

Research on Performance Evaluation of tertiary Grade-A Hospitals Based on the Balanced Scorecard

-- A Case Study of AZ Hospital

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ABSTRACT

The Balanced Scorecard (BSC), as a crucial tool for performance evaluation, has been widely applied in the production and operational processes of various organizations or enterprises. This paper aims to highlight the characteristics of tertiary Grade-A hospitals by combining theoretical research with practical investigation. Building upon the traditional four dimensions of the BSC and integrating the concepts of public welfare and social benefits inherent to tertiary Grade-A hospitals, a social responsibility dimension is introduced to reconstruct the BSC, thereby organically aligning the hospital's strategic objectives with performance evaluation. Using AZ Hospital as a case study, data from the past year and the average KPIs of tertiary Grade-A hospitals were collected and analyzed to compare AZ Hospital's performance across various dimensions. The Analytic Hierarchy Process (AHP) was employed to determine indicator weights and establish a comprehensive scientific evaluation system, ultimately assessing AZ Hospital's performance, drawing conclusions, and providing recommendations.

KEYWORDS

Balanced Scorecard; Tertiary Grade-A hospitals; Social responsibility; Performance evaluation

1. INTRODUCTION

1.1. Research Background and Significance

1.1.1. Research Background

In recent years, with the development and growth of private hospitals [1], competition in the medical market has become increasingly intense, especially for tertiary hospitals. Previously, performance management in domestic tertiary hospitals was largely based on the hospital's actual financial operations during the current year or accounting period, as well as the annual budget, to plan the year's performance levels. These were then allocated to various departments (functional units) in appropriate proportions, and subsequently distributed to individuals within each department. Performance management was limited solely to financial aspects. This directly led hospitals to pursue financial performance one-sidedly, thereby neglecting the importance of other non-financial indicators. Consequently, this performance management approach has certain limitations.

To improve this traditional performance evaluation model, in recent years, some tertiary hospitals in China have begun to adopt the Balanced Scorecard for performance evaluation, aiming to enhance its scientific rigor and rationality.

On April 21, 2016, the State Council issued the "Notice on Key Tasks for Deepening the Reform of the Medical and Health System in 2016." The document requires the government to fulfill its responsibilities, stipulating that tertiary hospitals must abolish drug bonus policies and implement reforms in personnel management, internal distribution, and autonomous operational management. It also mandates pilot cities to establish and improve a comprehensive performance evaluation system for tertiary hospitals, introducing third-party evaluations to ensure fairness.

Given the above, traditional performance evaluation systems are no longer adequate to meet the tide of reform. The new circumstances impose higher and stricter demands on hospital performance evaluation.

1.1.2. Research Significance

Assisting hospitals in improving operational efficiency. This is primarily reflected in three aspects: education, healthcare, and research [2]. Education represents the valuable opportunities medical colleges provide for students to gain practical experience and accumulate relevant work skills before employment. In healthcare, it signifies the hospital's ability to better and more realistically meet patients' needs, offering superior medical services. Research, of course, refers to financial performance-related research, specifically using the Balanced Scorecard to elevate the hospital's performance evaluation standards. This has significant and far-reaching implications for the sustainable development of hospitals.

The Balanced Scorecard is undoubtedly a performance evaluation tool that reflects a hospital's strategic vision. It emphasizes the causal relationships among various indicators, organically integrating educational, healthcare, and research factors into the hospital's overall management system. Additionally, hospitals are sacred places dedicated to protecting public health, possessing unique characteristics. First, the social attributes inherent to hospitals provide significant public welfare, necessitating that they prioritize public interests and fulfill their responsibility to safeguard community health. This requires hospital administrators, especially top management, to strategically position the hospital, clarifying its mission, values, and vision.

The Balanced Scorecard enables hospitals to shift their strategic goals from merely pursuing maximum economic benefits to achieving comprehensive benefits, particularly in the new realm of social responsibility. If hospitals successfully design and develop a Balanced Scorecard performance evaluation system tailored to their needs, they will undoubtedly thrive in future competitive environments.

The Balanced Scorecard is a vital tool for comprehensively enhancing hospital performance management. To date, most hospitals still adopt performance evaluation models focused solely on profit maximization, which exhibit significant shortcomings. By incorporating the original four dimensions and integrating non-financial indicators into performance evaluation, the Balanced Scorecard fundamentally transforms traditional performance management.

Providing theoretical support for Management by Objectives [3]. Currently, many top-tier hospitals in China have begun exploring and implementing "Management by Objectives" to advance their strategic goals. When executing management objectives, each department should set its own targets while striving for alignment with others. Without proper goal allocation, larger organizations with more personnel are prone to conflicts, inefficiencies, and waste. Hospitals should not always view overarching objectives in Management by Objectives solely from a strategic perspective. The evolution of Management by Objectives has led to the Balanced Scorecard, which perfectly aligns an organization's strategic vision with its goals, balances various factors, significantly improves performance evaluation, fosters employee growth, and enhances motivation in work and life.

1.2. Current Research Status at Home and Abroad

1.2.1. International Research Status

According to surveys, the first academic paper on medical scorecards appeared as early as 1994, followed by a surge of articles on healthcare services and medical management.

U.S. healthcare institutions began adopting medical scorecards for strategic management in 1996 [4]. Healthcare organizations in Michigan also developed a balanced scorecard tailored to medical institutions based on the fundamental principles and core concepts of the medical scorecard. At this stage, the balanced scorecard system still included many dimensions without distinguishing between secondary and tertiary dimensions.

The first successful implementation of the balanced scorecard was at the Duke Children's Hospital in the UK, with encouraging results. From 1996 to 2000, the hospital's profitability saw steady growth for four consecutive years, while patient satisfaction, nursing unit efficiency, and employee satisfaction also improved significantly.

The UK NHS Performance Assessment Framework. Performance evaluation of UK hospitals began as early as 1983, but during this period, the data sources for performance indicators were limited to administrative aspects, and subjectivity and human bias affected reliability. In 2001, the UK Department of Health introduced a star rating system to address widespread issues such as long waiting times and lack of incentives, aiming to improve healthcare service efficiency. The NHS framework categorized evaluation results into four levels: failing, acceptable, good, and excellent. In June 2008, the UK released "Developing the NHS Performance Assessment System," implementing a new performance framework in NHS hospitals. The evaluation dimensions included financial performance, service performance, and board capability.

The U.S. ORYX Evaluation Program. The most authoritative accreditation body in the U.S. is The Joint Commission. In 1997, the Commission launched the ORYX program, integrating performance evaluation into the overall hospital accreditation system to guide hospitals in improving healthcare quality. The program designed core and non-core dimensions, allowing hospitals to choose their preferred combination of these dimensions during evaluation based on their specific circumstances.

WHO's European Hospital Performance Assessment Project. In 2003, the World Health Organization's Regional Office for Europe initiated the "Performance Assessment Tool for Quality Improvement in Hospitals" project, aimed at enhancing hospital performance evaluation methods.

The Netherlands' 2013 Performance Evaluation Indicators Project [5]. The Netherlands conducts performance evaluations through the establishment of the Healthcare Institution Inspection Department, which is responsible for overseeing the operational quality of hospitals and the quality of healthcare services. The evaluations are categorized into three groups: the hospital as a whole, emergency rooms, operating rooms, and intensive care units, and specific conditions and interventions. This project does not rank hospitals based on evaluation results nor produce performance reports. Instead, it places particular emphasis on incentivizing improvements in hospital performance and encourages horizontal comparisons among hospitals.

1.2.2. Current Status of Domestic Research

In China, the practice of applying the Balanced Scorecard in healthcare institutions started relatively late. It can be said that the Balanced Scorecard is still in the exploratory stage, with no reports of particularly successful implementations yet.

In 2000, the first article on the application of the Balanced Scorecard in the healthcare field appeared nationwide, followed by an increasing number of theoretical studies in this area. Some scholars proposed that the basic steps for implementing the Balanced Scorecard and constructing a hospital performance evaluation system can be divided into: creating a strategy map, designing the Balanced

Scorecard's indicator system, establishing evaluation standards and criteria for the Balanced Scorecard, clarifying the strategic management approach of the Balanced Scorecard (using tools such as SWOT analysis, Porter's Five Forces Model, and benchmarking management), expanding organizational strategy (using tools like the Boston Matrix, value chain analysis, and key objectives), evaluating the current performance evaluation system, designing strategic issues, setting strategic goals, linking causal relationships to form a strategy map, setting strategic target values for objectives, and developing strategic action plans.

Tang Yuehong [6] and others established a relatively applicable and scientific Balanced Scorecard performance evaluation system for Class III Grade A hospitals. Based on the Balanced Scorecard survey results and research reports from nine foreign healthcare institutions and nine renowned universities, they proposed that the Balanced Scorecard is an important tool suitable for performance evaluation in healthcare institutions.

Scholars Zhai Shuyou and Wu Jian summarized the design approach of the Balanced Scorecard and potential issues encountered during its development and practical application, offering valuable guiding principles for the successful future use of the Balanced Scorecard. Based on the entire implementation process of the Balanced Scorecard in hospitals, the two scholars proposed establishing an indicator system across three levels: the hospital level, department level, and employee level. By integrating the hospital's development strategy and objectives, they aim to balance employee development, operational development, and research development, thereby achieving comprehensive, coordinated, and sustainable development of the hospital.

To effectively enhance the overall competitiveness of the hospital, a Shanghai-based hospital began implementing a two-tier balanced scorecard performance management system in July 2003. Before the specific implementation, the hospital first provided a detailed introduction to the basic theory of the balanced scorecard to all medical staff and conducted relevant training, ensuring everyone fully understood its operational model and discussed the steps for its implementation. In September 2003, the balanced scorecard was further rolled out at the departmental level. Following this, the hospital's revenue and inpatient rates saw significant increases, and customer satisfaction in certain disciplines (such as orthopedics and cardiovascular diseases) also improved notably.

In January 2005, a hospital in Shenzhen officially began applying the balanced scorecard in the critical area of operating room bonus distribution. The process roughly involved first identifying non-quantitative factors (comprehensive factor evaluation), then establishing relevant assessment criteria for quantitative factors, followed by integration, and finally allocating bonuses based on individual total scores.

In January 2006, the emergency department of a Shenzhen hospital adopted the balanced scorecard to evaluate all its nurses. Beyond that, the hospital also implemented multi-dimensional assessments, trialing this initiative in the field of bonus distribution to ensure it could genuinely serve as a key tool for motivating medical staff. These measures received highly positive feedback.

In 2006, the nursing department of a hospital in Guangxi introduced the balanced scorecard for performance evaluation. Nurses were comprehensively assessed across dimensions such as customer satisfaction, workflow efficiency, staff growth, cost-effectiveness, and incentive programs. This reform demonstrated that the balanced scorecard is entirely suitable for performance evaluation in nursing departments and can yield excellent results.

In summary, the balanced scorecard has played an indispensable role in providing performance evaluation for hospitals. It not only offers a theoretical foundation for analyzing and solving problems but can also be tailored to different hospitals, providing them with customized evaluation criteria.

1.3. Research Methodology

1.3.1. Research Methodology

To ensure the rationalization and standardization of the selected indicators, the determination of indicators was conducted through the Delphi method, expert consultation, questionnaire surveys, and innovative additions. Performance evaluation indicators were established across five dimensions. The expert team consisted of 20-30 members, including directors, deputy directors, chief physicians, and associate chief physicians from top-tier hospitals in Beijing. After selecting the participants, 20-30 questionnaires were distributed. Based on the experts' suggestions, the Balanced Scorecard's indicator system was adjusted, refined, and modified, ultimately establishing the performance evaluation indicator system.

The weight of each indicator in this study was determined using the Analytic Hierarchy Process (AHP) method [7]. The steps for determining indicator weights via AHP are as follows: first, pairwise comparisons were made between each pair of indicators to assess their relative importance (significance). The indicator weights were derived from the scores and recommendations provided in the 20-30 expert questionnaires. The selected indicators were then calculated and summarized using AHP to determine their respective proportions within the same dimension. Similarly, the relevant theories of AHP (including calculation methods) were applied to determine the proportion of each tertiary indicator within its respective dimension, laying the groundwork for subsequent indicator scoring.

1.3.2. Research Content

The first part is the introduction. It analyzes the background and significance of applying the Balanced Scorecard to hospital performance evaluation, reviews the current research status domestically and internationally, and outlines the research methods used in this paper. The fourth part examines the challenges and difficulties in applying the Balanced Scorecard to hospital performance evaluation, followed by the paper's three key innovations.

The second part covers the theoretical foundations of performance evaluation. It is divided into two sections. The first section introduces the relevant concepts of performance evaluation, including definitions, principles, and functions. The second section details the specific performance evaluation methods employed in the paper, which include three approaches: the Balanced Scorecard, Key Performance Indicators (KPI), and the Analytic Hierarchy Process (AHP).

The third part focuses on the design of the performance evaluation indicator system. This section is the core chapter of the paper. It is divided into three parts. The first part elaborates on the principles to be followed in setting the indicators. The second part specifies the names, data sources, data characteristics, and selection rationale for each of the 31 indicators. The third part summarizes the five secondary dimensions and 31 tertiary indicators (including calculation formulas) of the Balanced Scorecard in tabular form.

The fourth part is AZ Hospital Performance Evaluation. This chapter is divided into two parts. The first part elaborates on the principles and calculation methods for determining weights; in the second part, leveraging the introduction to weights from the first part, the indicators are categorized into quantitative and qualitative ones, with the weights and scores of these 31 tertiary indicators in the balanced scorecard calculated and analyzed separately. In the final subsection, a performance evaluation of AZ Hospital is conducted, analyzing its strengths and weaknesses, paving the way for the conclusions and recommendations in the next chapter.

The fifth part presents the conclusions and recommendations. This section provides the conclusions and recommendations of the study, discusses its limitations, and highlights the innovative aspects of the research in the context of hospital performance.

1.4. Research Challenges

1.4.1. High Implementation Difficulty

Regarding the balanced scorecard as a performance tool itself, applying units need to invest significant human, material, and financial resources [8]. Additionally, the balanced scorecard inherently requires that the indicator system must fully account for the factor of weighted elements, which inevitably leads to an increase in subjective components. These uncertainties can broadly include variations in hospital performance, various constraints in healthcare institution management, the management models and mechanisms of healthcare institutions, the inherent shortcomings of the evaluators in performance assessment, and discrepancies between performance evaluation and the implementing unit's strategic goals. During the process of evaluating indicators, various departments (specifically, hospital units) often prioritize their own interests, demanding the inclusion of evaluation indicators that favor them and yield long-term benefits. Due to the existence of such phenomena, hospitals introducing the balanced scorecard for performance evaluation may struggle to achieve their original objectives. Therefore, if a hospital's foundation for performance management is weak, it is advisable not to directly use the original indicators from the balanced scorecard's dimensions. Instead, the hospital should first enhance its management capabilities, apply the tool flexibly, and fully realize the functions of the balanced scorecard.

1.4.2. Difficulty in Constructing the Indicator System

Among the four dimensions of the balanced scorecard, the financial dimension is relatively easier to set up, but the other dimensions pose greater challenges in data collection, not to mention issues like evaluation criteria in later stages. Thus, hospitals must engage in long-term exploration and summarization, avoiding sole reliance on the original dimensions, to genuinely promote the refinement of the indicator system. Meanwhile, considering the external environment, the competitive landscape hospitals face is constantly evolving. Hospitals should formulate different evaluation indicators based on their development plans, strategic goals at various stages, and response strategies for different phases to achieve the rational and effective use of the balanced scorecard.

1.4.3. Numerous Indicators Involved in Evaluation, Unreasonable Weight Calculation

Weight allocation is a key focus in performance evaluation. It broadly divides into two issues: weight allocation between different levels (secondary dimensions) and between different indicators (tertiary dimensions). If the weights differ for different indicators at the same level across different tiers, it may lead to varying evaluation outcomes. Additionally, it should be noted that the Balanced Scorecard itself lacks clear rules for allocating indicator weights, making it impossible to establish strictly objective standards for weight setting, which inevitably increases subjectivity.

Currently, among all top-tier hospitals using the Balanced Scorecard, financial indicators are given excessive weight, while public welfare and medical quality indicators are underweighted. Some target values for evaluation indicators are fundamentally unreasonable and lack objectivity [9], resulting in low recognition from operational departments (functional units). Top-tier hospitals often determine target values without undergoing bottom-up analysis and discussion. Some staff in performance management departments are non-healthcare professionals with insufficient knowledge of medical care basics.

1.4.4. Ineffective Evaluation in Cost Control

In terms of medical cost control, the proportion of drug inspections to medical revenue is highly uncertain and often fluctuates significantly, suggesting human influence. Currently, implementing a dynamic evaluation mechanism for medical supplies in top-tier hospitals is unfeasible; it is generally only used to guide material costs for health departments, nothing more. Consequently, monthly quantity fluctuations are substantial, making the income-to-expenditure ratio difficult to measure and thereby increasing evaluation complexity.

1.4.5. Performance Evaluation Execution Tends to Be Superficial

Currently, most top-tier general hospitals in China lack professional management personnel to oversee performance evaluation. Moreover, many hospital leaders underestimate the importance of performance evaluation, failing to recognize its significance. Members of hospital performance evaluation committees are often medical professionals lacking management expertise, inevitably leading to superficial execution. Additionally, during departmental performance evaluations, busy schedules—especially in departments like pediatrics and cardiac surgery—result in leaders paying insufficient attention to the process.

1.5. Technical Approach

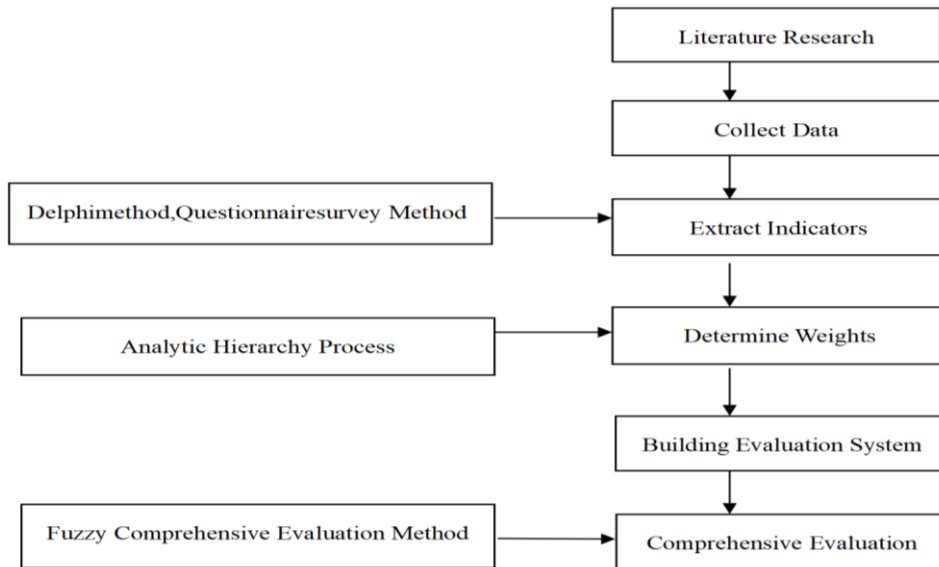


Figure 1.1. Technical Road map

1.6. Chapter Summary

This chapter serves as the introduction, first analyzing the background and significance of applying the Balanced Scorecard to hospital performance evaluation. It then reviews domestic and international research status and outlines the research methods used in this paper. The fourth section examines current challenges and difficulties in applying the Balanced Scorecard to hospital performance evaluation, followed by the paper's three key innovations.

2. THEORETICAL FOUNDATIONS OF PERFORMANCE EVALUATION

2.1. Concepts Related to Performance Evaluation

2.1.1. Definition of Performance

Performance encompasses both behavior and process. It includes individual performance and organizational performance. Organizational performance is achieved only when it is divided into each position and every individual within a logical relationship, fulfilling the organization's requirements. Currently, the definition of performance has three key points: one views performance as results; another views performance as behavior; the third emphasizes the relationship between performance and employee potential.

2.1.2. Performance Evaluation

Performance evaluation [10] is the assessment of behavioral effects and efficiency in people's social production and daily life activities. It involves applying certain scientific methods and established procedures to evaluate the work of every employee in an organization. It assesses employees' attitudes and their contributions to the organization and provides feedback. Performance evaluation is a neutral assessment of employee performance, ultimately implementing rewards or penalties based on the evaluation results to achieve the goal of improving performance.

2.1.3. Functions of Performance Evaluation

It helps organizations formulate human resource policies. Through performance evaluation, organizations can quickly identify areas and positions where human resources are lacking and organize recruitment accordingly. However, inappropriate human resource management policies often suppress employees' ability to showcase their talents, leading to adverse effects such as turnover.

It benefits employees' personal development. Through performance evaluation, organizations can promptly understand employees' work skills, attitudes, achievements, and growth potential, using this information as key criteria for appointments, promotions, and dismissals.

It facilitates the establishment of a reasonable salary system. Only through evaluation can outstanding employees be distinguished from average ones, with different compensation levels applied based on the evaluation results. This also helps progressively refine the organization's salary system.

It fosters a competitive mechanism and strengthens incentive mechanisms. Performance evaluation has three purposes: first, to understand employees' work performance and promote their healthy development; second, to identify shortcomings in employees' work processes, offer improvement suggestions, and help them effectively overcome these shortcomings to enhance performance in the future; finally, the performance evaluation system makes employees' work competitive, thereby bringing more economic benefits to the organization.

2.2. Methods of Performance Evaluation

2.2.1. Balanced Scorecard

From an accounting perspective, the goal of finance is to maximize shareholder equity. It reveals the impact of our contribution to the economic efficiency of an organization [11], whether positive or negative. Therefore, the financial dimension serves as the starting point for the other three dimensions and is relatively more important, carrying a higher weight. Depending on the different stages of the product lifecycle, we select various financial indicators to reflect the four aspects of relevant capabilities. For example: to gauge an organization's profitability, metrics like return on equity (ROE), return on assets (ROA), and profit margin on sales might be chosen; for operational efficiency, total asset turnover or accounts receivable turnover could be used.

The customer dimension answers the question, "How do customers perceive us?" Customers are the ultimate source of profit for every organization. As the saying goes, "The customer is king," emphasizing a people-centric approach where customers naturally remain the focal point. Core metrics in the customer dimension include: 1) Customer satisfaction, reflecting the gap between actual experience and expectations; 2) Customer loyalty, measured by retention rates, new customer acquisition, customer profitability, and market share.

The internal process dimension addresses the question, "What are our strengths?" and focuses on showcasing an organization's core competitiveness. Thus, organizations should prioritize factors that most significantly impact customer satisfaction—such as time, quality, and productivity—for performance evaluation.

The learning and growth dimension seeks to answer, "Can we continue to create and enhance customer value?" Continuously improving employees' technical skills and leadership's management quality is essential for any organization, as it drives value creation and service efficiency. Only then can an organization enter new markets and increase dividends and shareholder value.

Based on past experience, a balanced scorecard with around 20–25 indicators is generally appropriate. These indicators are not perfectly positively correlated. As the foundation for performance evaluation, determining which metrics to reasonably include or exclude without compromising evaluation integrity is a critical consideration when applying the balanced scorecard.

2.2.2. Key Performance Indicator (KPI) Evaluation Method

Key Performance Indicators (KPIs) [12] are a vital evaluation method that links critical metrics to an organization's strategy to establish a performance assessment system aligned with strategic goals. Organizations break down high-level objectives into actionable tactical targets. KPIs form the basis of performance evaluation systems, with two primary interpretations:

First, KPIs are quantifiable or actionable standards for assessing system performance; second, KPIs reflect value-added outcomes in organizational performance metrics. When establishing key performance indicators, the SMART principle should be followed: S stands for "Specific," meaning the goal must be as concrete as possible; M represents "Measurable," indicating that performance indicators should be quantifiable or behavior-oriented; A signifies "Achievable," meaning the goal must be attainable through effort; R denotes "Realistic," implying the goal should be verifiable and observable; T stands for "Time-bound," meaning a specific timeframe must be clearly defined for achieving the goal. KPIs generally require breaking down strategic objectives and then establishing specific indicators. There are two basic methods for setting indicators: first, based on job descriptions, after evaluating all potential indicators, select the few most critical ones that best reflect performance as KPIs; second, combine hard and soft indicators in the development process, striving to refine the indicators to ensure they are both specific and representative. Additionally, when setting goals, choose appropriate targets to avoid being too high or too low, which could render them unattainable or demotivating.

2.2.3. Analytic Hierarchy Process

The Analytic Hierarchy Process [13], also known as AHP, was proposed by the renowned American scholar T.L. Saaty in the mid-1970s. It is a highly practical decision-making tool. When faced with a complex problem, it systematically breaks it down into components and ranks the alternatives based on human judgment. This process embodies the meticulous and analytical characteristics inherent in human decision-making.

Internationally, quantitative models or statistical methods are commonly used for analysis, which to some extent reduces subjectivity. Currently, China lacks the fundamental conditions and theoretical assumptions required for such big data approaches. Fortunately, the AHP method combines quantitative analysis with qualitative judgment and does not rely on extensive historical data, making it more aligned with China's basic national context.

AHP [14] involves pairwise comparisons of elements at each level, using a specific scaling theory to derive relative importance scales. A judgment matrix is then constructed, followed by calculating the maximum eigenvalue and eigenvector. Based on the upper-level elements, the importance order of elements at each level is determined, forming a weight vector. The main steps are as follows:

This study adopts the importance rating method, as shown in Table 2.1:

Table 2.1. Relative Importance Scale

Importance Level	Meaning
1	Two factors are equally important
2	The former is slightly more important than the latter
3	The former is moderately more important than the latter
4	The former is strongly more important than the latter
5	The former is extremely more important than the latter
1/2, 1/3, 1/4, 2/3, etc.	Intermediate judgment values between 1, 2, 3, 4, and 5, respectively

After obtaining the eigenvalues and eigenvectors, an additional step is required: conducting a consistency check to derive the single-ranking result.

There are multiple methods to calculate the weight of the judgment matrix, including the sum-product method, the square-root method, the power method, and the least squares method. This paper adopts the sum-product method to determine the weight vector W . The specific algorithm is as follows: normalize each column of the judgment matrix, where the general term of its elements is:

Add the normalized judgment matrix row-wise to obtain the vector $W=(W_1, W_2, W_n)$ t. Normalize it, and $W=(W_1, W_2, \dots, W_n)$ t becomes the approximate solution of the desired eigenvector. Calculate the maximum eigenvalue λ of the judgment matrix. Then proceed with the consistency check:

- (1) Calculate the consistency index $C=\lambda_{max}-n/n-1$ [15]
- (2) Identify the corresponding index (consistency) RI
- (3) Calculate the consistency ratio $CR=C/RI$

When $CR<0.1$, the consistency check is acceptable; otherwise, revise A . (The consistency check is indispensable in AHP).

2.3. Chapter Summary

This chapter serves as the theoretical foundation for performance evaluation. It is divided into two parts: the first part covers the relevant concepts of performance evaluation, including definitions, principles, and functions; the second part details the specific methods of performance evaluation used in this paper, which include three approaches: the Balanced Scorecard, the Key Performance Indicator (KPI) method, and the Analytic Hierarchy Process (AHP).

3. DESIGN OF THE PERFORMANCE EVALUATION INDICATOR SYSTEM

3.1. Principles for Indicator Setting

The four dimensions of the Balanced Scorecard are inherently interconnected. The process of setting Balanced Scorecard indicators is highly intricate, as it requires linking all indicators through these relationships rather than simply aggregating them [16]. In summary, Balanced Scorecard indicators must incorporate the following characteristics: comprehensiveness, causal relationships, a balance between short-term and long-term goals, a mix of quantitative and qualitative measures, a combination of result-oriented and behavior-oriented approaches, and an integration of organizational and individual perspectives.

3.1.1. Principle of Independence

The indicators selected for our evaluation system must exhibit high discriminability, and the factors must maintain mutual independence.

3.1.2. Principle of Quantification

Balanced Scorecard indicators should be quantifiable whenever possible to ensure their evaluability. For example, when assessing employee training outcomes, avoid using vague terms like "good, okay, poor" and instead introduce measurable indicators such as pass rates for job evaluations.

3.1.3. Principle of Accessibility

In performance evaluation, new evaluation indicators are introduced based on varying needs. However, before setting each new indicator, one question must be considered: Is the relevant data readily obtainable? If acquiring this data still requires significant effort, it inadvertently increases costs. After weighing the benefits against the costs, if the latter outweighs the former, then the newly proposed indicator is not recommended for use.

3.2. Specific Design of Indicators

The Balanced Scorecard [17] encompasses five secondary dimensions: financial, customer, internal processes, learning and growth, and social responsibility. Hospitals need to integrate their operational characteristics while considering strategic vision, long-term goals, and actual conditions to construct a suitable performance evaluation system.

3.2.1. Financial Dimension Indicators

The core of the Balanced Scorecard indicators is financial objectives.

(1) Total Fixed Assets

AZ The hospital's strategic goal over the next decade is to vigorously advance service transformation, implement health benefit projects, and develop AZ Hospital into an international comprehensive hospital with first-class technology, service quality, and management. Among these initiatives, the quantity and scale of fixed assets play a decisive role to some extent, making the total fixed assets a viable tertiary indicator.

(2) Current Ratio

The current ratio reflects the hospital's short-term solvency. During AZ Hospital's vigorous promotion of reforms and health benefit projects, funding shortages may inevitably arise. Setting the current ratio can help monitor the hospital's short-term solvency in real-time, preventing excessive liabilities and an overly high debt-to-asset ratio.

(3) Return on Assets

Return on assets indicates the overall profitability of all assets, including net assets and liabilities, and is used to evaluate an organization's ability to generate profits from its total assets. It is a key indicator of asset operation efficiency. In recent years, AZ Hospital has continuously introduced advanced PET/CT and CT/MRI equipment, integrated its imaging system platform, and established a clinical database platform. These measures will undoubtedly expand the hospital's asset scale. To prevent artificial inflation of asset size and loss of national property, setting the return on assets can enable real-time monitoring.

(4) Operating Surplus Ratio

The operating surplus ratio reflects the hospital's surplus level excluding revenues and expenditures from fiscal and scientific-educational projects. It demonstrates the hospital's financial condition, the efficiency of medical expenditure, and management quality. Beyond serving as a performance evaluation tool, the Balanced Scorecard can also be viewed as a strategic management tool. The operating surplus ratio can be selected to reflect the hospital's overall management level and monitor its frugality in daily expenditures, thereby avoiding waste.

(5) Budget Expenditure Execution Rate

The budget execution rate reflects the hospital's budget management level. In recent years, AZ Hospital has continuously introduced advanced PET/CT and CT/MRI equipment, integrated the hospital's imaging system platform, and established a clinical database platform. These measures will undoubtedly expand the hospital's asset scale. To avoid inflating the asset scale and causing waste of national resources, the budget expenditure execution rate can be selected to evaluate AZ Hospital's budget management performance.

(6) Proportion of drug revenue in medical revenue

In 2016, the State Council issued a new regulation, the "2016 Notice on Healthcare System Reform." According to the spirit and essence of this notice: "Reduce costs for drugs, medical devices, and consumables through centralized procurement, medical insurance cost control, and standardized medical practices. Adjust medical service prices step by step strictly, not only targeting the elimination of drug markup. The adjusted portion shall be included in the medical insurance payment scope as required." The elimination of drug markup has become a major trend in the reform of tertiary hospitals. Based on this requirement, the proportion of drug revenue in medical revenue can be selected as an important financial indicator to measure the performance of AZ Hospital.

3.2.2. Customer Dimension Indicators

In terms of the customer dimension, the hospital's strategic goals are to advance discipline construction, improve patient service levels and comfort experience, enhance the hospital's capability in managing critical affairs, and improve information technology application skills. The aim is to build AZ Hospital into an internationally renowned comprehensive hospital with first-class technology, service quality, and management.

(1) Outpatient patient growth rate and inpatient patient growth rate

As the most intuitive indicators for measuring the performance of AZ Hospital, the outpatient patient growth rate and inpatient patient growth rate directly reflect patient satisfaction with the hospital. A continuous increase in these rates indicates that the hospital has a solid patient base, with patients choosing to trust the hospital and willingly seeking medical care at AZ Hospital while enjoying its high-standard services.

(2) Average daily patient consultations per specialist

The number of patients seen by specialists daily can reflect customer satisfaction to some extent. Currently, due to improved living standards, the number of patients seeking medical care at tertiary comprehensive hospitals is increasing, leading to a situation where specialist appointments are in high demand. Based on this, the average daily patient consultations per specialist can be selected as an indicator to reflect the hospital's patient satisfaction.

(3) Proportion of drug costs in per-visit outpatient medical expenses and per-capita inpatient medical expenses

In 2016, the State Council introduced new regulations, the "Healthcare Reform 2016 Notice." According to the spirit and essence of this notice: "Reduce costs of drugs, medical equipment, and consumables through centralized procurement, medical insurance cost control, and standardized medical practices. Adjust medical service prices step by step, not solely based on the elimination of drug markups, with the adjusted portions included in the medical insurance payment scope as stipulated." The elimination of drug markups has become a major trend in the reform of top-tier hospitals. Abolishing drug markups means that, except for imported and patented drugs, the prices of other medications will decrease, significantly improving patient satisfaction. Therefore, the proportion of drug costs in medical expenses can be used as an indicator to reflect patient satisfaction.

3.2.3. Internal Process Dimension Indicators

The indicators set in this dimension are based on the actual conditions of AZ Hospital. Since each hospital's situation varies, the settings of these tertiary indicators will differ accordingly.

(1) Cardiac Surgery Success Rate

According to the specific circumstances of AZ Hospital, its cardiac surgery department is a specialty unit and the department that receives the most national research projects annually. It has been recognized as a national key discipline, performing nearly 3,000 cardiac surgeries each year with a success rate of 98%. The cardiac surgery success rate can be selected as an indicator to monitor the dynamic development of the hospital's internal processes.

(2) Bed Occupancy Rate and Bed Turnover Frequency

The standard for bed occupancy rate is crucial for hospital planning. Hospitals can expand or maintain their bed capacity based on actual or expected bed occupancy rates. Planning and management departments can also determine overall bed requirements using this metric. Improving bed occupancy rates and turnover frequency not only positively impacts patient satisfaction but also significantly reflects the management level of a hospital's internal processes.

(3) Average Length of Stay for Discharged Patients

The average length of stay for discharged patients effectively reflects a hospital's medical and service quality, as well as its operational efficiency and overall management level. Fixed assets in inpatient departments, such as beds and rooms, should be fully utilized to enhance overall operational efficiency.

(4) Inpatient Mortality Rate, Hospital-Acquired Infection Rate, and Pass Rate of Basic Competency Evaluation for Healthcare Staff

The hospital's strategic goal for the next five years is to vigorously advance development in four key areas: discipline construction, patient service and experience, critical hospital management, and IT application. Based on this, AZ the hospital will place greater emphasis on patient service and experience in the future. AZ Hospital will continuously enhance the overall capabilities and professionalism of its medical staff and vigorously promote discipline construction. Therefore, we have set indicators such as inpatient mortality rate, hospital-acquired infection rate, and pass rate of the "Three Basics" evaluation for healthcare personnel to reflect the hospital's overall management level and the comprehensive quality of its medical and healthcare staff.

(5) Success Rate of Emergency and Critical Care Resuscitation

The success rate of emergency and critical care resuscitation is one of the key indicators of medical standards, the competence of medical personnel, and their coordination. In performance evaluation, it is crucial not to focus solely on numbers but to consider the future development trends of departments, especially the complexity and severity of different diseases and the timeliness of hospital admission, which reflect the diagnostic and treatment capabilities of the respective departments. Selecting the success rate of emergency and critical care resuscitation can motivate departments to actively treat critically ill patients and improve patient satisfaction.

3.2.4. Learning and Growth Dimension Indicators

For any organization to achieve continuous development and break through its current limits, it must have aspirations. Learning and growth are critical factors for future success.

(1) Employee Training Cost Growth Rate and Proportion of Staff Participating in Various Trainings

Due to difficulties in sourcing data, these can be set as qualitative indicators. These two indicators effectively demonstrate the hospital's emphasis on the all-round development of its staff. Conversely,

improved employee satisfaction will positively impact AZ the hospital's overall service and management levels.

(2) Per Capita Number of Published Papers and Research Projects

In 2016, the State Council issued new regulations, the "2016 Notice on Medical System Reform," encouraging pilot cities to explore methods for determining the total performance-based salary for top-tier hospitals and establishing incentive mechanisms closely tied to job responsibilities, work performance, customer satisfaction, and actual contributions. In line with this requirement, per capita number of published papers and research projects are included as performance evaluation indicators in the tertiary indicators.

3.2.5. Social Responsibility Dimension Indicators

As a non-profit organization, hospitals are not solely profit-driven. Compared to profit-oriented enterprises, hospitals bear an undeniable moral and social responsibility. Adding the social responsibility dimension as the fifth dimension of the balanced scorecard holds profound significance and impact for its refinement.

The tertiary indicators in the social responsibility dimension are all qualitative due to their relatively subjective nature. At the level of social responsibility, AZ Hospital has made significant efforts in recent years to improve medical services, focusing on appointment-based diagnosis and treatment, day surgery, information, settlement services, pharmaceutical services, emergency care, and high-quality nursing. It has comprehensively implemented appointment-based diagnosis and treatment to elevate the standard of medical services, enhance the patient experience, and increase the public's sense of fulfillment. The quality of hospital services has seen substantial improvement.

Optional tertiary indicators in the social responsibility dimension may include setting up music-assisted therapy, organizing free medical consultations, conducting aid activities, morning rounds with care, hosting health lectures, and participating in public health emergencies.

3.3. Determination of the Indicator System

For the specific indicator system, refer to Table 3.1.

Table 3.1. Indicator System

Objective Layer	Criterion Layer	Indicator Layer	Calculation Formula
Performance Evaluation System	Financial Dimension F	Total Fixed Assets F1	Amount of Fixed Assets
		Current Ratio F2	Current. Assets/Current Liabilities ×100%
		Return on Assets F3	EBIT/Average Total Assets
		Operating Surplus Ratio F4	Operating. Surplus / (Medical Revenue + Basic Fiscal Subsidy Income + Other Income) ×100%
		Budget Expenditure Execution Rate F5	Actual Expenditure in Current Period/Budgeted Expenditure in Current Period ×100%
		Proportion of Drug Revenue to Medical Revenue F6	Drug Revenue/Medical Revenue ×100%
	Customer Dimension C	Patient Satisfaction C1	Qualitative Indicator
		Outpatient Growth Rate C2	(Current Outpatients - Previous Outpatients)/Previous Outpatients
		Inpatient Growth Rate C3	(Current Inpatients - Previous Inpatients)/Previous Inpatients
		Daily Average Patient Visits per Specialist C4	Number of Patients Served Daily by Specialists
		Proportion of Drug Costs in Per-Visit Medical Expenses for Outpatients C5	DrugExpenditure/Outpatient Expenditure per Visit
		Proportion of Drug Costs in Per-Capita Medical Expenses for Inpatients C6	DrugExpenditure/Inpatient Expenditure per Capita
	Internal Process Dimension I	Cardiac Surgery Success Rate I1	Number of Successful Surgeries in the Period / Total Number of Surgeries in the Period
		Bed Occupancy Rate I2	Ratio of Total Bed Days Actually Occupied to Total Bed Days Actually Available
Bed Turnover Rate I3		Actual Bed Turnover in the Period / Standard Bed Turnover in the Period × Bed Occupancy Rate	
Average Length of Stay for Discharged Patients I4		Total Bed Days Occupied by Discharged Patients / Number of Discharged Patients in the Same Period	
Inpatient Mortality Rate I5		Number of Deaths in the Period / Total Number of Inpatients in the Period	
Admission and Discharge Diagnosis Concordance Rate I6		Number of Outpatient Diagnoses Matching Discharge Diagnoses / Number of Discharged Patients with Outpatient Admission Diagnoses	
Success Rate of Emergency and Critical Care Resuscitation I7		Number of Successful Emergency and Critical Care Resuscitations / Total Number of Emergency and Critical Care Patients Admitted	
Hospital-Acquired Infection Rate I8		Number of Hospital-Acquired Infections in the Period / Total Number of Inpatients in the Period	
Qualification Rate of "Three Basics" Evaluation for Healthcare Personnel I9		Number of Qualified Evaluations / Total Number of Participants Evaluated	
Learning and Growth Dimension S		Employee Training Cost Growth Rate S1	Qualitative Indicator
		Proportion of Staff Participating in Various Training Programs S2	Qualitative Indicator
		Number of New National-Level Research Projects Annually S3	Number of Research Projects Undertaken by the Hospital Annually
		Average Number of Papers Published per Capita S4	Total Number of Papers Published in the Period / Total Number of Medical Staff
Social Responsibility Dimension R		Participation in Public Health Emergencies R1	Qualitative Indicator
		Conducting Health Education Lectures and Awareness Campaigns R2	Qualitative Indicator
		Providing Free Medical Consultation Services R3	Qualitative Indicator
		Morning Ward Round Care R4	Qualitative Indicator
		Participation in Art-Assisted Therapies (e.g., Music, Painting) R5	Qualitative Indicator
	Aid Expenditure R6	Qualitative Indicator	

3.4. Chapter Summary

This chapter is the most central section. It is divided into three parts. The first part elaborates on the principles to be followed in setting indicators; the second part details the specific names, data sources, data characteristics, and selection rationale for 31 indicators; the third part presents the five secondary dimensions in the balanced scorecard and the 31 tertiary indicators (including calculation formulas) in tabular form as a summary. dimensions and 31 tertiary indicators (including calculation formulas) are presented as a conclusion.

4. AZ HOSPITAL PERFORMANCE EVALUATION

4.1. Weight Determination

4.1.1. Principles of Weight Determination

When using the balanced scorecard, determining indicator weights is essential, as it plays a crucial role in the scorecard's effectiveness. Only by assigning weights to different indicators [17] can the balanced scorecard transition from an abstract theoretical tool to a practical management instrument. This paper employs the Analytic Hierarchy Process (AHP) to determine weights.

The Analytic Hierarchy Process is a more scientific and representative method for determining indicator weights compared to expert scoring. It can be used to design weights for the various indicators in the balanced scorecard. This significantly reduces subjective factors, resulting in more accurate and scientific quantitative decisions, thereby compensating for the limitations of expert scoring.

4.1.2. Weight Calculation

After obtaining pairwise comparisons of the importance between factors, the software application, based on the expert decision-making method, can determine the relative importance of different factors. During the importance comparison, a consistency check is required to ultimately derive the weights of different factors.

To ensure the scientific and practical nature of the weights, this study primarily involves creating questionnaires, inviting relevant professionals to provide scores and comparisons, inputting the comparison values of different levels and indicators into the software, and conducting consistency checks.

To ensure the scientific validity of the weights, this study mainly involves creating questionnaires (see Appendix 1-7), inviting relevant professionals to score [18]. A total of 45 questionnaires were distributed and all 45 were collected. In the AHP software, we input the comparison or scoring values of different levels and indicators, ultimately deriving the weight values for each indicator. Using group expert decision-making in the software, the importance of different questionnaires was determined, as shown in Table 4.1:

Table 4.1. Judgment Matrix for Secondary Dimensions

Secondary dimension	F	C	I	S	R	Wi
F	1.0000	3.0000	2.0000	4.0000	2.0000	0.3764
C	0.3333	1.0000	1.0000	1.0000	1.0000	0.1403
I	0.5000	1.0000	1.0000	4.0000	2.0000	0.2430
S	0.2500	1.0000	0.2500	1.0000	2.0000	0.1224
R	0.5000	1.0000	0.5000	0.5000	1.0000	0.1179

Consistency ratio for performance evaluation research: 0.0753; Weight for "performance evaluation research": 1.0000; λ_{\max} : 5.3373, CR=0.0743<0.1

Here, we clarify that for convenience and to make the table appear concise, we use algebra (English letters) to represent secondary dimensions, which helps keep the table neat and orderly.

Financial dimension F, Customer dimension C, Internal process dimension I, Learning and growth dimension S, Social responsibility dimension R, are represented by these 5 letters respectively.

Below is the weight table for the tertiary indicators within the 5 dimensions.

Table 4.2. Financial dimension judgment matrix

F	F1	F2	F3	F4	F5	F6	Wi
F1	1.0000	3.0000	2.0000	3.0000	4.0000	3.0000	0.3413
F2	0.3333	1.0000	0.3333	4.0000	3.0000	2.0000	0.1714
F3	0.5000	3.0000	1.0000	3.0000	2.0000	2.0000	0.2321
F4	0.3333	0.2500	0.3333	1.0000	0.5000	0.5000	0.0611
F5	0.2500	0.3333	0.5000	2.0000	1.0000	2.0000	0.1037
F6	0.3333	0.5000	0.5000	2.0000	0.5000	1.0000	0.0904

Financial dimension consistency ratio: 0.0658; Weight for "performance evaluation research": 0.3764; λ_{\max} : 6.4142, CR=0.0743<0.1. See Table 4.3:

Table 4.3. Customer dimension judgment matrix

C	C1	C2	C3	C4	C5	C6	Wi
C1	1.0000	3.0000	3.0000	2.0000	3.0000	3.0000	0.3392
C2	0.3333	1.0000	1.0000	0.5000	2.0000	2.0000	0.1368
C3	0.3333	1.0000	1.0000	0.3333	1.5000	1.5000	0.1159
C4	0.5000	2.0000	3.0000	1.0000	2.0000	2.0000	0.2237
C5	0.3333	0.5000	0.6667	0.5000	1.0000	0.5000	0.0814
C6	0.3333	0.5000	0.6667	0.5000	2.0000	1.0000	0.1029

Customer dimension consistency ratio: 0.0293; Weight for "performance evaluation research": 0.1403; λ_{\max} : 6.1843, CR=0.0743<0.1. See Table 4.4:

Table 4.4. Internal Process Dimension Judgment Matrix

I	I1	I2	I3	I4	I5	I6	I7	I8	I9	Wi
I1	1.000	1.000	0.500	2.000	2.000	3.000	0.333	0.500	0.500	0.095
I2	1.000	1.000	2.000	1.000	2.000	3.000	0.250	0.500	1.000	0.107
I3	2.000	0.500	1.000	1.000	1.000	0.500	0.250	2.000	2.000	0.104
I4	0.500	1.000	1.000	1.000	0.500	0.333	0.333	0.500	0.333	0.056
I5	0.500	0.500	1.000	2.000	1.000	1.000	0.333	0.500	1.000	0.072
I6	0.333	0.333	2.000	3.000	1.000	1.000	0.333	0.500	0.500	0.079
I7	3.000	4.000	4.000	3.000	3.000	3.000	1.000	2.000	3.000	0.256
I8	2.000	2.000	0.500	2.000	2.000	2.000	0.500	1.000	2.000	0.132
I9	2.000	1.000	0.500	3.000	1.000	2.000	0.333	0.500	1.000	0.099

Internal process dimension consistency ratio: 0.0882; Weight for "performance evaluation research": 0.2430, λ (max): 10.0302, CR=0.0743<0.1. See Table 4.5:

Table 4.5. Learning and Growth Dimension Judgment Matrix

S	S1	S2	S3	S4	Wi
S1	1.0000	2.0000	0.5000	1.0000	0.2260
S2	0.5000	1.0000	0.3333	1.0000	0.1436
S3	2.0000	3.0000	1.0000	3.0000	0.4588
S4	1.0000	1.0000	0.3333	1.0000	0.1716

Learning and growth dimension consistency ratio: 0.0172; Weight for "performance evaluation research": 0.1224; λ_{\max} : 4.0458, CR=0.0743<0.1. See Table 4.6:

Table 4.6. Judgment matrix for social responsibility dimension

R	R1	R2	R3	R4	R5	R6	Wi
R1	1.0000	3.0000	2.0000	4.0000	4.0000	1.0000	0.3077
R2	0.3333	1.0000	0.5000	3.0000	2.0000	0.5000	0.1287
R3	0.5000	2.0000	1.0000	3.0000	2.0000	1.0000	0.1898
R4	0.2500	0.3333	0.3333	1.0000	0.2500	0.3333	0.0534
R5	0.2500	0.5000	0.5000	4.0000	1.0000	0.5000	0.1060
R6	1.0000	2.0000	1.0000	3.0000	2.0000	1.0000	0.2144

Social Responsibility Dimension Consistency Ratio: 0.0410; Weight for "Performance Evaluation Research": 0.1179; λ_{\max} : 6.2582, CR=0.0743 <0.1.

At this point, we have presented the weights of the five dimensions of the balanced scorecard in tabular form.

In the table below, we comprehensively display the weights, as shown in Table 4.7:

Table 4.7. AZ Hospital Operational Evaluation Indicator Weights

Objective Layer	Criterion Layer	Weight	Indicator Layer	Weight
Performance Evaluation System	Financial Dimension F	0.3764	Total Fixed Assets F1	0.3413
			Current Ratio F2	0.1714
			Return on Assets F3	0.2321
			Business Income Surplus Rate F4	0.0611
			Budget Expenditure Execution Rate F5	0.1037
			Proportion of Drug Revenue in Medical Revenue F6	0.0904
	Customer Dimension C	0.1403	Patient Satisfaction C1	0.3392
			Outpatient Growth Rate C2	0.1368
			Inpatient Growth Rate C3	0.1159
			Daily Average Specialist Consultations C4	0.2237
			Proportion of Drug Costs in Outpatient Medical Expenses C5	0.0814
			Proportion of Drug Costs in Inpatient Medical Expenses C6	0.1029
	Internal Process Dimension I	0.2430	Cardiac Surgery Success Rate I1	0.2559
			Bed Occupancy Rate I2	0.0792
			Bed Turnover Rate I3	0.0716
			Average Length of Stay I4	0.0559
			Inpatient Mortality Rate I5	0.1038
			Diagnosis Compliance Rate at Admission and Discharge I6	0.1072
			Emergency and Critical Care Success Rate I7	0.1324
			Hospital Infection Rate I8	0.0994
			Qualification Rate of "Three Basics" Evaluation for Health Personnel I9	0.0945
	Learning Growth Dimension S	0.1224	Employee Training Cost Growth Rate S1	0.2260
			Proportion of Employees Participating in Various Trainings S2	0.1436
			Number of National-Level New Research Projects Annually S3	0.4588
			Average Number of Papers Published per Capita S4	0.1716
	Social Responsibility Dimension R	0.1179	Participation in Public Health Emergencies R1	0.3077
			Health Education Lectures and Awareness Campaigns R2	0.1287
			Free Clinic Services R3	0.1898
			Morning Ward Round Care R4	0.0534
Participation in Art-Assisted Therapies (Music, Painting, etc.) R5			0.1060	
Aid Expenditure R6			0.2144	

4.2. Performance Evaluation of AZ Hospital

After completing the analysis of indicator weights, we now proceed to score the performance evaluation of AZ Hospital. In this scoring process, the 31 indicator layers of AZ Hospital are divided into two parts: qualitative indicators and quantitative indicators. AZ Hospital is categorized into five dimensions with a total of 31 indicators. Among these 31 indicators, we first discuss the quantitative indicators, which can also be further divided into two parts [19]. Some indicators can be precisely measured with collected data, while others are less straightforward to quantify but can still be represented by specific numerical values (e.g., rates, percentages). These indicators are derived by referencing the industry average (for tertiary general hospitals) and combining them with the actual conditions of AZ Hospital, ensuring a certain level of relevance.

The first category includes indicators for which data can be collected or determined based on industry reference values: total fixed assets, current ratio, return on assets, operational surplus rate, budget expenditure execution rate, proportion of drug revenue in medical revenue, outpatient patient growth rate, inpatient patient growth rate, average daily consultations per specialist, proportion of drug costs in outpatient medical expenses per visit, proportion of drug costs in inpatient medical expenses per capita, success rate of cardiac surgeries, bed occupancy rate, bed turnover rate, average length of stay, inpatient mortality rate, diagnosis consistency rate between admission and discharge, success rate of critical care rescues, hospital-acquired infection rate, pass rate of "three basics" evaluation for healthcare personnel, annual number of national-level new research projects, and average number of published papers per capita.

In the quantitative indicator analysis, the indicator values for AZ Hospital primarily reference the social responsibility reports from the hospital's performance evaluation office, employee performance salary reports, and industry yearbooks. The collected data is then compared with industry reference values to derive the quantified values for different indicators.

For qualitative indicators [20], the focus is on scoring AZ Hospital's specific performance in each corresponding qualitative indicator. Based on its actual performance, objective and scientific scores are assigned accordingly.

These indicators mainly include: patient satisfaction, growth rate of employee training expenses, proportion of staff participating in various training programs, involvement in public health emergencies, organization of health education lectures and promotional activities, provision of free medical consultations, morning ward-round care, participation in art-assisted therapies (e.g., music, painting), and aid expenditures.

4.2.1. Analysis of Quantitative Indicator Evaluation

Indicators are divided into two major categories: positive-direction and negative-direction. For the former, higher actual values relative to target values are preferable, while for the latter, lower actual values relative to target values are preferable, as shown in Table 4.8:

Table 4.8. Indicator Positive and Negative Directionality Table

Indicator	Directionality
Total Fixed Assets	Positive Correlation
Current Ratio	Positive Correlation
Return on Assets	Positive Correlation
Operating Surplus Ratio	Positive Correlation
Budget Expenditure Execution Rate	Negative Correlation
Proportion of Drug Revenue to Medical Revenue	Negative Correlation
Outpatient Growth Rate	Positive Correlation
Inpatient Growth Rate	Positive Correlation
Average daily patient consultations per specialist	Positive correlation
Proportion of drug costs in average outpatient medical expenses	Negative correlation
Proportion of drug costs in average inpatient medical expenses	Negative correlation
Success rate of cardiac surgeries	Positive correlation
Bed occupancy rate	Positive correlation
Bed turnover rate	Positive correlation
Average length of hospital stay	Negative correlation
Inpatient mortality rate	Negative correlation
Consistency rate between admission and discharge diagnoses	Positive correlation
Success rate of critical and emergency care	Positive correlation
Hospital-acquired infection rate	Negative correlation
Qualification rate of healthcare personnel in "Three Basics" evaluation	Positive correlation
Annual number of national-level new research projects	Positive correlation
Average number of published papers per capita	Positive correlation

Positive indicator quantified value = Actual value / Target value ×100%; Negative indicator quantified value = Target value / Actual value ×100%; Single indicator total score = Single indicator weight × Single indicator quantified value; Dimension total score = \sum Single indicator composite score, Total score = \sum (Dimension composite score × Dimension weight)

In the quantitative indicator analysis, this study derived the quantified values by comparing AZ Hospital's indicator data with industry standard reference values. It should be noted that the sample data we used was based on the hospital's operational reports, satisfaction score sheets, medical quality reports, financial statements, nursing quality reports, and other materials from 2014 to 2016, as shown in Table 4.9:

Tab.4.9. Quantification of quantitative indicators

Quantitative evaluation metrics	Metric value	Reference value	Quantified value
Total fixed assets (100 million yuan)	7.2	6.9	1
Current ratio	1.8	2.0	0.9
Return on assets	16%	20%	0.8
Operating surplus ratio	3%	2.87%	1
Budget expenditure execution rate	103.2%	100%	1
Proportion of drug revenue to medical revenue	37%	30%	0.810
Outpatient patient growth rate	5%	8%	0.625
Inpatient growth rate	2%	3%	0.66
Average daily consultations per specialist	11	8	1
Drug cost proportion in outpatient medical expenses per visit	75%	70%	0.93
Drug cost proportion in inpatient medical expenses per capita	65%	60%	0.923
Success rate of cardiac surgeries	98%	90%	1.089
Bed occupancy rate	101.8%	89%	1
Number of bed turnovers (times)	19.5	17	1
Average length of stay for discharged patients (days)	7.85	6.57	0.837
Inpatient mortality rate	0.09%	0.1%	1
Consistency rate between admission and discharge diagnoses	96%	95%	1
Success rate of emergency and critical care rescues	75%	80%	0.9375
Hospital-acquired infection rate	5%	7.5%	1
Qualification rate of "Three Basics" evaluation for health personnel	100%	100%	1
Annual number of national-level new research projects	8	5	1
Average number of papers published per capita	13	15	0.867

4.2.2. Evaluation and Analysis of Qualitative Indicators

In the analysis of qualitative indicators, the specific performance of the AZ hospital corresponding to the main relevant indicators is scored. This paper sets the following scale for scoring, as shown in Table 4.10:

Table 4.10. Qualitative Indicator Scoring Table

Very good	Comprehensive evaluation score reaches 90 points (including 90 points)
Good	Comprehensive evaluation score reaches 80-90 points (including 80 points)
Fairly good	Comprehensive evaluation score reaches 70-80 points (including 70 points)
Average	Comprehensive evaluation score reaches 60-70 points (including 60 points)
Below average	Comprehensive evaluation score reaches 50-60 points (including 50 points)
Poor	Comprehensive evaluation score is below 50 points

If an organization's performance is considered excellent within the industry (referring to Class III general hospitals in this context), the score should be greater than 90 points. Outstanding performance may warrant an additional 1-5 points based on specific circumstances, while significant issues may result in a deduction of 1-5 points [21]. Based on this, the scores for each qualitative indicator are determined. Below is the scoring for qualitative indicators, as shown in Table 4.11:

Table 4.11. Qualitative Indicator Scoring Table

Qualitative Evaluation Indicators	AZ Hospital Performance	Rating
Patient Satisfaction	The hospital won four five-star management awards in "Hospital Discipline Construction," "Patient Service and Experience," "Hospital Pharmaceutical Management," and "Information Technology Application."	95
Growth Rate of Employee Training Expenses	Established exchange and collaborative learning relationships with renowned foreign hospitals, continuously recommending outstanding colleagues for overseas training.	85
Percentage of Staff Participating in Various Training Programs	Beijing Anzhen Hospital has frequently secured major research projects under the National Key R&D Program, 863 Program, and international collaborations.	85
Participation in Public Health Emergencies	None	83
Conducting Health Education Lectures	Organized experts to hold multiple large-scale health education lectures in Caofeidian.	92
Conduct free clinic services	In December 2015, experts were organized to conduct a large-scale free clinic activity in Caofeidian, along with multiple major health education lectures.	93
Morning ward rounds with care	Established a system for morning ward rounds involving at least one associate chief physician, two attending physicians, and no fewer than three resident doctors.	95
Music-assisted therapy	None, no particularly outstanding aspects	87
Aid expenditure	Implementing the Beijing-Tianjin-Hebei coordinated development plan, medical cooperation in Caofeidian was advanced. On July 26, 2016, the unveiling ceremony of AZ Hospital's Caofeidian cooperative hospital was held at Caofeidian District Hospital in Tangshan.	90

4.2.3. Quantitative Indicator Scores

The scores for the quantitative indicators are as follows, see Table 4.12:

Table 4.12. Quantitative Indicator Scoring Sheet

Quantitative evaluation metrics	Weight	Quantitative value	Score
Total fixed assets (100 million yuan)	0.3413	1	0.3413
Current ratio	0.1714	0.9	0.15426
Return on assets	0.2321	0.8	0.18568
Business income surplus rate	0.0611	1	0.0611
Budget expenditure execution rate	0.1037	1	0.1037
Proportion of drug revenue to medical revenue	0.0904	0.810	0.073224
Outpatient patient growth rate	0.1368	0.625	0.0855
Inpatient growth rate	0.1159	0.66	0.076494
Average daily consultations per specialist	0.2237	1	0.2237
Proportion of drugs in outpatient medical costs per visit	0.0814	0.93	0.075702
Proportion of drugs in inpatient medical costs per capita	0.1029	0.923	0.094977
Success rate of cardiac surgeries	0.2559	1.089	0.278675
Bed occupancy rate	0.0792	1	0.0792
Bed turnover rate (times)	0.0716	1	0.0716
Average length of stay (days)	0.0559	0.837	0.046788
Inpatient mortality rate	0.1038	1	0.1038
Diagnosis consistency rate upon admission and discharge	0.1072	1	0.1072
Success rate of emergency and critical care rescues	0.1324	0.9375	0.124125
Hospital-acquired infection rate	0.0994	1	0.0994
Qualification rate of "Three Basics" evaluation for healthcare personnel	0.0945	1	0.0945
Annual number of national-level new research projects	0.4588	1	0.4588
Average number of published papers per capita	0.1716	0.867	0.148777

4.2.4. Qualitative Indicator Scores

The scores for qualitative indicators are as follows, see Table 4.13:

Table 4.13. Qualitative Indicator Scoring Sheet

Qualitative evaluation indicators	Weight	Score	Points
Patient satisfaction	0.3392	95	32.224
Growth rate of staff training expenses	0.2260	85	19.21
Proportion of personnel participating in various trainings	0.1436	85	12.206
Number of medical staff involved in public health emergencies	0.3077	83	25.5391
Conducting health education lectures and promotional activities	0.1287	92	11.8404
Number of free medical consultation receptions	0.1898	93	17.6514
Number of morning ward round care interactions	0.0534	95	5.073
Participation ratio of art-assisted therapies (e.g., music, painting)	0.1060	87	9.222
Growth rate of aid expenditures	0.2144	90	19.296

4.2.5 Five-Dimensional Comprehensive Score

The comprehensive scores of the five dimensions are shown in Table 4.14:

Table 4.14. Comprehensive Scoring Table

Objective Layer	Criterion Layer	Weight	Indicator Layer	Individual Score	Composite Score (Individual * Weight)
Performance Evaluation System	Financial Dimension	0.3764	Total Fixed Assets	34.13	91.9*0.3764 =34.6
			Current Ratio	15.426	
			Return on Assets	18.568	
			Business Income Surplus Rate	6.11	
			Budget Expenditure Execution Rate	10.37	
			Proportion of Drug Revenue in Medical Revenue	7.3224	
	Customer Dimension	0.1403	Patient Satisfaction	32.224	87.67*0.1403 =12.3
			Outpatient Growth Rate	8.55	
			Inpatient Growth Rate	7.6494	
			Daily Average Specialist Consultations	22.37	
			Proportion of Drug Costs in Outpatient Medical Expenses	7.5702	
			Proportion of Drug Costs in Inpatient Medical Expenses	9.4977	
			Qualification Rate of "Three Basics" Evaluation for Health Personnel	9.45	
Learning and Growth Dimension	0.1224	Employee training cost growth rate	19.21	92.32*0.1224 =11.3	
		Percentage of employees participating in various trainings	12.206		
		Annual number of national-level new research projects	45.88		
		Average number of papers published per capita	14.8777		
	Social Responsibility Dimension	0.1179	Participation in public health emergencies	25.5391	88.2*0.1179=10.4
			Conducting health education lectures and promotional activities	11.8404	
			Providing free medical consultation services	17.6514	
			Morning ward rounds with care	5.073	
			Participation in art-assisted therapies such as music and painting	9.222	
			Aid expenditure	19.296	

$V=34.6+12.3+24.4+11.3+10.4=93$ (points). It can be seen that $V \geq 90$, indicating that AZ Hospital has performed excellently overall, but there is still room for further improvement.

4.2.6. Performance Analysis of AZ Hospital

As shown in the table, AZ the hospital's overall performance is very good, with a comprehensive score above 90 [22]. Moreover, when examining each specific dimension, AZ Hospital also demonstrates strong performance. The financial dimension scores 91 points, the customer dimension scores 87, the internal process dimension scores as high as 99, the learning and growth dimension scores 92, and the social responsibility dimension scores 88.

Financial Dimension. In recent years, the hospital's scientific research and technological capabilities have achieved balanced and comprehensive development, gradually establishing it as a highly competitive institution domestically. AZ Hospital frequently secures projects under major research initiatives such as the Ministry of Science and Technology's National Key R & D Program, the 863 Program, and international collaborations. Additionally, numerous major research platforms, including the Ministry of Education's Engineering Center, Key Laboratory, and National Clinical Medical Research Center, have been established at AZ Hospital. On November 10, 2016, the Nuclear Medicine Molecular Imaging Center was inaugurated at AZ Hospital. These initiatives demonstrate that the hospital's strong financial metrics are a result of continuously introducing advanced scientific instruments and elevating its research standards. For example, the return on assets has significantly improved due to the enhanced operational efficiency and profitability of these advanced instruments, attracting more patients—especially those with severe conditions—which presents a promising opportunity for AZ Hospital's long-term development. However, there is still room for improvement. For instance, the proportion of drug revenue to total medical revenue at AZ Hospital is 7 percentage points higher than the industry average. In 2016, the State Council issued the new "Healthcare Reform 2016 Notice," explicitly calling for the elimination of drug markups and the reduction of costs for medications, equipment, and consumables through various measures. AZ Hospital's performance in this area has been less than satisfactory. The reason is that the new healthcare reform policy was introduced less than a year ago in 2016, and its implementation across the hospital's numerous departments has not yet been widespread. Currently, it is only being piloted in the Cardiac Surgery Department, a key specialty. It is believed that AZ the hospital will continue to improve in this regard in the future.

Customer dimension. This dimension is one where AZ Hospital performs relatively poorly compared to others, scoring only in the 80-90 range, rated as "good." Delving into the reasons, it's evident that two indicators—the proportion of drug costs in outpatient medical expenses per visit and the proportion of drug costs in inpatient medical expenses per capita—fall short, exceeding the industry average by 5-10 percentage points. The primary cause lies in the fact that most medications used by the hospital's core department (Cardiac Surgery), such as imported Western drugs like immunoglobulins (from the U.S. and Germany), contribute to higher drug cost ratios in medical expenses. Additionally, the reform to eliminate drug price markups has not yet been fully implemented across all departments at AZ Hospital (it began only in 2016), making above-average figures understandable. However, in recent years, AZ Hospital has initiated improvements in this dimension. For example, in April 2017, AZ launched a pilot comprehensive reform to separate drug sales from medical services, featuring extensive "top-to-bottom, side-to-side" staff training and repeated drills at every level to ensure smooth operations and continuous service enhancement. Beyond this, AZ Hospital has introduced online specialist appointments, specialized and refined services, and quality-safety upgrades, along with multiple measures to improve service quality. Specific departmental initiatives include: the Emergency Chest Pain Center establishing a green channel for critical conditions like acute myocardial infarction, aortic dissection, and pulmonary embolism; specialized clinics for specific diseases and symptoms, such as Aortic Disease Clinic, Pain Clinic, Atrial Fibrillation Clinic, Valve Center Clinic, and Anorectal Clinic, effectively guiding patients to accurate care pathways while consolidating pharmacist resources.

Internal Process Dimension. In this dimension, AZ Hospital performs exceptionally well, particularly in the success rate of cardiac surgeries. As the flagship department of AZ Hospital, its scores naturally exceed the industry average [23]. Bed utilization and turnover rates are also higher than the industry average. The only shortcoming is the lower success rate in rescuing critically ill patients compared to the industry average. A significant portion of patients visiting AZ Hospital are cardiothoracic surgery cases, whose conditions often involve unique etiologies and urgent onset, leading to inherently lower rescue success rates—an objective factor. However, there is room for improvement. For instance, in 2016, AZ Hospital's Emergency Chest Pain Center established a green channel for treating critically ill patients with conditions like acute myocardial infarction, aortic

dissection, and pulmonary embolism, allowing direct access to the surgical area and saving valuable time for patients. Other departments, however, have yet to implement similar green channels, requiring further communication and coordination with the hospital administration. It is believed that in the near future, AZ Hospital will achieve notable progress in rescuing critically ill patients.

Learning and Growth Dimension. To enhance inter-hospital and interdisciplinary communication and collaboration, thereby improving overall treatment standards, AZ Hospital's CCU established a Cardiac Critical Care Exchange Platform in May 2012, organizing quarterly academic exchange activities. As a result, the training of medical staff and healthcare professionals is relatively better than the industry average. However, the participation rate in various training programs remains low. Moving forward, large-scale training courses and strengthened exchanges should be prioritized. For example, AZ Hospital's participation in the Sino-French collaborative training program in 2016 serves as an excellent practice.

The social responsibility dimension is newly added to the original Balanced Scorecard dimensions. As a non-profit organization, social responsibility must be considered. AZ Hospital has done quite a lot in this regard. For example, in December 2015, AZ Hospital organized experts to conduct a large-scale free medical consultation activity in Caofeidian and held multiple large-scale health education lectures, which were well-received and praised by the local community. AZ Hospital also established a morning ward round system, stipulating that there must be at least one associate chief physician, two attending physicians, and no fewer than three resident physicians participating. In terms of professional technologies such as computer software [24], AZ the hospital has developed high-end research projects like genetic technology, robotic minimally invasive surgery, and monitoring analysis systems. Additionally, AZ the hospital has built a virtual surgical data collection information platform, replacing traditional methods with information technology. The area where social responsibility efforts fall short is the participation of medical staff in public health emergencies, which has been lackluster. It is hoped that AZ the hospital can increase the deployment of medical personnel in such events, actively engaging in public health emergencies. This would also enhance customer satisfaction and improve AZ the hospital's social reputation.

4.3. Chapter Summary

This chapter is divided into two parts. The first part explains the principles and calculation methods for determining weights. In the second part, leveraging the introduction of weights from the first part, the indicators are categorized into quantitative and qualitative indicators. The weights and scores of these 31 tertiary indicators in the Balanced Scorecard are calculated and analyzed separately. In the final subsection, a performance evaluation of AZ the hospital is conducted, analyzing its strengths and weaknesses, paving the way for the conclusions and recommendations in the next chapter.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

AZ The overall performance evaluation of the hospital is excellent. Particularly in quantitative indicators, a significant portion surpasses the industry average. However, despite this, there are still relatively weaker aspects in the hospital's performance evaluation that could be further improved [25]. The overall conclusions are as follows:

(1) Hospitals should introduce the Balanced Scorecard when conducting performance evaluations. Applying the Balanced Scorecard to establish a performance evaluation system in hospitals is a highly complex project, involving various aspects, external interests, and internal interests. While implementing the Balanced Scorecard, it is essential to maintain a developmental and dynamic perspective. The reasonableness of the set indicators and weights must be measured against the

hospital's strategic goals during different periods. The Balanced Scorecard must never be fixed; a one-time solution is absolutely unacceptable. In practice, it requires repeated refinement, adjustment, and improvement. In this regard, AZ Hospital has not performed well, as it currently fails to conduct regular reviews, feedback, and summaries in practice, nor does it monitor certain indicators in real-time afterward.

(2) The introduction of the social responsibility dimension has significantly improved the Balanced Scorecard. Everything exists in a dynamic development process. In practice, we need continuous improvement and refinement, flexibly combining the Balanced Scorecard with other performance evaluation tools. Ultimately, through a comprehensive performance management system, we can promote the systematization, specialization, and scientization of hospital management, uphold social welfare, and achieve sustainable hospital development. We must implement national policies, prioritize people, and provide the public with a safe, hygienic, effective, convenient, and cost-effective healthcare service system.

(3) Representative indicators for performance evaluation should be selected based on the organization's strategic vision and actual conditions [26]. The establishment of reference values for these indicators must not only consider the average level of similar departments in comparable hospitals but also account for the hospital's past performance and its current strategic vision and goals.

(4) AZ Hospital excels in the financial dimension, internal process dimension, and learning and growth dimension, but its performance in the customer dimension and social responsibility dimension is relatively weak. For hospitals, customers are patients, and social responsibility is an absolute priority. AZ Hospital should continuously improve service standards in future management, develop projects that benefit the public, advance disciplinary construction, enhance major event control capabilities, and improve IT application skills, striving to build AZ Hospital into an internationally renowned comprehensive hospital with top-tier service quality.

5.2. Recommendations

For AZ hospitals, the Balanced Scorecard remains a relatively new management tool. Hospitals should adopt a proactive attitude toward learning and applying the Balanced Scorecard, gradually absorbing, refining, and developing it. Without a doubt, the Balanced Scorecard can effectively drive the implementation of hospital strategic goals and facilitate scientific decision-making [27].

(1) Gain an in-depth understanding of the psychological journey and personal circumstances of medical and healthcare staff. When most hospital employees first encountered the Balanced Scorecard, their psychological journey typically followed this pattern: complete unfamiliarity, resistance and opposition, gradual dissipation of denial, attempting to participate in training, trying it out, beginning to develop a favorable impression, acceptance, active engagement, offering suggestions for improvement, and contributing ideas. Such a psychological journey is understandable and normal in any change initiative, as everyone worries about potential personal losses from the transformation. Facts have proven that a reasonable and scientific performance evaluation system is now accepted by employees, evolving from passively providing data for assessments to actively communicating with management and consulting on relevant management information.

(2) Strengthen training [28]. The target audience for training must include medical and healthcare personnel with higher professional titles and expertise, especially department heads and head nurses. Gaining their endorsement can, to some extent, align departmental performance with the hospital's overall development strategy and accelerate the hospital's rapid growth in future stages.

(3) Tailor performance evaluations to specific departments [29]. AZ Hospital currently faces an urgent issue that needs resolution. For example, when calculating employee salaries, the hospital often uses the same metrics across different departments to uniformly assess performance pay, which is highly unscientific. To illustrate, in the internal process dimension, AZ Hospital uniformly applies

the "first postoperative recurrence rate" to all departments, including the security office and cardiac surgery. However, the security office does not perform surgeries, making this metric irrelevant. Consequently, cardiac surgeons might receive lower performance pay than security staff. In future evaluations, the hospital should customize metrics to suit each department's specific context.

(4) Consider introducing a supporting computer management system in the future [30]. This measure has already begun trial runs at AZ Hospital but has yet to be widely implemented across all departments. In applying the Balanced Scorecard, determining reference and target values requires expert scoring, empirical data, and industry averages. The initial stages of data collection and processing demand significant manpower and resources, highlighting the practical need for a scientific computer-based performance evaluation system. Leveraging computers for data collection and weight scoring can drastically reduce complexity and achieve greater efficiency with less effort.

5.3. Research Innovations

The innovations of this paper are as follows: First, in response to AZ Hospital's development vision, strategic plans, departmental missions, and core values in recent years, more targeted indicators are introduced to construct a performance evaluation system; Second, in 2016, the General Office of the State Council issued the "Notice on Key Tasks for Deepening the Reform of the Medical and Health System in 2016." This paper incorporates these tasks into the indicator settings, making the balanced scorecard more comprehensive and policy-oriented; Third, as a representative of non-profit organizations, a hospital's existence is not merely for profit but, more importantly, to uphold social responsibility and prioritize people-centric values. This paper adds a social responsibility dimension as the fifth dimension of the balanced scorecard to comprehensively evaluate the hospital's performance management.

5.4. Limitations of the Study

This paper adopts a method combining theory and practice. Through detailed data collection, questionnaire distribution, and field research, a AZ hospital performance evaluation system was established, providing a foundation and some guidance for performance evaluation in other domestic tertiary general hospitals. However, due to the author's limited capabilities, there are still many shortcomings in this study. First, it should be noted that AZ Hospital is a non-profit organization and cannot be listed, so some data cannot be quantified and require qualitative research methods such as expert consultation. The selected performance indicators and determined weights may not suit all hospitals, posing certain difficulties in establishing AZ Hospital's performance evaluation system. Additionally, there are issues with questionnaire distribution. Due to constraints, the expert team involved may not cover all relevant fields, and it was unlikely to engage highly authoritative medical experts. For specific departments, collecting data via questionnaires was even more challenging. Thus, this study could not comprehensively extend performance evaluation to all departments or conduct deeper research, limiting the analysis to the hospital level. Finally, due to time constraints, the content may lack thorough consideration. Feedback and corrections from reviewers are sincerely welcomed.

REFERENCES

- [1] Li Yong. Thoughts on Introducing the Balanced Scorecard to Hospital Management [J]. *Investment and Finance*, 2013:80.
- [2] Liu Chenhui. Research on the Operational Evaluation System of Tertiary Hospitals: From the Perspective of an Improved Balanced Scorecard [J]. *Hospital Finance*, 2015:24-0087-04.
- [3] Gao Tian. Practical Exploration of the Balanced Scorecard in Hospitals [J]. *Science and Management*, 2007 (4):26-29.
- [4] Lin Qing-Lian; Liu Long; Liu Hu-Chen. Integrating Hierarchical Balanced Scorecard with Fuzzy Linguistic for Evaluating Operating Room Performance in Hospitals [J], *MAY 2013*, 40:6.

- [5] Rraeisi; AhmadReza; Yarmohammadian. Performance evaluation of Al-Zahra academic medical center based on Iran balanced scorecard model. [J], 2012, Mar 28, 1:1.
- [6] Tian Huixiang. Construction of a hospital performance evaluation index system based on the balanced scorecard [J]. Economic Research Guide, 2014, No. 32: 264-265.
- [7] Fu Jianqiu. Research on performance evaluation of DA Real Estate Company based on the balanced scorecard [D]. China University of Mining and Technology (Beijing), 2014.
- [8] Xing Ming. A review of the application of the balanced scorecard in hospital management [J]. Chinese Hospitals, 2010, 14(1): 77-79.
- [9] Sun Hongcai, Tian Ping, Wang Lianfen. Analytic Network Process and Decision Science [M]. Beijing: National Defense Industry Press, 2011.
- [10] Xu Yuhong. Research on establishing a balanced scorecard performance management system for hospitals [J]. Friends of Accounting, 2010:34.
- [11] Wu Ye. Application of the balanced scorecard in hospital performance management [J]. Human Resources, 2015:35-42.
- [12] Duan Wentian. Research on performance evaluation methods for all employees in underground coal mines [D]. China University of Mining and Technology (Beijing), 2015.
- [13] Wu Meiyong. Application of the balanced scorecard in hospital performance management [J]. Finance & Economics, 2014, 6 (11): 36-38.
- [14] Sun Hui. The role of the balanced scorecard in constructing a comprehensive hospital performance management system [J]. China Management Informationization, 2013, 16(3):62-64.
- [15] Xing Chao. New thinking in medical services: Theory and practice of the balanced scorecard [J]. Contemporary Medicine, 2003, 9(10): 26-28.
- [16] Chen Yuan. Exploring the application of balanced scorecard theory and methods in hospital performance management [J]. Human Resources, 2014, 14, 296: 339-340.
- [17] Lü Jiulai. Application and practice of the balanced scorecard in hospital performance management [J]. China Management Informationization, 2016, 19(12):87-89.
- [18] Yuan Xinchun. Design and application of the strategic management balanced scorecard: Based on hospital strategic management practice [J]. Communication of Finance and Accounting, 2009 (2): 61 -62.
- [19] Ma Yingqi, Li Yuping, Li Jianjun. Application of the analytic hierarchy process in evaluating the operational effectiveness of tertiary hospitals [J]. Chinese Health Economics, 2012, 5 (5): 69-70.
- [20] Yi Lihua, Hu Minmin, Hu Xueping. Research on new models of modern hospital performance and salary management [J]. Chinese Journal of Hospital Administration, 2006, 22(6):366-368.
- [21] Zou Guangwen. A Preliminary Exploration of the Application of the Balanced Scorecard in Hospital Performance Management [J]. Economic Research Guide, 2015, No. 9: 201-202.
- [22] Tang Yuehong, Xue Qian, Jiang Xiaoming, et al. Constructing a Balanced Scorecard Indicator System for Performance Evaluation in Tertiary Hospitals [J]. Chinese Health Economics, 2007, 26: 37-39.
- [23] Zhai Shuyue, Wu Jian, Chen Hengnian. The Application of the Balanced Scorecard in Performance Management of Foreign Hospitals [J]. Chinese Hospital Management, 2004, 24(4):21-24.
- [24] Fang Ling. Research on the Application of the Balanced Scorecard in Hospital Performance Management Systems [J]. Human Resources, 2010, 2:280-282.
- [25] Liu Cuiming. The Role of the Balanced Scorecard in Promoting the Public Welfare of Tertiary Hospitals [J]. China Health Human Resources, 2013, 08:76-79.
- [26] Li Deqin. Research on the Performance Management System of Tertiary Hospitals Based on the Balanced Scorecard [J]. Friends of Accounting, 2012 (1): 77-78.
- [27] Bian Kewei. Construction of a Performance Management Evaluation System for Military Hospitals Based on the Balanced Scorecard [J]. Hospital Management, 2007, 134:40-45.
- [28] Quan Ye. Research on Performance Evaluation of S Hospital Based on the Balanced Scorecard [J]. Contemporary Accounting, 2014.06:8-10.
- [29] Wang Ling. The Application and Development of the Balanced Scorecard in Hospital Performance Management [J]. Hospital Administration, 2015, 8(10): 225-228.
- [30] Xiang Henglai. The Role and Function of Financial Personnel and Financial Work in Enterprise Comprehensive Budget Management [J]. Modern Economic Information, 2015.

APPENDIX

Performance Indicator Weight Survey Questionnaire

The Balanced Scorecard performance evaluation system for AZ Hospital is divided into five dimensions: financial, customer, internal process, learning and growth, and social responsibility. Among these five dimensions, each dimension and indicator varies in importance and weight.

We have now set five levels to judge relative importance: 1: equally important, 2: slightly important, 3: moderately important, 4: very important, 5: extremely important.

When submitting to experts for scoring, inform them of the following scoring principles: If A is equally important as B, fill in 1; if A is slightly more important than B, fill in 2; if A is moderately more important than B, fill in 3; if A is significantly more important than B, fill in 4; if A is extremely more important than B, fill in 5.

Appendix 1 Relative Importance Table for Secondary Dimensions

Table 1. The secondary dimensions relatively important

	Financial Perspective	Customer Perspective	Internal Process Perspective	Learning and Growth	Social Responsibility Perspective
Financial Perspective	1	3	2	4	2
Customer Perspective		1	1	1	1
Internal Process Perspective			1	4	2
Learning and Growth				1	2
Social Responsibility Perspective					1

(When scoring, pay close attention to consistency issues. For example, if the financial dimension is more important than the learning and growth dimension, assign 3 points; if the financial dimension is very important compared to social responsibility, assign 4 points. This way, it can be seen that learning and growth (IDU) is more important than the social responsibility dimension, but the difference is not significant, so you can assign 1 or 2 points based on the specific situation.)

Complete the following 5 scoring tables:

Appendix 2. Secondary Dimensions Judgment Matrix

Evaluation Dimension	Finance	Customer	Internal Process	Learning and Growth	Social Responsibility
Finance	1				
Customer		1			
Internal Process			1		
Learning and Growth				1	
Social Responsibility					1

Appendix 3. Financial Dimension Judgment Matrix

Financial Indicators	R1	R2	R3	R4	R5	R6
R1	1					
R2		1				
R3			1			
R4				1		
R5					1	
R6						1

Note: Total fixed assets F1, current ratio F2, return on assets F3, operating surplus ratio F4, budget expenditure execution rate F5, proportion of drug revenue to medical revenue F6.

Appendix 4. Customer dimension judgment matrix

Customer Dimension	C1	C2	C3	C4	C5	C6
C1	1					
C2		1				
C3			1			
C4				1		
C5					1	
C6						1

Note: Patient satisfaction C1, outpatient growth rate C2, inpatient growth rate C3, average daily consultations per specialist C4, proportion of medication costs in per-visit outpatient expenses C5, proportion of medication costs in per-capita inpatient expenses C6.

Appendix 5. Internal Process Dimension Judgment Matrix

Internal process	I	I	I	I	I	I	I	I	I
I	1								
I		1							
I			1						
I				1					
I					1				
I						1			
I							1		
I								1	
I									1

Note: Cardiac surgery success rate I1, bed occupancy rate I2, bed turnover frequency I3, average length of stay for discharged patients I4, inpatient mortality rate I5, admission and discharge diagnosis concordance rate I6, critical care rescue success rate I7, hospital-acquired infection rate I8, "Three Basics" evaluation pass rate for healthcare personnel I9.

Appendix 6. Learning and Growth Dimension Judgment Matrix

Learning and Growth	Increase in Training Costs	Percentage of Trained Personnel	Number of Research Projects	Papers Published per Capita
Increase in Training Costs	1			
Percentage of Personnel Trained		1		
Number of Research Projects			1	
Papers Published per Capita				1

Appendix 7. Judgment Matrix of Social Responsibility Dimensions

Social Responsibility	Emergency Incident	Educational Lecture	Free Medical Consultation	Ward Round Care	Adjuvant Therapy	Aid Expenditure
Emergency Incident	1					
Educational Lecture		1				
Free Medical Consultation			1			
Ward Round Care				1		
Adjuvant Therapy					1	
Aid Expenditure						1