Engineering Educators Bringing the World Together
2025 ASEE Annual Conference & Exposition
Palais des congrès de Montréal, Montréal, QC • June 22–25, 2025 ASEE
Paper ID #48547

The EFQM Excellence Model: An Integrated Quality Management Tool for the Engineering Management Toolbox

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Abstract

This study investigates the implementation of the European Foundation for Quality Management (EFQM) Excellence Model to see how the EFQM model supports continuous improvement, strengthens leadership, and encourages employee engagement to support strategic planning. The EFQM model is structured into nine main criteria: five Enablers criteria (leadership, strategy, employees, partnerships & resources, and processes) and four Results criteria (employees, customers, society, and key business), each assessed independently and jointly with a total score of 1000 points. Enablers criteria are weighted at 10% each, while customer-related and key results criteria at 15% each, and employee-related and society-related results criteria at 10% each. The study employed quantitative method for results or performance metrics and qualitative method for enablers. The quantitative method included hypothesis testing of target vs performance metrics using paired t-test. The qualitative method included the RADAR (Results, Approach, Deployment, Assessment, and Review) framework for performance assessment and continuous improvement. Data were collected from XXX Steel Plant located in Iran with 13,000 employees and analyzed using SPSS and MS Excel. This study concentrated on customer-related data (sub-criteria 5.e and 6.b) to illustrate the effectiveness of the overall methods. The findings reveal a gap between the performance metrics and the target. The research explores the influence of implementing the EFQM model on customer performance, emphasizing its structured qualitative and quantitative approach to monitoring and enhancing strategic planning. Lessons learned from the EFQM model's organizational deployment offer actionable strategies to enhance strategic planning, leadership, and process optimization. This is useful for engineering education as a quality management tool.

Keywords: EFQM Excellence Model, Quality Management, quantitative method, hypothesis testing, qualitative method, RADAR.

1. Introduction

The European Foundation for Quality Management (EFQM) Excellence Model serves as a comprehensive framework for achieving organizational development and strategic alignment by emphasizing continuous improvement, leadership, and stakeholder engagement. Despite its well-established theoretical foundation and extensive practical applications, challenges such as resistance to change and the difficulty of measuring intangible outcomes persist in its implementation. This paper addresses these challenges, focusing on bridging gaps in understanding and proposing actionable strategies for overcoming deployment barriers.

The research stems from the need to explore the EFQM model's potential to enhance organizational performance while offering insights for academic and practical contexts. For the same, a case study at XXX Steel Plant has been conducted with the following research questions:

> RQ1: Is there a statistically significant difference between Target metrics and Performance metrics? Corresponding hypothesis has been described in the Methodology section.

RQ2: What is the organization's EFQM assessment point across sub-criteria, criteria, and the entire model?

By investigating the impact of implementing the EFQM model at the XXX Steel Plant, this study examines how structured methodologies like the RADAR (Results, Approach, Deployment, Assessment, and Review) framework and performance metrics assessment can drive sustainable success. The analysis incorporates quantitative statistical tools and qualitative approaches to explore critical relationships between EFQM Enablers and Results.

This paper discusses the practical application of the EFQM model, offering a strategic perspective for leveraging its principles to improve organizational outcomes. It explores how these insights can also inform broader contexts, including enhancing teaching and learning in engineering education through structured evaluation and continuous refinement.

2. Literature Review

The following section provides a comprehensive literature review of each key terminology and method.

Quality Management Models: TQM, EFQM, and Their Evolution

In the 1950s, Deming introduced statistical quality control in Japan, elevating manufacturing standards [1]. Juran emphasized customer-defined quality, while Feigenbaum advocated for "Total Quality Control" [2]. By the 1980s, Total Quality Management (TQM) emerged, focusing on excellence across business operations. Rooted in scientific management, TQM integrates processes and employees to ensure customer satisfaction and continuous improvement. Early contributions by Shewhart, Deming, and Juran were expanded by Crosby's zero defects philosophy. Global recognition includes ISO 9000 standards, the Deming Prize, and the Malcolm Baldrige Award [3], [4]. Inspired by MBNQA (Malcolm Baldrige National Quality Award), EFQM launched in 1989 to foster European organizational excellence. The EFQM Model, introduced in 1991, has evolved with updates in 1999 (RADAR), 2010 (sustainability), and 2020 (agility and transformation) [5]. Research highlights its integration with strategic tools like SWOT (strengths weaknesses opportunities and threats) analysis, BSC (balance scorecard), and Six Sigma to enhance performance [6], [7].

EFQM and Strategic Models: A Comprehensive Enhancement

The EFQM Excellence Model stands out as a robust and adaptable framework that not only complements but significantly enhances various strategic models by providing a holistic and integrated approach to organizational excellence. Unlike many traditional strategic models that focus on specific aspects of performance, EFQM offers a comprehensive view that encompasses leadership, strategy, people, partnerships, processes, and results. This breadth allows EFQM to serve as a unifying platform that integrates and amplifies the strengths of other methodologies, ensuring that organizations achieve sustainable success.

One of the key differentiators of EFQM is its emphasis on a system-thinking approach. While models like SWOT and BSC provide valuable insights into specific areas of organizational performance, EFQM ensures that these insights are interconnected and aligned

with the broader organizational vision and values. For instance, EFQM's focus on strong governance and decision-making processes enhances the internal analysis of SWOT, while its emphasis on customer satisfaction and market performance helps organizations identify and capitalize on external opportunities and threats. This integration ensures that strategic insights are not isolated but are part of a cohesive strategy that drives continuous improvement and innovation.

Moreover, EFQM's unique RADAR logic (Results, Approach, Deployment, Assessment, and Refinement) provides a structured methodology for continuous improvement that complements and enhances other strategic models. For example, while the Balanced Scorecard focuses on translating strategy into measurable objectives, EFQM ensures that these objectives are systematically deployed and refined over time. The RADAR logic supports the Plan-Do-Check-Act (PDCA) cycle central to Hoshin Kanri, reinforcing the alignment of organizational goals and ensuring that strategic objectives are consistently met.

EFQM also addresses areas that are often underrepresented in other models. For instance, while Kaplan and Norton's Strategy Map visually represents cause-and-effect relationships between strategic objectives, EFQM adds dimensions such as societal impact and employee engagement, ensuring a more comprehensive view of organizational success. Similarly, while Six Sigma focuses on process improvement, EFQM integrates this focus into a broader strategic context, ensuring that process improvements contribute to overall organizational excellence.

In comparison to the Malcolm Baldrige National Quality Award (MBNQA), EFQM offers a more European-oriented framework that can be adapted to organizations aiming for international excellence. Both models share a focus on leadership, strategy, and customer focus, but EFQM explicitly includes societal and sustainability results, providing a more holistic view of organizational performance. This makes EFQM particularly valuable for organizations looking to balance financial performance with social responsibility and environmental sustainability.

The EFQM Excellence Model enhances and supplements other strategic models by providing a comprehensive, flexible, and integrated framework that ensures all aspects of organizational performance are aligned and optimized. Its emphasis on continuous improvement, systems thinking, and a holistic view of success makes it a powerful tool for organizations striving for excellence in a complex and dynamic business environment. By integrating the strengths of various strategic models and addressing their limitations, EFQM helps organizations achieve sustainable success and long-term value creation.

The EFQM Model and Industry

The EFQM Excellence Model has been widely adopted across industries such as manufacturing, healthcare, education, and services due to its flexibility and comprehensive approach to organizational excellence. Its application has led to significant improvements in performance, customer satisfaction, employee engagement, and sustainability. For example, companies like Siemens and Bosch have used EFQM to align leadership with strategic goals, streamline processes, and enhance product quality. Similarly, the UK's National Health Service (NHS) has applied EFQM to improve patient care and operational efficiency. The model's

adaptability and focus on continuous improvement make it a powerful tool for driving innovation and maintaining competitiveness in dynamic markets.

Importance of Adding EFQM to Curriculum

The EFQM model's proven effectiveness and global recognition make it a vital addition to business and management curricula. Its real-world applications across diverse industries provide students with practical skills to address complex organizational challenges. EFQM's ability to integrate and enhance other strategic models, such as SWOT and Balanced Scorecard, offers a unified framework for strategic management. Additionally, its explicit focus on sustainability, leadership, and holistic performance equips engineering students to lead in areas critical to modern organizations. By incorporating EFQM into engineering academic programs, institutions prepare future leaders to drive sustainable success and long-term value creation in an increasingly complex business environment.

The EFQM 2010 Model: The Structure of Criteria

Figure 1 represents EFQM 2010 Model which is used by XXX Steel Plant with enablers and results criteria and points.

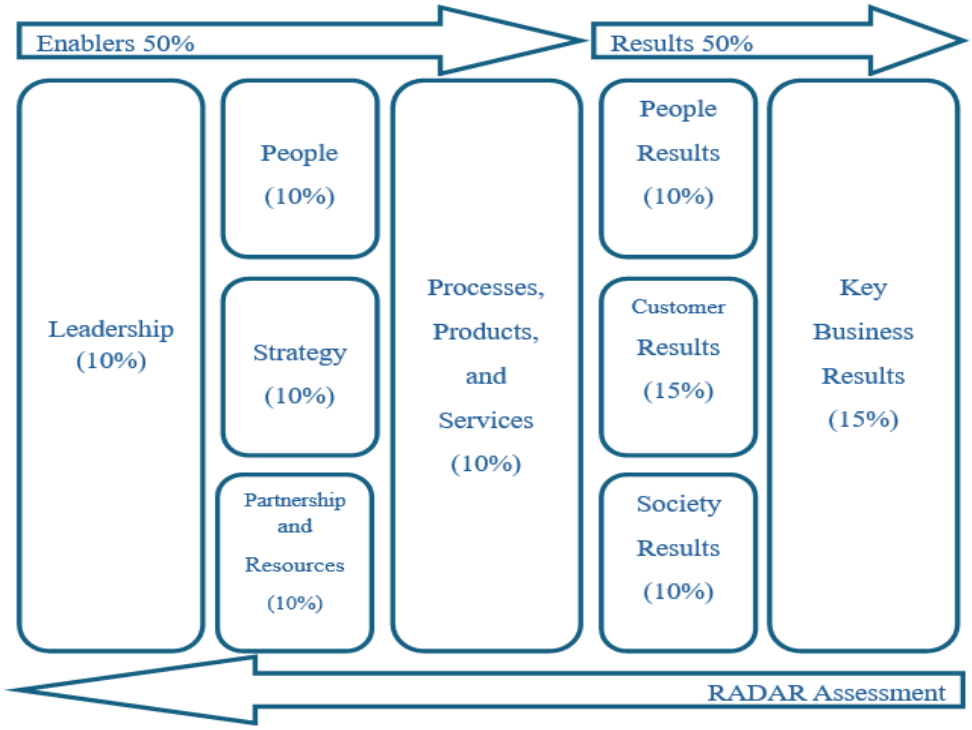

Figure 1. EFQM 2010 Model, Main Criteria and Points

Table 1 represents the descriptions of EFQM criteria and sub-criteria. These criteria and sub-criteria provide a comprehensive framework for organizations to assess their performance, find areas for improvement, and drive continuous excellence.

Table 1. EFQM Criteria and Sub-Criteria

Criteria	Sub-Criteria
1. Leadership	1a. Leaders set up the mission, vision, values, and ethics, and serve as role models. 1b. Leaders are actively engaged in the development, implementation, and continuous improvement of the organization's management system. 1c. Leaders engage with customers, partners, and societal representatives. 1d. Leaders instill a culture of excellence within the organization. 1e. Leaders ensure that the organization stays adaptable, and handles change efficiently.
2. Strategy	2a. Strategy is founded on the requirements of stakeholders and the external opportunities and threats. 2b. Strategy relies on evaluating internal strengths. 2c. Strategy, policies and procedures are created, revised. 2d. Strategy, policies and procedures are deployed and controlled.
3. Employees	3a. Employee plans align with the organization's strategy. 3b. Employees' knowledge and skills are enhanced. 3c. Employees are engaged, committed, and empowered. 3d. Employees are provided with effective communication across the organization. 3e. Employees receive rewards, recognition, and support
4. Partnerships & Resources	4a. Subcontractors are managed to ensure support benefits 4b. Fiscal management ensures ongoing success. 4c. Assets and materials/ natural resources are managed in a sustainable manner. 4d. Technological approaches support the implementation of strategy. 4e. Knowledge based approaches are supported to enhance decision-making effectiveness.
5. Processes, Products & Services	5a. Value chain models are supported for processes to achieve best stakeholders' values. 5b. Products development and service delivery are adopted to create value for customers. 5c. Effective marketing approaches are adhered to promote products and services. 5d. Products and services are created, provided, and overseen. 5e. Customer relationships are developed and strengthened.
6. Customer Results	6a. Perception measures

	6b. Performance indicators
7. People Results	7a. Perception measures 7b. Performance indicators
8. Society Results	8a. Perception measures 8b. Performance indicators
9. Key Results	9a. Perception measures 9b. Performance indicators

These criteria and sub-criteria provide a comprehensive framework for organizations to assess their performance, find areas for improvement, and drive continuous excellence.

In the EFQM Management Document, the five enabler criteria are the organization's performance in descriptive (qualitative) format and the four result criteria convey organizational metrics in numerical (quantitative) data.

Case Study: XXX Steel Plant, Management Systems and Management Document

Founded in 1990 during Iran's industrialization, XXX Steel Plant operates with 13,000 employees, contributing 45% to national steel production. Utilizing EFQM 2010, the plant integrates strategic tools like SWOT (Strengths, Weaknesses, Opportunities, and Threats) and BSC (Balanced Scorecards) to address challenges, including sanctions and resource limitations [8]. EFQM's scoring system evaluates organizational processes. Data from the Management Information System (MIS), integrated with tools like SPSS and MS Excel, supports assessments through RADAR methodology [9]. Key management systems include TPM (Total Productive Maintenance), CRM (Customer Relationship Management), and ISO standards, ensuring alignment with organizational goals [10].

Data was collected in 2020 from XXX Steel Plant in the EFQM Management Document for a time period of 2015-2020. This document, also known as Declaration of Excellence, reflects the organization's efforts and performance during the implementation period of the EFQM model. The EFQM Management Document has the following sections:

- Key Information: This section provides an overview of the organization's operating environment, structure, stakeholders, and strategic objectives.
- Enablers Section: This section outlines the key strategies the organization have implemented to achieve their strategic objectives.
- Results Section: This section provides an overview of the key performance indicators (KPIs) and metrics the organization has achieved, illustrating their effectiveness in advancing towards strategic objectives.

3. Methodology

This section outlines the methods used to evaluate the organizational performance outcomes of XXX Steel Plant following the implementation of the EFQM model. The criteria and processes were defined through an extensive literature review, as highlighted in Figure 1 and Table 1. The study leverages data from the EFQM Management Document and employs the RADAR method and SPSS paired samples t-tests for quantitative analysis.

Research Questions

- **RQ1:** Is there a statistically significant difference between Target metrics and Performance metrics?
    - **H_0:** No significant difference exists.
    - **H_1:** A significant difference exists.

SPSS paired t-tests analyze differences between paired Target and Performance metrics, ensuring assumptions of scale-level data, normality, and no outliers, as validated in Results section.

- **RQ2:** What is the organization's EFQM assessment point across sub-criteria, criteria, and the entire model?

This question assesses the effectiveness of EFQM implementation through RADAR logic, document reviews, self-assessment records, and site visits. Points were calculated using the MS Excel workbook "EFQM Assessment."

Data Analysis

1. **Quantitative Analysis:**
   Focused on paired t-tests to compare organizational metrics. Bonferroni correction ensured Type I error control ($\alpha = .05$).

2. **Qualitative Assessment:**
   Used RADAR analysis for EFQM evaluation. Techniques included reviewing management documents, benchmarking, surveys, and site visits.

EFQM RADAR and PDCA Cycle

Key RADAR elements follow PDCA (Plan, Do, Check, and Act) cycle:

- Results: Measures tangible and intangible outcomes.
- Approach: Defines strategies to achieve objectives.
- Deployment: Implements approaches across the organization.
- Assessment/Review: Evaluates performance and identifies areas for improvement.

Assessors conducted individual scoring using EFQM criteria and RADAR logic, with calculations performed in an MS Excel tool. Results were consolidated through consensus meetings before site visits.

Site Visit and Follow-Up

Site visits involved meetings, interviews, focus groups, and document reviews, concluding with a feedback session highlighting strengths and areas for improvement. Details on scoring and results are elaborated in the next section.

Subjectivity in the Research Methodology

While the methodology incorporates qualitative elements that inherently involve some subjectivity, it is designed to minimize bias through structured processes, standardized tools, and consensus-based validation. The use of quantitative methods, such as paired t-tests, further reduces subjectivity by relying on statistical evidence. Overall, the combination of quantitative and qualitative approaches, supported by EFQM's RADAR logic and PDCA cycle, ensures a balanced and objective evaluation of organizational performance.

4. Results and Discussion

Table 2 illustrates the interrelations between EFQM Results (criteria 6–9) and Enablers (criteria 1–5), highlighting the model's integrated and dynamic nature.

Table 2. EFQM Results and Enablers Interrelations

Enablers	Results	Description of Interrelation
1. Leadership	9. Key Results	Strong leadership defines the vision, supports strategies, and drives the organization to achieve measurable outcomes.
	6. Customer Results	Leaders play a pivotal role in shaping strategies that align with customer needs and expectations.
2. Strategy	6. Customer Results	Clear strategies are designed to meet customer expectations and ensure high satisfaction levels.
	7. People Results	Strategies ensure that employees are engaged and supported to achieve organizational goals.
	8. Society Results	Strategic initiatives include social and environmental goals to achieve positive societal impact.
3. People	7. People Results	Investment in employee development and engagement translates into better workforce satisfaction and productivity.
	9. Key Results	Empowered and skilled employees contribute directly to achieving organizational key performance indicators.
4. Partnerships and Resources	6. Customer Results	Effective use of partnerships and resources ensures consistent delivery of value to customers.
	8. Society Results	Collaborating with external stakeholders fosters social responsibility and sustainability initiatives.
	9. Key Results	Proper resource management and partnerships align with achieving financial and operational goals.

5. Processes, Products, and Services	6. Customer Results	Optimized processes ensure high-quality products and services, resulting in enhanced customer satisfaction.
	9. Key Results	Streamlined processes and innovative products improve efficiency and organizational success.
	8. Society Results	Sustainable and ethical processes positively influence societal outcomes.

Table 2 shows that customer results serve as the primary pathways of majority of the enablers. Hence, for this sample analysis to emphasize on customer related processes, the "Hot-Rolled Product A" is selected as 5.e enabler sub-criterion (Table 3) and analyzed in joint with 6.b result sub -criterion (Table 4). Sub-criterion 5.e (Table 3) outlines XXX Steel Plant's initiatives for customer loyalty, while sub-criterion 6.b (Table 4) reflects the corresponding outcomes driven from Management Document.

Table 3. Sub Criterion 5.e. Customer Relationships Development in RADAR Format

Results (Related Sub-Criteria)	**A**pproach, **D**eployment, **A**ssessment, and **R**eview
Results: 6.a 6.b	**Approach:** • Segment customers based on field of activity, product needs (domestic market), geographic region, and export markets. • Define and revise value propositions for target customer groups annually. • Collaborate with a university to enhance customer experience management through a three-stage project: -Designing and redesigning the customer experience management model. -Implementing the customer experience management model. -Evaluating the customer experience management model post-implementation. • Benchmark against leading global steel companies to refine strategies, including managing brand experience. Develop technical and commercial guidance initiatives tailored for specific customer groups**.** **Deployment:** • Categorize domestic customers into 12 groups and international customers into 3 groups. • Implement multiple general and specialized policies/processes for effective relationship management. • Execute initiatives to improve customer experience, such as: -Developing employee competencies and authority. -Enhancing customer information systems. -Conducting regular customer visits. -Expanding the CRM system. -Establishing management systems. • Launch the XXX Steel Brand Management project to strengthen brand experience.

	• Provide technical consultations, publish technical manuals, organize specialized seminars, and hold technical and commercial meetings. **Assessment:** • Measure customer experience using indicators such as: -Trust and confidence in XXX Steel Plant. -Flexibility in addressing customer expectations. -Ease of access to services. • Evaluate effectiveness through overall customer satisfaction indices and likelihood of repeat purchases. •
	• Assess satisfaction with technical guidance, commercial consultations, and feedback on training sessions and technical recommendations. **Review:** • Annually validate and adjust value propositions for target customer groups. • Use feedback from customer interactions and benchmarking activities to refine strategies and projects. • Update technical manuals and assign expert consultants based on customer feedback, focusing on mechanical properties, packaging, and defect details. • Continuously improve processes and systems to ensure alignment with customer needs and industry best practices.

Table 4. Sub Criterion 6.b: Customer Satisfaction with Products Based on Sales Price

Product		2015	2016	2017	2018	2019	2020
Hot-Rolling Product A	Target (%)	80	80	80	80	80	80
	Performance (%)	79.4	68.9	67	71	77	77
Hot-Rolling Product B	Target (%)	80	80	80	80	80	80
	Performance (%)	79.4	62.7	69	70	74	75
Cold-Rolling Product C	Target (%)	80	80	80	80	80	80
	Performance (%)	78.2	73.1	73	77	80	78

Quantitative Analysis Results

A paired sample t-test examined the difference between Target and Performance metrics for Hot-Rolled Product A, addressing RQ1: *Is there a statistically significant difference between*

Target and Performance metrics? Results ($t(5) = 3.192$, $p = .024 < .05$) indicate significant differences, rejecting the null hypothesis [11]. Descriptive statistics (Table 5) and inferential analysis (Table 6) support this conclusion. For further detail, readers may refer to [12].

Table 5. Descriptive Statistics for Target and Performance

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Target	80.0000	6	.00000	.00000
	Performance	73.3833	6	5.07717	2.07275

Table 6. Inferential Statistics (Paired Sample t-Test)

Paired Samples Test

		Paired Differences					t	df	Significance	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			One-Sided p	Two-Sided p
Pair 1	Target - Performance	6.61667	5.07717	2.07275	1.28850	11.94483	3.192	5	.012	.024

The EFQM RADAR as a qualitative analysis tool is employed next to investigate the reasons that strategic target performances are not meeting.

Qualitative Analysis

The EFQM RADAR tool assessed strategic target gaps. Assessors from National Organizational Excellence Award (2020) conducted evaluations using the EFQM framework (approach, deployment, assessment/review). Table 7 summarizes strengths and improvement areas for sub-criterion 5.e, with a final score of 65%. Key findings show misalignments in strategy deployment and outdated customer relationship procedures (last updated in 2017).

Table 7. Sub Criterion 5.e. Customer Relationships Development RADAR Analysis and Scores

Analysis	Related Scores
Strengths Findings are explained as follows: - **Results (score: refer to 6.b):** • The Target metrics for customer satisfaction with sales price for Product A is well-defined in yearly intervals and aligns with organizational strategies. - **Approach (score 65%):** • The strategies are broken to detailed metrics including the customer satisfaction. • Implemented a 3-phase customer experience project with university. - **Deployment (score 70%):** • Customer data are analyzed.	Approach: 65% Deployment: 70% Assessment/ Review: 60% **Sub-Criteria Score: 65%.**

- Developed initiatives like employee training, CRM expansion, and customer touchpoint optimization.
- Established tailored policies and processes, including site visits and complaint handling.

- **Assessment and Review (score 60%):**
  - A systematic evaluation of the organization's performance against customers was performed.

Areas to Improve

Findings are explained as follows:

- **Results:** Based on the paired sample t-test analysis, the performance metrics for customer satisfaction with sales price for Product A are not meeting the strategic targets.
- **Approach:**
  - Despite the strategies are well defined and broken to detailed metrics including the customer satisfaction, defined approach does not ensure consistency and effectiveness in achieving desired outcomes.

- **Deployment:**
  - Although the XXX Plant Steel has segmented its customers based on internal variables and geographical regions, there were no records showing the customer classifications mentioned in the Management Document part 5.e. is deployed. There was not available records of deployment and effectively cascading strategies, policies, and initiatives throughout all levels and customer relation department. Deployment is not effective and does not ensure that everyone within the organization is aligned and working towards common goals.

Assessment and Review*:*

This assessment was not involved collecting and analyzing relevant data and information to find strengths and weaknesses in customer relationships. The last update of customer relation procedures was done in 2017.

Scoring and Reporting

Figure 2 (detailed EFQM scores) and the EFQM Assessment Report (Table 7) consolidate findings, providing a comprehensive performance review. The weighted score for the organization is 670.9/1,000. Final recommendations are detailed in the next section.

Criterion	Criterion Part	Approach	Deployment	Assessment & Refinement	Average	Overall total score
1	a	80	65	65	70.0	70
	b	75	75	65	71.7	70
	c	90	75	60	75.0	75
	d	70	50	60	60.0	60
	e	90	60	60	70.0	70
Average		81.0	65.0	62.0	69.3	69.0
2	a	65	65	65	65.0	65
	b	70	65	60	65.0	65
	c	85	75	55	71.7	70
	d	80	70	65	71.7	70
Average		75.0	68.8	61.3	68.3	67.5
3	a	80	60	60	66.7	65
	b	75	65	60	66.7	65
	c	65	60	55	60.0	60
	d	60	55	50	55.0	55
	e	70	60	35	55.0	55
Average		70.0	60.0	52.0	60.7	60.0
4	a	65	70	60	65.0	65
	b	75	70	50	65.0	65
	c	90	80	55	75.0	75
	d	85	75	55	71.7	70
	e	75	70	50	65.0	65
Average		78.0	73.0	54.0	68.3	68.0
5	a	90	75	55	73.3	75
	b	80	50	50	60.0	60
	c	80	50	50	60.0	60
	d	80	80	60	73.3	75
	e	65	70	60	65.0	65
Average		79.0	65.0	55.0	66.3	67.0
6	a	70	60		65.0	65
	b	70	75		72.5	70
Average		70.0	67.5		68.8	67.5
7	a	70	55		62.5	60
	b	75	55		65.0	65
Average		72.5	55.0		63.8	62.5
8	a	75	55		65.0	65
	b	75	75		75.0	75
Average		75.0	65.0		70.0	70.0
9	a	75	65		70.0	70
	b	80	70		75.0	75
Average		77.5	67.5		72.5	72.5

Figure 2. EFQM Scores

5. Conclusions, Implications, and Future Work

5.1 Conclusions

The study utilized the EFQM model to analyze organizational data, comprising 34 sub-criteria under 9 main criteria. SPSS-based paired sample t-tests assessed performance targets (RQ1), while the RADAR methodology ensured achievements were systematically supported. An Excel-based evaluation quantified adherence to the EFQM model, addressing RQ2. Key findings focus on customer metrics (6.b: satisfaction with products) and enabler criterion (5.e: customer relationship management). Descriptive and inferential statistics revealed Product A's customer satisfaction scores failed to meet strategic targets. A paired t-test ($t = 3.192$, $p = .024 < .05$) rejected the null hypothesis, indicating significant differences between target and actual performance. This highlights the gaps in achieving customer satisfaction goals. EFQM scores identified strengths in relevance/usability (70%) and benchmarking practices (75%). Weaknesses include limited benchmarking (<25%) and inconsistencies in customer relationship deployment, with outdated procedures (last update: 2017).

The study emphasizes EFQM's value in strategic alignment and continuous improvement. It integrates statistical analysis with the RADAR framework to recommend customer satisfaction enhancement, drive evidence-based decisions, and benchmark against industry standards.

This study emphasized the customer's leading role in defining quality. Table 2 demonstrates that customer results serve as key pathways for most enablers. To illustrate this, the 6.b result sub-criterion was analyzed alongside the 5.e enabler sub-criterion. The 5.e enabler reflects XXX Steel Plant's initiatives, such as customer segmentation, to drive satisfaction and loyalty, while 6.b presents corresponding outcomes, as documented in the plant's management records. This analytical approach can be applied across all enabler-result relationships in Table 2, making it scalable to the broader organization and model. On the other hand, the study's findings, grounded in customer-related processes, are applicable across the organization and highlight EFQM's potential as a global tool for continuous improvement.

5.2. Implications

By systematically applying EFQM criteria as outlined in Table 8, industries can significantly improve the learning outcomes for engineers, ensuring they are equipped to meet current and future challenges.

Table 8. EFQM Engineering Learning Outcomes Outlined by Criteria

Criterion	Approach	Results
Leadership (Criterion 1)	- Leaders prioritize continuous learning and innovation. - Establish a professional development culture.	- Learning-centric environment. - Engineers motivated to engage in training programs.
Strategy (Criterion 2)	- Align training with organizational strategy and future trends. - Address challenges like sustainability and digital transformation.	- Strategically relevant skills aligned with organizational goals.
People (Criterion 3)	- Invest in competency-based training and mentoring. - Engineers encouraged to take ownership of learning.	- Improved skills, higher engagement, productivity, and innovation.
Partnerships and Resources (Criterion 4)	- Collaborate with universities and professional bodies for training. - Use digital tools and labs to enhance hands-on learning.	- Access to state-of-the-art resources and expertise.
Processes, Products, and Services (Criterion 5)	- Develop structured programs with real-world projects. - Continuously refine content using feedback and industry trends.	- Engineers prepared for practical problem-solving, boosting organizational effectiveness.
Customer Results (Criterion 6)	- Measure satisfaction and assess post-training performance. - Use feedback mechanisms for continuous improvement.	- Improved learning outcomes and measurable impacts on performance and stakeholder satisfaction.
People Results (Criterion 7)	- Track engagement and alignment with career development needs.	- Higher motivation and retention due to meaningful professional development.
Society Results (Criterion 8)	- Incorporate sustainability, ethics, and societal impact in education. - Encourage projects benefiting society (e.g., renewable energy solutions).	- Engineers contribute to societal well-being alongside organizational goals.
Business Results (Criterion 9)	- Link educational outcomes to business metrics (e.g., innovation rates, time-to-market, cost efficiency).	- Demonstrable improvements in business performance, validating investment in education.

5.3.Future Work and Post EFQM Activities

Future research can extend this methodology by engineers to other EFQM dimensions, such as employee engagement and technical processes optimization, exploring enabler-result interrelations embedded in the model. For example, initiatives like fostering state-of-the-art technologies or enhancing sustainable growth in employees training could be assessed through specific enabler and result sub-criteria. Applying this systematic approach across all EFQM areas will enable engineers to achieve holistic excellence and strategic alignment, leveraging the

model's full potential to drive innovation and continuous improvement. Examples of future implementations can include:

1. Leadership establishes a strategic initiative to upskill engineers in artificial intelligence and sustainable engineering practices.

2. A Strategy is created to align training with organizational goals like innovation and carbon reduction.

3. People are engaged in customized training programs, blending classroom learning with hands-on projects.

4. Partnerships and Resources leverage collaborations with universities and tech companies for state-of-the-art content and tools.

5. Processes ensure that feedback loops and iterative improvements are built into training programs.

6. Results criteria (Customer, People, Society, Business) measure the success of these initiatives, creating a feedback cycle for ongoing enhancement.

After receiving the EFQM assessment report, organizations embark on a structured process to drive improvement and align strategies with their vision. Key steps include:

1. Identify strengths, areas for improvement, and priority areas aligned with strategic goals. Engage leadership to ensure alignment with the organizational vision.

2. Share results with stakeholders, celebrate achievements, and emphasize the commitment to improvement.

3. Set clear objectives, prioritize actions, and assign responsibilities to address critical areas.

4. Integrate changes into operations, leverage EFQM practices, and build employee capacity through training.

5. Establish KPIs, conduct regular reviews, and create feedback loops to track progress.

6. Encourage employee participation, embed EFQM principles, and benchmark against industry standards.

7. Reflect on outcomes, iterate the process, and work towards EFQM certification or higher recognition levels.

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