

Critical Literature Review

Design and Creative Technologies

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AI Insights from Customer Feedback: Correlating Sentiment Analysis with Business Performance in Healthcare Clinics

1. Introduction

Patient feedback is a critical component of healthcare delivery, functioning as both a measure of service quality and a driver of continuous improvement. While surveys and metrics such as the Net Promoter Score (NPS) remain common, these tools often fail to capture the richness of patient experience or provide reliable links to business outcomes such as retention, referrals, and revenue. Advances in artificial intelligence (AI), particularly natural language processing (NLP), create opportunities to analyze unstructured feedback at scale and extract actionable insights.

Within the field of Information and Communication Technologies (ICT), this represents a key research and development (R&D) challenge: designing AI systems that transform unstructured patient feedback into business intelligence. This review critically examines existing literature across six themes—emotions, fine-grained sentiment analysis, patient experience, NPS, AI frameworks, and business perspectives—highlighting strengths, limitations, and areas for improvement. It concludes by identifying a research gap in linking AI-enabled sentiment analysis with financial performance in healthcare clinics, positioning this as a direction for ICT-driven R&D.

2. Literature Themes

Recent literature on AI-driven sentiment analysis highlights a convergence between emotional theory, computational methods, and managerial decision-making in healthcare. The discussion below integrates insights from multiple domains - ranging from emotion modeling to business intelligence - to show how research has evolved and where key gaps remain.

2.1. Understanding Emotions in Customer Engagement

Emotions play a pivotal role in shaping customer engagement following negative experiences. Angelis et al. (2024) show that anger can energize corrective engagement, whereas fear leads to disengagement. This is particularly relevant in healthcare, where anger about waiting times may still prompt loyalty if improvements follow, while fear over safety or misdiagnosis can trigger permanent disengagement. The strength of Angelis et al. lies in differentiating emotional responses; however, the study is limited to data breach contexts, not clinical care. Extending these insights to healthcare feedback requires testing whether AI models can detect comparable emotional distinctions, a gap left unaddressed by current research.

2.2. From Polarity to Fine-Grained Sentiment

Traditional sentiment analysis often reduces feedback to positive, neutral, or negative, limiting its strategic value. Xiao et al. (2022) advocate for aspect-based sentiment analysis that ties opinions to service dimensions such as staff performance or environment. Extending this approach, Alkhnbashi, Mohammad, and Hammoudeh (2024) applied large language models (LLMs) to patient feedback, achieving fine-grained classification across aspects like empathy, communication, and wait times. While both studies demonstrate technical feasibility, they diverge in method: Xiao's focus on lean automation versus Alkhnbashi's LLM-based modeling. While Alkhnbashi et al. (2024) emphasize technical accuracy with LLMs, Shankar & Yip (2024) highlight actionability in translating insights into service improvements. However, neither study correlates sentiment outputs with revenue or retention, showing that technical and operational advances remain disconnected from business intelligence — a shared gap across current literature.

2.3. Patient Experience and Operational Insights

Patient experience is increasingly recognized as a central performance pillar alongside clinical safety and effectiveness. Godovykh and Pizam (2023) show that positive experience influences loyalty, adherence, and complaint behavior. Building on this, Shankar and Yip (2024) analyzed more than 120,000 patient feedback entries using NLP techniques such as topic modeling and emotion detection. Embedding their study in an action research framework, they demonstrated how qualitative comments could be translated into actionable service improvements. However, their study—like others in this area—does not explicitly link sentiment categories to financial performance. The limitation is clear: operational insights are captured, but the economic impact of patient sentiment remains underexplored.

2.4. Re-evaluating the Net Promoter Score

NPS is widely adopted as a loyalty metric but is increasingly criticized for methodological weaknesses. Dawes (2024) highlights that NPS relies on intention rather than behavior, exhibits cultural bias in scoring, and shows inconsistent correlation with growth. While its strength lies in simplicity and comparability, its reductionist design risks misinterpretation, especially in healthcare contexts shaped by complex emotional and cultural dynamics. This suggests that while NPS should not be abandoned, it should be augmented with richer sentiment analysis methods to provide a more reliable predictor of both patient satisfaction and business outcomes.

2.5. AI Frameworks, Ethics, and Decision Support

AI frameworks developed in education provide transferable lessons for healthcare. Hwang et al. (2020) conceptualize AI as tutor, tool, or advisor, arguing that trust, transparency, and ethics are critical to adoption. Translated into healthcare, AI can serve as a “decision-support advisor,” processing patient feedback to inform managerial decisions. This framework's strength is

adaptability; however, healthcare introduces unique challenges, including data privacy, clinical accountability, and ethical governance. Recent studies, such as Shankar and Yip (2024), underscore the importance of interpretability: while NLP models can classify patient sentiment, managers need transparent explanations to act confidently on results.

2.6. From Customer Success to Business Growth

From a business standpoint, customer feedback is central to growth strategies. Chen (2023) emphasizes the role of customer data in growth product management, while Mar and Armaly (2023) stress proactive retention through continuous customer success monitoring. These practitioner texts lack peer-reviewed rigor but provide applied context. Their strength lies in highlighting the translation of customer insights into growth levers, while their limitation is the absence of validation through academic research. Together, they reinforce the need to bridge the divide between patient experience as a clinical measure and as a business performance driver.

3. Research Gap and Proposed Direction

Three gaps are evident across the reviewed literature:

- **Emotion detection in healthcare feedback:** While emotions like anger and fear are theorized to shape engagement (Angelis et al., 2024), few healthcare studies have validated AI sentiment models against these categories.
- **Fine-grained sentiment and business outcomes:** Although studies such as Xiao (2022) and Alkhnbashi et al. (2024) demonstrate technical accuracy, they fail to connect sentiment classifications with financial metrics.
- **NPS and patient experience surveys:** Widely adopted, yet insufficient in bridging patient feedback with business intelligence.

This creates a research opportunity: to test whether AI-driven sentiment analysis of patient feedback can predict business outcomes such as revenue, retention, and referrals. The availability of large-scale patient feedback data (e.g., NPS and sentiment scores across 27,000 records) alongside store-level revenue metrics further underscores the feasibility of empirically exploring this correlation in future research.

While prior studies have demonstrated the technical feasibility of NLP-based sentiment analysis in healthcare (e.g., Shankar & Yip, 2024), none have empirically examined its correlation with clinic-level financial performance or compared it with traditional satisfaction metrics like NPS. This absence of quantitative linkage defines the research gap that the current study aims to address.

3.1. Research Questions

Based on the identified gaps, this research proposes to investigate:

- **RQ1:** To what extent can AI-driven sentiment analysis predict revenue in healthcare clinics?
- **RQ2:** Can fine-grained emotion classification (anger, fear, satisfaction) be reliably automated from unstructured patient feedback using NLP techniques?
- **RQ3:** How does aspect-based sentiment analysis compare to traditional NPS as a predictor of clinic-level financial outcomes?

4. Ethical Considerations

Analyzing patient feedback with AI requires strict adherence to ethical and governance principles. Patient comments must be anonymized to protect confidentiality, with explicit consent obtained where data is identifiable. NLP systems risk embedding bias, for example, misclassifying feedback from minority or non-native speakers, which could disadvantage certain patient groups. Legal frameworks such as the Australian Privacy Act, GDPR, and HIPAA emphasize accountability, requiring that AI outputs remain advisory rather than deterministic. Transparent, bias-aware methods and human oversight are essential to ensure both scientific validity and social responsibility. For ICT-driven R&D, these governance issues are not merely compliance obligations but design principles that shape responsible innovation. Embedding privacy-by-design, explainability, and bias mitigation into sentiment analysis systems will be critical for healthcare adoption.

5. Conclusion

This review shows that AI-driven sentiment analysis offers strong technical potential but has yet to bridge the gap between patient experience and business performance in healthcare clinics. Current research demonstrates advances in emotion theory, fine-grained sentiment modeling, and action research for operational improvements, yet consistently fails to correlate sentiment with revenue or retention outcomes. NPS, while convenient, is insufficient as a standalone metric. AI frameworks from education provide conceptual guidance, but their application in healthcare requires adaptation to protect patient data and ensure transparency. This positions AI-driven sentiment analysis as an ICT innovation pathway, aligning technical progress in NLP with the dual goals of improving patient outcomes and enabling sustainable business growth in healthcare clinics.

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