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KPI-Based Project Health Assessment Model for Agile IT Operations and Service Reliability

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Research Article

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Abstract

This study proposes a KPI-based project health assessment model for evaluating agile IT operations and service reliability in technology enabled organizations. The study addresses the challenge of project delays, weak visibility, recurring service issues, SLA gaps, and fragmented stakeholder reporting. The study is evaluated using synthetic project data and simulated IT service records to demonstrate the model. The proposed method combines project schedule indicators, milestone completion rates, SLA compliance, incident recurrence, documentation quality, stakeholder response time, and resource utilization into one project health score. A composite project health score may be expressed as $PHS = \Sigma w_i x_i$, where w_i represents the assigned weight of each performance indicator and x_i represents the normalized score of each variable. Risk exposure may be calculated as $R = P \times I \times D$, where P is probability of delay or failure, I is impact severity, and D is detection difficulty. Based on the final score, projects may be classified into green, yellow, and red status categories. The study can contribute an academic model that helps IT leaders identify project risks earlier, improve service reliability, and strengthen operational visibility.

Keywords: Agile IT Operations, Project Health Assessment, Key Performance Indicators (KPIs), Service Reliability, Project Health Score, Risk Assessment, Project Monitoring, Decision Support

I. Introduction

Organizations increasingly depend on Agile IT projects to deliver software services, maintain digital infrastructure, and support business operations. Continuous project execution requires timely evaluation of project progress, service performance, and operational conditions. Project managers often monitor multiple key performance indicators (KPIs), including schedule performance, milestone completion, service-level agreement (SLA) compliance, documentation quality, incident records, stakeholder communication, and resource utilization. These indicators provide useful operational information; however, independent evaluation often produces fragmented project status reports that complicate management decisions. A structured assessment framework capable of combining multiple performance indicators into a single project evaluation process can improve project visibility and support consistent decision-making throughout the project lifecycle.

A. Background and Motivation

Agile project environments generate operational data from project management platforms, service management systems, incident repositories, and organizational reporting tools. The volume and diversity of these data sources have increased the use of dashboards, management information systems, and analytical reporting for project monitoring. Despite these developments, project managers frequently review separate performance indicators instead of obtaining an overall representation of project condition. Differences among measurement scales, reporting formats, and operational priorities also make project comparison difficult across multiple teams and reporting periods. Service reliability introduces another dimension to project evaluation. Delayed milestone completion, repeated service incidents, missed SLA targets, incomplete documentation, and slow stakeholder responses often occur simultaneously rather than independently. Evaluating these conditions through separate reports increases the possibility of inconsistent project interpretation. Consequently, organizations require an assessment method that combines operational performance and service reliability within one structured evaluation framework suitable for Agile IT operations.

B. Problem Statement

Existing approaches examine project monitoring, KPI evaluation, management information systems, dashboard reporting, service reliability, and operational analytics from different

perspectives. Most methods focus on individual operational functions and generate separate performance measures for project execution or service management. As a result, project managers frequently interpret multiple reports before identifying the overall project condition. This fragmented evaluation process limits consistent project assessment across different operational scenarios. Another limitation involves the absence of a unified mathematical framework that combines project execution indicators and service reliability into one quantitative project health measure. Without an integrated assessment model, management decisions rely on isolated KPI interpretation instead of a standardized project evaluation process. This limitation motivates the development of a KPI-Based Project Health Assessment Model capable of integrating multiple operational indicators and supporting consistent project classification for Agile IT operations.

C. Proposed Solution

This study proposes a KPI-Based Project Health Assessment Model for Agile IT operations and service reliability. The framework combines schedule performance, milestone completion, SLA compliance, incident recurrence, documentation quality, stakeholder response time, and resource utilization within a unified Project Health Score (PHS). A separate operational risk assessment complements the health evaluation and supports project classification through Green, Yellow, and Red status categories. The proposed methodology applies data normalization, weighted KPI aggregation, and risk evaluation within one mathematical framework. The resulting assessment process provides a standardized interpretation of project condition suitable for project monitoring, management reporting, and executive decision making.

Accordingly, the objective of this study is to develop and evaluate a KPI-based project health assessment framework that integrates operational performance and service reliability into a standardized decision model for Agile IT project monitoring.

D. Contributions

This study contributes a unified mathematical framework for project health assessment in Agile IT operations through the integration of seven operational KPIs into a single Project Health Score. The proposed framework combines project execution and service reliability within one quantitative evaluation process while maintaining an independent operational risk assessment for project classification. The methodology also introduces a structured validation process using synthetic project datasets and simulated IT operational records, allowing the framework to be

evaluated without confidential organizational information. These contributions provide a consistent approach for project monitoring, management reporting, and comparative evaluation across different Agile IT environments.

E. Paper Organization

The remainder of this paper is organized as follows. Section II reviews previous studies related to KPI-based project assessment, management information systems, business intelligence, dashboard reporting, and service reliability. Section III presents the proposed methodology together with the mathematical model and project health assessment framework. Section IV presents the results and discussion, including operational risk assessment and project classification. Section V concludes the paper and presents directions for future research.

II. Related Work

Agile IT projects operate in environments where project status, service quality, and operational performance change continuously throughout the project lifecycle. Project managers rely on performance indicators to evaluate progress, identify operational issues, and support management decisions. Recent studies have examined project monitoring, management information systems, business intelligence, dashboard technologies, and service reliability from different perspectives. Most existing research investigates these topics independently, while relatively few studies combine them into a unified project health assessment framework suitable for Agile IT operations. The following sections summarize the major research directions related to this study.

A. Project Health Assessment and KPI-Based Performance Evaluation

Project health assessment has received increasing attention as organizations seek objective methods for evaluating project performance. Mian et al. [1] introduced a project health check approach that combines critical success factors and key performance indicators to evaluate overall project status. Their work demonstrated that structured performance measurement provides managers with a clearer understanding of project conditions than isolated schedule or cost indicators. Sarma et al. [6] discussed agility assessment during project feasibility analysis and emphasized continuous evaluation throughout project execution. Akter [12] later presented KPI-based predictive analytics for workforce productivity measurement, while Sharmin [16] examined information system support for project coordination and organizational process improvement. Although these studies contribute useful performance assessment methods, they

primarily evaluate individual operational dimensions instead of producing a comprehensive project health score.

B. Management Information Systems for Operational Decision Support

Management information systems provide a foundation for collecting, organizing, and evaluating organizational data across multiple business functions. Akhter [2] demonstrated how MIS event logs can support internal control activities through algorithmic analysis. Sany et al. [3] reported that ERP and MIS integration improves information sharing and operational planning across enterprise processes. Islam [10] proposed an artificial intelligence integrated management information system for operational risk reduction, while Nahian [13] applied mathematical optimization techniques to support financial resource allocation through MIS-based decision models. These studies illustrate the growing role of enterprise information systems in organizational decision making. However, they do not present an integrated framework that combines operational KPIs into a quantitative project health assessment model.

C. Business Intelligence, Dashboards, and Performance Analytics

Business intelligence platforms transform operational data into information that supports monitoring and managerial reporting. Hasan [4] investigated predictive analytics for business process optimization using large-scale organizational data. Afrin [5] developed cloud-integrated monitoring dashboards that provide continuous visibility of network operations through IoT and edge computing technologies. Jasem [9] proposed an artificial intelligence dashboard for monitoring system health in predictive maintenance applications. Barua [14] designed business intelligence dashboards for enterprise operational performance monitoring, whereas Chokder [15] focused on dashboard reporting for customer relationship management and sales performance evaluation. These contributions demonstrate the importance of analytical reporting tools in organizational monitoring. Nevertheless, existing dashboard studies generally concentrate on individual operational functions rather than combining multiple project indicators into a single health evaluation framework.

D. Service Reliability and Risk-Oriented IT Operations

Reliable IT operations depend on continuous observation of infrastructure performance, operational risks, security events, and service quality. Al Sany [7] demonstrated that data analytics supports more effective financial planning and operational decision making in organizational environments. Zaman [8] examined automated vulnerability management and

incident response for enterprise networks, highlighting the value of continuous operational monitoring. Mirza [11] proposed predictive reliability engineering techniques for cloud-scale business intelligence platforms using anomaly detection and proactive support automation. These studies contribute methods for improving operational reliability and risk identification. However, current research rarely combines project schedule performance, milestone completion, SLA compliance, incident recurrence, documentation quality, stakeholder responsiveness, and resource utilization within one mathematical assessment model. This limitation provides the motivation for the proposed KPI-Based Project Health Assessment Model, which integrates multiple project and service indicators into a unified health score for Agile IT operations.

III. Methodology

This study develops a quantitative framework for evaluating project health in Agile IT operations through integrated key performance indicators (KPIs). The proposed methodology combines project execution metrics, service reliability indicators, and operational risk assessment within one mathematical decision model. Public project management datasets, simulated IT service records, or synthetic datasets may be used to demonstrate the framework without exposing confidential organizational information. The methodology consists of KPI identification, data preparation, score computation, risk evaluation, and project status classification. Figure 1 illustrates the overall architecture of the proposed assessment framework.

A. Research Design

The study follows a quantitative design science approach that develops and evaluates a mathematical decision framework for project health assessment. The framework integrates operational KPIs into a single Project Health Score (PHS) that supports project monitoring throughout the execution lifecycle. The model focuses on seven performance indicators: schedule performance, milestone completion, SLA compliance, incident recurrence, documentation quality, stakeholder response time, and resource utilization. These variables represent operational performance, service quality, and project execution, allowing project managers to evaluate overall project condition through a unified assessment model.

B. Data Preparation and KPI Identification

The proposed framework accepts project information from synthetic datasets, simulated IT operational records, or publicly available project management sources. Data preparation includes validation, duplicate record removal, missing value treatment, and normalization before KPI

calculation. Each performance indicator is transformed into a normalized value within the range of 0 to 1 to maintain a common measurement scale. Table I summarizes the variables used in the proposed model. These standardized indicators provide consistent input for project health computation and subsequent risk evaluation.

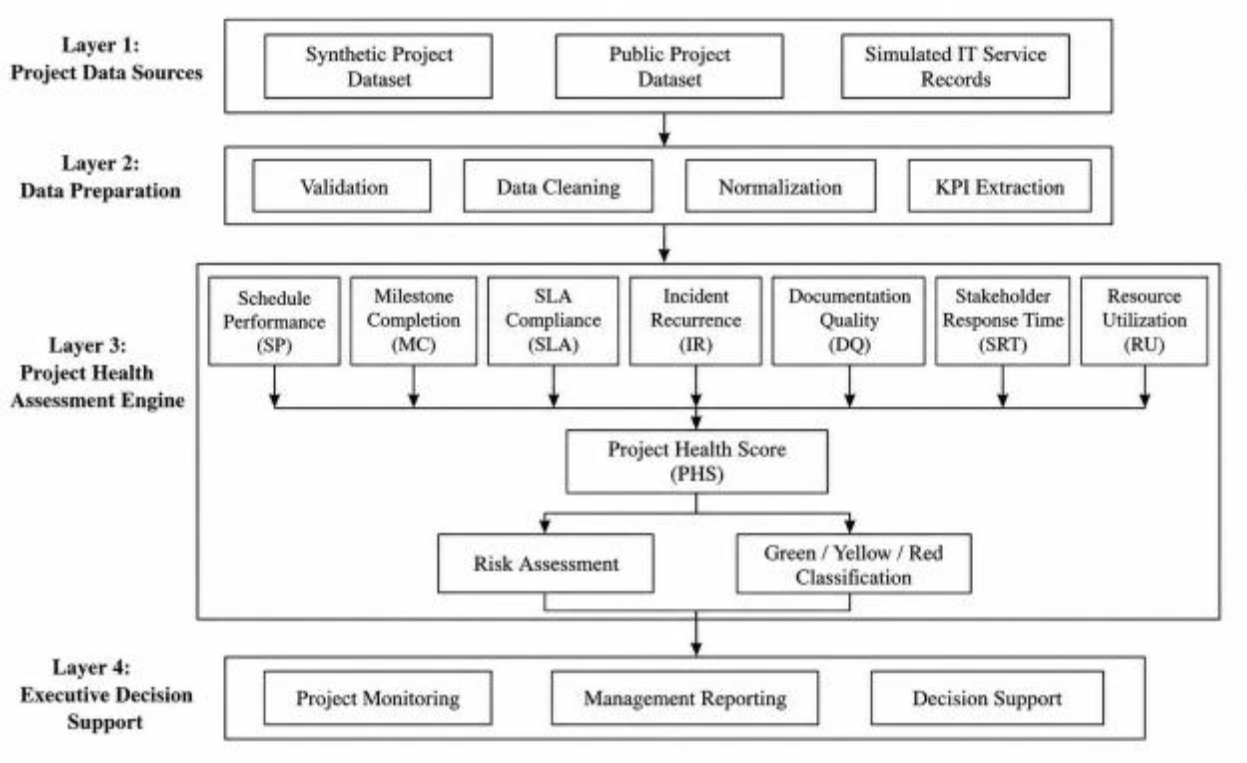


Figure 1. Layered Architecture of the KPI-Based Project Health Assessment Framework

Where

SP = Schedule Performance

MC = Milestone Completion

SLA = SLA Compliance

IR = Incident Recurrence

DQ = Documentation Quality

SRT = Stakeholder Response Time

RU = Resource Utilization

Table I. Performance Indicators Used in the Proposed Framework

Indicator	Symbol	Description
Schedule Performance	SP	Progress against planned schedule
Milestone Completion	MC	Percentage of completed milestones
SLA Compliance	SLA	Percentage of satisfied service-level agreements

Indicator	Symbol	Description
Incident Recurrence	IR	Frequency of repeated service incidents
Documentation Quality	DQ	Completeness and consistency of project documentation
Stakeholder Response Time	SRT	Average response time to project communications
Resource Utilization	RU	Effective utilization of assigned project resources

C. KPI-Based Project Health Assessment Model

The proposed model integrates normalized KPIs into a single Project Health Score (PHS) that represents the overall condition of an Agile IT project. Each indicator receives a predefined weight according to its contribution to project performance. The weighted aggregation converts multiple operational measurements into one quantitative score, allowing project managers to compare projects using a common evaluation scale. The model treats every KPI as an independent performance component while preserving its contribution to the final assessment. Figure 2 presents the mathematical structure of the proposed health assessment model.

KPI Normalization

Because the selected KPIs have different measurement units, each indicator is normalized before aggregation. Min max normalization converts every variable to a common scale between 0 and 1.

$$Xi = \frac{x_i - x_{min}}{x_{max} - x_{min}}$$

where

Xi = normalized KPI value,

x_i = observed KPI value,

x_{min} = minimum observed value,

x_{max} = maximum observed value.

The assigned KPI weights satisfy

$$\sum_{i=1}^{7} w_i = 1$$

where w_i denotes the relative importance of each performance indicator.

The overall Project Health Score is calculated as

$$PHS = \sum_{i=1}^{7} \quad w_i X_i$$

where

$$PHS = w_{SP}SP + w_{MC}MC + w_{SLA}SLA + w_{IR}(1 - IR) + w_{DQ}DQ + w_{SRT}(1 - SRT) + w_{RU}RU$$

The variables Incident Recurrence (IR) and Stakeholder Response Time (SRT) are expressed as inverse measures because lower values indicate better project performance.

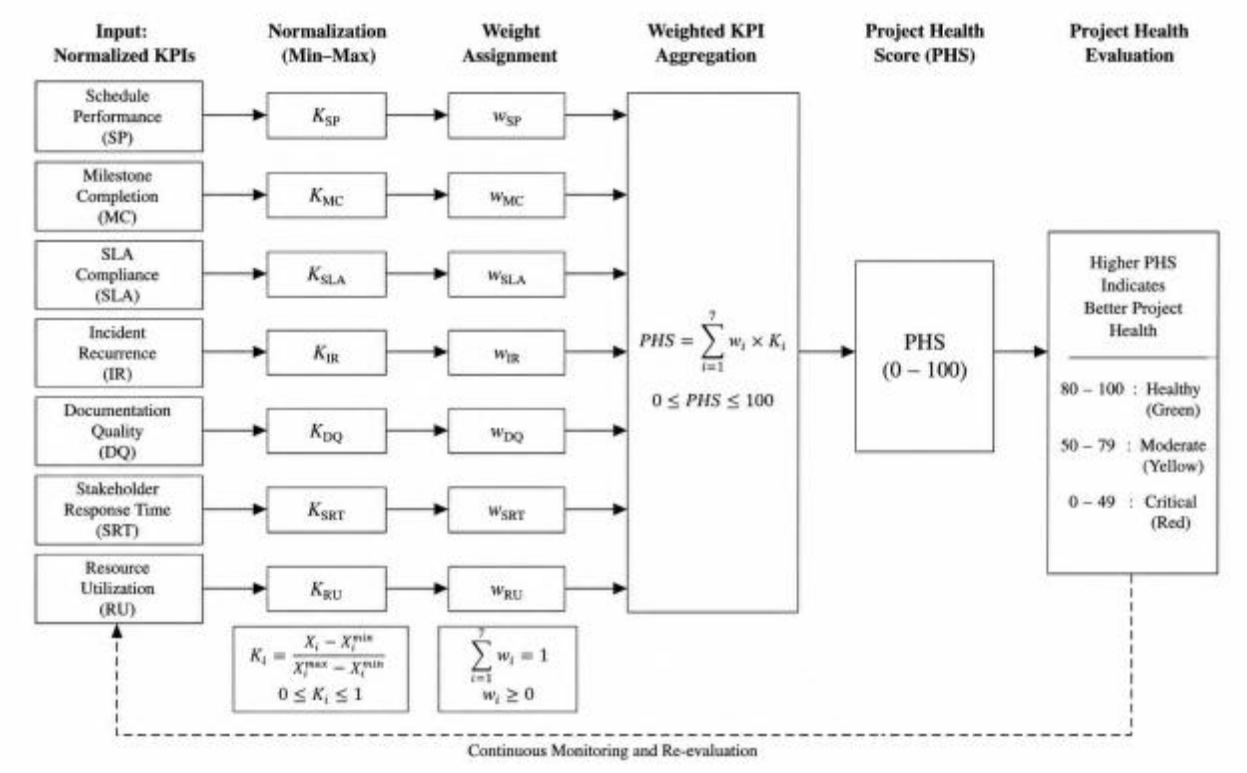


Figure 2. Mathematical Structure of the KPI-Based Project Health Assessment Model

D. Risk Assessment and Project Classification

Project health alone cannot fully represent operational conditions because projects with similar performance scores may have different risk levels. Therefore, the framework evaluates operational risk separately using the probability of occurrence, impact severity, and detection difficulty. The calculated risk score complements the Project Health Score during project evaluation and supports management decisions when operational issues require immediate attention.

The project risk score is calculated as

$$R = P \times I \times D$$

where

P = probability of project delay or service failure,

I = operational impact,

D = detection difficulty.

Projects are classified according to the Project Health Score.

Project Health Score	Status
$PHS \geq 0.80$	Green
$0.60 \leq PHS < 0.80$	Yellow
$PHS < 0.60$	Red

The classification provides a consistent interpretation of project condition and supports operational reporting through a simplified traffic-light representation.

E. Model Validation

The proposed framework is evaluated using synthetic project datasets, simulated IT service records, or publicly available project management data. Validation focuses on the consistency of the Project Health Score under different operational conditions rather than organization-specific performance. Multiple test scenarios are created by varying schedule performance, SLA compliance, incident recurrence, and resource utilization while maintaining identical evaluation procedures. The resulting Project Health Scores and risk values are compared across scenarios to examine model stability and classification consistency. Figure 3 summarizes the validation process adopted in this study.

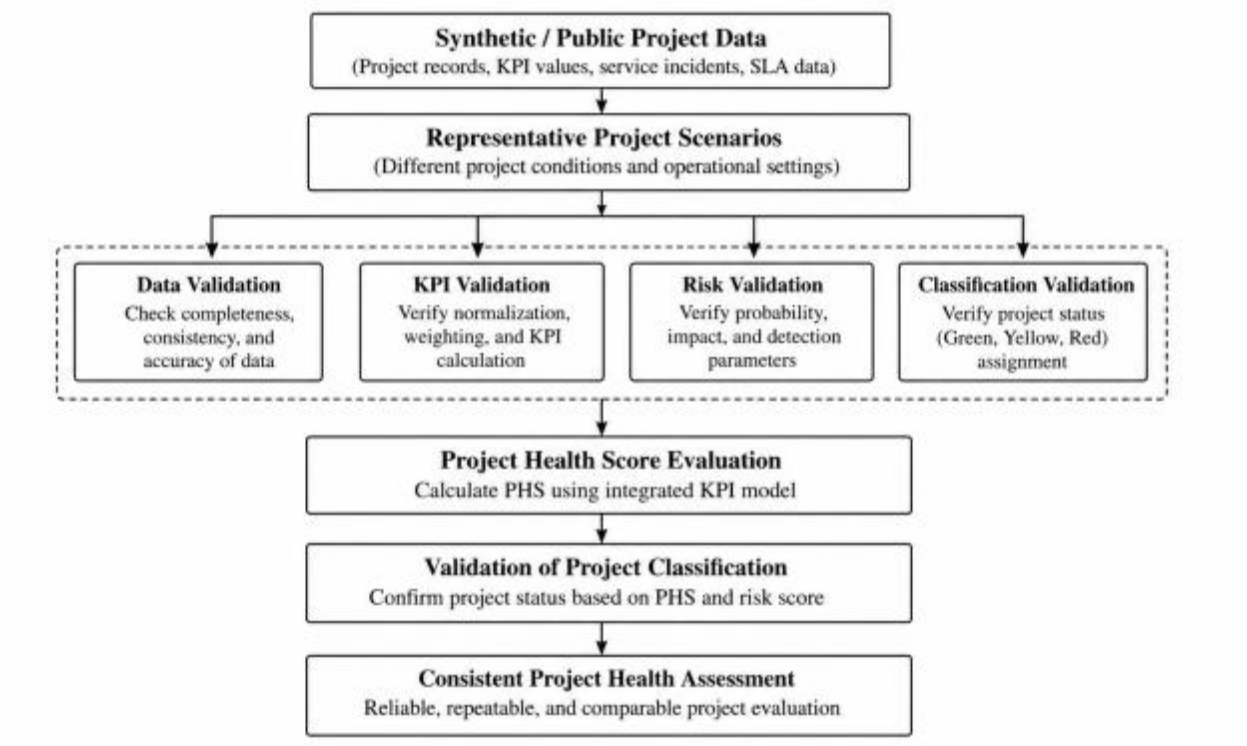


Figure 3. Validation Framework for Project Health Assessment

Figure 3 summarizes the validation process used to evaluate KPI consistency, risk assessment, and project classification across representative project scenarios.

Table II. Project Health Classification Criteria

Project Health Score	Risk Score	Project Status	Recommended Management Action
≥ 0.80	Low	Green	Continue project execution and routine monitoring
0.60–0.79	Moderate	Yellow	Review KPIs and implement corrective actions
< 0.60	High	Red	Immediate management intervention and risk mitigation

IV. Results and Discussion

The proposed framework was evaluated using representative project scenarios derived from synthetic project datasets and simulated IT operational records. Each scenario contained the seven performance indicators defined in the proposed methodology. After data normalization, the indicators were combined to calculate the Project Health Score (PHS), followed by operational risk evaluation and project classification. The assessment examined how the

integrated KPI model represented different project conditions while maintaining a consistent evaluation process across multiple operational scenarios.

A. KPI Performance Analysis

The seven selected KPIs represented complementary dimensions of Agile IT project execution. Schedule performance and milestone completion reflected project progress, whereas SLA compliance indicated service delivery performance. Documentation quality and stakeholder response time represented communication and coordination activities, while resource utilization described operational efficiency. Incident recurrence served as the only inverse indicator because repeated service interruptions reflected declining operational stability. After normalization, all indicators contributed to the Project Health Score using a common measurement scale. This approach produced comparable project evaluations despite differences in the original measurement units and operational characteristics.

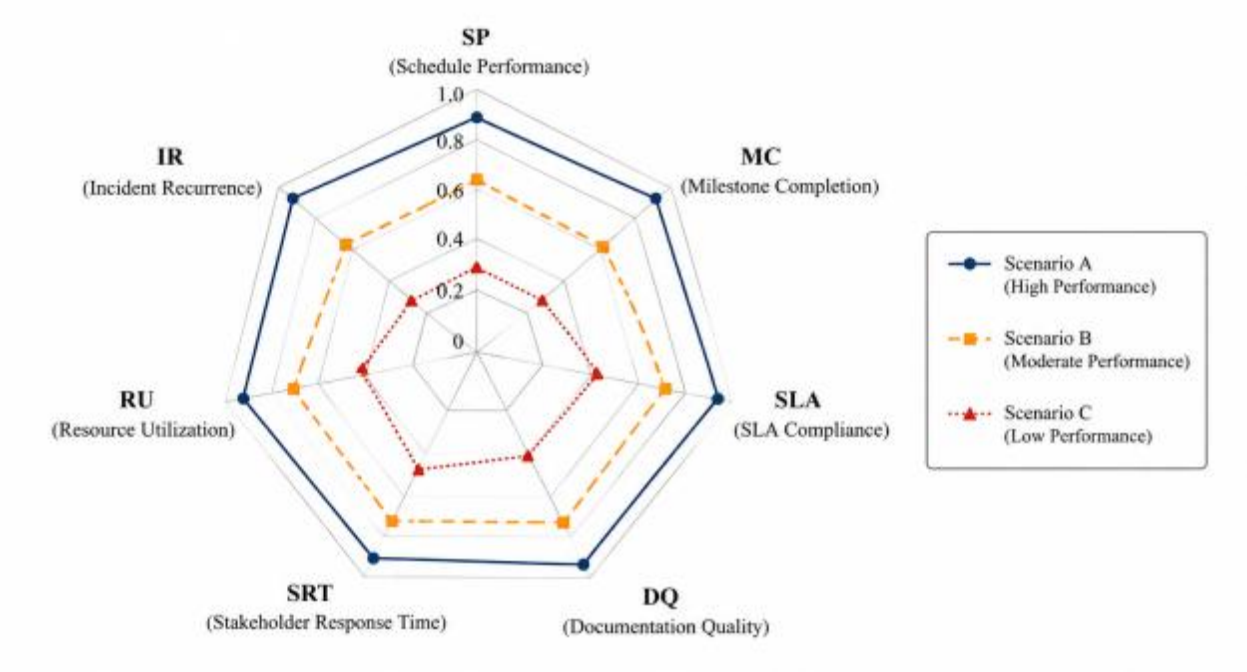


Figure 4. KPI Contribution to Project Health Assessment

Figure 4 illustrates the relative contribution of seven KPIs to the Project Health Score under representative project scenarios

B. Project Health Assessment

The integrated Project Health Score summarized project execution through one quantitative assessment. Projects assigned to the Green category demonstrated satisfactory operational performance across most KPIs. Yellow projects reflected moderate deviations requiring

management review before operational conditions declined further. Red projects contained several unfavorable indicators that indicated higher operational concern and increased management attention. The classification framework simplified project reporting because every project followed the same evaluation procedure while preserving detailed KPI information for operational analysis.

Table III. Project Health Classification

Project Condition	PHS Level	Status	Management Action
Stable execution	High	Green	Routine monitoring
Moderate deviation	Medium	Yellow	Review affected KPIs
Multiple operational issues	Low	Red	Immediate corrective action

C. Risk Assessment

Operational risk complemented the Project Health Score through independent evaluation of project exposure. Projects with comparable health scores did not always present identical operational conditions because incident severity and detection difficulty differed across project scenarios. The combined interpretation of project health and operational risk produced a broader assessment than KPI evaluation alone. This structure allowed project managers to identify projects requiring immediate attention while distinguishing temporary operational variation from persistent project concerns.

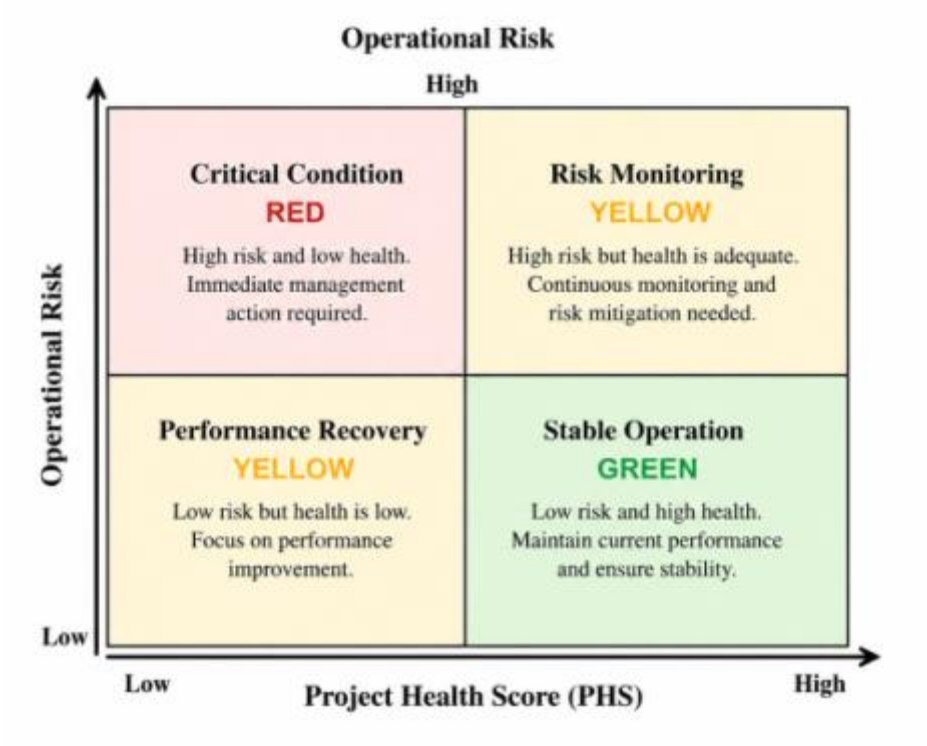


Figure 5. Project Health–Risk Evaluation Matrix

Figure 5 presents project classification based on Project Health Score and operational risk, supporting consistent management decisions across different project conditions.

D. Comparative Discussion

Previous studies examined KPI-based project assessment [1], [6], [12], management information systems [2], [3], [10], [13], business intelligence and dashboard reporting [4], [5], [9], [14], [15], and service reliability monitoring [8], [11]. Each research direction addressed a specific operational function. The proposed framework combines these perspectives within one Project Health Score supported by an independent risk evaluation model. The unified assessment reduces fragmented interpretation of project information and introduces a standardized Green–Yellow Red classification suitable for Agile IT operations. This structure also presents project status in a format that remains consistent across different evaluation periods.

E. Limitations and Future Work

The framework was evaluated using synthetic and publicly available project data. Organizational datasets were not included, and KPI weights remained predefined. Future research may examine industrial Agile IT projects, adaptive KPI weighting methods, and integration with real-time project management platforms for continuous project health assessment.

V. Conclusion

This study proposed a KPI-Based Project Health Assessment Model for Agile IT operations and service reliability. The framework combines schedule performance, milestone completion, SLA compliance, incident recurrence, documentation quality, stakeholder response time, and resource utilization into a unified Project Health Score. A separate risk assessment model complements the health evaluation and supports Green–Yellow–Red project classification. The proposed methodology offers a structured approach for project evaluation, operational monitoring, and management reporting through a common assessment process. The use of synthetic and publicly available project data demonstrates the applicability of the framework without requiring confidential organizational information.

Future research may evaluate the framework using industrial Agile IT projects from different organizations and operational contexts. Additional work may examine adaptive KPI weighting methods, integration with enterprise project management platforms, and long-term project datasets. These studies can expand the practical application of the proposed model and assess its performance across different project environments.

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