

Quality Management Systems in Mongolian Higher Education: A Baldrige-based Case Study of the University of Finance and Economics

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Abstract: This paper examines the quality management system of the University of Finance and Economics using a Baldrige-based assessment framework. Although quality assurance and accreditation have become increasingly important in Mongolian higher education, limited empirical research has examined how quality management systems operate inside universities as integrated institutional systems. Using survey evidence from 205 academic, administrative, and support staff members, the study evaluates seven Baldrige-based categories: leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results. The empirical analysis combines descriptive assessment, reliability analysis, regression-based pathway analysis, multicollinearity diagnostics, Lasso robustness checks, and selected institutional performance indicators used as supporting context. The results show that the university obtained 745 out of 1,000 points, equivalent to 74.5%, indicating a relatively strong quality management system. Leadership, customer focus, and results are the strongest categories, while workforce and strategy are the main areas requiring further improvement. Cronbach's alpha values range from 0.884 to 0.967, confirming strong to excellent internal consistency across the seven assessment categories. The regression-based pathway analysis shows that leadership is strongly associated with strategy and measurement, while operations and customer focus are directly associated with organizational results. The estimated indirect pathway from leadership to results through strategy and operations is positive, suggesting that leadership contributes to institutional performance through strategic planning and operational implementation. The Lasso robustness checks support the stability of the main pathway relationships. The paper concludes that quality management in higher education should be understood as an interconnected institutional system rather than a compliance-oriented activity. For Mongolian universities, the findings highlight the importance of strengthening workforce development, strategic alignment, evidence-based decision-making, operational coordination, and stakeholder-oriented continuous improvement.

Keywords: Quality Management System, Baldrige Framework, Higher Education, Institutional Performance, Quality Assurance, Mongolia

1. Introduction

Quality management has become an important issue in higher education because universities are increasingly expected to demonstrate institutional effectiveness, stakeholder responsiveness, accountability, continuous

improvement, and measurable performance outcomes. In many higher education systems, quality is no longer understood only as compliance with accreditation standards. It is increasingly viewed as an integrated management process that connects leadership, strategy, evidence-based decision-

making, workforce development, operational effectiveness, stakeholder engagement, and institutional results [1, 2, 6].

Higher education institutions operate in a complex and competitive environment. They must provide relevant academic programs, improve teaching and learning, support research, respond to student and employer expectations, meet accreditation requirements, and strengthen institutional competitiveness. These pressures have encouraged universities to move from narrow quality assurance toward broader quality management systems. While quality assurance focuses mainly on whether standards are met, quality management emphasizes continuous improvement, organizational learning, process management, and the systematic use of performance information [7–9].

Recent international research confirms that quality management and quality assurance remain central issues in higher education. Iqbal et al. [32] show that quality management initiatives are positively related to institutional performance and that academic accreditation can strengthen this relationship. Serrano [33] finds that the effectiveness of quality assurance systems is associated with institutional performance through management support, infrastructure quality, and stakeholder engagement. Tran [34] also shows that research on higher education quality assurance has expanded internationally, reflecting growing attention to institutional reputation, teaching quality, research capacity, and competitiveness.

The Baldrige Excellence Framework provides a useful model for examining quality management as an interconnected institutional system. The framework evaluates organizational performance through seven major categories: leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results [15, 16]. Its central logic is that leadership provides direction, strategy translates direction into priorities, measurement supports evidence-based decision-making, workforce and operations implement institutional processes, customer focus connects the institution with stakeholders, and results reflect overall organizational performance [4, 19].

The Baldrige framework is particularly relevant for higher education because universities are not simple production organizations. Their performance depends on the interaction of academic, administrative, student-service, research, governance, and external engagement processes. Therefore, a quality management system in higher education should not be evaluated only through isolated indicators such as student numbers, accreditation status, or research output. Instead, it should be assessed as a system in which leadership, strategy, staff capacity, data use, operational processes, and stakeholder orientation jointly contribute to institutional results [3, 6, 14].

Recent studies also emphasize that the success of quality assurance and quality management systems depends on institutional context and implementation capacity. Mtitu [35] shows that the introduction and implementation of quality assurance systems are shaped by organizational, regulatory, and stakeholder-related factors. Mukhatayev et al. [36] similarly show that post-transition higher

education systems face quality assurance challenges related to coordination, stakeholder participation, and institutional development. These findings are relevant for Mongolia, where higher education institutions have experienced structural change, accreditation reform, and increasing expectations for international competitiveness.

Mongolian higher education has undergone major changes since the transition period, including the expansion of access, growth of private institutions, accreditation reforms, institutional restructuring, and increasing attention to graduate employability and international competitiveness [30, 31]. These changes have increased the importance of internal quality assurance and quality management systems. However, much of the discussion in Mongolia has focused on accreditation, program standards, governance reform, and external evaluation. Relatively limited empirical research has examined how quality management systems operate inside Mongolian universities using an integrated diagnostic framework.

This research gap is important for both academic and practical reasons. From an academic perspective, there is a need for empirical evidence on how international quality management models can be applied in developing-country and post-transition higher education contexts. From a practical perspective, Mongolian universities need diagnostic tools that can identify not only whether quality assurance mechanisms exist, but also how leadership, strategy, workforce, operations, stakeholder orientation, and institutional results are connected. A Baldrige-based framework is useful in this regard because it allows quality management to be assessed as a system rather than as a set of separate administrative activities.

This study addresses this gap by examining the quality management system of the University of Finance and Economics using a Baldrige-based assessment framework. The University of Finance and Economics provides a relevant case because it has pursued institutional development through quality assurance, program improvement, stakeholder engagement, international accreditation, and performance-oriented management. Although a single case cannot represent all Mongolian universities, it can provide useful institutional evidence on how a quality management system is structured, where its strengths are located, and which areas require further improvement.

The main objective of the study is to assess the current state of the quality management system at the University of Finance and Economics and to examine how the main Baldrige-based categories are associated with organizational results. More specifically, the study aims to:

- 1) assess the university's quality management system using a 1,000-point Baldrige-based scoring structure;
- 2) identify the strongest and weakest quality management categories;
- 3) evaluate the internal consistency and construct validity considerations of the Baldrige-based survey categories;
- 4) examine the regression-based pathway relationships among leadership, strategy, measurement, workforce, operations, customer focus, and results; and

- 5) review selected institutional performance indicators as supporting context for interpreting quality management development.

Based on these objectives, the study addresses the following research questions:

- 1) What is the current level of quality management performance at the University of Finance and Economics?
- 2) Which Baldrige-based categories represent the strongest and weakest areas of the university's quality management system?
- 3) Are the survey categories internally consistent and theoretically suitable for empirical analysis?
- 4) How are leadership, strategy, measurement, workforce, operations, and customer focus associated with organizational results?
- 5) What institutional improvement priorities can be identified from the Baldrige-based assessment?

The study contributes to the literature in three ways. First, it provides empirical evidence on quality management in Mongolian higher education, a context that remains underrepresented in international quality management research. Second, it applies a Baldrige-based framework to assess the quality management system of a higher education institution as an integrated organizational system. Third, it uses regression-based pathway analysis to examine how quality management categories are connected with institutional results, thereby moving beyond descriptive quality assessment toward system-level interpretation.

The central argument of the paper is that quality management performance in higher education depends on system alignment. Leadership is expected to shape strategy and measurement. Strategy and measurement are expected to support workforce and operations. Operations and customer focus are expected to contribute directly to organizational results. This logic is consistent with the Baldrige view that institutional performance is produced through the interaction of management categories rather than through isolated quality assurance activities. It is also consistent with recent work on strategic management in higher education, which emphasizes the importance of linking institutional priorities, governance, implementation capacity, and performance outcomes [37].

The scope of the study is limited to the University of Finance and Economics. Therefore, the findings should not be interpreted as nationally representative of all Mongolian higher education institutions. In addition, the survey data are cross-sectional, meaning that the regression analysis identifies statistical associations rather than strict causal effects. Despite these limitations, the study provides useful evidence for institutional managers, quality assurance units, policymakers, and higher education researchers interested in strengthening quality management systems in Mongolia.

The remainder of the paper is organized as follows. Section 2 reviews the literature on quality management in higher education, the Baldrige framework, quality management dimensions, institutional performance, and Mongolian higher education. Section 3 describes the

research design, data, sample, assessment framework, scoring procedure, reliability and construct validity considerations, and empirical methods. Section 4 presents the descriptive assessment, reliability results, regression-based pathway analysis, multicollinearity diagnostics, Lasso robustness checks, and selected institutional performance indicators. Section 5 discusses the findings and their implications for quality management in Mongolian higher education. Section 6 concludes the paper and identifies directions for future research.

2. Literature review

2.1. Quality Management in Higher Education

Quality management has become an important issue in higher education as universities face increasing pressure to improve institutional performance, strengthen accountability, respond to stakeholder expectations, and demonstrate the quality of teaching, research, and services. In the higher education context, quality is a multidimensional concept that may refer to fitness for purpose, value for money, learner transformation, stakeholder satisfaction, institutional effectiveness, and continuous improvement [1–3]. Because universities perform multiple functions, including teaching, research, community engagement, professional training, and student support, quality management cannot be limited to inspection or compliance. It requires an integrated institutional system that connects leadership, strategy, academic processes, staff development, stakeholder engagement, evidence-based decision-making, and results [4–6].

Traditional quality assurance in higher education often emphasizes accreditation, external evaluation, program review, and compliance with national standards [7, 8]. These mechanisms are important because they help protect minimum standards and strengthen public confidence in higher education institutions. However, compliance-oriented quality assurance alone may not be sufficient to produce continuous improvement. For this reason, the literature distinguishes between quality assurance and quality management. Quality assurance focuses on demonstrating that standards are met, whereas quality management focuses on building internal systems that continuously improve institutional processes and outcomes [1, 6, 9]. This distinction is particularly important for developing higher education systems, where universities are expected not only to satisfy accreditation requirements, but also to improve institutional performance, stakeholder satisfaction, and labor-market relevance.

The literature on total quality management emphasizes customer focus, leadership commitment, employee involvement, process management, data-based decision-making, and continuous improvement [10–12]. Although these principles were developed mainly in industrial and service-sector contexts, they have increasingly been applied to higher education [3, 13, 14]. In universities, quality management requires adaptation because students are not ordinary customers, academic work is complex,

and educational outcomes are co-produced by institutions, teachers, students, employers, and society. Therefore, higher education quality management must balance stakeholder responsiveness with academic standards, professional autonomy, institutional mission, and long-term educational value [1, 3, 6].

2.2. Baldrige Framework as a Quality Management Model

The Baldrige Excellence Framework is one of the most widely used models for assessing organizational performance and quality management. The framework evaluates organizations through interconnected categories such as leadership, strategy, customers, measurement, analysis and knowledge management, workforce, operations, and results [15, 16]. Unlike narrow quality-control approaches, the Baldrige framework treats organizational performance as a system. It assumes that leadership sets direction, strategy translates direction into priorities, measurement and knowledge management support evidence-based decisions, workforce and operations implement organizational processes, customer focus aligns the organization with stakeholder needs, and results reflect the overall performance of the system [4, 15, 19].

The Baldrige framework has been applied in education because it provides a structured method for examining how institutional management processes contribute to educational and organizational outcomes [4, 17]. In higher education, the framework can be used to assess leadership effectiveness, strategic planning, student and stakeholder engagement, information systems, staff development, academic and administrative processes, and performance results. It is therefore useful not only as an award or evaluation model, but also as a diagnostic tool for institutional self-assessment and continuous improvement [4, 17, 18].

A major strength of the Baldrige framework is its systems logic. The framework does not treat quality dimensions as isolated areas. Instead, it emphasizes alignment among institutional mission, leadership, strategy, processes, human resources, stakeholder expectations, and outcomes [15, 19]. This is particularly relevant for universities because institutional performance depends on the coordination of multiple academic and administrative units. For example, improvement in student outcomes may require leadership commitment, curriculum reform, staff development, student support services, data systems, stakeholder feedback, and operational coordination. A Baldrige-based approach is therefore suitable for analyzing quality management in higher education as an interconnected institutional system rather than as a collection of separate activities.

2.3. Core Dimensions of Quality Management Systems

Leadership is widely recognized as a central dimension of quality management. Senior leaders are responsible for setting institutional direction, defining quality priorities, building

an improvement culture, allocating resources, and ensuring accountability [10, 11, 19]. In higher education, leadership is especially important because universities are professional organizations where academic and administrative units must be coordinated around a shared mission. Effective leadership supports strategic alignment, evidence-based decision-making, staff participation, and stakeholder engagement [3, 4]. Leadership is therefore commonly treated as a foundational driver of quality management performance.

Strategy is another essential component of quality management. Strategic planning links institutional mission with measurable objectives, implementation mechanisms, resource allocation, and performance monitoring [15, 20]. In higher education, strategic planning is necessary because universities must respond to changing student demand, labor-market expectations, research priorities, accreditation requirements, internationalization, and technological change. However, strategic planning becomes meaningful only when it is translated into operational processes and institutional learning [6, 21]. Thus, strategy should not be viewed only as a formal planning document, but also as a management process that connects institutional priorities with everyday academic and administrative practice.

Customer focus and stakeholder orientation are also important in higher education quality management. The concept of customer focus is debated in universities because students are learners, participants, and co-producers of educational outcomes, not simply consumers [3, 6]. Nevertheless, stakeholder orientation remains essential. Universities must understand and respond to the expectations of students, graduates, employers, academic staff, administrative staff, government agencies, accreditation bodies, professional associations, and society [1, 13]. A stakeholder-oriented quality management system can help institutions improve student services, curriculum relevance, graduate employability, employer satisfaction, and public accountability.

Measurement, analysis, and knowledge management provide the evidence base for quality improvement. Quality management requires reliable data on teaching, research, student satisfaction, graduate employment, stakeholder feedback, staff development, operational processes, and institutional outcomes [15, 19]. Without measurement and analysis, universities may rely on informal impressions rather than systematic evidence. Institutional research, performance indicators, internal surveys, program reviews, and feedback systems therefore play an important role in evidence-based management [6, 21]. In this sense, measurement is not only a reporting activity, but also a learning mechanism that supports continuous improvement.

Workforce is a critical dimension of quality management in higher education. Academic and administrative staff are the main actors who design curricula, deliver teaching, support students, conduct research, manage operations, and implement institutional strategy. Staff development, employee engagement, professional training, workload balance, participation in decision-making, and recognition

systems are therefore important for institutional quality [5, 14]. Quality management cannot be sustained if employees do not understand institutional goals or are not supported in implementing improvement initiatives. This makes workforce development a key condition for the effective functioning of a university quality management system.

Operations refer to the design, management, and improvement of core institutional processes. In universities, operations include teaching and learning, curriculum management, student admission, academic administration, research support, library and digital services, student services, quality assurance procedures, and external engagement. Process management is central to quality management because institutional results depend on the consistency and effectiveness of operational processes [12, 19]. From a Baldrige perspective, operations translate leadership, strategy, measurement, and workforce capacity into concrete institutional performance.

2.4. Quality Management and Institutional Performance

A key assumption of the quality management literature is that well-designed management systems contribute to improved organizational performance. Empirical studies have shown that leadership, strategic planning, customer focus, workforce involvement, process management, and information analysis are associated with stronger performance outcomes [22–25]. In higher education, this relationship is more complex because institutional outcomes include teaching quality, student satisfaction, graduate employment, research output, accreditation results, stakeholder trust, and long-term reputation [4, 6, 14].

The Baldrige framework is useful for analyzing this relationship because it links management practices with results. Results are not treated as independent achievements; they are understood as outcomes of leadership, strategy, customer focus, measurement, workforce, and operations [15, 16]. This systems perspective is especially important in higher education, where institutional performance cannot be explained by one factor alone. For example, graduate employability may depend on curriculum design, teaching quality, employer engagement, student support, institutional reputation, and labor-market conditions. Similarly, research performance may depend on leadership priorities, staff capacity, funding, collaboration, and knowledge management. Quality management studies should therefore examine how institutional categories are connected rather than treating them as isolated indicators.

Previous studies also show that quality management in higher education should be connected with continuous improvement rather than one-time evaluation [3, 6]. Continuous improvement requires feedback loops, performance monitoring, staff participation, and institutional learning. It also requires that survey results and assessment scores be translated into action plans. From this perspective, the value of a Baldrige-based assessment lies not only in producing a total score, but also in identifying where the

institution is strong, where it is weak, and how improvement initiatives should be prioritized.

2.5. Quality Management in Mongolian Higher Education

Mongolian higher education has experienced significant changes since the transition period, including expansion of access, growth of private institutions, accreditation reforms, institutional restructuring, increasing attention to quality assurance, and stronger expectations regarding graduate employability and international competitiveness [30, 31]. These changes have increased the need for universities to strengthen internal quality assurance and quality management systems. As higher education institutions compete for students, accreditation, partnerships, and labor-market relevance, institutional quality can no longer be evaluated only through enrollment numbers or compliance with formal requirements.

In Mongolia, quality assurance has often been discussed in relation to accreditation, program standards, institutional governance, and policy reform. However, relatively limited empirical research has examined quality management systems inside universities using an integrated diagnostic framework. This creates a research gap because quality management requires more than external evaluation. Universities need internal systems that connect leadership, strategy, evidence-based management, workforce development, operations, stakeholder engagement, and results. A Baldrige-based framework is useful in this context because it provides a structured method for examining these relationships within a single institutional system.

The University of Finance and Economics provides a relevant case for this type of analysis. As a specialized higher education institution in Mongolia, it has pursued institutional development through quality assurance, program improvement, stakeholder engagement, international accreditation, and performance-oriented management. Studying this case can provide insight into how a Mongolian university applies quality management principles and where further improvement may be required. Although one case cannot represent all Mongolian universities, it can generate useful institutional evidence and provide a model for applying quality management assessment in similar higher education contexts.

2.6. Research Gap and Study Positioning

The reviewed literature shows that quality management in higher education has shifted from compliance-oriented quality assurance toward integrated systems of institutional improvement. It also shows that the Baldrige framework is suitable for examining quality management as an interconnected system linking leadership, strategy, customer focus, measurement, workforce, operations, and results [4, 15, 16]. However, there remains limited empirical evidence on the application of Baldrige-based quality management assessment in Mongolian higher education.

This study addresses that gap by applying a Baldrige-based diagnostic framework to the University of Finance and Economics. The paper contributes to the literature in three ways. First, it provides institutional evidence on the current state of a quality management system in a Mongolian higher education institution. Second, it identifies the relative strengths and weaker areas of the system using category-level assessment scores. Third, it examines the relationships among quality management categories through regression-based pathway analysis, thereby showing how leadership, strategy, measurement, workforce, operations, and customer focus are associated with organizational results.

Based on the literature, the study expects quality management performance to depend on system alignment. Leadership is expected to influence strategy and measurement. Strategy and measurement are expected to support workforce and operations. Operations and customer focus are expected to be directly associated with organizational results. This logic reflects the Baldrige view that institutional performance is produced through an integrated management system rather than through isolated quality assurance activities.

3. Methodology

3.1. Research Design

This study employs a quantitative, cross-sectional case study design to examine the quality management system of the University of Finance and Economics in Mongolia. A Baldrige-based assessment framework is used to evaluate the current state of the university's quality management system and to examine the relationships among leadership, strategy, customer focus, measurement, workforce, operations, and organizational results.

A case study design is appropriate because the research focuses on one higher education institution and examines its quality management system in depth. The University of Finance and Economics provides a relevant case because it has implemented several quality assurance and institutional development initiatives, including process-based management, international accreditation, strategic planning, and performance-oriented institutional reforms. The case therefore allows the study to examine how a Baldrige-based quality management framework can be applied in the context of Mongolian higher education.

The empirical analysis proceeds in four stages. First, descriptive statistics are used to summarize the sample structure and the Baldrige-based category scores. Second, reliability analysis is conducted using Cronbach's alpha to assess the internal consistency of the survey categories. Third, regression-based pathway analysis is used to examine how leadership, strategy, measurement, workforce, operations, and customer focus are associated with organizational results. Fourth, multicollinearity diagnostics and Lasso robustness checks are conducted, and selected institutional performance indicators are reviewed as supporting contextual evidence.

3.2. Data and Sample

The empirical data were collected through a structured questionnaire administered to academic, administrative, and support staff of the University of Finance and Economics. The survey was designed to assess the current state of the university's quality management system based on the main categories of the Baldrige framework.

The final sample consists of 205 respondents, representing 75.1% of the university's total employees. The sample includes 109 out of 127 academic staff members, corresponding to a response rate of 85.8%, and 96 out of 146 administrative and support staff members, corresponding to a response rate of 65.8%. The sample therefore provides broad institutional coverage and includes both academic and non-academic perspectives on the university's quality management system.

The data have a cross-sectional structure because the survey was conducted at one point in time. Therefore, the empirical analysis identifies statistical associations among quality management dimensions, but it does not establish strict causal effects. The regression results are interpreted as evidence of association and pathway consistency rather than as definitive causal estimates.

3.3. Assessment Framework and Variables

The study applies a Baldrige-based quality management assessment framework. The framework evaluates the university's quality management system across seven major categories: leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results. These categories represent the main dimensions through which institutional quality management is planned, implemented, monitored, and improved.

Leadership captures the role of senior management, governance, institutional direction, and responsibility for quality improvement. Strategy refers to the formulation and implementation of institutional priorities. Customer focus reflects the university's ability to understand and respond to the needs of students, graduates, employers, and other stakeholders. Measurement, analysis and knowledge management captures the use of data, evidence, performance indicators, and organizational knowledge in decision-making. Workforce refers to human-resource development, staff engagement, capacity building, and employee support. Operations captures process management, operational effectiveness, and continuous improvement. Results represent the institutional outcomes of the quality management system.

These seven categories are used as the main variables in the regression-based pathway analysis. The model examines how leadership, strategy, measurement, workforce, operations, and customer focus are associated with organizational results. In the final pathway model, results are treated as the dependent variable, while leadership, strategy, measurement, workforce, operations, and customer focus are treated as explanatory or

mediating dimensions within the quality management system.

3.4. Scoring Procedure

The descriptive assessment follows a 1,000-point Baldrige-based scoring structure. The seven assessment categories are weighted according to the Baldrige framework: leadership 120 points, strategy 85 points, customer focus 85 points, measurement, analysis and knowledge management 90 points, workforce 85 points, operations 85 points, and results 450 points. The total maximum score is therefore 1,000 points.

Each category was operationalized through survey items corresponding to the relevant Baldrige-based assessment dimension. The responses within each category were aggregated to obtain a category-level score. The obtained score was then converted into a percentage of the maximum possible score for that category. The weighted category score was calculated as follows:

$$S_j = \frac{O_j}{M_j} \times W_j,$$

where S_j denotes the weighted score for category j , O_j denotes the obtained raw score, M_j denotes the maximum possible raw score, and W_j denotes the Baldrige point weight assigned to that category.

The total quality management score was calculated by summing the weighted scores of the seven categories:

$$Total\ score = \sum_{j=1}^7 S_j.$$

This procedure allows the study to express the university's quality management performance both as a total point score and as a percentage of the maximum possible score. It also enables comparison across categories and identification of relative strengths and improvement priorities.

3.5. Reliability and Construct Validity

Reliability analysis was used to evaluate the internal consistency of the Baldrige-based survey categories. Cronbach's alpha was used as the main reliability coefficient because it measures whether the items within each category consistently represent the same underlying construct [26]. In applied social science research, alpha values above 0.70 are commonly interpreted as acceptable, while values above 0.80 and 0.90 indicate strong and excellent internal consistency, respectively [27, 28].

The reliability analysis was conducted for the seven assessment categories: leadership, strategy, customer focus, measurement, workforce, operations, and results. High alpha values indicate that the items within each category are internally consistent and suitable for use in the descriptive assessment and regression-based pathway analysis.

Construct validity was considered in three ways. First, content validity was supported by aligning the survey structure with the Baldrige Excellence Framework and the literature on

quality management in higher education. Second, face and contextual validity were supported by adapting the assessment categories to the institutional context of the University of Finance and Economics and by collecting responses from academic, administrative, and support staff who have direct knowledge of the university's quality management processes. Third, internal consistency evidence was provided through Cronbach's alpha values for each category.

However, formal tests of convergent and discriminant validity, such as average variance extracted, composite reliability, or confirmatory factor analysis, were not conducted because the study uses predefined category-level composite scores rather than a full latent-variable measurement model. This is a methodological limitation. Therefore, the results are interpreted as evidence of internal consistency and theoretically grounded category-level validity, rather than as full psychometric validation of the measurement model. Future research with larger multi-institutional samples could apply confirmatory factor analysis or structural equation modeling to test convergent validity, discriminant validity, and structural relationships more fully.

3.6. Descriptive Assessment

Descriptive analysis is used to summarize the current state of the quality management system at the University of Finance and Economics. The analysis reports category-level scores, obtained points, possible points, and percentage values within the 1,000-point Baldrige-based assessment structure. The purpose of this assessment is to identify the relatively stronger and weaker areas of the university's quality management system.

The category scores are interpreted in relation to the maximum possible score assigned to each Baldrige category. Higher scores indicate relatively stronger development of the corresponding quality management dimension, while lower scores indicate areas requiring further improvement. This analysis provides the empirical basis for identifying strengths such as leadership, customer focus, and results, as well as improvement priorities such as workforce and strategy.

3.7. Regression-based Pathway Model

Regression-based pathway analysis is used to examine the relationships among the Baldrige-based quality management categories. The model is designed to assess whether leadership is associated with organizational results through strategy, measurement, workforce, operations, and customer focus. This approach follows the logic of quality management systems, where leadership shapes institutional direction, strategy, and evidence-based management; these factors support workforce and operational processes; and operational and stakeholder-oriented processes are associated with institutional results.

A regression-based pathway model was selected instead of structural equation modeling (SEM) for three reasons. First, the objective of the study is diagnostic rather than full latent-

variable theory testing. The study aims to examine whether the Baldrige-based categories are associated with one another in a theoretically expected sequence. Second, the Baldrige categories are treated as predefined composite assessment dimensions rather than newly developed latent constructs. Therefore, the analysis focuses on category-level associations rather than item-level measurement modeling. Third, the study is based on a single-institution cross-sectional sample. Although the sample size is sufficient for regression-based analysis, a full SEM approach would require stronger item-level measurement validation, including confirmatory factor analysis and formal tests of convergent and discriminant validity. For these reasons, the regression-based pathway model provides a transparent and parsimonious approach for examining system alignment among the Baldrige categories.

In the pathway model, the main variables are abbreviated as follows: L_i denotes leadership, S_i strategy, M_i measurement, analysis and knowledge management, W_i workforce, O_i operations, C_i customer focus, and R_i results. The model is specified as follows:

$$\begin{aligned} S_i &= \alpha_0 + \alpha_1 L_i + \varepsilon_{1i}, \\ M_i &= \gamma_0 + \gamma_1 L_i + \varepsilon_{2i}, \\ W_i &= \delta_0 + \delta_1 L_i + \delta_2 S_i + \delta_3 M_i + \varepsilon_{3i}, \\ O_i &= \theta_0 + \theta_1 S_i + \theta_2 M_i + \theta_3 W_i + \varepsilon_{4i}, \\ C_i &= \lambda_0 + \lambda_1 S_i + \lambda_2 W_i + \lambda_3 O_i + \varepsilon_{5i}, \\ R_i &= \beta_0 + \beta_1 O_i + \beta_2 C_i + \varepsilon_{6i}. \end{aligned} \quad (1)$$

The first equation estimates the association between leadership and strategy. The second equation estimates the association between leadership and measurement, analysis and knowledge management. The third equation estimates how leadership, strategy, and measurement are associated with workforce. The fourth equation estimates how strategy, measurement, and workforce are associated with operations. The fifth equation estimates how strategy, workforce, and operations are associated with customer focus. The final equation estimates how operations and customer focus are associated with institutional results.

The estimated coefficients are interpreted as pathway associations among the main dimensions of the quality management system. A positive coefficient indicates that a higher score in one quality management category is associated with a higher score in the subsequent category. Model fit is assessed using R^2 , the overall significance of the model, and the statistical significance of the estimated coefficients. Since the Baldrige categories are conceptually related, the pathway results are interpreted as evidence of association and system alignment, not as strict causal effects.

Figure 1 presents the conceptual pathway model used in the study. The figure summarizes the expected relationships among the Baldrige-based quality management categories. The model follows the Baldrige logic that leadership shapes strategy and measurement, these categories support workforce and operations, and operations and customer focus are associated with organizational results.

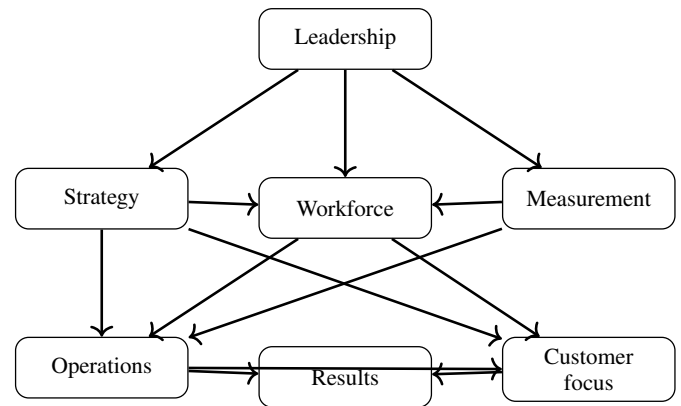


Figure 1. Conceptual pathway model of Baldrige-based quality management categories

Indirect effect calculation. The pathway model also allows the study to estimate selected indirect effects. In particular, the indirect association between leadership and results through strategy and operations is calculated as the product of the relevant pathway coefficients:

$$\text{Leadership} \rightarrow \text{Strategy} \rightarrow \text{Operations} \rightarrow \text{Results}.$$

The indirect effect is therefore calculated as:

$$\alpha_1 \times \theta_1 \times \beta_1.$$

This calculation is used to examine whether leadership is associated with organizational results through strategic planning and operational performance.

3.8. Multicollinearity Diagnostics and Robustness Checks

Because the Baldrige-based categories are conceptually related, multicollinearity may occur in the multiple-regression models. For this reason, variance inflation factors are calculated for the models that include more than one explanatory variable. VIF values are used to identify whether the explanatory variables are strongly correlated with one another.

Where moderate multicollinearity is observed, Lasso regression is used as a robustness procedure. Lasso regression applies an L_1 penalty and can shrink coefficients when explanatory variables are correlated [29]. This method is useful in quality management studies because leadership, strategy, measurement, workforce, operations, and customer focus are expected to be mutually connected.

The purpose of the robustness analysis is not to replace the theoretical pathway model, but to examine whether the main coefficient signs and relative magnitudes remain stable under penalized estimation. If the Lasso estimates are broadly consistent with the baseline pathway model, the empirical findings can be interpreted as more stable.

3.9. Institutional Performance Review

In addition to the survey-based assessment and regression analysis, the study reviews selected institutional performance indicators as supporting contextual evidence. These indicators

are used to examine whether the development of the quality management system is connected with broader institutional outcomes. The reviewed indicators include student enrollment, program development, stakeholder satisfaction, graduate employment, research output, international accreditation, professional recognition, technology-oriented program development, and international ranking participation.

This performance review does not replace the survey-based assessment and should not be interpreted as direct causal evidence. Instead, it helps connect the Baldrige-based quality management framework with observable institutional changes. In this way, the paper combines survey evidence with selected institutional performance indicators to provide a broader picture of quality management development at the University of Finance and Economics.

3.10. Ethical Considerations and Methodological Limitations

The study uses survey data collected from employees of the University of Finance and Economics. Participation was voluntary, and the results are reported in aggregate form. Individual respondents are not identified in the analysis. Since the study examines staff perceptions of institutional quality management, confidentiality and responsible handling of survey data were maintained to protect respondents and support the credibility of the research.

Several methodological limitations should be acknowledged. First, the study is based on a single case institution, so the findings should not be interpreted as representative of all Mongolian higher education institutions. Second, the survey data are cross-sectional, which limits causal interpretation. Third, the study relies partly on self-reported survey responses, which may be affected by perception bias, response style, or institutional familiarity. Fourth, the regression-based pathway model identifies statistical associations among Baldrige categories, but it does not prove strict causal relationships. Fifth, selected institutional performance indicators may also be influenced by external factors such as demographic trends, labor-market conditions, policy changes, and macroeconomic conditions.

Despite these limitations, the methodology provides a structured empirical approach for assessing the quality management system of a Mongolian higher education institution. By combining a Baldrige-based assessment, reliability analysis, regression-based pathway modeling, Lasso robustness checks, and selected institutional performance indicators, the study provides evidence on how quality management dimensions are associated with organizational

results at the University of Finance and Economics.

4. Empirical Analysis

This section presents the empirical results of the Baldrige-based assessment of the quality management system at the University of Finance and Economics. The analysis proceeds in several steps. First, the sample structure and survey coverage are summarized. Second, the descriptive results of the seven Baldrige-based assessment categories are presented: leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results. Third, the reliability of the measurement instrument is evaluated using Cronbach's alpha. Fourth, the relative strengths and weaker areas of the current quality management system are identified based on the category scores. Fifth, regression-based pathway analysis is used to examine how leadership, strategy, measurement, workforce, operations, and customer focus are associated with organizational results. Finally, multicollinearity diagnostics and Lasso robustness checks are reported, and selected institutional performance indicators are discussed as supporting context for interpreting the survey-based findings.

4.1. Sample and Measurement Structure

The empirical assessment is based on survey data collected from academic, administrative, and support staff of the University of Finance and Economics. A total of 205 respondents participated in the survey, representing 75.1% of the university's total employees. The sample includes 109 out of 127 academic staff members, corresponding to a response rate of 85.8%, and 96 out of 146 administrative and support staff members, corresponding to a response rate of 65.8%. This coverage provides a broad institutional basis for assessing the university's quality management system from both academic and non-academic perspectives.

The measurement instrument was structured according to the Baldrige-based quality management assessment framework. The survey evaluates seven major categories of the university's quality management system: leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results. These categories are used to assess the current state of the quality management system and to identify its relative strengths and areas requiring improvement. The overall assessment follows a 1,000-point scoring structure, while the regression-based analysis examines how the main quality management dimensions are associated with organizational results.

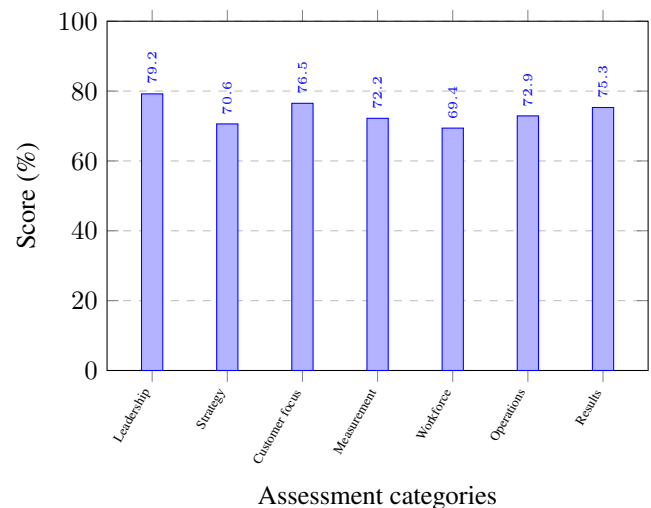
Table 1. Sample and measurement structure.

Item	Description
Study context	Quality management system in Mongolian higher education
Case institution	University of Finance and Economics
Research design	Quantitative cross-sectional case study survey
Assessment framework	Baldrige-based quality management assessment framework
Respondents	Academic staff, administrative staff, and support staff
Total number of employees	273
Final sample size	205 respondents
Overall response coverage	75.1% of total employees
Academic staff respondents	109 out of 127 academic staff members, corresponding to 85.8%
Administrative and support staff respondents	96 out of 146 administrative and support staff members, corresponding to 65.8%
Main assessment categories	Leadership, strategy, customer focus, measurement, analysis and knowledge management, workforce, operations, and results
Overall scoring structure	1,000-point Baldrige-based assessment scale
Main empirical methods	Descriptive assessment, reliability analysis, category-score comparison, regression-based pathway analysis, and institutional performance review

4.2. Descriptive Results

The descriptive results summarize the current state of the quality management system at the University of Finance and Economics based on the Baldrige-based assessment categories. The overall assessment score is 745 out of 1,000 points, equivalent to 74.5%. This indicates that the university has developed a relatively strong quality management system, although several areas still require further improvement.

Among the seven assessment categories, leadership receives the highest score at 79.2%, followed by customer focus at 76.5% and results at 75.3%. These findings suggest that the university demonstrates relatively strong performance in leadership commitment, stakeholder orientation, and institutional outcomes. By contrast, workforce receives the lowest score at 69.4%, followed by strategy at 70.6%. This indicates that human-resource development, staff engagement, strategic planning, and strategy implementation remain important areas for further improvement.

**Figure 2.** Baldrige-based category scores of the quality management system**Table 2.** Descriptive assessment of the quality management system.

Category	Possible	Obtained	Score	Interpretation
Leadership	120	95	79.2%	Highest category score
Strategy	85	60	70.6%	Relatively weaker area
Customer focus	85	65	76.5%	Strong stakeholder orientation
Measurement, analysis and knowledge management	90	65	72.2%	Moderate performance
Workforce	85	59	69.4%	Lowest category score
Operations	85	62	72.9%	Moderate performance
Results	450	339	75.3%	Strong institutional outcome score
Total score	1,000	745	74.5%	Relatively strong overall QMS performance

Overall, the descriptive findings show that the university's quality management system is relatively well developed, particularly in leadership, customer focus, and results. However, the lower scores for workforce and strategy suggest

that future improvement efforts should focus on strengthening staff development, employee engagement, strategic planning, and the systematic implementation of quality improvement initiatives.

4.3. Reliability Analysis

Reliability analysis was conducted to assess the internal consistency of the Baldrige-based quality management assessment instrument. Cronbach's alpha was used as the reliability coefficient for each of the seven assessment categories. The results show that all categories have high reliability values, ranging from 0.884 to 0.967. This indicates that the survey items within each category are internally consistent and suitable for further empirical analysis.

The highest reliability coefficient is observed for the results

category, with a Cronbach's alpha value of 0.967. Customer focus and operations also show very high reliability, with alpha values of 0.954 and 0.950, respectively. Strategy also demonstrates strong internal consistency with an alpha value of 0.943. The remaining categories, including measurement, analysis and knowledge management, workforce, and leadership, also exceed the commonly accepted threshold of 0.70. Therefore, the reliability results support the use of the seven Baldrige-based categories in the subsequent descriptive and regression-based analyses.

Table 3. Reliability analysis of the Baldrige-based assessment categories.

Assessment category	Cronbach's α	Interpretation
Leadership	0.884	Strong internal consistency
Strategy	0.943	Excellent internal consistency
Customer focus	0.954	Excellent internal consistency
Measurement, analysis and knowledge management	0.912	Excellent internal consistency
Workforce	0.899	Strong internal consistency
Operations	0.950	Excellent internal consistency
Results	0.967	Excellent internal consistency

Since the assessment framework is based on predefined Baldrige categories, exploratory factor analysis is not reported in this section. Instead, the reliability results confirm that the category-level measures are sufficiently consistent for use in the following descriptive assessment and regression-based pathway analysis.

4.4. Preliminary Association Analysis

Before estimating the regression-based pathway model, the expected relationships among the Baldrige-based quality management categories were examined conceptually and descriptively. The purpose of this preliminary analysis is not to estimate a separate correlation matrix, but to clarify how

the main quality management dimensions are expected to be connected within the Baldrige framework.

The Baldrige model assumes that organizational results are produced through an integrated management system. Leadership provides institutional direction and influences strategic planning and measurement systems. Strategy and measurement support workforce development and operational effectiveness. Workforce and operations then contribute to customer focus and organizational results. Therefore, the empirical analysis proceeds from the assumption that leadership, strategy, measurement, workforce, operations, customer focus, and results are positively related components of the same quality management system.

Table 4. Expected relationships among Baldrige-based quality management categories.

Quality management category	Expected association	Rationale
Leadership	Strategy	Leadership defines institutional direction and supports strategic priorities.
Leadership	Measurement	Leadership encourages evidence-based decision-making and performance monitoring.
Strategy	Workforce	Clear strategy supports staff alignment, participation, and institutional commitment.
Measurement	Workforce	Data and knowledge management help identify staff development needs.
Strategy	Operations	Strategic priorities guide the design and improvement of academic and administrative processes.
Measurement	Operations	Performance data support process monitoring and operational improvement.
Workforce	Operations	Staff capacity and engagement influence the effectiveness of institutional processes.
Operations	Customer focus	Effective operations improve services for students, graduates, employers, and other stakeholders.
Operations	Results	Well-managed processes are expected to contribute directly to institutional outcomes.
Customer focus	Results	Stakeholder-oriented management is expected to strengthen institutional performance.

This preliminary association logic provides the basis for the regression-based pathway analysis. Rather than treating the Baldrige categories as isolated variables, the study analyzes them as connected elements of a quality management system. Accordingly, the following subsection estimates the pathway relationships among leadership, strategy, measurement, workforce, operations, customer focus, and results.

4.5. Regression-based Pathway Analysis

The study does not rely on a separate correlation matrix. Instead, the empirical model evaluates how the main Baldrige-based quality management categories are associated with organizational results. The pathway analysis is based on six regression equations and examines how leadership is linked with results through strategy, measurement, workforce, operations, and customer focus.

Before presenting the estimated pathway equations, the variables are abbreviated as follows: L_i denotes leadership, S_i strategy, M_i measurement, W_i workforce, O_i operations, C_i customer focus, and R_i results.

The results show that leadership is positively associated with both strategy and measurement. In Model 1, the coefficient of leadership in explaining strategy is 1.0773, with an R^2 value of 0.76. In Model 2, the coefficient of leadership in

explaining measurement is 0.9804, with an R^2 value of 0.98. These findings suggest that leadership plays an important role in shaping the strategic and measurement-related foundations of the university's quality management system.

The subsequent models show how the quality management system operates through internal organizational processes. Workforce is associated with leadership, strategy, and measurement, with measurement showing the largest coefficient among the three predictors. Operations are associated with strategy, measurement, and workforce. Customer focus is associated with strategy, workforce, and operations. Finally, organizational results are associated with operations and customer focus. In Model 6, the coefficient for operations is 0.6302, while the coefficient for customer focus is 0.3580, suggesting that operations have the stronger direct association with results in the estimated pathway model.

$$\begin{aligned} S_i &= -0.4744 + 1.0773L_i + \varepsilon_{1i}, \\ M_i &= 0.9804L_i + \varepsilon_{2i}, \\ W_i &= 0.0348L_i + 0.2727S_i + 0.4207M_i + \varepsilon_{3i}, \\ O_i &= 0.3002S_i + 0.2705M_i + 0.2053W_i + \varepsilon_{4i}, \\ C_i &= 0.2886S_i + 0.1651W_i + 0.1882O_i + \varepsilon_{5i}, \\ R_i &= 0.6302O_i + 0.3580C_i + \varepsilon_{6i}. \end{aligned} \quad (2)$$

Table 5. Regression-based pathway analysis results.

Model	Dependent variable	Coefficient estimates	Model fit
1	Strategy	Const. = -0.4744, $t = -2.929$, $p = 0.004$; Leadership = 1.0773, $t = 25.06$, $p < 0.01$	$F = 628.3^{***}$; $R^2 = 0.76$; Adj. $R^2 = 0.759$
2	Measurement	Leadership = 0.9804, $t = 106.36$, $p < 0.01$	$R^2 = 0.98$; Adj. $R^2 = 0.980$
3	Workforce	Leadership = 0.0348, $t = 2.53$, $p = 0.01$; Strategy = 0.2727, $t = 5.38$, $p < 0.01$; Measurement = 0.4207, $t = 8.32$, $p < 0.01$	$F = 6822.0^{***}$; $R^2 = 0.99$; Adj. $R^2 = 0.990$
4	Operations	Strategy = 0.3002, $t = 7.08$, $p < 0.01$; Measurement = 0.2705, $t = 6.20$, $p < 0.01$; Workforce = 0.2053, $t = 3.29$, $p < 0.01$	$F = 422.0^{***}$; $R^2 = 0.83$; Adj. $R^2 = 0.827$
5	Customer focus	Strategy = 0.2886, $t = 4.07$, $p < 0.01$; Workforce = 0.1651, $t = 2.06$, $p = 0.04$; Operations = 0.1882, $t = 2.16$, $p = 0.03$	$F = 118.2^{***}$; $R^2 = 0.64$; Adj. $R^2 = 0.635$
6	Results	Operations = 0.6302, $t = 19.87$, $p < 0.01$; Customer focus = 0.3580, $t = 11.44$, $p < 0.01$	$F = 2.399 \times 10^{4***}$; $R^2 = 0.99$; Adj. $R^2 = 0.990$

Note: The number of observations is $N = 205$ for all models. Adjusted R^2 values are calculated from the reported R^2 , the number of observations, and the number of predictors in each model. *** indicates $p < 0.01$. The F-statistic for Model 2 is not reported in the source table in a clearly interpretable form; therefore, only the coefficient-level test statistic is reported.

The results indicate that leadership plays a foundational role in the quality management system. Leadership is positively associated with strategy and measurement, which in turn support workforce, operations, customer focus, and organizational results. The final model shows that both operations and customer focus are positively associated with results. The coefficient for operations is larger than the coefficient for customer focus, suggesting that operational performance has the stronger direct association

with organizational results in the estimated pathway model.

The indirect pathway from leadership to results through strategy and operations is calculated as:

$$1.0773 \times 0.3002 \times 0.6302 = 0.2038.$$

This positive indirect effect suggests that leadership is associated with organizational results through strategic planning and operational performance. Therefore, the findings support the view that quality management performance

at the University of Finance and Economics depends on system alignment among leadership, strategy, measurement, workforce, operations, customer focus, and results.

4.6. Multicollinearity and Robustness Analysis

Since several Baldrige-based quality management categories are conceptually related, multicollinearity diagnostics were conducted for the multiple-regression models. Variance inflation factors (VIFs) were calculated for Models 3, 4, and 5, where more than one explanatory variable is included. The results show that some explanatory variables have moderately high VIF values, particularly strategy in Model 3, workforce in Model 4, and strategy, workforce, and operations in Model 5. This indicates that the explanatory variables are correlated with one another, which is expected in a quality management system because leadership, strategy, measurement, workforce, operations, and customer focus are

mutually reinforcing dimensions.

Note: VIF values below 5 are generally interpreted as acceptable, while values around or above 5 indicate moderate multicollinearity. The results show no severe multicollinearity, but moderate correlation is present in some models. Therefore, Lasso regression is used as a robustness check to examine whether the main coefficient signs and relative magnitudes remain stable under penalized estimation.

To examine whether the pathway results are sensitive to multicollinearity among the Baldrige-based categories, Lasso regression was used as a robustness procedure for Models 3, 4, and 5. Lasso regression applies an L_1 penalty to the regression coefficients and is useful when explanatory variables are correlated. In this study, the purpose of the Lasso robustness check is not to replace the theoretical pathway model, but to assess whether the main coefficient signs and relative magnitudes are preserved under penalized estimation.

Table 7. Lasso robustness estimates for pathway models.

Model	Dependent variable	λ	Baseline and Lasso coefficient comparison
Model 3	Workforce	0.001	Leadership: 0.0348 $\rightarrow$ 0.0295 ($\Delta = -0.0053$); Strategy: 0.2727 $\rightarrow$ 0.2746 ($\Delta = 0.0019$); Measurement: 0.4207 $\rightarrow$ 0.4243 ($\Delta = 0.0036$).
Model 4	Operations	0.001	Strategy: 0.3002 $\rightarrow$ 0.3192 ($\Delta = 0.0190$); Measurement: 0.2705 $\rightarrow$ 0.2805 ($\Delta = 0.0100$); Workforce: 0.2053 $\rightarrow$ 0.1893 ($\Delta = -0.0160$).
Model 5	Customer focus	0.010	Strategy: 0.2886 $\rightarrow$ 0.3180 ($\Delta = 0.0294$); Workforce: 0.1651 $\rightarrow$ 0.1492 ($\Delta = -0.0159$); Operations: 0.1882 $\rightarrow$ 0.1751 ($\Delta = -0.0131$).

Note: The first value is the baseline pathway coefficient and the second value is the Lasso coefficient. All Lasso estimates preserve positive coefficient signs, indicating that the main pathway relationships remain stable under penalized estimation.

The Lasso robustness estimates preserve the positive signs of all baseline pathway coefficients and remain close to the original regression estimates. In Model 3, measurement remains the strongest predictor of workforce, while strategy also retains a stable positive association. In Model 4, strategy and measurement remain the main predictors of operations, and the workforce coefficient remains positive after penalized estimation. In Model 5, strategy remains the strongest predictor of customer focus, while workforce and operations also preserve positive coefficients. The coefficient changes between the baseline and Lasso estimates are small, indicating that the main empirical conclusions are not driven by unstable coefficient estimates. Although moderate multicollinearity is present in some models, the robustness analysis supports the interpretation that the university's quality management system operates as an interconnected system, where leadership influences strategy and measurement, these factors support workforce and operations, and operations and customer focus are directly associated with organizational results.

4.7. Summary of Empirical Findings

The empirical analysis provides several main findings on the quality management system of the University of Finance and Economics. First, the Baldrige-based assessment shows that the university obtained 745 points out of a possible 1,000 points, equivalent to 74.5%. This indicates that the university has developed a relatively strong quality management system. Second, the strongest assessment categories are leadership, customer focus, and results, with scores of 79.2%, 76.5%, and 75.3%, respectively. Third, the relatively weaker categories are workforce and strategy, with scores of 69.4% and 70.6%, respectively, indicating areas where further institutional improvement is required.

Fourth, the reliability analysis confirms that the survey instrument is internally consistent. Cronbach's alpha values range from 0.884 to 0.967 across the seven assessment categories, indicating strong to excellent reliability. Fifth, the regression-based pathway analysis shows that leadership is positively associated with strategy and measurement, while operations and customer focus are positively associated with organizational results. Sixth, the indirect pathway

from leadership to results through strategy and operations is positive, with an estimated indirect effect of 0.2038. Seventh, the multicollinearity and robustness analysis shows that, although moderate multicollinearity is present in some

models, the Lasso estimates preserve the positive signs of the main coefficients and remain close to the baseline pathway estimates.

Table 8. Summary of main empirical findings.

No.	Empirical area	Main finding
1	Overall QMS assessment	The university obtained 745 out of 1,000 points, equivalent to 74.5%, indicating relatively strong overall quality management performance.
2	Strongest categories	Leadership, customer focus, and results received the highest scores, with 79.2%, 76.5%, and 75.3%, respectively.
3	Weaker categories	Workforce and strategy received the lowest scores, with 69.4% and 70.6%, respectively, indicating priority areas for improvement.
4	Reliability	Cronbach's alpha values range from 0.884 to 0.967, confirming strong to excellent internal consistency across the seven assessment categories.
5	Leadership role	Leadership is positively associated with strategy and measurement, showing its foundational role in the quality management system.
6	Direct predictors of results	Operations and customer focus are positively associated with organizational results, with operations showing the stronger direct coefficient.
7	Indirect effect	The indirect pathway from leadership to results through strategy and operations is positive, with an estimated effect of 0.2038.
8	Multicollinearity diagnostics	VIF diagnostics indicate moderate multicollinearity in some models, which is expected because the Baldrige-based categories are conceptually related.
9	Robustness analysis	Lasso estimates preserve the positive signs of the main coefficients and remain close to the baseline pathway estimates, supporting the stability of the main results.
10	Institutional performance review	Selected institutional indicators provide supporting context for interpreting broader institutional development, but they are not treated as direct causal evidence.
11	Managerial implication	Future improvement should focus on workforce development, staff engagement, strategic alignment, evidence-based decision-making, and systematic continuous improvement.

Overall, the empirical findings show that the University of Finance and Economics has established a relatively mature quality management system. The strongest evidence is found in leadership, stakeholder orientation, and institutional results. However, the lower scores for workforce and strategy suggest that the next stage of quality management improvement should focus on human-resource development, staff participation, strategic alignment, and the systematic use of performance data. The regression-based pathway analysis further indicates that quality management performance should be understood as an interconnected system, where leadership shapes strategy and measurement, these factors influence workforce and operations, and operations and customer focus contribute directly to organizational results.

5. Discussion

This study examined the quality management system of the University of Finance and Economics using a Baldrige-based assessment framework. The results show that the university obtained 745 out of 1,000 points, equivalent to 74.5%, indicating a relatively strong quality management system. However, the category-level results also show uneven development. Leadership, customer focus, and results are the strongest areas, whereas workforce and strategy require further improvement.

The strong leadership score is consistent with the quality management literature, which emphasizes leadership

as a central driver of institutional direction, strategic alignment, evidence-based decision-making, and continuous improvement [10, 11, 19]. The regression-based pathway analysis also supports this interpretation. Leadership is positively associated with strategy and measurement, suggesting that leadership contributes to the development of strategic and evidence-based management foundations. This result is consistent with the Baldrige framework, where leadership is expected to guide strategy, measurement, workforce development, operations, customer focus, and results [15, 16].

The findings are also consistent with recent empirical studies on quality management and institutional performance in higher education. Iqbal et al. [32] show that quality management initiatives are positively related to higher education institutional performance and that academic accreditation can strengthen this relationship. Serrano [33] similarly finds that effective quality assurance systems are associated with institutional performance through management support, infrastructure quality, and stakeholder engagement. The present study supports these findings in the Mongolian context by showing that operations and customer focus are positively associated with organizational results.

The lower scores for workforce and strategy identify important improvement priorities. Workforce development is essential because academic, administrative, and support staff are directly involved in implementing strategy, delivering educational services, supporting students, and maintaining

institutional processes. This finding is consistent with recent studies showing that quality assurance implementation depends not only on formal systems, but also on organizational capacity, staff participation, and stakeholder engagement [35, 36]. Therefore, future improvement should focus on staff development, employee engagement, workload balance, professional training, and participation in quality improvement activities. The lower strategy score also suggests the need to strengthen the link between strategic objectives, departmental planning, resource allocation, performance monitoring, and implementation.

The final pathway model shows that operations and customer focus are positively associated with organizational results, with operations showing the stronger direct coefficient. This finding highlights the importance of process management in higher education. Institutional results depend not only on leadership commitment and formal strategy, but also on how effectively academic, administrative, student-service, research-support, and quality assurance processes are designed and implemented. This result is consistent with previous empirical research showing that process management, information analysis, workforce involvement, and customer focus are important components of quality management performance [22–25].

The role of strategy in this study is also consistent with recent research on strategic management in higher education. Fumasoli and Hladchenko [37] argue that universities increasingly operate as strategic organizations facing complex governance, positioning, and performance challenges. In the present study, strategy is positively associated with workforce, operations, and customer focus, indicating that strategic planning becomes meaningful when it is translated into institutional processes and stakeholder-oriented improvement.

The high R^2 values in several regression models should be interpreted carefully. They may reflect strong system alignment among the Baldrige-based categories, but they may also indicate conceptual overlap among closely related constructs. Leadership, strategy, measurement, workforce, operations, customer focus, and results are all components of the same quality management system, so shared variance is expected. In addition, the data were collected using the same survey instrument, which may increase the observed associations among variables. Therefore, the high R^2 values should not be interpreted as evidence of causal determination. Rather, they indicate strong within-sample associations among interconnected quality management dimensions.

The robustness analysis helps address this concern. Since the Baldrige categories are conceptually connected, moderate multicollinearity is expected. The VIF results indicate moderate multicollinearity in some models, while the Lasso estimates preserve the positive signs of the main coefficients and remain close to the baseline pathway estimates. This supports the interpretation that the pathway model reflects a stable quality management structure rather than unstable coefficient estimates. At the same time, the possibility of conceptual overlap among constructs remains a limitation, and

future research should apply confirmatory factor analysis and structural equation modeling using larger multi-institutional samples.

Selected institutional performance indicators provide additional context for interpreting the survey-based findings. Improvements in areas such as enrollment, stakeholder satisfaction, graduate employment, research output, international accreditation, technology-oriented program development, and institutional recognition suggest that quality management development is connected with broader institutional outcomes. However, these indicators should not be interpreted as direct causal evidence because they may also be influenced by external factors such as demographic trends, labor-market conditions, policy changes, and macroeconomic conditions.

The findings have practical implications for Mongolian higher education. Universities should move beyond compliance-oriented quality assurance and develop integrated quality management systems that connect leadership, strategy, measurement, workforce, operations, customer focus, and results. Quality improvement should be embedded across academic departments, administrative units, student services, research centers, and senior management rather than treated as the responsibility of a single quality assurance unit. This is consistent with recent international research showing that quality assurance is increasingly studied as a system-level process involving governance, institutional capacity, stakeholder participation, and performance improvement [33, 34].

Several limitations should be acknowledged. First, the study is based on a single case institution, so the findings should not be generalized mechanically to all Mongolian higher education institutions. Second, the survey data are cross-sectional, which limits causal interpretation. Third, the analysis partly relies on staff perceptions. Fourth, the high explanatory power in some regression models suggests that the Baldrige categories are closely related and may partly overlap conceptually. Fifth, the study reports reliability evidence, but further research should examine convergent and discriminant validity using larger samples and latent-variable methods.

Overall, the study shows that the University of Finance and Economics has established a relatively mature quality management system, but further improvement is needed in workforce development and strategic implementation. The main empirical message is that quality management performance depends on system alignment: leadership provides direction, strategy and measurement translate direction into institutional mechanisms, workforce and operations implement the system, customer focus connects the university with stakeholders, and results reflect the combined performance of these dimensions.

6. Conclusion

This study examined the quality management system of the University of Finance and Economics using a Baldrige-

based assessment framework. The results show that the university obtained 745 out of 1,000 points, equivalent to 74.5%, indicating a relatively strong quality management system. The strongest categories are leadership, customer focus, and results, while workforce and strategy are the main areas requiring further improvement.

The regression-based pathway analysis shows that leadership is positively associated with strategy and measurement, while operations and customer focus are positively associated with organizational results. The estimated indirect pathway from leadership to results through strategy and operations is also positive. This suggests that leadership contributes to institutional performance mainly through strategic planning, evidence-based management, and operational implementation. The findings therefore support the view that quality management in higher education should be understood as an interconnected institutional system rather than as a set of isolated quality assurance activities.

The results also identify important improvement priorities. The relatively lower scores for workforce and strategy suggest that the next stage of quality management development should focus on staff development, employee engagement, strategic alignment, performance monitoring, and systematic continuous improvement. In higher education institutions, quality improvement depends not only on formal policies and accreditation requirements, but also on the active participation of academic, administrative, and support staff.

The multicollinearity and robustness analysis supports the stability of the main empirical findings. Although moderate multicollinearity is present in some models, this is expected because the Baldrige-based categories are conceptually related. The Lasso estimates preserve the positive signs of the main coefficients and remain close to the baseline pathway estimates, supporting the interpretation that the main pathway relationships are stable.

The study contributes to the literature by applying a Baldrige-based diagnostic framework to a Mongolian higher education institution. It also provides practical evidence for university managers, quality assurance units, and policymakers. For Mongolian universities, the findings suggest that quality assurance should move beyond compliance-oriented evaluation toward integrated quality management. Universities should strengthen evidence-based decision-making, staff development, stakeholder engagement, strategic planning, and operational coordination in order to improve institutional results.

Several limitations should be acknowledged. The study is based on a single case institution, so the findings should not be generalized mechanically to all Mongolian higher education institutions. The survey data are cross-sectional, which limits causal interpretation. In addition, the analysis partly relies on staff perceptions, which may be influenced by subjective evaluation. Future research could apply the same Baldrige-based framework to multiple universities, compare public and private institutions, and use longitudinal data to examine how

quality management systems evolve over time.

Overall, the study shows that the University of Finance and Economics has established a relatively mature quality management system, but further improvement is needed in workforce development and strategic implementation. The Baldrige-based framework provides a useful tool for diagnosing institutional strengths and weaknesses and for guiding continuous improvement in Mongolian higher education.

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Abbreviations

QMS	Quality Management System
UFE	University of Finance and Economics
VIF	Variance Inflation Factor
DOI	Digital Object Identifier
NIST	National Institute of Standards and Technology

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Author Contributions

Munkhbayer Byambadash: Conceptualization, Investigation, Writing – original draft

Azjargal Battulga: Supervision, Resources, Validation, Writing – review & editing

Tumendelger Lkhagvasuren: Methodology, Formal Analysis, Visualization, Writing – review & editing

Batbayer Tsagaachin: Data curation, Resources

Data Availability Statement

The data are available from the corresponding author upon reasonable request, subject to institutional permission and confidentiality requirements.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Harvey, L., and D. Green. (1993). Defining quality. *Assessment & Evaluation in Higher Education*, 18(1), 9–34. <https://doi.org/10.1080/0260293930180102>
- [2] Harvey, L., and P. Knight. (1996). *Transforming higher education*. Buckingham: Society for Research into Higher Education and Open University Press.
- [3] Srikanthan, G., and J. Dalrymple. (2007). A conceptual overview of a holistic model for quality in higher education. *International Journal of Educational Management*, 21(3), 173–193. <https://doi.org/10.1108/09513540710738647>
- [4] Ruben, B. D. (2007). *Excellence in higher education guide: An integrated approach to assessment, planning, and improvement in colleges and universities*. Washington, DC: National Association of College and University Business Officers.
- [5] Svensson, M., and B. Klefsjo. (2006). TQM-based self-assessment in the education sector: Experiences from a Swedish upper secondary school project. *Quality Assurance in Education*, 14(4), 299–323. <https://doi.org/10.1108/09684880610703929>
- [6] Manatos, M. J., C. S. Sarrico, and M. J. Rosa. (2017). The integration of quality management in higher education institutions: A systematic literature review. *Total Quality Management & Business Excellence*, 28(1–2), 159–175. <https://doi.org/10.1080/14783363.2015.1050180>
- [7] Brennan, J., and T. Shah. (2000). *Managing quality in higher education: An international perspective on institutional assessment and change*. Buckingham: Organisation for Economic Co-operation and Development, Society for Research into Higher Education, and Open University Press.
- [8] Stensaker, B. (2008). Outcomes of quality assurance: A discussion of knowledge, methodology and validity. *Quality in Higher Education*, 14(1), 3–13. <https://doi.org/10.1080/13538320802011532>
- [9] Newton, J. (2002). Views from below: Academics coping with quality. *Quality in Higher Education*, 8(1), 39–61. <https://doi.org/10.1080/13538320220127434>
- [10] Deming, W. E. (1986). *Out of the crisis*. Cambridge, MA: MIT Press.
- [11] Juran, J. M. (1988). *Juran on planning for quality*. New York: Free Press.
- [12] Oakland, J. S. (2014). *Total quality management and operational excellence: Text with cases*. 4th ed. London: Routledge.
- [13] Kanji, G. K., and A. M. B. A. Tambi. (1999). Total quality management in UK higher education institutions. *Total Quality Management*, 10(1), 129–153. <https://doi.org/10.1080/0954412998126>
- [14] Psomas, E., and J. Antony. (2017). Total quality management elements and results in higher education institutions: The Greek case. *Quality Assurance in Education*, 25(2), 206–223. <https://doi.org/10.1108/QAE-08-2015-0033>
- [15] National Institute of Standards and Technology. (2023). *Baldrige excellence framework, 2023–2024: Leadership and management practices for high performance*. Gaithersburg, MD: U.S. Department of Commerce.
- [16] Baldrige Performance Excellence Program. (2023). *Baldrige excellence framework: Education criteria for performance excellence*. Gaithersburg, MD: National Institute of Standards and Technology.
- [17] Calvo-Mora, A., A. Leal, and J. L. Roldan. (2006). Using enablers of the EFQM model to manage institutions of higher education. *Quality Assurance in Education*, 14(2), 99–122. <https://doi.org/10.1108/09684880610662006>
- [18] Arif, M., and F. M. Smiley. (2004). Baldrige theory into practice: A working model. *International Journal of Educational Management*, 18(5), 324–328. <https://doi.org/10.1108/09513540410543475>
- [19] Evans, J. R., and W. M. Lindsay. (2017). *Managing for quality and performance excellence*. 10th ed. Boston, MA: Cengage Learning.
- [20] Bryson, J. M. (2018). *Strategic planning for public and nonprofit organizations: A guide to strengthening and sustaining organizational achievement*. 5th ed. Hoboken, NJ: Wiley.
- [21] Kettunen, J. (2011). Strategy and quality maps in higher education. *Quality Assurance in Education*, 19(2), 149–162.
- [22] Flynn, B. B., R. G. Schroeder, and S. Sakakibara. (1994). A framework for quality management research and an associated measurement instrument. *Journal of Operations Management*, 11(4), 339–366. [https://doi.org/10.1016/S0272-6963\(97\)90004-8](https://doi.org/10.1016/S0272-6963(97)90004-8)
- [23] Samson, D., and M. Terziovski. (1999). The relationship between total quality management practices and operational performance. *Journal of Operations Management*, 17(4), 393–409. [https://doi.org/10.1016/S0272-6963\(98\)00046-1](https://doi.org/10.1016/S0272-6963(98)00046-1)
- [24] Kaynak, H. (2003). The relationship between total quality management practices and their effects on firm performance. *Journal of Operations Management*, 21(4), 405–435. [https://doi.org/10.1016/S0272-6963\(03\)00004-4](https://doi.org/10.1016/S0272-6963(03)00004-4)

- [25] Sila, I. (2007). Examining the effects of contextual factors on TQM and performance through the lens of organizational theories: An empirical study. *Journal of Operations Management*, 25(1), 83–109. <https://doi.org/10.1016/j.jom.2006.02.003>
- [26] Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334. <https://doi.org/10.1007/BF02310555>
- [27] Hair, J. F., W. C. Black, B. J. Babin, and R. E. Anderson. (2019). *Multivariate data analysis*. 8th ed. Andover: Cengage Learning.
- [28] Field, A. (2018). *Discovering statistics using IBM SPSS statistics*. 5th ed. London: SAGE Publications.
- [29] Hastie, T., R. Tibshirani, and J. Friedman. (2009). *The elements of statistical learning: Data mining, inference, and prediction*. 2nd ed. New York: Springer. <https://doi.org/10.1007/978-0-387-84858-7>
- [30] World Bank. (2010). *Mongolia: Higher education policy note*. Washington, DC: World Bank.
- [31] Ministry of Education. (2025). *Higher education statistics of Mongolia, 2024–2025 academic year*. Ulaanbaatar: Ministry of Education.
- [32] Iqbal, T., S. Ahmad, F. Aftab, and C. K. Mahmood. (2025). Enhancing higher education institutions' performance: The mediating role of academic accreditation in quality management initiatives in UAE. *SAGE Open*. <https://doi.org/10.1177/21582440251358980>
- [33] Serrano, O. M. E. (2025). Determinants of the effectiveness of quality assurance systems and institutional performance in higher education. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2581411>
- [34] Tran, C. A. (2025). Research in higher education quality assurance worldwide: A bibliometric analysis. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2479405>
- [35] Mtitu, E. A. (2025). Exploring factors for the introduction and implementation of quality assurance systems in selected higher education institutions in Tanzania. *Cogent Education*, 12(1). <https://doi.org/10.1080/2331186X.2025.2455767>
- [36] Mukhatayev, A., et al. (2024). Quality assurance system of higher education in Kazakhstan. *Education Sciences*, 14(12), 1297. <https://doi.org/10.3390/educsci14121297>
- [37] Fumasoli, T., and M. Hladchenko. (2024). Strategic management in higher education: Conceptual insights, lessons learned, emerging challenges. *Tertiary Education and Management*, 29, 331–339. <https://doi.org/10.1007/s11233-024-09134-5>