

Critical Literature Review

Design and Creative Technologies

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Table of Contents

| | |
|--|-------------------------------------|
| 1. Introduction | 3 |
| 2. Research Questions, Aim and Objectives..... | 3 |
| 3. Comparative Analysis of Research Methodologies | 5 |
| 3.1. Research Questions | Error! Bookmark not defined. |
| 4. Proposed Methodology and Research Methods..... | 7 |
| 4.1. Design Paradigm..... | 7 |
| 4.2. Data Collection..... | 7 |
| 4.3. Data Processing Timeline..... | 8 |
| 4.4. Quantitative Analysis | 9 |
| 5. Rationale for Method Choice | 10 |
| 6. Ethical Considerations | 12 |
| 7. Data Analysis Strategies and Tools | 12 |
| 8. Limitations and Delimitations..... | 13 |
| 9. Conclusion..... | 13 |
| 10. References | 16 |

Exploring the Relationship between Net Promoter Score and Revenue Growth in Healthcare Clinics.

1. Introduction

The project investigates whether Net Promoter Score (NPS)—a common measure of patient satisfaction—correlates with revenue performance in healthcare clinics. Understanding this relationship can inform evidence-based managerial decisions and guide future AI-enabled feedback systems. In the healthcare sector, however, the bridge between patient sentiment and measurable business outcomes such as revenue, retention, or referrals remains under-explored.

This project proposes an ICT-driven research framework that leverages fine-grained sentiment analysis and business-intelligence methods to examine whether emotional patterns in patient feedback can predict financial performance in clinical environments. The study builds directly on the literature gaps identified in Assessment 1 and adopts a mixed-methods design to ensure both computational accuracy and contextual validity.

2. Research Questions, Aim and Objectives

Aim: To investigate the predictive relationship between AI-derived sentiment metrics and business KPIs in healthcare clinics.

Research Questions:

- RQ1: To what extent is NPS correlated with monthly revenue growth in healthcare clinics?
- RQ2: Can NPS trends over time predict short-term revenue fluctuations?

Hypothesis:

- H0: There is no statistically significant correlation between NPS scores and monthly revenue ($p = 0$).
- H1: There is a positive correlation between NPS scores and monthly revenue ($p > 0$, $p < 0.05$)

Objectives:

- Collect and prepare Net Promoter Score (NPS) and monthly revenue data from Pro-Corpo's clinics to ensure accuracy and comparability across time periods of the available data.
- Conduct quantitative analysis – including descriptive statistics, correlation, and regression – to examine the relationship between NPS scores and revenue performance.
- Perform correlation analysis (Pearson or Spearman) to quantify the strength and direction of the NPS to revenue relationship).
- Apply regression modeling to test whether NPS predicts revenue while controlling for temporal and clinic-specific variables.
- Validate findings through residual diagnostics and sensitivity analysis to ensure statistical robustness.

- Develop a practical ICT framework that demonstrates how NPS-based metrics can inform strategic decision-making and performance evaluation in healthcare.

3. Comparative Analysis of Research Methodologies

Healthcare business research operates at the intersection of human experience and organizational performance, requiring methodological approaches that balance measurement rigor with contextual understanding. The choice of methodology fundamentally shapes what can be known: quantitative methods enable hypothesis testing and generalization across populations, while qualitative methods reveal mechanisms and meanings that numbers alone can't capture (Creswell & Plano Clark, 2023). In ICT research and development (R&D), this tension is particularly salient when translating patient feedback—a qualitative phenomenon—into business intelligence metrics.

This study adopts a **pragmatic paradigm** (Morgan, 2014), prioritizing practical problem-solving over skepticism. Three methodological approaches were evaluated:

| Methodology | Description | Strengths | Weakness | Suitability |
|--------------|--|--|---|---|
| Qualitative | Explores human meaning through interviews or thematic coding | Rich context and interpretive depth. | Limited generalizability; prone to researcher bias. | Useful to verify how patients express emotions and validate UI outputs. |
| Quantitative | Employs numerical measurement, | Objectivity, replicability, scalability. | May overlook cultural tone. | Ideal for correlating NPS |

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| | hypothesis testing, statistical inference. | | | scores with revenue (KPIs) |
| Mixed Methods | Integrate both qualitative and quantitative strands. | Triangulation improves validity; merges AI outputs with human interpretation. | Requires time and data integration skills. | Best suited to AI research involving both algorithms and human review. |

Given that this study seeks to establish a baseline empirical relationship between existing business metrics (NPS and revenue), a quantitative approach is most appropriate. The availability of large-scale longitudinal data (27,000 records across 36 months) makes statistical analysis both feasible and methodologically sound (Pallant, 2020). Qualitative methods, while valuable for understanding **why** correlations exist, require resources (patient interviews, thematic coding) beyond this study's scope. Mixed methods remain relevant for future research integrating NLP-derived sentiment with financial outcomes but require the foundational correlation analysis this study provides.

This methodological choice reflects ICT R&D principles: iterative development from simple to complex systems. By demonstrating statistical relationships first, subsequent research can build AI-enabled sentiment analysis with confidence that the underlying NPS-revenue connection merits computational investment.

4. Proposed Methodology and Research Methods

4.1. Design Paradigm

The study adopts a pragmatic paradigm, valuing methodological pluralism to address practical ICT challenges. Quantitative components establish statistical validity, while qualitative insights ensure interpretability and ethical robustness.

4.2. Data Collection

- **Primary Source:** Anonymized operational dataset provided by Pro-Corpo Estetica (<https://procorpoestetica.com.br/>), comprising $\approx 27\,000$ records (2022–2025).
- **Variables:** textual feedback, NPS scores, month/year, clinic ID, and monthly revenue.
- **Data Security:** stored on encrypted drives compliant with the Australian Privacy Act (1988) and Brazilian Data Protection Law.
- **Authorization:** formal company consent letter ensuring confidentiality and academic use only.

The dataset originates from Pro-Corpo’s post-service Net Promoter Score (NPS) program, which automatically invites clients to provide feedback within 24 hours of receiving treatment. Respondents can identify themselves or remain anonymous and answer four brief questions: (1) a 1-to-10 satisfaction rating, (2) optional comments, (3) confirmation of the store visited, and (4) optional mention of staff members for praise or concern. This process has generated approximately 27 000 records collected between 2022 and 2025, providing a rich source of structured (scores, store, month) and unstructured (text feedback) data. Monthly revenue data for each store are also available, enabling correlation between customer sentiment, NPS, and financial performance.

4.3. Data Processing Timeline

Phase 1: Data Extraction

- Extract NPS survey responses (score, date, clinic ID, optional text comments)
- Extract monthly revenue records (clinic ID, month, total revenue)
- Timeframe: January 2022 – December 2024 (36 months)

Phase 2: Data Cleaning

- Remove duplicates (based on timestamp + clinic ID)
- Handle missing values:
 - NPS missing: exclude record (cannot impute satisfaction scores)
 - Revenue missing: interpolate if isolated gap (linear interpolation); exclude clinic-month if systematic missingness
- Outlier detection: flag revenue values >3 standard deviations from clinic mean for review

Phase 3: Data Transformation

- Aggregate NPS to clinic-month level (mean, median, standard deviation, response count)
- Normalize revenue for clinic size: Revenue per appointment (if appointment data available)
- Create derived variables:
 - NPS category: Detractors (0-6), Passives (7-8), Promoters (9-10)
 - Revenue growth: Month-over-month percentage change
 - Lagged NPS: NPS from 1 and 2 months prior (for temporal analysis)

Phase 4: Integration

- Merge datasets on: `clinic_id + year + month`
- Validate temporal alignment (ensure NPS survey dates precede revenue measurement)
- Final dataset structure: Each row = one clinic-month observation

4.4.Quantitative Analysis

Step 1: Check Assumptions

Before running statistical tests, the data must meet certain conditions (Field, 2018):

- **Normality:** Test whether NPS and revenue follow normal distributions using Shapiro-Wilk test
- **Linearity:** Create scatterplots to see if NPS and revenue have a straight-line relationship
- **Outliers:** Identify extreme values that might distort results (values >3 standard deviations from mean)

Step 2: Describe the Data

Calculate basic statistics for each clinic and time period:

- Average NPS score and revenue
- Spread of scores (standard deviation)
- Range (minimum to maximum)
- Visual summaries: histograms showing distribution patterns

Step 3: Test Correlation (RQ1)

Measure how strongly NPS and revenue move together:

- **If data is normally distributed:** Use Pearson correlation (r)
- **If data is not normal:** Use Spearman correlation (ρ)

- **Interpret strength** (Cohen, 1988):
 - Weak: r between 0 and 0.29
 - Moderate: r between 0.30 and 0.69
 - Strong: r above 0.70
- Test significance: $p\text{-value} < 0.05$ means the relationship is unlikely due to chance

Step 4: Test Prediction (RQ2)

Use regression to see if NPS can predict future revenue:

- **Simple model:** Does this month's NPS predict this month's revenue?
 - Formula: $\text{Revenue} = \beta_0 + \beta_1(\text{NPS}) + \text{error}$
- **Time-lagged model:** Does last month's NPS predict this month's revenue?
 - Formula: $\text{Revenue}(\text{month } t) = \beta_0 + \beta_1(\text{NPS month } t-1) + \text{error}$
- **Evaluate model quality:**
 - R^2 : percentage of revenue variation explained by NPS
 - p -value: whether NPS is a significant predictor

Step 5: Check Robustness

Verify results are reliable by:

- Re-running tests excluding the top and bottom 5% of clinics (outlier sensitivity)
- Testing different time periods separately (2022 vs 2023 vs 2024)
- Comparing results using different NPS thresholds

Tools: Python (scipy.stats, statsmodels), Excel for verification, Matplotlib for visualizations

5. Rationale for Method Choice

This study adopts a purely **quantitative design** for the methodological reasons below:

- **Nature of Research Questions:** Both RQ1 and RQ2 seek to quantify relationships and predictive power—questions best answered through statistical analysis rather than interpretive methods (Bryman, 2016). The hypothesis-testing framework (H0 vs. H1) requires numerical measurement and inferential statistics to establish evidence-based conclusions.
- **Data Characteristics:** The dataset comprises structured numerical variables (NPS scores 0-10, monthly revenue in currency units) collected systematically across 27,000 observations. This scale and structure align with quantitative methods' strengths: detecting patterns across large samples with statistical confidence (Field, 2018).
- **ICT R&D Context:** In software engineering and IT research, quantitative validation provides the empirical foundation for system design decisions (Wohlin et al., 2012). Establishing whether NPS correlates with revenue—and at what magnitude—determines whether investing in automated NPS analytics systems is justified. Qualitative understanding of **why** correlations exist can follow, but the **whether** question requires quantitative evidence first.

Why Not Mixed Methods?

While Creswell and Plano Clark (2023) advocate for mixed methods when phenomena require both measurement and meaning, this study focuses narrowly on measurement. The optional text comments in NPS surveys could enable qualitative analysis, but:

- Text analysis (even basic thematic coding) would shift the study toward NLP research—Assessment 1's original scope

- The current research questions do not require understanding patient motivations, only quantifying statistical relationships
- Resource constraints (time, coding expertise) favor depth in quantitative rigor over breadth across methods

Alignment with Assessment Progression

This quantitative foundation positions Assessment 3 to propose mixed-methods extensions:

"Having established correlation (Assessment 2), future research will employ NLP to identify **which** aspects of patient experience drive revenue outcomes."

6. Ethical Considerations

- **Anonymity & Consent:** No personally identifiable data will be used. Pro-Corpo's written authorization ensures institutional consent.
- **Data Governance:** Compliance with the Australian Privacy Act (1988), GDPR, and HIPAA standards.
- **Responsible AI Design:** Any outputs will be advisory, not decision-making.
- **Transparency:** All code and analysis scripts are documented for audit and open-sourced for learning purposes.

7. Data Analysis Strategies and Tools

| Purpose | Tool / Technique | Outputs | Justification |
|--------------------|------------------------|-------------------------|---------------|
| Data preparation | Python (Pandas, NumPy) | Cleaned dataset | |
| Assumption testing | Excel, Python | Summary stats, averages | |

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| Descriptive statistics | Word Cloud or manual thematic analysis | Verified emotion themes | |
| Correlation analysis | Streamlit, Matplotlib | Trend plots and correlation heatmaps | |
| Regression modeling | Combine AI, NPS and revenue metrics | Composite predictive model | |
| Visualization | | | |

8. Limitations and Delimitations

- **Scope:** Restricted to one clinic group (Pro-Corpo), limiting cross-industry generalizability.
- **Data Bias:** Feedback may be skewed toward extreme experiences.
- **Time Frame:** Analysis limited to 2022–2025 data.
- **Delimitation:** Study focuses on correlational evidence, not causal inference.

While data are anonymized, reflexivity remains essential: as an ex-internal collaborator, the researcher must remain aware of interpretive bias when analyzing familiar organizational contexts.

9. Conclusion

This research framework investigates the correlation between Net Promoter Score and revenue growth through a quantitative lens, establishing an empirical foundation for understanding customer experience as a business performance driver in healthcare. By employing descriptive statistics, correlation analysis, and regression modeling, the study

provides measurable evidence—or lack thereof—regarding NPS's predictive validity for financial outcomes.

This quantitative approach aligns with ICT R&D principles of evidence-based system design: before investing resources in complex AI-enabled sentiment analysis platforms, fundamental questions must be answered with statistical rigor. Does NPS correlate with revenue? If so, how strongly? Can past satisfaction scores predict future financial performance? These are prerequisite questions that computational solutions ultimately depend upon. The study contributes to both academic and practitioner knowledge by:

- Empirical validation: Testing whether widely-adopted NPS metrics demonstrate predictive validity in healthcare settings
- Methodological transparency: Documenting a reproducible analysis workflow that other researchers can audit and extend
- Strategic foundation: Providing clinic managers with evidence to inform dashboard design, resource allocation, and customer experience investments.

By establishing baseline correlations in Assessment 2, Assessment 3 can propose extensions: if NPS shows strong predictive power, simpler tracking systems suffice; if correlations are weak, more sophisticated NLP-enabled sentiment analysis becomes essential to capture the nuances traditional metrics miss. This progression from foundational quantitative research to advanced mixed-methods proposals reflects iterative R&D practice—validate core assumptions before building complex systems.

Statement of Acknowledgment

I acknowledge that I have used the following AI tool(s) in the creation of this report:

- OpenAI ChatGPT (GPT-5): Used to assist with outlining, refining structure, improving clarity of academic language, and supporting with APA 7th referencing conventions.

I confirm that the use of the AI tool has been in accordance with the Torrens University Australia Academic Integrity Policy and TUA, Think and MDS's Position Paper on the Use of AI. I confirm that the final output is authored by me and represents my own critical thinking, analysis, and synthesis of sources. I take full responsibility for the final content of this report.

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