework integrated Importance-Performance Analysis (IPA) and multiple regression modeling to evaluate perceived importance and satisfaction across various service attributes. The findings reveal that customer satisfaction in DRO is not determined solely by technical service delivery—such as Recovery Time Objective (RTO) and Recovery Point Objective (RPO)—but is significantly influenced by relational dimensions, including communication effectiveness, responsiveness, and trust. IPA results identified critical service gaps in service pricing, data backup timeliness, and RPO performance. These attributes were rated highly important but underperforming, placing them in the "Concentrate Here" quadrant. Regression analysis confirmed that relational quality is the most influential predictor of overall satisfaction ($\beta = 0.49$), followed by technical service quality ($\beta = 0.38$) and economic perception ($\beta = 0.22$), with the model explaining 72.3% of the variance. The study concludes that a multidimensional approach that balances technical reliability, economic fairness, and human-centric service design is essential to improving satisfaction and retention in disaster recovery outsourcing relationships. Strategic recommendations are provided for enhancing service transparency, adaptability, and customer engagement.

Keywords: *Disaster recovery outsourcing, Customer satisfaction, Importance-Performance Analysis (IPA), Recovery Time Objective (RTO), Recovery Point Objective (RPO), Technical service quality, IT service management*

1. Introduction

In the modern digital economy, data has become a core asset essential for business continuity, informed decision-making, and maintaining customer trust. As organizations increasingly depend on digital infrastructure, the consequences of system failures—ranging

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from data loss to prolonged downtime—pose significant threats, including financial losses, reputational harm, and regulatory non-compliance. To address these challenges, Disaster Recovery (DR) has evolved from a support function to a strategic imperative in enterprise IT. Traditional DR strategies, which relied on on-site hardware redundancy and manual backup procedures, are increasingly seen as costly, inflexible, and slow to scale. This has led to the rise of Disaster Recovery as a Service (DRaaS), a cloud-enabled, third-party solution that integrates virtualization, real-time replication, and automated orchestration to deliver scalable and resilient recovery capabilities [1]. In evaluating DR outsourcing, organizations consider both technical and relational dimensions. Foundational metrics such as Recovery Point Objective (RPO) and Recovery Time Objective (RTO) measure acceptable data loss and downtime, serving as benchmarks for technical service delivery. However, client satisfaction often hinges equally on non-technical aspects, including communication quality, responsiveness, transparency in pricing, and vendor trustworthiness [2][3].

The disaster recovery landscape has grown increasingly complex due to hybrid cloud adoption, rising cyber threats, and expanding compliance requirements. Enterprises now demand integrated solutions that align with continuity goals and conform to standards such as ISO/IEC 27031 and NIST SP 800-34 [4]. As a result, customer satisfaction has become a critical indicator of provider performance, influencing renewals, retention, and competitive advantage. Despite its strategic importance, empirical research into customer satisfaction in DR outsourcing remains limited. While technical benchmarks like RTO and RPO are widely studied, there is insufficient understanding of how other factors such as service cost, customization options, and data security, and geographic coverage impact client perceptions. Prior studies suggest that dissatisfaction can arise even when technical metrics are met, particularly when there is a mismatch between perceived importance and actual service performance [5].

This study addresses the existing gap by empirically examining the determinants of customer satisfaction in disaster recovery outsourcing. Utilizing data from the finance and IT service sectors, Importance-Performance Analysis (IPA) is employed to evaluate the relationship between perceived importance and delivered performance across various services attributes. The core proposition suggests that customer satisfaction in disaster recovery outsourcing is a multidimensional construct, shaped by the alignment between client expectations and actual outcomes across technical, relational, and economic dimensions. By identifying the attributes most valued by clients and highlighting areas of service underperformance, the study provides actionable insights for service providers to enhance quality, strengthen client relationships, and improve long-term retention.

2. Literature review

Disaster Recovery (DR) has undergone a significant transformation, evolving from static, hardware-based backup systems to dynamic, cloud-enabled service models. As reliance on digital infrastructure grows, so too does the complexity of ensuring business continuity in the face of disruptions. This literature review synthesizes research across two main dimensions: the evolution of DR architectures and metrics, and the multidimensional nature of customer satisfaction in disaster recovery outsourcing.

2.1. Disaster recovery architecture, metrics, and service models

Traditional disaster recovery approaches rooted in physical redundancy, tape backups, and offsite storage has been increasingly replaced by Disaster Recovery as a Service (DRaaS).

DRaaS leverages virtualization, cloud orchestration, and real-time replication to deliver scalable and automated recovery capabilities. Kesa [6] proposed a tiered DRaaS architecture incorporating snapshot-based versioning and hypervisor-level orchestration, enabling rapid resource reallocation during outages.

Core recovery metrics such as Recovery Time Objective (RTO) and Recovery Point Objective (RPO) remain foundational in evaluating DR performance. However, static definitions of these metrics have proven inadequate in dynamic environments. Abualkishik et al. [7] emphasized the need for adaptive SLA frameworks that can recalibrate RTO and RPO based on workload sensitivity and real-time system demands. Thekdi et al. [8] introduced artificial intelligence into recovery orchestration, using reinforcement learning algorithms to predict failures and optimize system responsiveness, thus reducing variance in RTO and RPO outcomes.

To support these architectural advancements, researchers have emphasized the importance of integrated compliance and governance frameworks. Lacity et al. [10] identified that regulatory adherence and institutional trust are critical for service provider credibility, especially when DR services are deployed in highly regulated sectors. As DR architectures become more complex, incorporating hybrid and multi-cloud strategies, auditability and standard alignment—such as compliance with ISO/IEC 27031—are essential components of modern service delivery [4].

2.2. Determinants of customer satisfaction in DR outsourcing

Technical performance remains central to disaster recovery; customer satisfaction is increasingly recognized as a multidimensional construct. Liou et al. [9] developed a hybrid SERVQUAL-AHP model to measure latent satisfaction dimensions, including assurance, responsiveness, and empathy. Their results indicated that client satisfaction extends beyond measurable performance metrics to include soft factors such as flexibility and personalized support.

Duan [11] applied Importance-Performance Analysis (IPA) to assess misalignments between client expectations and actual service performance, finding that recovery testing frequency and customization were commonly underperforming areas. These findings underscore the need for providers to regularly evaluate customer feedback and incorporate it into service design. Economic perception also plays a key role. Mechler [12] modeled DR Service delivery as a constrained optimization problem, demonstrating that mismatches between expenditure and system capacity can negatively impact satisfaction. Customers are particularly sensitive to service pricing, especially when technical performance is acceptable but relational or economic factors fall short. Guerrero et al. [13] broadened the satisfaction paradigm by introducing Continuous Availability (CA) as a more proactive, resilience-driven model. Their findings showed that while CA architectures can enhance uptime and system robustness, they also introduce operational complexity that may affect client onboarding and long-term engagement. Wang et al. [14] reinforced the importance of long-term alignment, proposing a lifecycle satisfaction model that integrates technical metrics, SLA compliance, and user feedback to predict customer retention.

This study suggests that successful DR outsourcing depends on a balance between high-performance infrastructure, transparent and responsive service, and a pricing model that reflects customer-perceived value. Providers must therefore manage not only recovery capabilities but also client relationships and economic expectations to maintain competitiveness and trust in a crowded outsourcing market.

3. Methodology

This study employs a quantitative, cross-sectional research design to empirically assess the determinants of customer satisfaction in disaster recovery outsourcing. The methodology integrates structured survey instrumentation, stratified sampling across industry verticals, and multivariate statistical analysis. The core analytical framework is based on Importance-Performance Analysis (IPA), allowing simultaneous evaluation of customer perceptions and service attribute prioritization.

3.1. Research design and framework

The research is grounded in Multi-Criteria Decision-Making (MCDM) theory, using a SERVQUAL-informed construct to model satisfaction as a function of both technical service parameters (e.g., RTO, RPO, data accuracy) and experiential factors (e.g., communication, pricing, trust). The model incorporates latent variables from prior validated studies and extends them with DR-specific operational metrics to improve domain specificity.

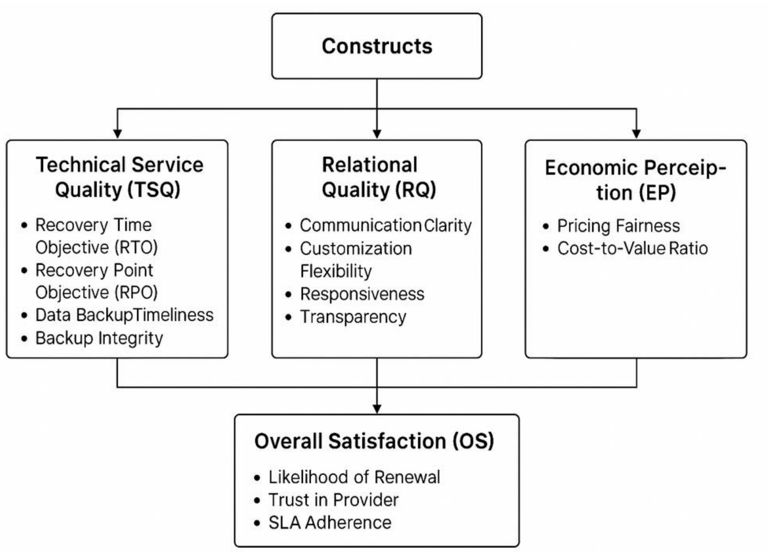

Figure 1. Conceptual framework for evaluating customer satisfaction in disaster recovery outsourcing

The proposed framework in [Figure 1] operationalizes customer satisfaction as a multidimensional construct derived from interrelated service quality domains. Technical Service Quality (TSQ) encompasses quantifiable DR performance metrics, including Recovery Time Objective (RTO), Recovery Point Objective (RPO), and backup accuracy. Relational Quality (RQ) addresses service delivery attributes such as vendor responsiveness, communication effectiveness, and customization flexibility. Economic Perception (EP) evaluates perceived fairness in pricing and return on investment.

These independent variables are hypothesized to collectively influence Overall Satisfaction (OS), which is measured through renewal intent, trust in the service provider, and SLA fulfillment. The model supports empirical analysis through Importance-Performance Analysis (IPA), regression modeling, and latent factor validation, allowing for a holistic understanding of satisfaction determinants in outsourced DR environments.

3.2. Instrumentation and survey design

To measure customer satisfaction in disaster recovery outsourcing, a structured survey instrument was developed based on established frameworks in IT service quality, disaster recovery performance, and outsourcing satisfaction. The design followed DeVellis' protocol for scale development to ensure both content validity and construct reliability. The instrument comprised 24 items, organized into four constructs: Technical Service Quality (TSQ), Relational Quality (RQ), Economic Perception (EP), and Overall Satisfaction (OS), the latter serving as the dependent latent variable.

Each item was rated on a 10-point Likert scale. Respondents indicated importance (1 = Not Important, 10 = Extremely Important) and satisfaction (1 = Very Dissatisfied, 10 = Very Satisfied) for each attribute. Sample items included satisfaction with average RTO performance for Tier 1 applications (TSQ), responsiveness to configuration change requests (RQ), and alignment between perceived cost and service scope (EP).

The instrument underwent expert validation by three disaster recovery consultants and two IT governance academics, resulting in a Content Validity Index (CVI) of 0.92. A pilot test involving 20 IT professionals was conducted to refine language clarity and eliminate redundancy. Minor lexical adjustments were made based on participant feedback. Internal consistency was confirmed through Cronbach's alpha, yielding strong reliability scores across constructs: 0.91 for TSQ, 0.89 for RQ, 0.87 for EP, and 0.90 for OS. Exploratory Factor Analysis (EFA) later verified construct validity, as detailed in Section 3.4.

3.3. Sampling and data collection

This study adopted a stratified purposive sampling strategy targeting professionals directly involved in disaster recovery outsourcing decisions. The sample included firms from four sectors with high dependency on IT resilience: finance, healthcare, IT services, and manufacturing. The sampling frame was built using enterprise client databases from disaster recovery providers, professional networks such as ISACA and DRJ, and LinkedIn groups focused on IT continuity and resilience.

Participants were selected based on their roles in IT infrastructure, business continuity planning, or vendor management. Invitations were extended to key decision-makers, such as IT leads and continuity officers, to ensure responses reflected informed evaluations of service quality and satisfaction.

A total of 200 structured surveys were distributed via a secure web-based platform. After screening for completion and validity, 198 responses were retained, yielding a 99% effective response rate. The respondent pool was composed of 47% from finance and banking, 21% from healthcare and pharmaceuticals, 19% from IT services, and 13% from industrial manufacturing. Participants had an average of 5.8 years of experience in DR outsourcing, and 92% had previously engaged in vendor evaluation or service-level agreement design.

Mandatory completion of all survey items ensured a complete dataset, with no missing values. Ethical considerations were fully addressed through informed consent, anonymized data handling, and compliance with ISO/IEC 27001 data protection standards.

3.4. Data analysis techniques

Data collected from the 198 valid responses were analyzed using SPSS v28 and R v4.3.1. Descriptive statistics were first computed to examine central tendencies, dispersion, and distribution for each service attribute. All variables met normality assumptions, with no missing data due to enforced completion. Outliers were checked using Mahalanobis distance and found to be non-significant.

Exploratory Factor Analysis (EFA) was conducted to validate the measurement model. The Kaiser-Meyer-Olkin (KMO) value was 0.914, and Bartlett's Test of Sphericity was significant ($\chi^2 = 2856.7$, $p < 0.001$), indicating suitability for factor analysis. Four factors aligned with the conceptual framework—Technical Service Quality (TSQ), Relational Quality (RQ), Economic Perception (EP), and Overall Satisfaction (OS)—explaining 78.2% of the variance, with all factor loadings above 0.70.

An Importance-Performance Analysis (IPA) was then performed by plotting mean-centered importance and satisfaction scores for each attribute on a two-dimensional grid. This enabled categorization into strategic quadrants (e.g., "Concentrate Here," "Keep Up the Good Work") to identify critical service gaps and strengths.

Finally, a multiple linear regression was conducted to examine the influence of TSQ, RQ, and EP on Overall Satisfaction. The model was significant ($F(3,194) = 174.9$, $p < 0.001$) with an adjusted R^2 of 0.723. Standardized beta coefficients indicated that Relational Quality ($\beta = 0.49$) was the strongest predictor, followed by Technical Service Quality ($\beta = 0.38$) and Economic Perception ($\beta = 0.22$). Assumptions of linearity, normality, and homoscedasticity were all met, and multicollinearity was not a concern.

4. Results

4.1. Descriptive statistics and construct reliability

The analysis of 198 valid survey responses yields robust evidence in support of the multidimensional satisfaction framework. [Table 1] summarizes the descriptive statistics for key service attributes. Customers rated core operational measures such as Recovery Time Objective (RTO) accuracy, Data Security, and Backup Correctness highly important (8.76, 8.25, and 9.45, respectively). In contrast, satisfaction with Service Pricing and Data Backup Timeliness remained significantly lower (means of 3.81 and 4.12, respectively), signaling critical areas for service improvement. The high importance yet poor performance ratings for these attributes reinforce the necessity for targeted interventions.

Table 1. Descriptive statistics for key service attributes (n = 198)

Attribute	Mean Importance	SD Importance	Mean Satisfaction	SD Satisfaction
Recovery Time Objective	8.76	0.65	8.40	0.70
Data Security	8.25	0.70	8.50	0.65
Backup Correctness	9.45	0.55	9.00	0.60
Service Pricing	8.20	0.80	3.81	1.20
Data Backup Timeliness	8.70	0.75	4.12	1.10

4.2. Importance-Performance Analysis (IPA)

An Importance-Performance Analysis (IPA) was conducted to assess how well key disaster recovery outsourcing attributes meet customer expectations. As shown in [Figure 2], service attributes were plotted on a two-dimensional matrix based on their mean importance and satisfaction ratings.

Attributes such as Backup Correctness, Data Security, and Recovery Time Objective (RTO) appeared in the "Keep Up the Good Work" quadrant, reflecting strong alignment between performance and customer expectations. In contrast, Service Pricing, Data Backup

Timeliness, and Recovery Point Objective (RPO) fell into the "Concentrate Here" quadrant, indicating high importance but low satisfaction—critical areas require immediate attention. Interestingly, RTO, despite its high satisfaction rating, was categorized under "Possible Overkill," suggesting that continued investment in minimizing recovery time may offer limited additional value. No attributes were classified as "Low Priority," reinforcing the relevance of all evaluated dimensions to overall customer satisfaction. [Figure 2] provides a clear visual diagnostic, helping service providers prioritize improvements that balance technical performance with economic and relational expectations.

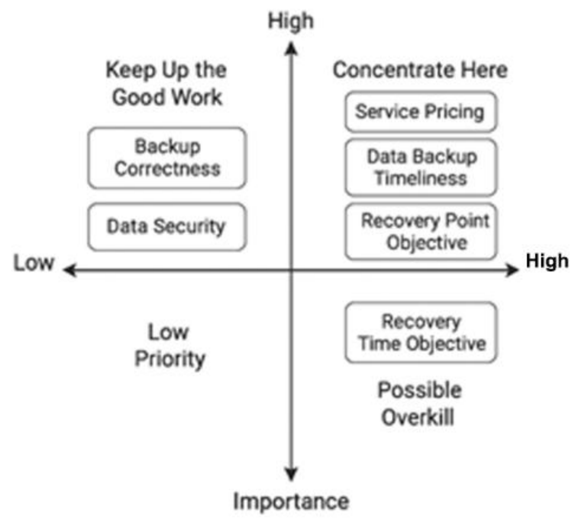

Figure 2. Importance-Performance Analysis (IPA) matrix for disaster recovery outsourcing attributes

4.3. Regression analysis

A multiple linear regression was conducted to determine the predictive strength of the identified dimensions—Operational Performance (reflecting outcomes such as RTO and RPO), Relational Quality (communication, responsiveness, and customization), and Economic Perception (pricing fairness)—on Overall Satisfaction (OS). The regression model is detailed in [Table 2].

Table 2. Regression analysis results for predictors of overall satisfaction (OS)

Predictor	B	Std. Error	Standardized β	p-value
Operational Performance	0.412	0.056	0.38	<0.001
Relational Quality	0.527	0.048	0.49	<0.001
Economic Perception	0.231	0.075	0.22	0.005
Model Summary				
Adjusted R^2			0.723	

The model explains approximately 72.3% of the variance in Overall Satisfaction. Among the predictors, Relational Quality exhibited the strongest influence ($\beta = 0.49$, $p < 0.001$), followed by Operational Performance ($\beta = 0.38$, $p < 0.001$) and Economic Perception ($\beta = 0.22$, $p = 0.005$). Diagnostic tests confirmed that the regression assumptions—linearity, normality, homoscedasticity, and independence—were satisfactorily met, with no multicollinearity issues detected.

4.4. Correlation analysis

To further substantiate the relationships among constructs, Pearson correlation coefficients were calculated. As shown in [Table 3], all independent variables are significantly and positively correlated with Overall Satisfaction. Relational quality, for instance, demonstrated the highest correlation ($r = 0.68$, $p < 0.001$), reinforcing its role as a critical driver of customer satisfaction in disaster recovery outsourcing environments.

Table 3. Correlation matrix among key constructs

Variable	Operational Performance	Relational Quality	Economic Perception	Overall Satisfaction
Operational Performance	1.00	0.55**	0.43**	0.62**
Relational Quality	0.55**	1.00	0.47**	0.68**
Economic Perception	0.43**	0.47**	1.00	0.53**
Overall Satisfaction	0.62**	0.68**	0.53**	1.00

**Note: *Significant at p < 0.001.*

In summary, the results confirm the multidimensional nature of customer satisfaction in disaster recovery outsourcing. Although operational performance indicators (e.g., RTO, RPO) are robust, the relational aspects—such as communication effectiveness and responsiveness—play a pivotal role in overall satisfaction. Additionally, the low satisfaction scores in pricing and timeliness underscore significant service gaps that providers must address. The overall high explanatory power of the regression model (adjusted $R^2 = 0.723$) validates the proposed framework and aligns with previous empirical studies.

5. Discussion

This study highlights the complex interplay of operational, relational, and economic factors that shape customer satisfaction in disaster recovery outsourcing. While technical performance metrics such as RTO and RPO remain essential, the findings confirm that relational quality including communication, responsiveness, and customization—has the strongest impact on overall satisfaction [15][16]. This suggests that disaster recovery providers must go beyond delivering reliable systems to building trust and maintaining consistent client engagement.

The IPA results in [Figure 2] revealed key service gaps in pricing fairness, backup timeliness, and RPO performance. Despite being rated as highly important, these attributes had low satisfaction scores, placing them in the “Concentrate Here” quadrant. This mismatch indicates a disconnect between client expectations and actual service delivery, echoing findings from similar studies in the UK and Canada [17][18]. The strong correlation between relational quality and satisfaction reinforces that customers increasingly value human-centric service features over purely technical capabilities [19][20]. In regulated sectors especially, proactive communication and tailored support can significantly enhance perceptions of service value and reliability [21].

Although economic perception showed a smaller effect than relational or technical factors, it remains a meaningful predictor. Customers may tolerate premium pricing when service quality is high, but unclear or mismatched pricing can erode satisfaction and trust. These results suggest that transparent, value-based pricing models could improve overall perceptions and client retention. In summary, the study supports a multidimensional model of customer satisfaction, where technical reliability must be complemented by relational excellence and fair economic terms. Service providers must address both operational and experiential dimensions to compete effectively in the evolving disaster recovery market.

5. Conclusion and recommendations

This research examined the drivers of customer satisfaction in disaster recovery outsourcing using Importance-Performance Analysis (IPA) and multiple regression modeling. The results demonstrate that while technical service quality remains a core expectation especially in metrics like RTO and RPO relational quality is the most significant determinant of overall satisfaction. Economic perception also plays a meaningful, though secondary, role.

IPA results identified key areas for improvement in pricing fairness, backup timeliness, and RPO performance. These service gaps represent critical challenges that providers must address to enhance client satisfaction and retention. Conversely, strengths in RTO performance and backup accuracy validate ongoing technical investments, though excessive focus on RTO may yield diminishing returns.

Based on these findings, six strategic recommendations are proposed for service providers:

1. Improve real-time visibility by deploying client-facing dashboards that display recovery metrics and SLA compliance.
2. Enhance RPO delivery using continuous data protection and tiered backup strategies.
3. Formalize communication protocols to ensure clarity and responsiveness during incidents.
4. Transition to value-based pricing models that reflect usage, performance, and customer priorities.
5. Conduct regular disaster simulations with client participation to build trust and readiness.
6. Evolve Service Level Agreements dynamically based on client feedback and business needs.

In conclusion, the study contributes a validated, domain-specific model for understanding customer satisfaction in disaster recovery outsourcing. As organizations face growing digital threats and compliance pressures, DR providers must adopt a holistic, customer-centric approach that balances technical strength with transparency and personalized service. Doing so will not only enhance satisfaction but also secure long-term competitive advantage in the IT services sector.

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