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Design and Functional Validation of an AI-Enabled Social Accounting and Performance Excellence Decision-Support System for Dental Clinic Networks

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Abstract-*Multi-unit dental service organizations require integrated monitoring of organizational performance, service quality, patient experience, and social impact. Conventional dashboards usually report historical indicators but provide limited support for linking performance deviations to traceable managerial action. Objective: This study aimed to design, develop, and functionally validate an artificial-intelligence (AI)-enabled decision-support system integrating Social Accounting and Performance Excellence principles for dental clinic networks. Methods: A Design Science Research approach guided problem identification, requirements analysis, artifact design, prototype development, demonstration, and functional evaluation. The prototype integrates organizational KPIs, social-impact indicators, branch comparison, SOP/audit functionality, role-based processes, SQLite persistence, and AI-supported managerial insights. In addition to the documented local functional test, a reproducible synthetic engineering dataset comprising 30 branch-month records (five fictional branches over six months) was generated to verify KPI calculations, social-impact aggregation, prioritization, and anomaly-oriented decision logic when real operational data were unavailable. The synthetic observations contain no real patient or clinic records and are not treated as UAT evidence. Results: The study produced an executable Alpha v0.1 prototype that runs on localhost and supports indicator input, data persistence, KPI summarization, analytical insight generation, branch-level comparison, and audit-oriented workflow. The available technical evidence reports 10 of 10 predefined local functional checks as PASS (100%). In the supplementary synthetic verification, the 30 records yielded a network mean performance index of 85.2, mean social-impact index of 80.5, and mean combined score of 83.3. The deliberately stressed fictional branch B04 was classified as high priority in all six simulated months, whereas B02 produced the highest mean combined score (90.4), demonstrating the expected discrimination of the analytical rules. Conclusion: The artifact demonstrates the technical feasibility of integrating Social Accounting, Performance Excellence, and AI-supported organizational analytics in a unified dental-network decision-support system. The synthetic exercise strengthens engineering verification of the analytical logic but does not substitute for relevant-environment user validation, real-data validation, or clinical evaluation.*

Keywords: *Social Accounting; Performance Excellence; Artificial Intelligence; Decision Support System; Dental Services; Design Science Research; Social Impact*

1. Introduction

1.1 Problem Context

Dental clinic networks face an increasingly complex management problem: performance must be monitored across multiple units while preserving consistency in service quality, patient experience, workforce performance, process compliance, and social accountability. Oral diseases affect billions of people globally, and access to oral-health services remains constrained by unequal workforce distribution, facility limitations, and out-of-pocket costs, making accessibility and service organization relevant management concerns [1,2].

organizations expand across branches, information is often distributed across operational records, service indicators, audit documents, and managerial reports. This fragmentation can prevent decision-makers from seeing how organizational performance, patient-facing outcomes, and broader social value interact.

The challenge is especially relevant in oral-health services because organizational success cannot be interpreted only through financial output or service volume. Accessibility, affordability, waiting time, patient education, inclusivity, and community reach are also relevant to the social value of dental services [1,2]. A clinic may report acceptable productivity while still experiencing unequal access, persistent waiting-time problems, inconsistent SOP compliance, or weak follow-up on identified deviations.

Conventional dashboards are useful for displaying indicators but frequently remain descriptive. They show what happened, yet do not systematically support the sequence of identifying a deviation, interpreting its likely managerial significance, prioritizing attention, connecting the issue to a relevant SOP or corrective action, documenting the response, and re-evaluating the outcome. The present study therefore develops a closed-loop decision-support artifact in which reporting becomes the starting point of organizational improvement rather than the endpoint.

1.2 Scientific Gap

Three interconnected gaps motivate this study. First, Social Accounting provides an accountability perspective for connecting organizational resources and activities to stakeholder and social outcomes [3,4], but these measures are often not operationalized within routine performance-management systems. Recent work positions social accounting as a mechanism for relating organizational expenditure and activity to measurable social conditions rather than assuming that social initiatives should be judged only through short-term profitability [3].

Second, Performance Excellence frameworks such as the Baldrige framework offer a systemic view of leadership, strategy, customers, workforce, operations, measurement, analysis, knowledge management, and results [5]. Empirical work on Baldrige-based performance measurement also demonstrates that organizational excellence should not be treated as a purely mechanical aggregate score [6]. However, performance-excellence systems do not always operationalize detailed social-impact indicators alongside day-to-day operational metrics.

Third, AI research in dentistry is still dominated by clinical applications such as image-based diagnosis, landmark identification, prediction, and treatment planning [7-9]. These contributions are important, but they leave a comparatively less developed space for AI as an organizational decision-support mechanism that assists managers in interpreting performance variation, detecting anomalies, comparing branches, and prioritizing corrective action. This study addresses that space without positioning AI as a clinical diagnostic system or autonomous decision-maker.

1.3 Research Objective

This study aims to design, develop, and functionally validate an AI-enabled Social Accounting and Performance Excellence decision-support system for multi-unit dental service organizations.

The specific objectives are to:

- develop an integrated indicator architecture linking organizational performance with social-impact measures;
- translate the conceptual architecture into an executable software prototype;
- implement traceable AI-supported organizational analytics and recommendations;
- evaluate the functional integration of the prototype through predefined local test scenarios; and
- establish a technical evidence base for subsequent relevant-environment validation and technology-readiness assessment.

1.4 Research Contributions

The study contributes at the intersection of accounting, performance management, health-service operations, and information systems. It integrates Social Accounting and Performance Excellence within a single measurement architecture; operationalizes social and organizational indicators in a software artifact; positions AI as human-supervised organizational decision support; incorporates auditability and SOP-oriented follow-up; and provides prototype-level functional evidence that can be used as a basis for the next stage of relevant-environment validation.

2. Theoretical Background

2.1 Social Accounting and Social Impact Measurement

Social Accounting extends organizational accountability beyond conventional financial reporting and emphasizes accountability for organizational consequences affecting stakeholders and society [3,4]. In this study, Social Accounting is operationalized not as an external narrative report alone, but as a structured measurement layer that can be linked to routine management information.

For dental-service organizations, relevant social dimensions include access, affordability, waiting time, patient education, inclusivity, community outreach, and patient experience. These domains reflect the broader health-system concern that oral-health need, service availability, and financial access are unevenly distributed [1,2]. They allow management to examine whether operational performance is accompanied by meaningful stakeholder-oriented outcomes.

2.2 Performance Excellence

Performance Excellence provides the second theoretical pillar. The Baldrige health-care framework treats performance as an interconnected system spanning leadership, strategy, customers, measurement/analysis/knowledge management, workforce, operations, and results [5]. This system perspective is useful for dental networks because branch performance is rarely caused by a single metric. Performance variation may reflect staffing, process design, scheduling, patient demand, leadership, data quality, or several interacting factors; empirical Baldrige research similarly cautions against over-reliance on a single aggregate score [6].

The proposed system therefore avoids presenting a single opaque excellence score as the sole decision basis. Instead, it preserves the underlying indicators, branch comparisons, deviations, and audit records so that managers can trace how a result was generated and what action followed.

2.3 AI-Enabled Organizational Decision Support

In the present artifact, AI has a deliberately bounded organizational role. The AI layer does not diagnose dental disease, interpret radiographs, prescribe treatment, or replace dentists. Its purpose is to assist management in reading organizational data through trend analysis, deviation detection, anomaly identification, comparative pattern recognition, prioritization, and—when sufficient data exist—limited clustering or prediction. This organizational emphasis differs from the predominantly clinical and imaging-oriented uses described in dental AI reviews [7-9].

This distinction separates the artifact from most dental AI systems discussed in the clinical literature [7-9]. The unit of analysis is primarily the organization or branch rather than the patient's diagnosis. The intended output is a managerial insight that can be reviewed, accepted, rejected, or contextualized by authorized users.

2.4 Human-in-the-Loop and Explainability

The design adopts a human-in-the-loop principle. AI-generated insights are treated as decision-support information rather than final decisions. Managers remain responsible for reviewing evidence, considering local context, selecting interventions, and documenting follow-up. This principle is consistent with health-AI and responsible-AI guidance emphasizing human autonomy, accountability, transparency, explainability, privacy, validity, reliability, and management of harmful bias [10,11].

To support traceability, the artifact links analytical outputs to source indicators and retains audit-oriented records of subsequent organizational actions. A detected statistical deviation therefore becomes a prompt for managerial review rather than an automatic conclusion that a branch or staff member has failed.

2.5 Conceptual Integration

The conceptual integration used in the artifact can be summarized as: Resources/Inputs → Leadership and Strategy → Workforce and Processes → Service Quality → Patient Experience → Organizational Performance → Social Impact → AI Analytics → Managerial Recommendation → SOP-Based Action → Audit Trail → Re-evaluation. The closed-loop structure is central to the design because it links measurement to learning and corrective action.

3. Research Method

3.1 Research Design

The study adopts Design Science Research (DSR) because its primary output is a purposeful information-system artifact constructed to address a defined organizational problem. Established DSR guidance emphasizes building and evaluating artifacts for identified problems [12], while the Design Science

Research Methodology operationalizes the process through problem identification, definition of solution objectives, design and development, demonstration, evaluation, and communication [13]. This approach is suitable because theoretical integration must be translated into an executable system and evaluated for utility and functional coherence.

3.2 Research Setting and Scope

The prototype is designed for a multi-unit dental-service network. Intended user roles include organizational management, branch managers, front-office personnel, service personnel, and authorized system administrators. The current study evaluates prototype functionality and organizational decision-support logic. It does not evaluate patient-level clinical diagnosis or treatment outcomes.

3.3 Requirements Identification

Requirements were derived from the integration of Social Accounting, Performance Excellence, decision-support needs, data traceability, and auditability. The requirements are grouped into functional and non-functional categories.

Table 1. Functional and Non-Functional Requirements

Code	Requirement	Description
FR1	Indicator Input	Capture organizational and social-impact indicators.
FR2	KPI Processing	Calculate and summarize performance indicators.
FR3	Social Impact Monitoring	Monitor stakeholder- and community-oriented outcomes.
FR4	Branch Comparison	Compare harmonized indicators across units.
FR5	SOP Monitoring	Record compliance, deviation, and corrective action.
FR6	Audit Trail	Maintain traceable system and action records.
FR7	AI Insights	Identify trends, deviations, anomalies, and priorities.
FR8	Recommendations	Present explainable managerial recommendations.
FR9	Reporting	Generate structured performance information.
NFR1	Usability	Provide understandable navigation and output.
NFR2	Security	Restrict functions according to authorization.
NFR3	Reliability	Maintain consistent data processing.
NFR4	Traceability	Preserve source-to-output relationships.
NFR5	Performance	Provide acceptable response to user operations.
NFR6	Data Minimization	Process only data relevant to organizational purposes.
NFR7	Role-Based Access	Restrict information according to organizational roles.
NFR8	Auditability	Record relevant changes and managerial actions.

3.4 Indicator Architecture

The indicator architecture connects Performance Excellence dimensions to Social Accounting outcomes. The domains below are illustrative and should be finalized against the actual clinic-network data dictionary before field deployment.

Table 2. Performance and Social-Impact Indicator Domains

Domain	Illustrative Measurement Areas
Leadership and Strategy	Strategic targets, performance alignment, follow-up.
Workforce	Staffing, productivity, capability, workforce utilization.
Service Process	Service flow, waiting time, process conformity.
Patient Experience	Satisfaction, complaints, service experience.
Operational Results	Utilization, efficiency, service performance.
Access	Ability of target groups to obtain services.
Affordability	Financial accessibility of services.

Domain	**Illustrative Measurement Areas**
Inclusivity	Service accessibility across stakeholder groups.
Education	Patient/community oral-health education.
Community Outreach	Activities serving the wider community.
Social Impact	Documented stakeholder- and community-related outcomes.

3.5 Synthetic Engineering Validation Dataset

Dataset Synthetic Engineering, because complete real operational data were not available for this manuscript version, a deterministic synthetic dataset was created for engineering verification. The dataset contains 30 branch-month observations representing five fictional branches (B01-B05) across January-June 2026. Each record contains visit volume, average waiting time, patient-satisfaction score, SOP-compliance score, access, affordability, education, inclusivity, and community-outreach indicators. Values were generated within plausible engineering test ranges and one branch (B04) was intentionally stressed with longer waiting times, lower SOP compliance, and lower social-impact indicators so that anomaly and prioritization logic could be evaluated.

For the synthetic test only, the waiting-time score was defined as max[0, 100 - 2 × (average waiting time in minutes - 10)]. The Performance Index was calculated as 0.30 × Patient Satisfaction + 0.30 × SOP Compliance + 0.20 × Waiting-Time Score + 0.20 × Access. The Social Impact Index was the arithmetic mean of Access, Affordability, Education, Inclusivity, and Community Outreach. The Combined Score was calculated as 0.60 × Performance Index + 0.40 × Social Impact Index. High priority was triggered when Combined Score <75, SOP Compliance <85%, or average waiting time >30 minutes; Moderate priority was triggered when Combined Score <82, SOP Compliance <90%, or average waiting time >25 minutes. These thresholds are engineering test rules, not clinically validated cut-offs.

4. System Architecture and Data Model

4.1 Prototype Architecture

The Alpha v0.1 prototype is organized as an integrated organizational workflow consisting of presentation, application, analytics, data, and audit/logging functions. The implementation evidence supplied for this manuscript shows a working localhost dashboard, an indicator-input interface, a system/data-flow diagram, and a relational data model. These elements are presented separately below to make the technical evidence easier to inspect.

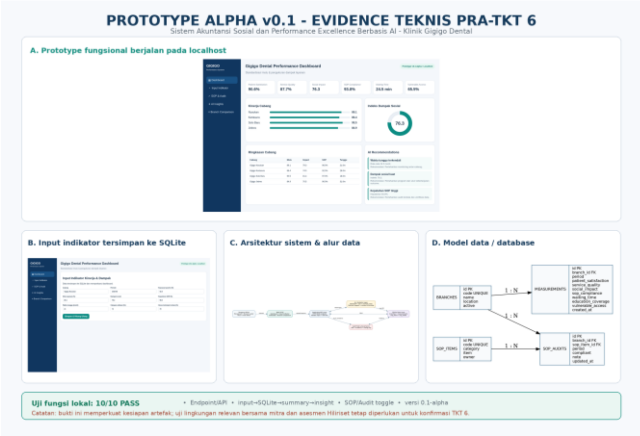

Figure 1. Alpha v0.1 prototype dashboard running on localhost.

Source: user-provided prototype evidence. The interface label is treated as prototype configuration and not as proof of completed field validation.

Figure 1 shows the principal management dashboard. The interface combines performance summary cards, branch-level comparison, a social-impact index, a branch summary table, and AI recommendations. This layout operationalizes the study's central design objective: placing organizational performance and social-impact information within the same decision environment.

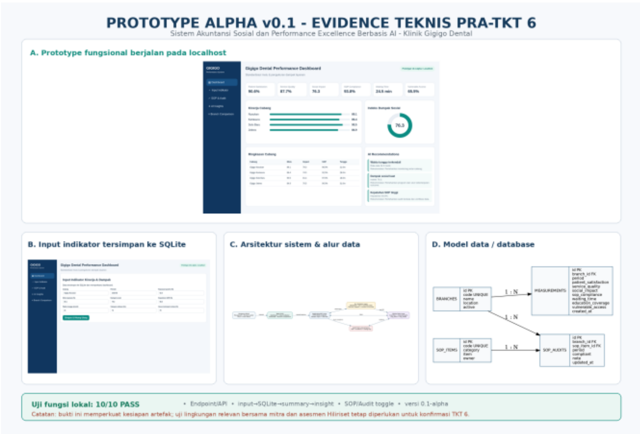

Figure 2. Indicator-input interface with SQLite persistence.

Source: user-provided prototype evidence (Alpha v0.1).

Figure 2 provides prototype evidence for the indicator-entry workflow. The design supports data entry at branch level and persistence to SQLite. At the prototype stage, local database persistence is appropriate for validating the data pipeline before migration to a production database or multi-user infrastructure.

4.2 Data Flow

Figure 3. Prototype system architecture and data-flow evidence.

Source: user-provided prototype evidence (Alpha v0.1).

The core information pathway can be summarized as Data Input → Validation → SQLite/Data Layer → KPI Summary → AI/Analytical Insight → Dashboard/Manager Review → SOP/Audit Action. The technical design preserves a separation between analytical output and managerial execution: AI supports interpretation, while authorized human users retain responsibility for action.

4.3 Data Model

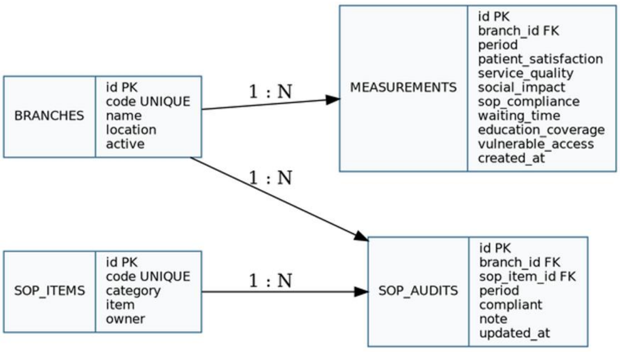

Figure 4. Prototype data model/database relationships.

Source: user-provided prototype evidence (Alpha v0.1).

The prototype data model includes branch-level entities, measurement records, SOP items, and SOP audit records. The visible relationships support one-to-many links between branches and measurements, branches and SOP audits, and SOP items and SOP audits. This structure provides a minimum traceability chain between organizational unit, measured condition, SOP requirement, and audit outcome.

5. Prototype Development

5.1 Technology Stack

The current implementation uses Python, SQLite, a locally executable web/application environment, and analytical routines used to produce KPI summaries and AI-supported insights. Technologies that are not actually implemented are intentionally excluded from the manuscript. The architecture remains modular so that the persistence layer, deployment environment, or analytical models can be replaced in later development stages without changing the theoretical measurement framework.

5.2 Main Modules

KPI Dashboard: Presents branch-level and network-level performance information in a management-oriented summary.

Indicator Input: Captures organizational measures and persists validated records to the data layer.

Social Impact: Organizes indicators of access, affordability, waiting time, education, inclusivity, community outreach, and patient experience.

SOP and Audit: Connects deviations to SOP items, compliance status, notes, and corrective-action follow-up.

Branch Comparison: Supports cross-unit benchmarking and identification of unusual patterns or persistent gaps.

AI Insights: Transforms available indicators into interpretable trend, deviation, anomaly, priority, and recommendation outputs for human review.

6. Functional Testing

Functional testing was used to determine whether the main integrated operations execute as intended within the local prototype environment. The technical evidence provided for Alpha v0.1 reports a local functional result of 10/10 PASS. The evidence identifies the tested pipeline at a high level as endpoint/API availability, input-to-SQLite-to-summary-to-insight flow, and SOP/Audit controls. Because the supplied visual does not contain the complete machine-readable log for each of the ten

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checks, the manuscript treats the 10/10 result as documented project evidence and distinguishes it from the independently generated synthetic analytical verification reported below.

Table 3. Local Functional Test Matrix for Alpha v0.1

No.	Test Scenario	Expected Functional Evidence	Status
1	Application availability	Prototype can be reached in the local environment.	**PASS**
2	Dashboard rendering	Core dashboard components load and display.	**PASS**
3	Indicator input	User can enter branch/indicator values.	**PASS**
4	SQLite persistence	Entered records are stored in SQLite.	**PASS**
5	Data retrieval	Stored records can be read back by the application.	**PASS**
6	KPI summary	Stored indicators are transformed into performance summaries.	**PASS**
7	AI insight generation	Available data can produce an organizational insight/recommendation output.	**PASS**
8	Branch comparison	Branch-level performance can be displayed comparatively.	**PASS**
9	SOP/Audit control	SOP/audit workflow controls execute as designed.	**PASS**
10	End-to-end workflow	Input → persistence → summary → insight/audit pathway completes.	**PASS**

The aggregate functional success rate is calculated as (10 successful tests / 10 predefined tests) × 100 = 100%. This percentage refers only to the local prototype scenarios included in the current test set. It does not imply 100% usability, reliability under production load, cybersecurity, clinical effectiveness, or operational readiness.

6.1 Supplementary Synthetic Analytical Verification

The synthetic dataset was used to test whether the stated calculation and prioritization rules produce internally coherent outputs across heterogeneous branch conditions. Across 30 branch-month records, the mean waiting time was 22.3 minutes, mean patient satisfaction was 86.4%, mean SOP compliance was 91.5%, mean Performance Index was 85.2, mean Social Impact Index was 80.5, and mean Combined Score was 83.3. Twenty-two records were classified as Low priority, two as Moderate, and six as High priority. All six High-priority records belonged to the deliberately stressed branch B04.

Table 4. Synthetic Branch-Level Validation Summary

Branch	Records	Avg visits	Wait (min)	Satisfaction (%)	SOP (%)	Performance	Social impact	Combined	High-priority
B01	6	358.8	19.9	87.4	93.6	87.8	82.0	85.4	0
B02	6	404.0	15.3	92.0	96.7	92.5	87.1	90.4	0
B03	6	324.2	22.4	85.9	91.2	84.8	79.0	82.4	0
B04	6	271.2	32.8	79.7	84.0	74.8	71.8	73.6	6
B05	6	372.3	20.8	87.0	92.2	86.3	82.4	84.8	0

Table 5. Synthetic Analytical Logic Verification

No	Verification target	Expected behavior	Observed synthetic output	Status
1	Record completeness	30 branch-month records available for calculation	30/30 records processed	PASS
2	Branch discrimination	Higher-performing branch ranks above deliberately stressed branch	B02 mean combined = 90.4; B04 = 73.6	PASS
3	High-priority detection	Deliberately stressed B04 is consistently escalated	B04 classified High in 6/6 months	PASS
4	Low-risk stability	Strong branches should not generate High-priority alerts	B01, B02 and B05 generated 0 High-priority records	PASS
5	Intermediate sensitivity	Borderline conditions can generate Moderate priority	B03 generated 2 Moderate-priority records	PASS
6	Formula traceability	Derived indices can be recalculated from source indicators	Independent recomputation matched stored synthetic values to rounding precision	PASS

The synthetic verification therefore supports the internal coherence of the proposed scoring, prioritization, and branch-comparison logic. It does not demonstrate predictive accuracy, causal validity, usability, generalizability, or effectiveness under real operational conditions.

7. Relevant-Environment Validation Protocol

7.1 Validation Status

Relevant-environment user validation is treated as a separate stage from both local functional testing and synthetic engineering verification. No completed field UAT result is claimed in this manuscript version. The synthetic dataset cannot satisfy this requirement because it does not involve real users, workflow conditions, or operational data. This separation prevents the 10/10 local result and the synthetic analytical PASS results from being misinterpreted as evidence that the system has already been validated under routine clinical-network operations.

7.2 Intended Participants and Tasks

The subsequent evaluation should involve users such as branch managers, front-office personnel, authorized administrators, and management representatives. Participants should complete standardized tasks including login, indicator input, KPI inspection, interpretation of an AI Insight, review of a relevant SOP, documentation of follow-up action, and branch comparison.

7.3 UAT Metrics and Acceptance Gate

Recommended UAT metrics include task-completion rate, error rate, usefulness, ease of use, perceived relevance, recommendation clarity, and need for assistance. The planned acceptance gate is that at least 80% of predefined scenarios can be completed without intensive assistance. This threshold is a prospective evaluation criterion and must not be reported as an achieved empirical result until actual user testing has been completed.

8. Results

8.1 Prototype Implementation Results

The study produced an executable Alpha v0.1 artifact that integrates indicator capture, SQLite persistence, KPI summarization, branch comparison, a social-impact view, SOP/audit functionality, and AI-supported recommendations. The four prototype figures demonstrate that the conceptual integration was translated into working interface, data-flow, and database components rather than remaining at the level of a conceptual framework.

8.2 Functional Validation Results

All ten local checks included in the reported functional test set achieved PASS status. The result indicates that the principal modules can exchange information through the intended local workflow. The end-to-end path from data entry through persistence and summary to analytical insight provides especially important evidence of system integration.

8.3 Data and System Integration

A central technical result is the realization of the following chain: Input → SQLite → KPI Summary → Analytics/AI Insight → Dashboard/Manager Review → SOP/Audit Action. This integration is theoretically important because Social Accounting and Performance Excellence would provide limited managerial value if their indicators remained separated across unrelated applications or reports.

8.4 Synthetic Engineering Validation Results

The synthetic engineering dataset produced interpretable differences across fictional branches. B02 showed the highest six-month mean Combined Score (90.4), followed by B01 (85.4), B05 (84.8), B03 (82.4), and B04 (73.6). B04 also exhibited a mean waiting time above 30 minutes and lower SOP and social-impact scores, causing all six of its monthly records to trigger High priority under the predefined engineering rules. B03 generated two Moderate-priority records, while B01, B02, and B05 generated no High-priority records. These outputs demonstrate that the test logic differentiates strong, borderline, and deliberately degraded operating conditions rather than producing uniform recommendations.

Because the values are synthetic, these results should be interpreted as calculation and workflow verification only. They provide a reproducible test bed for database, KPI, prioritization, anomaly, dashboard, and recommendation functions, but they do not estimate real dental-service performance or social impact.

8.5 Evidence Supporting Technology Readiness

The present study provides evidence in the form of an executable prototype, documented functional and non-functional requirements, a visible database model, a defined data flow, integrated system modules, local functional testing, and an end-to-end information pathway. Together, these elements demonstrate progress beyond conceptual design and isolated component development. They should be interpreted as evidence supporting further technology-readiness assessment, not as an unconditional declaration that a specific TKT level has already been achieved.

9. Discussion

9.1 Integration Contribution

The principal theoretical contribution is the integration of Social Accounting and Performance Excellence into a common decision architecture. Performance Excellence addresses how effectively the organization is led, managed, measured, and improved [5,6], whereas Social Accounting extends attention toward the consequences of organizational activity for stakeholders and society [3,4]. The integration allows a dental network to examine both organizational performance and the distribution of social value.

This dual perspective is important because a branch can appear operationally efficient while still underperforming in access, waiting time, affordability, education, inclusivity, or community reach. The proposed artifact makes those conditions visible within the same management environment and connects them to audit-oriented follow-up.

9.2 AI Contribution

The study also reframes the role of AI in dental-service research. Rather than concentrating on diagnosis or image interpretation—the dominant emphasis in much of the dental AI literature [7-9]—the artifact applies AI-oriented analytics to organizational data. This enables management to identify unusual branch patterns, deteriorating performance, potential priorities, and relationships between indicators. The AI layer is therefore complementary to clinical AI: it supports the organization that delivers care rather than making patient-level clinical decisions.

9.3 Human Oversight and Explainability

The prototype deliberately preserves human review between analytical output and organizational action, consistent with human-oversight principles for health AI [10,11]. This is necessary because an observed deviation can have multiple explanations. For example, lower patient volume may indicate reduced demand, a scheduled closure, staffing constraints, seasonal variation, infrastructure maintenance, or a data-entry problem. An automated alert is therefore an investigative prompt rather than a final judgment.

9.4 Organizational and Social Implications

For a clinic network, the artifact can support standardization, monitoring, benchmarking, audit, decision support, and continuous improvement. At the same time, the Social Accounting layer expands managerial attention toward access, waiting time, affordability, inclusivity, patient education, patient experience, and community impact, consistent with the wider oral-health agenda emphasizing equitable access and integration of essential oral-health services [1,2,14]. This combination supports a shift from periodic social reporting toward the operational management of social value.

10. Implications for Technology Readiness and Further Deployment

The combined technical evidence demonstrates that the artifact has progressed beyond conceptual design toward an integrated executable prototype. The current evidence includes defined requirements, a working user interface, documented data flow, a relational data model, implemented persistence, integrated analytical output, SOP/audit functionality, a reported local functional test result of 10/10 PASS, and a reproducible synthetic dataset used to verify calculation and prioritization logic. The synthetic component strengthens engineering evidence but does not replace field demonstration or UAT.

A defensible technology-readiness interpretation is therefore that the artifact has progressed beyond conceptual design and isolated component development toward an integrated prototype capable of systematic evaluation and subsequent demonstration under realistic operational conditions. This wording is intentionally more conservative than an unconditional statement that 'the system is TKT 6.'

Further deployment should focus on: (1) documented relevant-environment testing with intended users; (2) validation with real organizational datasets under appropriate governance; (3) assessment of security, privacy, performance, availability, and scalability; (4) version-controlled retention of test scripts and logs; and (5) longitudinal evaluation of whether managerial recommendations contribute to measurable organizational or social-performance improvement.

11. Limitations

This study has several limitations. First, the current evidence focuses primarily on a local Alpha v0.1 prototype environment. Second, a 100% result on the defined local test set does not establish production reliability or clinical effectiveness. Third, the supplementary dataset is synthetic; its 30 branch-month records were deliberately constructed for engineering verification and cannot be used to infer actual clinic performance, patient outcomes, or social impact. Fourth, relevant-environment UAT has not yet been reported as completed empirical evidence. Fifth, the prototype has not been fully integrated with all production systems that may exist within a dental clinic network. Sixth, advanced AI techniques depend on sufficient real-data volume, stability, representativeness, and quality. Seventh, the current evidence does not itself establish cybersecurity, privacy compliance, or long-term scalability. Finally, longitudinal real-world validation is required to determine whether the social-impact indicators are sensitive to meaningful organizational change.

12. Conclusion

This study designed, developed, and functionally evaluated an AI-enabled Social Accounting and Performance Excellence decision-support system for multi-unit dental-service organizations. The artifact integrates organizational KPIs, social-impact indicators, branch comparison, SOP/audit processes, data persistence, and AI-supported managerial insight in a common architecture.

The prototype evidence demonstrates that Social Accounting and Performance Excellence can be operationalized within an executable organizational system rather than applied as isolated reporting frameworks. AI is positioned as a human-supervised organizational decision-support mechanism capable of identifying patterns, deviations, priorities, and potential managerial responses without functioning as a clinical diagnostic system or autonomous decision-maker.

The reported 10/10 local functional result provides initial technical evidence of integrated prototype behavior, while the supplementary 30-record synthetic dataset provides reproducible engineering evidence that the proposed index, branch-comparison, and prioritization rules behave as intended under fictional test conditions. Neither result should be interpreted as completed relevant-environment validation. Real-user UAT, security and scalability assessment, real-data validation, and longitudinal organizational evaluation remain necessary before stronger deployment or technology-readiness claims are made.

Declarations

Ethics Approval

The present manuscript reports development, local functional evaluation, and synthetic engineering validation of an organizational software prototype. The synthetic dataset contains no real patient or staff information and does not constitute human-subject research. Institutional ethical-review requirements should nevertheless be determined before any subsequent relevant-environment study involving real users, patient-derived data, or identifiable operational records.

Informed Consent

Not applicable to the synthetic engineering dataset because no human participants or identifiable patient records were used. Appropriate informed-consent or waiver procedures should be documented for any subsequent UAT or field study if required by the responsible ethics committee.

Data Availability

The complete synthetic dataset used for the supplementary engineering analysis is reproduced in

Appendix B of this manuscript and is explicitly labeled as fictional. Prototype source code, machine-readable test logs, and technical documentation may be shared subject to organizational confidentiality, intellectual-property arrangements, and research-data governance.

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