

SUSTAINABILITY AND QUALITY COSTS IN THE HIGHER EDUCATION INSTITUTIONS

Cvetanka Velkoska, page 67-95

ABSTRACT

This paper explores the quality cost models in higher education institutions, that can help in the function of planning the cost of quality in higher education, monitoring and analyzing the cost of quality to locate the weak points in the operation and reduce and prevent unproductive spending from the aspect of quality. Sustainable development as a concept should be integrated into quality cost management not only in manufacturing but also in service activities such as higher education. This study focuses on quality costs within the framework of sustainability in higher education institutions. The research methodology involves a logical, systematic analysis of scientific research, situational analysis using comparative and summary methods. In this study is proposed a quality cost model for identifying quality cost elements with examples of quality cost elements. Incorporating the three dimensions of sustainability (economic, ecological, and social) into quality cost model involves considering the broader impacts and benefits of quality costs beyond just quality improvement. The paper advocates for incorporating preventive measures and sustainable practices to reduce failure costs and promote long-term sustainability goals. Future research directions include developing quality cost models that incorporate sustainability concept. The successful implementation of quality costs from the sustainability perspective requires commitment from top management, data-driven decision-making, and stakeholder engagement, ultimately leading to higher quality standards and sustainable development in higher education.

Keywords: sustainability, higher education, quality cost, prevention costs, appraisal costs, failure costs, PAF model.

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INTRODUCTION

Higher education institutions (HEIs), specifically universities, play a pivotal role in advancing the socio-economic fabric of communities. Thus, their corporate responsibility lies in pioneering innovative approaches to foster holistic human development, particularly by promoting sustainable development. This entails focusing on three key areas: scientific research, education (including teaching and learning), and active engagement in nurturing social values through community service (de Wit & Deca, 2020). Among the social values, sustainability and sustainable development hold significant importance.

In the realm of university education, pressing contemporary concerns about sustainable development necessitate a comprehensive, interdisciplinary, transdisciplinary, and integrative approach. This approach is essential for understanding and addressing the intricate challenges at the intersection of human activities and the environment across multiple scientific disciplines. The advent of advanced technologies associated with Industry 4.0, such as the Internet of Things, Cloud computing, Cyber-Physical systems, Big Data, Analytics, Data Visualization, Simulation, Augmented Reality, Artificial Intelligence, and Virtual Reality is anticipated to significantly enhance the efficiency, accuracy, transparency, and speed in resolving issues related to sustainable development (Battaglia et. al., 2023). For instance, Big Data can be leveraged within the context of Quality 4.0 in three main areas: enhancing the quality of design, ensuring conformity to quality standards, and quality of performance of products and services (Sony, 2020).

Universities are anticipated to play a role in preparing students as global citizens capable of tackling present and future challenges associated with transitioning to clean economies. Additionally, university leaders are expected to make well-informed decisions that integrate the principles of sustainable development and Education for Sustainable Development (ESD) (Amin et al., 2023). The incorporation of sustainability efforts and the Sustainable Development Goals (SDGs) in higher education should not solely aim to enhance university rankings (Lim, 2024).

Kofi Annan's statement is known: "Our biggest challenge is an idea that seems abstract - sustainable development, to turn it into a reality for all people in the world." (Pavlovic, 2011).

The idea of sustainable development has become a commonplace term used in various contexts and with varied intentions, encompassing environmental, economic, political, organizational, social, and ethical dimensions to advance progress across all facets of society. In our contemporary world, nearly every aspect of human endeavor, when viewed through a future-oriented lens, assumes a sustainability perspective. Fundamentally, sustainable development hinges on the principle of responsibly managing the present while safeguarding the future. (Pavlovic, 2011).

Sustainability and sustainable development as a concept should be integrated into quality management models not only in manufacturing but also in service activities such as higher education. Although there are numerous tools for measuring quality, the cost of quality (or quality costs) is to be the primary one. Green's (2007) review explores the relevance and application of Feigenbaum's quality cost model in higher education. The use of modern digital tools and advanced technologies, especially for the optimization of processes, rationalization of resources, timely identification and analysis of data, and sharing of information in real time with all stakeholders, can lead to a significant reduction of production costs, and especially costs for quality (Moeuf, 2018). All this creates prerequisites that we can expect that quality cost models will become relevant from the aspect of sustainable development, especially with the application of the possibilities of advanced technologies.

In research literature, there is a noticeable absence of both theoretical and empirical studies exploring the integration of sustainability and sustainable development concepts into quality cost models, not only within manufacturing but also in higher education. Therefore, this paper aims to present the author's perspective on the future evolution of quality cost models in higher education, specifically considering sustainability and sustainable development.

Research subject: This study focuses on quality costs within the framework of sustainability in higher education institutions.

Research Purpose: The goal is to propose a generic quality cost model adapted for identifying elements of quality costs and providing examples of quality cost elements.

Research Methodology: The methodology involves a logical, systematic analysis of scientific research, situational analysis using comparative and summary methods.

SUSTAINABLE DEVELOPMENT IN EDUCATION

The concept of sustainable development in education involves continuous progress and capital growth, but in a manner that ensures equitable opportunities for current and future generations. Sustainability inherently involves anticipating future impacts on human life and the environment. Thus, higher education institutions serve as instrumental entities of states, contributing to sustainability and sustainable development at local, national, and global levels.

The traditional approach to sustainable development, prevalent in the 1950s and 1960s, solely prioritized economic growth. By the 1970s, there was a shift towards understanding and advocating for ecological sustainability. Today's modern approach to sustainable development expands beyond economic and ecological dimensions to encompass social and even human development. (Đukic, 2011).

The concept of sustainable development began to be widely promoted with the adoption of the document Agenda 21 - Program for change before the threshold of the 21st century, adopted at the Second World Environmental Summit of world leaders in 1992, held in Rio de Janeiro. The basic principles of sustainability were adopted at the summit. The idea of sustainable development with a focus on ecological sustainability was articulated in the document World Conservation Strategy (1980) adopted by the international non-governmental organization International Union for Conservation of Nature and Natural Resources. The World Commission on Environment and Development of the United Nations in 1987 published the Report - Our Common Future known as the Brundtland Report. In this document, the definition of sustainable development is systematized: "Sustainable development is such development that meets the needs of the present, without compromising the opportunities of future generations to meet their needs", and is the basis for the summit in Rio de Janeiro. Otherwise, the term sustainability comes from the Latin word *susteneo* and *sustento*, and implies the ability for something to survive, sustain and last. But it does not only apply to

things in the natural world but also to human activities, processes and the creation of systems (Pavlovic, 2011).

The concept of sustainable development, which emphasizes sustainability as a societal value, is predominantly viewed as a contemporary global approach addressing environmental issues such as ecosystem renewal, biodiversity preservation, and the regulation of harmful emissions. These ecological aspects form the foundational component of sustainable development. The second component, the economic dimension, pertains to economic flows and environmental impacts, focusing on efficient resource utilization, adoption of new clean technologies, and proper distribution of material goods across time and space. The third component, known as the social dimension, concerns societal cohesion based on universally accepted civilizational values, justice, fairness, equality, and social well-being. (Đukic, 2011). Figure 1 illustrates the concept of sustainable development (created by the author).

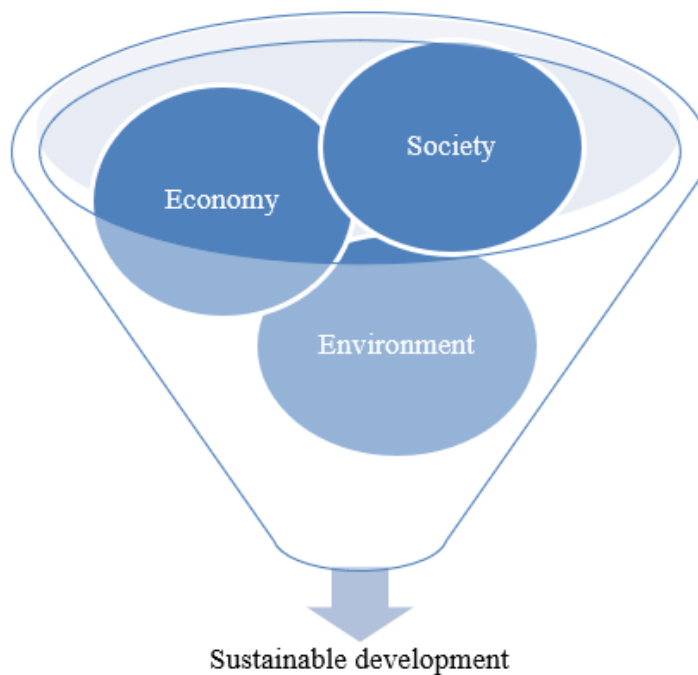


Figure 1. Concept of sustainable development

Education is not merely a fundamental human entitlement but also essential for attaining sustainable development, serving as a framework for managing and making decisions amidst systematic, critical, and creative individual behaviors. To advance sustainable development and enhance quality of life, higher education institutions should replace unsustainable work models with sustainable ones that integrate the three components of modern sustainable development into: (1) teaching and learning, (2) scientific research, and (3) collaboration with the social environment, adopting a more comprehensive approach (Lozano, 2015; Finnveden, 2017).

The establishment of the concept of sustainable development in higher education is preceded by many activities, collaborations and documents, including (Pavlovic, 2011, UNESCO).

1. The Action Plan of the Association of University Leaders for a Sustainable Future (The Talloires Declaration) adopted by 40 world universities in 1990.
2. Earth Charter adopted by the United Nations Educational, Scientific and Cultural Organization - UNESCO (United Nations Educational, Scientific and Cultural Organization) in 2000.
3. Proclamation of the Decade of Education for Sustainable Development 2005-2014, by the United Nations in 2002, in order to promote the importance and role of education for sustainable development.
5. Strategy for Education for Sustainable Development adopted by the United Nations in Vilnius, 2005.
6. Shaping the Future We Want, UN Decade of Education for Sustainable Development (2005-2014), UNESCO (2014), Paris.
7. Education for Sustainable Development Goals. Learning Objectives, UNESCO (2017), Paris.

Today's perspective on higher education regarding sustainable development is viewed as a catalyst for instigating changes that foster the adoption, implementation, and oversight of sustainable practices. In this context, the current higher education system must inspire all stakeholders to contribute to advancing education that not only theorizes about sustainable development but also puts it into practical application, thereby

ensuring the sustainability of socio-economic communities. To transform the existing higher education system into a model characterized by sustainable development principles, it is essential to systematically integrate the needs and expectations of modern organized societies, alongside knowledge of social values within economic, environmental, and humanitarian frameworks. This integration aims to create conditions conducive to a high quality of life.

Higher education is poised to adopt a new role, shifting from its traditional local participation to becoming an active participant in global dynamics shaped by evolving market structures and demands. This evolution emphasizes accessibility to education, lifelong learning opportunities, and heightened requirements for environmental stewardship and ethical practices. In this direction, higher education institutions play a crucial role in integrating diverse scientific knowledge from various disciplines and pioneering new research fields through the establishment of innovative scientific disciplines.

Literature discusses two approaches for integrating sustainable development principles into higher education. One approach advocates for embedding these principles within dedicated curricula or study programs, while the other suggests integrating them into existing teaching and study frameworks (Pavlovic, 2011; Milošević et al., 2016; Dahlin & Leifler, 2018). Currently, there is no consensus on a universal model for incorporating sustainable development concepts into higher education curricula or scientific research practices. Sustainability in higher education is a multifaceted topic that encompasses various aspects of environmental, social, and economic responsibility within academic institutions. Here are some ways in which higher education institutions can promote sustainability:

- **Curriculum Integration:** Incorporating sustainability into the curriculum across various disciplines ensures that students develop an understanding of environmental challenges and solutions. This can involve offering courses focused on sustainability, integrating sustainability topics into existing courses, and providing experiential learning opportunities such as internships or projects related to sustainability.

- **Research and Innovation:** Universities play a crucial role in advancing sustainability through research and innovation. Supporting interdisciplinary research projects that address environmental and social challenges can lead to the development of new technologies, policies, and practices for a more sustainable future.
- **Campus Operations:** Implementing sustainable practices in campus operations can significantly reduce the environmental footprint of higher education institutions. This includes initiatives such as energy and water conservation, waste reduction and recycling programs, sustainable transportation options, and green building design and construction.
- **Community Engagement:** Engaging with the local community and stakeholders is essential for promoting sustainability beyond the campus borders. Universities can collaborate with community organizations, government agencies, and businesses to address shared sustainability goals, such as improving local air and water quality, promoting renewable energy, or supporting equitable economic development.
- **Student Involvement:** Empowering students to become sustainability leaders and advocates fosters a culture of environmental stewardship on campus and beyond. Student-led initiatives, clubs, and organizations focused on sustainability can drive positive change through education, activism, and hands-on projects.
- **Partnerships and Networks:** Collaboration with other higher education institutions, as well as partnerships with industry, government, and nonprofit organizations, can amplify the impact of sustainability efforts. Participating in networks and initiatives focused on sustainability, such as the Association for the Advancement of Sustainability in Higher Education (AASHE) or the United Nations Sustainable Development Goals (SDGs),

provides opportunities for knowledge sharing, best practices, and collective action.

- **Policy and Planning:** Developing and implementing sustainability policies and strategic plans at the institutional level demonstrates a commitment to long-term sustainability goals. These policies can guide decision-making processes related to campus development, resource allocation, and procurement practices, ensuring that sustainability considerations are integrated into all aspects of university operations.

By embracing sustainability in these various ways, HEIs can fulfill their role as catalysts for positive change and contribute to building a more sustainable and resilient future for society.

QUALITY IN HIGHER EDUCATION INSTITUTIONS

Research on quality management in product manufacturing underscores the critical importance of quality in achieving operational success in business. Ensuring and improving quality can be done by reducing quality costs, and at the same time by developing competitive capabilities of producers and products resulting from sustainability and sustainable development requirements. The swift changes in economic, social, and technological landscapes compel higher education institutions to align themselves towards enhancing market competitiveness through knowledge-based approaches (Lisbon strategy), thus ensuring a balanced sustainable development and high-quality educational offerings (Daunorienė, 2011).

The literature covers various approaches to defining quality in higher education institutions, encompassing a broad spectrum of knowledge. However, all these approaches include several core elements: adherence to goals, performance monitoring, adherence to quality standards, excellence, economic advantages, satisfaction of diverse stakeholder interests, responsiveness to environmental shifts, and ongoing enhancement (Daunorienė, 2011).

Cadena et al. (2018) conducted research that identified 59 indicators grouped into a framework for evaluating university activities. This framework categorized indicators into six dimensions: Teaching, Research, Management, Community Engagement, Students, and Resources.

In Sweden, HEIs are actively promoting sustainable development. In 2016, the Swedish Government tasked the Swedish higher education authority with assessing the integration of sustainable development across all HEIs in the country. This comprehensive study focused on evaluating processes rather than outcomes. It yielded valuable recommendations for both HEIs and the government (Finnveden, 2020).

There is a scarcity of studies focusing on developing theoretical strategies for sustainability practices in management and Educational Sustainable Development through a transformative learning perspective. Viera et al. (2022) address this gap in their research. Transformative learning plays a crucial role in advancing the agenda for 2030, defined as "processes leading to significant and irreversible changes in how individuals experience, conceptualize, and engage with the world."

The United Kingdom stands out with a specific guide on education for sustainable development that prominently features transformative learning. Estonia, the Holy See, Romania, Sweden, Switzerland, and Ukraine also include varying degrees of support for this approach within their frameworks. While transformative learning for sustainable development is not explicitly stated in most quality frameworks, many provide opportunities to emphasize it. France and The Netherlands offer guidelines and criteria for obtaining a sustainable development label, whereas Andorra proposes integrating sustainable development goals into institutional quality assessments (Janssens, 2022).

The broader societal context necessitates that higher education institutions demonstrate tangible outcomes in ensuring the quality of their services, as the sustainable development of the community hinges on this aspect. Therefore, it is crucial to measure the performance of higher education institutions to evaluate their effectiveness in promoting quality and implementing national and global policies and legal frameworks. Implementing quality management systems in higher education is essential for measuring and analyzing processes aimed at improving

quality. This approach ensures that the diverse demands of stakeholders in higher education institutions such as students, faculty, governmental and non-governmental bodies, shareholders, and non-profit organizations are adequately addressed.

The famous guru of quality, Philip Crosby believes that quality techniques can be applied anywhere, including education (Green, 2007).

QUALITY COST IN THE HIGHER EDUCATION

Quality management systems in higher education are inherently related to measuring the effectiveness and efficiency of implementation of quality improvement and promotion programs. Quality costs should have their place in the quality management system. The introduction of a system for determining the cost of quality can help in the function of planning the cost of quality in higher education, monitoring and analyzing the cost of quality in order to locate the weak points in the operation and reduce and prevent unproductive spending from the aspect of quality. This process is presented by an algorithm in the study of Velkoska (2018) and provides clarity in the understanding and systematizing of the interrelated complex processes, application of the methodological approach elements when implementing each of the algorithm phases, placement the top responsibility with the top management, argument-based decision-making, risk management, with a view of continuous process improvements. In addition, the algorithm comprises processes of continuous planning, identification, recording, measuring, and analysis of the quality costs within a specific time interval.

The costs of quality can be determined only by having deep knowledge of the various approaches and models for defining the structure of the quality costs (Velkoska, 2018; Sadkowski, 2022; Tomov & Velkoska, 2021; Velkoska & Tomov, 2023).

The quality costs measurement system represents one of the ways to measure the effect of the programs and initiatives for company quality improvement. The stage and the systemic structure of the quality costs measurement system algorithm facilitate identification and tracking of the quality costs at the places where they occur and not at the places where they appear. This ensures the timeliness, accuracy and reliability of the data and information about the costs of quality, opens possibilities not

only for diagnostic analytics but also for predictive and prescriptive analytics of the costs of quality. Using this approach, companies that have introduced adequate, proper and acceptable quality costs measurement systems, where all components function as planned with the assistance of a program for provision of quality data and measurements also have the highest efficiency (Velkoska et al., 2018).

Future research should involve continuous study of the contribution of the contemporary ambitious concepts such as sustainability to the development of a higher level of quality maturity in the companies, which will make the application of quality costs more attractive. This will help redesign and redefine the quality costs structure with new and modern quality costs elements and the quality costs concept will be reaffirmed in a new direction and become recursive (Velkoska & Tomov, 2021; Velkoska & Tomov, 2022).

The research presented in the study by Tomov & Velkoska (2022) offers insights into the future evolution of models defining quality costs, viewed through the lens of policies promoting sustainable development in companies and communities (nations), particularly within the framework of the circular economy and holistic approaches. This study validates the central aim of developing a framework for the modern concept of quality costs aimed at fostering a more sustainable society. Ultimately, it suggests that embracing the contemporary concept of quality costs can enable stakeholders to make responsible decisions that promote sustainable, intelligent, and inclusive development within the social and economic community. Future research endeavors should focus on establishing theoretical foundations for creating a comprehensive model for the cost of sustainable quality. This model would encompass two primary categories: quality costs that contribute to sustainable development and those that do not.

The scientific contribution in the study of Velkoska (2022) involves the integration of the three known methodologies used in quality management: Juran's trilogy, Deming's quality cycle – PDCA (Plan-Do-Check-Act), and DMAIC (Define-Measure-Act-Improve-Control) methodology, in the development of the methodology for quality management with quality costs, aimed at improving the effectiveness of the management system with quality costs and the sustainability of the company.

Based on a review of scientific literature, various generic models of quality costs can be identified, including the PAF model (Prevention-Appraisal-Failure), Crosby model, Opportunity models, Intangible cost model, Process-cost model, Taguchi loss function model, Integrated model, and Activity-based costing technique (ABC) model (Velkoska, 2018). A widely accepted quality cost model categorizes quality costs into two main groups: costs associated with achieving the good quality – costs of conformance, which encompass prevention costs and costs of appraisal, and costs of poor quality - costs of nonconformance, which encompass costs related to internal and external failure costs. This model operates on the premise that investing in preventive activities can mitigate or eliminate costs associated with failure costs

Despite nearly 80 years of extensive research and discussion on quality costs, literature lacks substantial theoretical knowledge and practical examples detailing how quality costs are identified, collected, measured, and analyzed within higher education activities. Figure 2. illustrates a quality cost model to higher education institutions, synthesized from an analysis of existing literature on quality costs.

Higher education institutions should prepare and commit to the introduction of quality costs, in order to identify, measure, and eliminate organizational activities that do not add value to the student, institution, industry, and state, and to identify preventive and appraisal activities . Therefore, higher education institutions are expected to define the quality cost model, categorize quality cost elements for prevention, appraisal, and failure correction activities, identify, collect, measure, and analyze quality costs elements, as well as undertaking activities to improve quality.

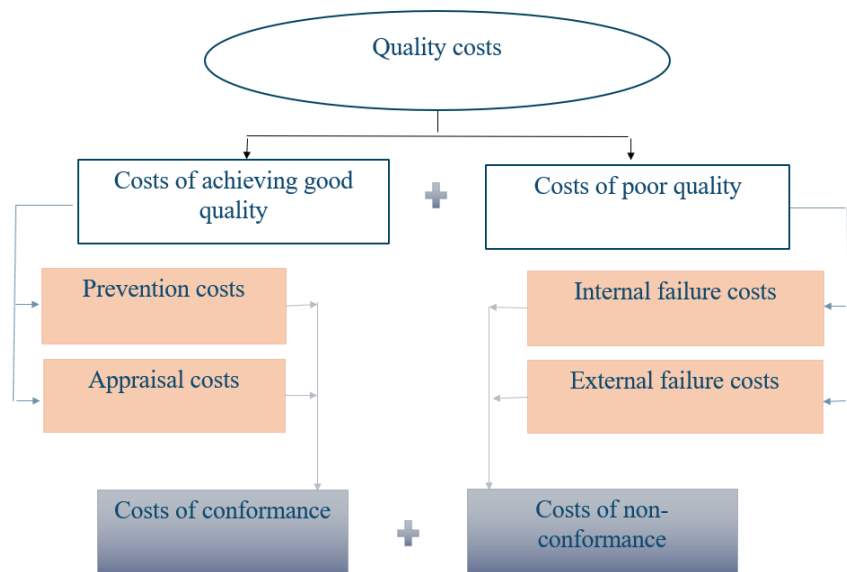


Figure 2. Quality Cost Model

To implement a quality costs program for the higher education institutions it is important to understand the essence and management features of the quality costs. Thus, the definition of costs of quality in higher education institutions is problematic because of the existing heterogeneity in the definition of the concept of quality in higher education, both in determining what is a higher education product, consumers, stakeholders, and so on. (Daunoriene & Zekeviciene, 2012).

Green (2007) examines the applicability of Feigenbaum's quality costs model for managers in higher education and proposes a method for implementing such a model within an educational context. The study emphasizes that committing to implementing the model requires an initial investment before cost savings can be realized. Case examples demonstrate that strategically planning these initial investments can lead to subsequent savings, although accurately measuring these savings presents challenges. The paper underscores the necessity for managers to delegate financial control to fund planned expenses. Both academic and non-academic staff must identify shortcomings, propose practical preventive measures, and actively participate in operationalizing new procedures. This paper advocates for a structured approach to everyday expenditures.

The application of preventive measures and associated costs has been shown to positively contribute to sustainability by conserving resources. Conversely, failures resulting from inadequate prevention can have adverse sustainability implications, leading to inefficient resource use. To foster a sustainable global environment, prioritizing prevention activities and their associated costs across all sectors is essential to minimize or eliminate the costs associated with failures (Yükçü & Polat, 2023). Table 1. provides a generic model of the quality costs in the higher education (Green, 2007; Daunorienė, 2011; Daunoriene & Zekeviciene, 2012)

Quality cost category	Description of category	Quality cost elements	Quality cost elements
Prevention cost	Prevention costs in educational contexts refer to expenditures incurred to prevent poor quality in educational offerings. These costs encompass activities aimed at lowering dropout rates. Greater investment in prevention activities results in progressively reduced costs associated with failures. In educational settings, prevention costs include measures such as comprehensive orientation programs for new teachers to ensure a clear grasp of teaching standards, meticulous	Process design Process change Quality audit Preventive maintenance	-Expenses related to market analysis and evaluation, -Costs associated with designing curriculum, -Expenditures for teacher training, -Costs for developing instructional strategies, -Expenses for preparing teaching materials, -Expenses related to planning individual teaching assignments, -Costs for planning lectures, -Expenses for preparing lectures, -Expenditures for improving lecturer qualifications (e.g., seminars, conferences), -Costs for additional learning facilities, -Expenses related to practical aspects of modules (e.g.,

	documentation of courses and modules, adherence to rigorous course review and development processes, contingency plans to manage disruptions caused by staff absences, and protocols focused on enhancing student well-being.		enterprise visits, collaborations with company management), -Costs related to investigating the reasons for absence, -Costs related to researching issues affecting student motivation and commitment to courses, -Costs for training in the application of standards.
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Quality cost category	Description of category	Quality cost elements	Examples of quality cost elements
Appraisal Cost	Appraisal costs within the framework of quality management refer to expenditures dedicated to measurement and monitoring activities aimed at improving student retention. These costs encompass the resources allocated to assess, evaluate, or audit the services of educational institutions to ensure they meet quality standards. In educational contexts, appraisal costs can be divided into two categories: beneficial and detrimental. Beneficial	Testing, measurements, evaluations, assessments, problem analysis, inspection, detection, and similar activities.	-Costs related to assessing new programs and modules, -Expenses for evaluating individual teaching assignments, -Costs for organizing midterm and final projects, -Expenses for updating and revising teaching materials, -Costs for updating information

	<p>appraisal costs include efficient internal review processes to maintain accurate grading standards, regular subject meetings to align educators on assessment levels across different skill levels (basic, intermediate, advanced), and frequent sessions to identify and support students at risk of dropping out. In contrast, detrimental appraisal costs arise from inefficient practices. In essence, appraisal costs in quality management involve financial investments aimed at ensuring that educational processes and outcomes consistently meet established quality benchmarks, encompassing both effective and inefficient assessment practices.</p>		<p>provided to students, -Expenses for self-assessment, -Costs for analyzing student assessments, -Expenses for analyzing and resolving student complaints, -Costs for monitoring attendance records, -Expenses for distributing lesson materials to absent students, -Costs for providing one-to-one coaching to students to meet minimum standards.</p>
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Quality cost category	Description of category	Quality cost elements	Examples of quality cost elements
Internal Failure Cost	Internal failure costs represent expenditures incurred due to errors and deficiencies within the educational system that lead to student failures and dropouts. Examples include revising lesson plans due to unclear specifications, reconvening examination boards because of inadequate regulations, and correcting errors in typed reports. These costs arise before the final delivery of educational outcomes to stakeholders.	Defect removal (false documents, etc.) Lost process time Costs incurred to lecture to students that eventually fail	<ul style="list-style-type: none"> -Costs for rectifying new programs and modules, -Expenses incurred due to delays in submitting accreditation requests for study programs, -Costs associated with delayed communication of information, -Expenditures for corrective measures in strategy, -Costs for revising and updating teaching materials after failures, -Expenses for additional consultations and re-evaluation of knowledge for students who did not pass, -Costs of instructing students repeating the course, -Additional expenses due to ineffective communication with students, -Students with poor attendance submitting below-standard coursework,

			<ul style="list-style-type: none"> -Students withdrawing from courses before completion, -Inadequate service delivery by the computer services department for academic needs, -Sending incorrect results letters to students.
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Quality cost category	Description of category	Quality cost elements	Examples of quality cost elements
External Failure Cost	External failure costs are expenses incurred due to flaws in educational services that impact students after they have been delivered. These costs include managing student complaints, providing remedial education or training, and addressing the negative effects on the institution's reputation caused by inadequate educational outcomes. These costs arise after the delivery of educational services has occurred.	<ul style="list-style-type: none"> Complaints Additional training costs Time lost Lost reputation Loss of income Government subsidies wasted on university failures 	<ul style="list-style-type: none"> -Costs of analysis of complaints of students or other stakeholders -Additional training costs of lecturers -Costs of student's dissatisfaction -Costs of research issues

SUSTAINABILITY AND QUALITY COST

Incorporating the three dimensions of sustainability (economic, ecological, and social) into quality costs involves considering the broader impacts and benefits of quality costs beyond just quality improvement. Here's how each dimension can be integrated into:

A) Prevention activities

1. Economic Dimension:

- **Cost Efficiency:** Prevention activities should be cost-effective in the long run, reducing overall costs associated with poor quality or failure. Investing in preventive measures early can potentially save costs that would otherwise be spent on rectifying issues later.

- **Resource Allocation:** Efficient use of financial resources ensures that investments in prevention yield returns in terms of improved product quality and reduced failure costs. This can involve budgeting for training, documentation, and infrastructure that supports quality enhancement.

2. Ecological Dimension:

- **Resource Conservation:** Prevention efforts should consider minimizing environmental impact. For instance, choosing sustainable materials or practices in product development and educational infrastructure can reduce waste and energy consumption.

- **Environmental Impact:** Assessing the ecological footprint of prevention activities ensures they align with environmental sustainability goals. This might involve adopting green technologies or practices that reduce carbon emissions and resource depletion.

3. Social Dimension:

- **Employee Well-being:** Ensuring adequate training and support for teachers and staff contributes to their professional development and job satisfaction, fostering a positive work environment.

- **Community Engagement:** Prevention costs can support community initiatives, such as educational outreach programs or partnerships with local stakeholders, enhancing social cohesion and educational outcomes.

- Stakeholder Involvement: Engaging students, parents, and the broader community in prevention efforts fosters a sense of ownership and responsibility towards maintaining quality standards in education.

B) Appraisal activities

1. Economic Dimension:

- Cost Efficiency: Appraisal activities should be cost-effective, ensuring that resources allocated to measurement and monitoring deliver value in terms of improved student retention and educational outcomes.

- Return on Investment (ROI): Investing in effective internal moderation and assessment practices early can potentially reduce costs associated with student dropout and academic underperformance over time.

2. Ecological Dimension:

- Resource Conservation: When conducting appraisal activities, institutes can adopt practices that minimize environmental impact. This might involve digitalizing assessment processes to reduce paper usage, using energy-efficient technologies in assessment centers, or promoting sustainable practices in campus operations related to appraisal activities.

- Environmental Responsibility: Ensuring that assessment processes adhere to sustainability principles can contribute to reducing the ecological footprint of educational operations. This aligns with broader environmental goals of the institution and supports sustainable development.

3. Social Dimension:

- Student Well-being: Effective appraisal practices contribute to student well-being by ensuring fair and accurate assessment, which can reduce stress and anxiety associated with academic performance. Regular pastoral tutor meetings and proactive identification of at-risk students promote a supportive learning environment.

- Community Engagement: Involving stakeholders such as students, faculty, and parents in appraisal processes fosters transparency and trust. This engagement can lead to better educational outcomes and a stronger sense of community within the institution.

- Equity and Inclusion: Ensuring that assessment practices are fair and unbiased supports social equity and inclusion. This includes implementing measures to mitigate biases in assessment and ensuring that all students have equal opportunities to succeed.

C) Internal Failure Cost

1. Economic Dimension:

- Cost Reduction: Efficiently managing internal failure costs can lead to significant cost savings over time. By minimizing the need for rework, such as revising lesson plans or reconvening examination boards, institutions can allocate resources more effectively towards enhancing teaching quality and student support.
- Resource Allocation: Investing in preventive measures to reduce internal failures, such as improving specifications for lesson plans or enhancing governance frameworks for examination procedures, can optimize resource utilization and reduce wastage.

2. Ecological Dimension:

- Resource Efficiency: Addressing internal failures can contribute to environmental sustainability by reducing the consumption of resources like paper and energy used in administrative processes related to corrections and revisions.
- Sustainable Practices: Implementing digital solutions for documentation and communication can reduce the environmental footprint associated with handling paper-based errors and corrections.

3. Social Dimension:

- Student Success: Minimizing internal failure costs improves educational outcomes and supports student success by ensuring that lesson plans are clear, and assessments are fair. This contributes to a positive learning environment and enhances student satisfaction and retention.
- Staff Morale: Effective management of internal failures, such as providing adequate training and support for lesson planning and

assessment procedures, fosters a supportive work environment for educators and administrative staff.

- Stakeholder Trust: By reducing errors and inefficiencies, institutions build trust with students, parents, and the community, demonstrating commitment to delivering quality education and responsible governance.

D) External Failure Cost

1. Economic Dimension:

- Cost Management: Effectively managing external failure costs can lead to significant cost savings by minimizing disruptions and inefficiencies that require additional resources to rectify. This includes reducing expenses related to staff absenteeism and the need to repeat classes.

- Resource Allocation: Investing in preventive measures and robust contingency plans can optimize resource allocation, ensuring that financial resources are used efficiently to mitigate external failure costs.

2. Ecological Dimension:

- Resource Efficiency: Addressing external failure costs can contribute to environmental sustainability by reducing resource consumption associated with repeated educational activities and administrative efforts to manage disruptions.

- Sustainable Practices: Implementing digital solutions and green technologies in educational operations can minimize the environmental footprint of addressing external failures, such as reducing paper usage and energy consumption.

3. Social Dimension:

- Student Impact: Minimizing external failure costs improves educational outcomes and student experiences by reducing disruptions in classes and ensuring effective teaching and learning environments.

- Community Engagement: Engaging stakeholders such as students, parents, and the broader community in addressing external failure costs fosters transparency and trust. This can enhance the institution's reputation and support long-term sustainability goals.

- Equity and Inclusion: Ensuring fair and equitable access to educational resources and minimizing disruptions benefits all students, promoting social equity and inclusion within the educational community.

CONCLUSION

This research advocates for the development of contemporary quality cost models that incorporate contemporary elements and sustainability concept. Such models are crucial for advancing the quality of education and contributing to the sustainable development of HEIs.

The successful implementation of these models hinges on data-driven decision-making and a strong commitment to sustainability at all organizational levels. Ultimately, by achieving higher quality standards and promoting sustainable development, HEIs can better prepare students to meet present and future challenges, thereby fulfilling their role as catalysts for positive societal change.

This paper underscores the critical importance of integrating quality cost models within higher education institutions (HEIs) to enhance their effectiveness and efficiency in delivering quality education. The swift changes in economic, social, and ecological landscapes necessitate that HEIs adopt comprehensive strategies to remain competitive and sustainable. By examining the PAF model, this study highlights the need for a systematic approach to identifying, monitoring, and analyzing quality costs in the context of higher education.

Sustainability is a central theme throughout the discussion, emphasizing the economic, ecological, and social dimensions within the quality cost model. By integrating the three dimensions of sustainability (economic, ecological, and social) into prevention activities, appraisal activities, the activities of internal and external failure, institutions can promote sustainable educational offer that not only enhance educational quality and reduce costs but also contribute positively to economic prosperity, environmental stewardship, social responsibility, and social well-being, contributing to a sustainable future for educational systems and communities.

Furthermore, the study calls attention to the necessity of engaging all stakeholders, including students, faculty, government bodies, and other stakeholders, in the quality improvement process. Stakeholder engagement is essential for ensuring that diverse demands are adequately addressed, and that the quality management system is aligned with national and global policies and legal frameworks. The role of top management commitment in driving quality improvements and fostering a culture of continuous enhancement is also emphasized.

Future research directions include developing quality cost models that incorporate sustainability concept through quality cost elements. The integration of advanced technologies associated with Industry 4.0, such as Big Data, Analytics, Artificial Intelligence and others is expected to significantly enhance the efficiency, accuracy, and transparency of quality cost elements. These technologies can facilitate the timely identification and analysis of data in real time, enabling HEIs to implement timely corrective and preventive activities. Descriptive, Diagnostic, and Predictive Analytics are commonly used in traditional quality assessment with traditional data. However, Prescriptive analytics represents a more advanced approach, not only predicting failures but also prescribing specific actions to address or alter the outcomes. The latter is expected to have a significant impact on the structure of quality cost elements.

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