

QATAR UNIVERSITY

COLLEGE OF ENGINEERING

LEAN PRACTICES AND ITS IMPACT ON ORGANIZATIONAL SUSTAINABILITY OF

QATARI HIGHER EDUCATION INSTITUTIONS

BY

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ABSTRACT

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Title: Lean Practices and Its Impact on Organizational Sustainability of Qatari Higher
Education Institutions

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This study examines the impact of lean practice on organizational sustainability in Qatari higher education institutions. Despite significant investments in education, Qatari universities face challenges in achieving sustainability while balancing global ambitions with local values. The research investigates how lean practice affect environmental, economic, and social sustainability. Data was collected from 124 staff members at Qatar University and the Community College of Qatar using a survey questionnaire. Partial Least Squares Structural Equation Modelling was implemented to execute the analysis. The results indicate that lean practice have a substantial positive impact on all three dimensions of sustainability. Leadership support, continuous improvement, and waste elimination were found to be particularly important. The study contributes to understanding how lean practice can enhance sustainability in higher education, providing valuable insights for institutional leaders and policymakers in Qatar. Recommendations include implementing targeted lean strategies to improve sustainability performance in Qatari higher education institutions.

DEDICATION

Dedicated to my family, friends, and university instructors.

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I want to convey my appreciation to God for granting me the strength, dedication, and expertise to conduct this study. I am grateful to Qatar University for providing all the necessary conditions to satisfy the requirements of this study in pursuit of my master's degree. I really appreciate Prof. Farayi Musharavati, who oversaw my thesis, for his unwavering support throughout this whole process. Ultimately, the acknowledgement would be incomplete without expressing my profound appreciation to my family, whose unwavering support and patience have been important not just in the completion of this study but throughout my whole life.

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CHAPTER 1: INTRODUCTION

Research Background

In recent decades, the notion of sustainability has grown in favour. According to the Brundtland Report (1987), the most commonly known concept of sustainability is "development that satisfies the current generation's needs without affecting future generations ability to satisfy their own needs." The growing emphasis on sustainability has spread to various sectors, including higher education, where institutions have a key influence in forming society through education, research, and knowledge dissemination, as well as establishing a framework for sustainable development (Ferrero-Ferrero et al., 2018).

Qatar's higher educational industry has experienced substantial reforms and investments in recent years. The nation's objective is to broaden its oil and gas-dependent economy by capitalizing significantly in education, research and development, and infrastructure in order to foster knowledge creation (Weber, 2014). The Supreme Educational Council (SEC), founded in 2002, is responsible for supervising Qatar's educational system at all levels. Its main tasks include formulating policies, overseeing changes, and assuring adherence to quality standards. Established in 1973, Qatar University is the foremost public university in Qatar. In order to support Qatar's shift to a knowledge-based society while also preserving its Arabic and Islamic traditions, it offers a broad range of undergraduate and graduate degrees (Qatar University, 2012a).

The Qatar Foundation developed Education City to offer exceptional specialized educational, housing branch campuses of prestigious worldwide universities. These satellite campuses function autonomously, following the same criteria as their main schools, and provide a creative environment for students (Qatar

Foundation, 2012e). Furthermore, in 2010, Hamad Bin Khalifa University (HBKU) was established as a burgeoning research university inside Qatar Foundation. It has been instrumental in the growth of Education City and the realization of Qatar's goal to become a prominent education center in the area (HBKU, 2015).

Although higher educational possibilities in Qatar have been rapidly expanding, there are still ongoing tensions between the objective of becoming an international education hub and the need to preserve the country's cultural character. There are concerns about the deterioration of traditional values due to the introduction of Western models and English education (Fromherz, 2012). In addition, although Qatar has achieved notable progress in higher education, the government still faces challenges in sustaining a knowledge-based economy, enhancing research output, and ensuring that the intended beneficiaries, the inhabitants, get the desired benefits (Khodr, 2011).

Lean methods have become a promising method for higher educational institutions (HEIs) in Qatar to enhance organization performance and sustainability. “The Toyota Production System is the source of lean principles” (Womack et al., 1990), prioritize the effective use of resources, waste elimination, and continuous process improvement to provide customer value (Liker, 2004; Womack & Jones, 2003). Implementing lean techniques in Higher Education Organizations entails the identification and elimination of inefficiencies, the enhancement of processes, and the generation of value for students (Emiliani, 2004; Antony, 2014).

Recent research has investigated the correlation between lean techniques and organization sustainability in many industries, such as manufacturing (So & Sun, 2015; Nawanir et al, 2020), services (Lizarelli et al, 2022), and higher educational (Klein et al., 2021). According to these research, using lean principles can improve

sustainable performance in terms of the economy, environment, and society. Nevertheless, dearth of study about the impact of lean practice on the sustainability throughout time of Qatari Higher Educational Institutions (HEIs).

By examining the influence of lean practice on the organization sustainability of Higher Educational Institutions (HEIs) in Qatar, this research aims to close this gap. The purpose of this study is to investigate the correlation that exist between lean practice and social, environmental, and economic sustainability. It aims to provide insightful information on how lean principles may be applied by Qatari Higher Educational Institutions (HEIs) to enhance their sustainability performance. This is crucial because they have to strike a balance between their aspirations for the global community and their local beliefs. The study's findings may help develop strategies and policies that support the long-term development of Qatar's higher education sector and further the nation's objective of creating a knowledge-driven society and economy.

Statement of the Problem

Qatar has made extensive expenditures in its higher education sector with the aim of diversifying its economy, fostering a knowledge-based society, and establishing itself as a prominent educational center in the area. With the founding of the Supreme Education Council, Qatar University, Education City, and Hamad Bin Khalifa University, Qatar has established a strong foundation for higher education. Qatari higher educational institutions (HEIs) encounter difficulties in attaining organization sustainability as they navigate the conflicts between their global ambitions and local beliefs.

According to Hansmann et al. (2012), organization sustainability is a multifaceted concept including elements related to the economy, the environment, and

society. Globally, higher educational institutions (HEIs) recognise the need of closely examining sustainability data in order to improve management, assess initiatives, and manage risks and opportunities (Schotz et al., 2018). Studies carried out in Qatar have looked at student awareness and concern for sustainability (Al-Nuaimi, 2022), how environmentally friendly HRM practice affect environmental performance (Alenzi, 2022), and how Qatar Foundation and Education City have developed environmental sustainability policies and practice (Luomi, 2013). However, research on how lean approaches affect the long-term sustainability of Qatari Higher Educational Institutions (HEIs) is scarce.

The Toyota Production System gave rise to lean methodologies, which put an emphasis on resource efficiency, waste elimination, and continuous improvement to deliver value to customers. Previous investigation has discovered the link between lean practice and organization sustainability in other industries (So & Sun, 2015; Nawanir et al., 2020; Lizarelli et al., 2022; Klein et al., 2021). Nevertheless, it is necessary to evaluate this link specifically in Qatari Higher Educational Institutions (HEIs).

This work aims to highlight the issue of limited comprehension of the impact of lean practice on the long-term viability of Qatari Higher Educational Institutions (HEIs). Qatari higher educational institutions encounter difficulties in attaining sustainability while simultaneously managing the expectations of global competitiveness, fulfilling the requirements of the local community, and safeguarding cultural values. Adopting lean principles might be a promising strategy for Qatari Higher Educational Institutions (HEIs) to improve their sustainability performance. Higher educational institutions (HEIs) in Qatar may have challenges in developing sustainable improvement strategies and policies if they do not have an in-depth

awareness of how lean practice impact sustainability's (social, economic, and environmental dimensions).

For a number of reasons, it is critical to investigate the relationship between organization sustainability and lean practice in Qatari Higher Educational Institutions (HEIs). First of all, considering the cultural, social, and economic characteristics of Qatar, it may provide insightful viewpoints on how lean principles might be used within the unique context of the nation's higher educational system. Furthermore, comprehending the influence of lean practice on sustainability may assist Qatari Higher Educational Institutions (HEIs) in identifying specific areas that require enhancement and in implementing focused interventions to improve their sustainability performance. Moreover, the findings of this research can contribute to the development of policies and strategies that foster the sustainable advancement of Qatar's higher education sector, aligning with the country's goal of creating a knowledge-based economy and society.

Addressing this issue is crucial for Qatari Higher Educational Institutions, policymakers, and the wider community. Qatari Higher Educational Institutions (HEIs) have the ability to improve their effectiveness and support the nation's sustainable development objectives through informed decisions regarding the implementation of lean principles. This involves understanding how lean techniques affect organization sustainability. Policymakers may utilize the discoveries to formulate supporting policies and distribute resources efficiently. The community may get advantages from a higher education sector that is more sustainable, catering to their need, and upholding cultural values, all the while fostering economic growth and environmental stewardship.

Research Questions

1. Does lean practice affect environmental sustainability of Qatari higher educational institutions?
2. Does lean practice affect economic sustainability of Qatari higher educational institutions?
3. Does lean practice affect social sustainability of Qatari higher educational institutions?

Objectives of the Study

1. To examine the impact of lean practice on environmental sustainability of Qatari higher educational institutions
2. To investigate the impact of lean practice on economic sustainability of Qatari higher educational institutions
3. To examine the impact of lean practice on social sustainability of Qatari higher educational institutions

Significance of Research

This research is significant as it may improve our comprehension and advancement towards organization sustainability in Qatari higher educational institutions (HEIs) through the use of lean concepts. This research addresses a critical gap in the existing literature by examining the impact of lean practice on the environmental, economic, and social dimensions of sustainability. It offers essential insights for Higher Educational Institutions (HEIs), governments, and society at large.

This research is notable due to its exploration of the distinctive environment of Qatar's higher education industry, which has experienced substantial reforms and

investments in recent years. Qatar's objective is to broaden its economic base, establish a culture focused on knowledge, and position itself as a prominent education center in the area. Nevertheless, Qatari higher educational institutions have difficulties in attaining organization sustainability as they navigate the conflicts between their global ambitions and local principles.

Furthermore, this research has importance as it provides practical implications for Qatari Higher Educational Institutions aiming to improve their sustainability performance. This work aims to study the correlation between lean practice and organization sustainability to assist Higher Educational Institutions (HEIs) in identifying areas that require enhancement and implementing specific interventions. For instance, the results may uncover which lean practice have the most effect on environmental, economic, and social sustainability, allowing Higher Educational Institutions to prioritize their implementation efforts. Furthermore, comprehending the obstacles and facilitators of lean implementation in Qatari Higher Educational Institutions (HEIs) might provide insights for creating efficient change management strategies and support systems.

This research is significant as it contributes to the understanding of lean methodologies and the sustainability of organisations within higher education. Prior research has investigated the relationship between lean practice and sustainability in many industries; however, there is a paucity of studies addressing this topic within Higher Educational Institutions (HEIs), particularly in the Middle East. This study seeks to address the knowledge gap by providing empirical evidence about the impact of lean practice on the sustainability of Qatari Higher Educational Institutions (HEIs). These findings may provide a foundation for further study in the Middle East and beyond. Furthermore, the findings of this study may be contrasted with those from

various geographical regions and sectors, so enriching the overall understanding of the relationship between lean methodologies and sustainability.

Furthermore, this research has great importance since it directly affects policymakers and decision-makers in Qatar's higher educational system. This study offers evidence-based insights on how lean methods affect the long-term viability of Qatari higher educational institutions (HEIs). The findings may be used to shape policies and strategies that promote the sustainable growth of these institutions. For instance, policymakers might utilize the findings to distribute resources and provide incentives to Higher Educational Institutions (HEIs) to inspire the adoption of lean methods. They also offer training and support programs for HEIs to enhance their ability to execute lean strategies. Furthermore, the results of this study can aid in aligning Qatar's higher educational sector with the country's overarching sustainability objectives and vision for a knowledge-driven economy and society.

Ultimately, this research has great importance since it has the capacity to bring about advantageous outcomes for the broader population in Qatar. An environmentally conscious higher educational sector that successfully harmonizes international ambitions with indigenous principles can enhance the welfare and economic success of Qatari society. Qatari Higher Educational Institutions (HEIs) may enhance the economic prosperity, social cohesion, and environmental stewardship of the country by ensuring that its graduates possess the required knowledge, skills, and values for sustainable development. Furthermore, a sustainable higher educational sector may act as an exemplar and catalyst for sustainability in other sectors and domains of Qatari society, fostering a culture of ongoing enhancement and value generation.

This research is significant as it addresses a critical information gap concerning lean practice and organization sustainability in Qatari higher educational institutions (HEIs). It has practical implications for higher educational institutions and policymakers, enhances the current literature on lean practice and sustainability in higher education, and has the potential to benefit the wider community in Qatar. This research investigates the impact of lean practice on the environmental, economic, and social dimensions of sustainability. It provides essential insights that may inform the development of plans, policies, and practice for the sustainable advancement of Qatar's higher educational sector and society at large.

Scope of the study

The purpose of this study is to examine how lean practice affect higher educational institutions' (HEIs) organization sustainability in Qatar. The study will investigate the adoption and application of lean tools, techniques, and principles in Qatari higher educational institutions (HEIs), and evaluate their influence on environmental, economic, and social sustainability performance metrics.

This research examines lean practice and organization sustainability in Qatar's higher educational system, focusing on Qatar University and the Community College of Qatar. This choice is justified by the institutions' representativeness and diversity within Qatar's public higher educational sector. Qatar University, the country's largest public university, offers a comprehensive research environment, while the Community College provides vocational and two-year programs. This focused approach allows for in-depth analysis and comparison between different institutional types, enhancing the study's feasibility and depth within resource constraints. Data will be gathered from administrators and faculty members to ensure a thorough understanding of perspectives on lean practice and sustainability within the context of

public higher education in Qatar. This method provides detailed insights into the application and effects of lean practice in diverse institutional contexts.

The study's focus is restricted to Higher Educational Institutions in Qatar and will utilize a quantitative approach. The study will be carried out within a designated time period, which will be selected based on the resources available and the ability to obtain data. The study intends to create significant insights and suggestions in higher educational management and sustainability by studying key topics and using a rigorous research approach. These insights and recommendations can impact theory, policy, and practice.

Thesis organization

The thesis will be structured into five primary chapters, each dedicated to examining a distinct facet of the topic. Chapter 1 will include an overview of the study, encompassing the background, issue description, aims, research questions, importance, and scope. Chapter 2 will provide an extensive literature analysis that encompasses lean practice, organization sustainability in higher education, and the correlation between lean practice and organization sustainability.

Chapter 3 will provide a complete explanation of the methodology used in this study. This will encompass the study design, the selection of the population and sampling methods, the procedures used for data collecting, the methods employed for data analysis, the steps taken to ensure validity and reliability, and the ethical issues taken into account. Chapter 4 will provide the findings and its discussion. This will include a detailed analysis of the sample, the effects of lean practice on environmental, social, and economic sustainability performance, and an analysis of the results with regards of the study's goals and body of prior research.

Chapter 5 will conclude the research by summarizing the findings, emphasizing the study's contributions to theory and practice, discussing the implications for policy and decision-making in Qatari HEIs, recommending ways to improve organization sustainability through lean practice, recognising the limits of the study and making recommendations for additional directions of research. The thesis shall incorporate references and appendices, which will encompass the survey questionnaire, ethical approval paperwork, and any further data and analysis.

CHAPTER 2: LITERATURE REVIEW

Introduction

This section reviews existing research on lean practice and organization sustainability. The discussion starts with an examination of Qatar's higher educational system's historical growth. Subsequently, it addresses the environmental, economic, and social dimensions of organization sustainability. The evaluation examines the sustainability of higher educational institutions, particularly in Qatar. The review also encompasses lean principles, their use in higher educational institutions and their potential to enhance organization sustainability. Finally, the chapter highlights research that demonstrate a correlation between lean practice and organization sustainability.

Qatar's Higher Education Sector

Supreme Education Council is the governing body responsible for overseeing Qatar's educational system at all levels. Established in 2002, it develops educational policies, monitors reforms, and ensures quality standards. The SEC manages scholarship programs for study abroad and publishes approved university lists. It replaced the earlier Ministry of Education.

Qatar University is the first and leading public university in Qatar, founded in 1973. Originally the College of Education, it became a full university in 1977. QU currently has eight colleges offering undergraduate and graduate degrees in diverse fields. With over 23,000 students from 80 nationalities, it aims to support Qatar's move towards a knowledge society while preserving Arabic and Islamic heritage. QU has sought greater autonomy, decentralization, accountability and international recognition.

To provide world-class specialized education locally, the Qatar Foundation established Education City. Reputable American and European universities including Cornell, Carnegie Mellon, Georgetown, and University College London have branch campuses there. The campuses operate independently with same standards as their home institutions. Education City creates an innovative ecosystem where students can cross-register for courses.

Hamad Bin Khalifa University (HBKU) was inaugurated in 2010 as an emerging research university under Qatar Foundation. It has several colleges and partnerships to provide diverse programs focused on innovation. HBKU shows a key role in the development of Education City and Qatar's aim of becoming a regional education hub.

In addition to universities, the Community College of Qatar was recognized in 2010 as the country's first community college, based on the American model. It provides undergraduate education, vocational training and English courses to support entering university or employment. The college enrolled over 4000 students within five years of opening.

Qatar has also formed partnerships with other international universities to offer branch campuses, though not located in Education City. These include the British University of Aberdeen, Dutch Stenden University and Canadian College of the North Atlantic. There are also local private universities in Qatar, such as Al Rayyan Colleges, Arab Open University and Hamad bin Khalifa University.

Rapid higher education expansion has increased opportunities for Qataris and residents. Reforms focus on moving towards a knowledge economy and society, developing national capacity, while meeting global standards. However, only around

12% of Qatar's 2.7 million population are citizens. Locals are underrepresented in enrollment and faculty at Education City institutions.

Tensions persist between goals of becoming an international education hub and maintaining Qatar's cultural identity. With imported Western models and English instruction, there are concerns about erosion of traditional values. It remains to be seen how Qatar can strike a balance between global aspirations and local history.

Qatar's enormous spending have resulted in significant higher educational advances and reforms. Key initiatives, such as Education City, have attracted top colleges. Along with scholarship programs, this has increased opportunities for young Qataris. However, the government continues to encounter hurdles in maintaining a knowledge economy, increasing research production, and ensuring that residents benefit as intended.

Organization sustainability

Sustainability has become one of the foremost objectives globally and for organizations in recent decades. This growing centrality stems largely from cultural shifts in society towards greater concern about the impacts of economic activities on ecological systems and human wellbeing (Sustainable Development Goals, n.d.). Due to the challenges they provide to both present and future generations, issues including resource depletion, hazardous pollution, biodiversity loss, and climate change have become serious concerns for society (Skogen et al., 2018; Pörtner et al., 2023).

Organizations across diverse sectors are increasingly recognizing the strategic importance of incorporating the concepts of sustainability and practice into their core business approaches (Peters & Simaens, 2020). They understand that sustainability encompasses more than corporate social responsibility initiatives and is fundamental to securing their long-term viability and competitiveness. By incorporating

sustainability across operations, organizations can reap both internal and external benefits. Internally, sustainability fosters improved operational efficiency, cost savings, risk management, and innovation (Calic et al., 2020). Externally, it strengthens reputation, attracts environmentally conscious consumers, investors and talented employees, and enables positive contribution to local communities (Winit et al., 2023).

Achieving organization sustainability requires a nuanced, multidimensional understanding of the diverse factors that drive it, from mindsets to stakeholder interests (Lange, 2012; Sharma, 2007; Rahman, 2022). It demands balancing the needs of the organization with those of society and the environment through a proactive, collaborative approach. This entails considering input from employees, customers, investors, regulators and the public when shaping strategy (Bharadwaj, 2013). The role of human resource management practice is also pivotal for inculcating a culture of sustainability (Wales, 2013). Ultimately, embedding environmental, social and economic accountability across operations represents a shift towards a more holistic, future-oriented management paradigm (Mirchandani, 2008).

While conceptual perspectives on sustainability vary, common themes around financial, social and environmental stewardship are evident. Hansmann et al. (2012) outlined three key pillars of economic, environmental and social sustainability that align with widely cited triple bottom line perspective (Colbert & Kurucz, 2007; Gomez-Trujillo & Gonzalez-Perez, 2020). Further expanded measurement frameworks and maturity models have also been proposed, reinforcing the multifaceted, complex nature of putting sustainability into practice (Savytska et al., 2019; Wright & Nyberg, 2017).

Organization sustainability is a complex concept with distinct considerations for environmental, economic, and social sustainability (Rahman, 2022). Each of these pillars entails unique imperatives for companies seeking to embed durable and ethical value creation.

Environmental Sustainability

Environmental sustainability, as defined by Elleuch (2018), is a critical aspect of business operations, requiring the reduction of waste and pollution. Fundamentally, environmentally focused companies invest in increasing efficiencies around resource utilization and material flows across their offices, supply chains and production processes. Doing so cuts costs while preserving nature and its vital services that all economic activity relies upon (Horodetska et al., 2022; Vazhenina et al., 2023).

In addition, Sustainable businesses are progressively implementing ecologically friendly practice such as using renewable energy, electrifying car fleets, and pursuing zero-waste projects. These behaviors are frequently motivated by a long-term mindset, green strategy, and green innovation (Saether, 2021). Waste management organizations are also moving toward more sustainable solutions, such as changing waste into energy and reusable products (Farooq, 2022). Renewable energy companies are diversifying their tactics to attain environmental excellence (Sulich, 2021). Small and medium-sized businesses are using resource efficiency measures to improve their performance, such as employing renewable energy and reducing waste (Majid, 2023). The potential for sustainable technology, including renewable energy, in manufacturing and logistics is being investigated considering the Sustainable Development Objectives (Richnák, 2022). The implementation of sustainability goals is encouraging environmental innovation in businesses (Ullah,

2021). In order to decarbonise transportation and power, a circular economy is still being implemented in the materials sector. (Mulvaney, 2021).

Österblom (2022) underscores the need for radical change in corporate biosphere stewardship to significantly lower a company's environmental footprint. This is particularly crucial when considering pandemics, as underlined by Moolman (2023), and in industries like coal mining, where the focus should be on lowering the carbon footprint (Ivanova, 2022).

Economic Sustainability

Economic sustainability, a critical component of organization sustainability, is a multifaceted notion that includes financial viability and long-term value development (Neacsu, 2023). Nevertheless, its definition and assessment remain uncertain, highlighting the need for additional research in this field (Tennakoon, 2022). The idea is strongly related to an enterprise's economic stability, which is affected by some elements like financial, industrial, and marketing components (Mishchenko, 2019; Iastremska, 2020). Financial sustainability, in particular, is critical for an enterprise's economic security, and it must be managed during integration procedures (Kopylyuk, 2021; Piletska, 2020). Furthermore, Rahman (2022) emphasizes the need of agility in promoting organization sustainability and business intelligence.

Fundamentally, economic sustainability necessitates identifying and managing risks that could undermine profits, revenue streams or access to financing and investment. It also means recognizing opportunities to improve efficiency, expand markets and reposition brands or offerings to satisfy evolving consumer demands. Ongoing adaptation is thereby vital to stay economically relevant now and into the future (Schulte & Hallstedt, 2018).

Moreover, economic sustainability requires company leaders to make decisions that balance immediate earnings performance with longer-term investments that will fuel innovation and position the firm for changing market conditions (Lloret, 2016). Achieving this balance between present returns and future readiness remains an ongoing strategic challenge. (Calignano & Tripl, 2020)

Generally, the goal of economic sustainability is to embed resilience against unexpected economic fluctuations or disruptions that could threaten financial outcomes, competitiveness and ultimately organization survival. Companies must work to actively predict, prepare for and manage such risk factors through conscious strategy (Haessler, 2020).

Social Sustainability

An organization's capacity to make a constructive contribution to society is referred to as social sustainability (Prieto et al., 2022). This means treating employees, partners, customers and communities with dignity and respect. Issues like diversity, equity, ethics, human rights, philanthropy and advocating for social justice all fall under this pillar (Missimer & Mesquita, 2022).

Essentially, socially sustainable companies focus on nurturing their workforce by offering fulfilling work, fair compensation, healthcare, training opportunities and work-life balance (Wang et al., 2022; Santos, 2023) . They also emphasize ethical conduct, integrity and transparency in their business dealings to build trust (Riedel, 2015).

Furthermore, companies that care about social sustainability seek collaborations and cooperation with non-profits, community groups, and other organizations to support vital issues. They help address societal concerns such as

poverty, education, hunger, and access to key resources (Ordóñez-Ponce 2021, Castagnola 2021, Díaz-Perdomo 2021).

Social sustainability generally aims to advance the long-term welfare of all parties impacted by an organization's operations . Businesses therefore aim to produce net societal benefit rather than net harm through purposeful policies and practice (Missimer & Mesquita, 2022).

Organization sustainability in HEIs

In Higher Educational Institutions, sustainability is a complex concept that entails integrating economic, social and environmental aspects into core operations, research, teaching, and community engagement activities (Díaz-Perdomo et al., 2021). In order to attain sustainability, an integrated plan is required that incorporates all parts of the organization, including leadership, planning, infrastructure, and resource management. However, constructing a Sustainable Higher Educational Institution (SHEI) is a challenging process with many obstacles to overcome (Chakraborty et al., 2019).

Among the biggest obstacles to organization sustainability in HEIs is the ambiguity and complexity of the sustainability concept itself. Many stakeholders, including teachers, staff, and management, see sustainability as an abstract and theoretical paradigm that lacks practical application. This lack of understanding and awareness causes resistance to change, and lack of dedication and participation in sustainability activities (Moreno Pires et al., 2022). Furthermore, rigid and archaic organization structures in HEIs frequently impede effective communication, information exchange, and openness to new paradigms (Gkrimpizi et al., 2023).

According to Farinha et al. (2020), lack of resources and budgetary constraints pose significant obstacles to organization sustainability in higher education. The

adoption of sustainability practice frequently necessitates upfront investments, and many institutions do not prioritize sustainability in their budgets. This is aggravated by a lack of financial autonomy in many higher educational institutions, particularly in Portugal. Besides, academics and staff lack specific training and experience in sustainability, impeding advancement (Weiss et al., 2021).

In order to encourage sustainability at institutions of higher learning, a number of essential enablers and tactics must be implemented. These include strong, proactive leadership that conveys a clear vision and commitment to sustainability (Bautista-Puig, 2019), integration of sustainability into strategic plans, policies, and processes, and a flexible organization structure that allows for cross-disciplinary collaboration and involvement (Rieg, 2021). Engaging all stakeholders, including students, teachers, staff, and external partners, is also critical (Waqas, 2019). However, there are several barriers to implementing sustainability in HEIs, such as lack of financial resources, faculty incompetency, and inadequate management support. HEIs must reframe the problem of students' (in)action for sustainability in order to overcome these obstacles, and they must reorient the emphasis from knowledge/capacity-building to learners' actual behaviours as results (Sule, 2019). Moreover, HEIs must embrace a transdisciplinary approach to teaching and research and systematically include sustainable development across the board (Findler, 2018). Finally, HEIs can serve as a transformative platform within the Sustainable Development Goals framework, actively participating in the diffusion and dissemination of the SDGs (López, 2019).

Several studies highlight the ability of higher educational institutions (HEIs) to encourage sustainability through community participation, innovation, and instruction. Kusmulyono (2023) highlight the role of HEIs in community

development and innovation, with Kusmulyono emphasizing the need for entrepreneurial-oriented community development and proposing a management framework for community innovation labs. Lim (2022) focuses on the educational aspect, advocating for transformative, interdisciplinary, and intercultural learning, and provide a thorough analysis of higher educational institutions' efforts to promote sustainable development via educational. Baturina (2022) explore the purpose of HEIs in sustainable cities and social innovation ecosystems, respectively, while Budihardjo (2021) offer strategies for sustainability implementation and inter- and transdisciplinary education. These studies collectively underscore the potential of HEIs to drive sustainability through a multifaceted approach that includes community engagement, innovation, and education.

Organization sustainability in Qatar HEIs

Multiple studies have examined the notion of organization sustainability at Qatar's higher educational institutions (HEIs). Al-Nuaimi (2022) assesses Qatari college students' awareness and concern for sustainability as well as the impact of Education for Sustainable Development (ESD) on their knowledge, convictions, and behaviour. A survey was administered to students from various disciplines and institutions in Qatar. The results showed that over 80% of respondents understood sustainability-related topics rather well. Nevertheless, this percentage rapidly declines when it comes to their attitudes and behaviors towards sustainability.

The survey also found that a majority of the students—more than 60%—identified external elements as having a greater influence on students' knowledge, attitudes, and behaviours on sustainable development than did aspects of the educational system. Similarly, Alenzi (2022) said that the study looked at the

relationship between environmental performance in firms and GHRM (green human resource management) methods, highlighting the significance of putting these strategies into reality. 383 workers from private companies participated in the study, which was carried out in Qatar. Structural equation modelling was used to examine theories about GHRM practice and environmental performance. Organisations must prioritise sustainability projects since the results point to a beneficial association between GHRM practice, employee behaviour, and environmental performance. The study advances knowledge about the potential effects of GHRM practice on environmental results in industrial organisations.

Furthermore, Luomi (2013) examines how environmental sustainability policies and practice are emerging in Doha, Qatar's Education City (EC) and Qatar Foundation (QF). Using document analysis, interviews, and surveys, the research used a multi-level, multi-method approach to analyse changes at the initiative, individual, and strategic levels. Al-Shaiba (2019) performed a study that compared organization efficiency models, metrics, and indicators using global best practice as a basis.

The study specifically focused on the Qatari organization setting. The approach used to measure and compare organization sustainability determines the present level of sustainability and effectiveness inside companies. Utilizing peer companies to define and benchmark indicators is crucial for management to have a full knowledge of the current state of the organisation and to effectively pursue short- and long-term sustainability objectives.

Furthermore, Weber (2014) examines Qatar's strategy for diversifying its economy away from oil and gas by making large investments in ICT, education, R&D, and the development of the country's coastline and tourist industry. Despite significant expenditures in knowledge economy projects, such as the Qatar Science

and Technology Park, the Qatar National Research Fund, and Education City by the Qatar Foundation, the nation still faces significant obstacles. These difficulties include an inadequate educational system, a fast-growing population, a reliance on foreign labour to supply the need for skilled labour, and an economy that is mostly dependent on petroleum resources and lacks economic diversification. Understanding the part Higher Educational Institutions (HEIs) play in advancing sustainability is provided by Hassan (2016). The relationship between several facets of organization behaviour and the uptake of sustainable building is investigated in this study. The study found that a company's level of sustainability competence is influenced by a number of behavioural traits, as well as by where they are from and the typical size of the projects they take on.

Lean practice

Lean definition and history

Lean is a management philosophy that has its roots in Japan's Toyota Production System (TPS). Lean's primary objectives are to maximise resource use and eliminate waste that does not provide value for the customer (Liker, 2004; Sampson, 2004). Lean management is today seen as a global management philosophy that can be used to both manufacturing and service industries due to its evolution throughout time (Womack & Jones, 2003).

The origins of lean may be found in the early 1900s, when Eiji Toyoda converted his family's loom manufacturing company to an automotive manufacturer. The Toyota Production System was developed to compete with the mass production advantage of U.S. automobile manufacturers (Womack et al., 1990). Lean was introduced to American manufacturers by the Massachusetts Institute of Technology's

International Motor Vehicle Program, suggesting that TPS is the industry standard in the automotive sector (Womack et al., 1990).

Lean has been described in several manners, however, there is a unanimous consensus over its essential principles. In their 2003 publication, Womack and Jones established a set of five principles that characterize lean. 1) Determine the specific monetary worth of each product; 2) Determine the sequence of activities that add value to each product; 3) Ensure a smooth and uninterrupted movement of products; 4) Implement a system where each stage in the process is initiated based on demand; and 5) Strive for the highest level of excellence and flawlessness. These principles provide as a roadmap for enterprises to attain the objective of eradicating waste and enhancing efficiency.

According to Wicker (2004), lean is identical with lean production, lean manufacturing, lean thinking, lean enterprise, lean theory, and lean philosophy. These phrases imply that lean is not only a collection of procedures, but rather a more comprehensive notion that includes strategies and cultures. Nevertheless, to study the implementation of lean in businesses, researchers need to analyze lean at the practice level. This level encompasses the tangible actions and behaviors that individuals carry out within firms to attain lean principles (Shah & Ward, 2003).

The TPS house diagram visually depicts the key elements of lean practice, showcasing a system that is built around a framework rather than merely a collection of methods (Liker, 2004). Four interrelated and cohesive sets of lean manufacturing practice—just-in-time (JIT), total quality management (TQM), total preventative maintenance (TPM), and human resource management (HRM)—were developed by Shah and Ward (2003). In addition, they assessed 22 techniques related to lean

manufacturing. They examined the impact of these packages on operational efficiency.

Lean management is a philosophy that seeks to maximise customer value by streamlining processes and removing waste. It came from the Toyota Production System and has spread over many other sectors. In order to attain organization excellence, lean concepts and methods emphasise constant improvement, cutting waste, and pursuing perfection.

Lean tools

Lean tools have been developed over the past five decades to address various situations and environments, aiming to minimize waste during the production process. Although there are no explicit rules governing which tool should be utilised in a certain context, some tools are more commonly used in certain industries (Leanproduction.com, n.d.). For example, in supply chain, just-in-time (JIT) (Keller & Kazazi, 1993), Kaizen (Imai, 1986), or automation (Shingo, 1989) are frequently utilised to enhance procedures. In automobile manufacturing, lean tools such as Key Performance Indicators (KPIs) (Parmenter, 2015), Kaizen (Continuous Improvement) (Imai, 1986), or Bottleneck Analysis (Roser et al., 2003) may be more popular.

In order to enhance the current process, managers must identify opportunities for improvement, devise a new plan, and implement it. Lean is a continuous process. According to Leanproduction.com (n.d.), this continuous improvement methodology assists in the mitigation of human errors and process errors. Lean principles are also founded on other concepts, incorporating the appropriate method delivering the right outcomes, respect for people, and long-term philosophy, and the continuous resolution of fundamental problems to propel organization learning.

Due to the success of the Toyota Production System, many manufacturers have begun to incorporate lean ideas into their manufacturing operations and service offerings. The implementation of lean principles has not been limited to the manufacturing industry; other industries, such as information technology (IT) (Puvanasvaran et al., 2013), transportation, and distribution logistics (Villarreal et al., 2016; Villarreal et al., 2017), have also embraced lean thinking.

The application of lean tools and principles has confirmed to be working in reducing waste, improving efficiency, and enhancing customer value across various industries. Organisations may simplify their processes, save costs, and enhance overall performance by continually identifying and removing non-value-added operations. An organization's capacity to choose and use the right tools will determine how well lean adoption goes based on their specific needs and context, as well as their commitment to promoting a culture of ongoing development.

Lean constructs

The core principles and dimensions known as lean constructs serve as a roadmap for implementing lean practice within organisations. These conceptual frameworks offer a means of comprehending the essential elements of lean thinking and its impact on organization performance.

Long-term thinking (LT) is a fundamental principle in lean methodology that emphasizes the need of doing operations and projects with a focus on long-term outcomes, even if they do not generate immediate profits or incur short-term financial losses. Ingelsson & Mortensson, 2014; Salhiah & Abdullah, 2019; Likear, 2004; Bhasin & Burcher, 2006; Ingelsson & Abdallah, 2019) workers face this idea on a daily basis at work.

One important concept that concerns the actions, attitudes, and behaviours that academic leaders and university administration exhibit in the course of their everyday duties and obligations is leadership support (LS). Additionally, it encompasses the assistance and way they provide to workers to successfully accomplish their assignments and achieve their desired outcomes and targets. Leaders have a vital role in creating an environment that promotes a fresh mindset and cultural transformation. They achieve this by being actively involved, accountable, motivating, and providing guidance, all while acknowledging the efforts of their employees (Schein, 2004; Achanga et al., 2006; Ingelsson & Mårtensson, 2014; Alefari et al., 2017; Lu et al., 2017; Sfakianaki & Kakouris, 2019).

Continuous improvement (CI) is a concept that enables employees to make incremental improvements on a daily basis in order to achieve organization objectives. Individuals should include continuous improvement and adherence to a certain pattern into their professional responsibilities (Maldonado et al., 2020).

The continuous process of eliminating practice or activities that don't provide value for a service's final customer is known as waste elimination, or WE. According to Dougls et al. (2015) and Salhieh & Abdullah (2019), it entails identifying inefficiencies in workplaces and continuously reducing or eliminating them.

One important factor in determining if lean practice are appropriate for higher educational institutions (HEIs) is the student value (StV). Its goal is to evaluate how much weight is placed on the activities that are available to pupils. This concept and the institution's commitment to providing value to students were evaluated in part by looking at complaints and suggestions for improving quality, as well as communication with management, teachers, and staff. (Balzer et al., 2016; Sfakinaki & Kakouris, 2019)

The concept of System view (SV) is founded on the fundamental notion that the operations of Higher Educational Institutions are interrelated and have a role in accomplishing the institution's overarching objectives. Employees must possess a clear vision in order to enhance continuous improvement (CI) and workplace efficiency (WE) processes and deliver enhanced stakeholder value (StV). According to Salhieh & Abdullah (2019), stakeholder value is the idea of discrete stages within processes and the connections between various activities.

Lean practices in HEIs

In higher educational institutions, Lean practice have been gaining attention as a means to improve organization performance and meet the challenges of international competition. HEIs are under pressure to make better and more effective use of their resources, and lean principles and practice offer a framework for achieving these goals (Sunder, 2016).

The application of lean practice in HEIs involves a focus on identifying and eliminating waste, continuously improving processes, and creating value for students (Emiliani, 2004; Antony, 2014). This involves a shift in the organization culture and belief, with leadership support playing an essential component in creating an environment that is to lean thinking and practice (Sfakianaki & Kakouris, 2019; Lu et al., 2017).

Lean practice in HEIs can be implemented across various areas, such as administrative processes, academic programs, and support services (Sajan et al., 2017). By adopting lean principles, HEIs can streamline their operations, decrease costs, and progress the quality ofand services provided to students (Douglas et al., 2015; Hussain & Malik, 2016).

Successful implementation of lean practice in HEIs requires participation and involvement of all parties involved, including management, faculty, staff, and students (Emiliani, 2015). This involves training and education to develop a shared understanding of lean principles and practice, in addition to the creation of cross-functional teams to lead efforts for continuous improvement (Balzer et al., 2016; Sunder, 2016).

In order to evaluate the efficacy of lean practice and pinpoint areas that still require development (Sfakianaki & Kakouris, 2019), it is essential to measure their effects in higher educational institutions. Tracking progress and assessing the effectiveness of lean efforts in terms of resource utilisation, process efficiency, student happiness, and overall organization performance may be done with the use of key performance indicators (KPIs) and other metrics (Antony, 2014; Sajan et al., 2017).

Lean practice and Organization sustainability

The body of research on the impact of lean practice on organization sustainability has grown over the past several years. So & Sun (2015) carried out a thorough investigation among 527 manufacturing companies using lean production methods in 17 developed nations. Their study sought to create a sustainable supply chain management plan for the manufacturing industry by implementing green practice. After doing research, the study put out three theories and a model to show how lean approaches relate to sustainable supply chains. They hypothesised that in an electronically enabled supply chain environment, firms who embrace lean practice as pro-environmental measures along with a cross-organization commitment are more likely to effectively execute supply chain management (SSCM) strategies. Their study's conclusions hint to a large degree of generalisability, suggesting that emerging nations might use the model as a guide. Importantly, the result advocate for

manufacturers in emerging nations to initially focus on lean practice, emphasizing humanistic values, as a precursor to adopting sustainability measures to enhance the likelihood of success.

Using a longitudinal multi-year and multi-case analysis approach, Piercy & Rich, (2015) conducted an extensive investigation into the effect of lean operations on sustainable operations. Their study, involving five cases, sought to broaden the understanding of the sustainability benefits of lean operations beyond the commonly perceived environmental advantages. The study explored how lean operations contribute to a wider array of sustainability outcomes. These include transparency, supply monitoring, community engagement, and workforce treatment, among others. The research suggests that the execution of lean practice and sustainability performance are inherently interconnected. This research marks a significant departure from previous studies by demonstrating that lean offers more than just a toolkit for waste reduction; it provides a comprehensive philosophy and strategic direction that aligns with various sustainability outcomes. Through creating the first comprehensive, stage-based lean and sustainable operations management (OM) paradigm.

Within the area of operational improvement and its correlation with organization sustainability, Caiado et al. (2019) current a work that examines the alignment of operational programs with sustainable performance measures in Brazilian organizations. The study attempts to provide guidelines for incorporating sustainability into operational frameworks by utilising a triangulated research approach that combines quantitative and qualitative data collection consisting of a thorough literature review, a survey among 50 industry professionals, and semi-structured interviews with 11 academics. This research highlights the essentiality of

corporate responsibility in simultaneously directing efforts towards operational enhancement programs and sustainability initiatives. It underscores the significance of a multitude of factors, incorporating supplier interactions, cost performance, quality management, company reputation, environmental protection, and supplier relations as essential to promoting organization sustainability.

In their exploration presented at the Nordic Ergonomic Society Annual Conference, Eklund et al., (2014) study the dynamics of lean production within the Swedish public sector, aiming to study causes that effect the sustainability and evolution of Lean implementations in public organizations. Through an interactive research project, which extend over 3 years and employed both interviews and questionnaires, the team studied seven public organizations to discern the elements that either facilitate or hinder the enduring adoption and progression of Lean practice. Their investigation uncovered a nuanced landscape: while certain factors were conducive to the sustainability and growth of Lean implementations, others served as significant impediments. A notable barrier to the sustained application of Lean within these entities was the frequent turnover of top management, observed in 5 of the organizations. This turnover often led to the introduction of alternative change philosophies, detracting from the focus on Lean principles. Additionally, the researchers identified a palpable deficiency in political and managerial ownership of Lean initiatives, coupled with financial constraints, as critical obstacles. The results from this comprehensive research bring invaluable understandings to the intricacies of sustaining and developing Lean methodologies in the public organizations sector, stress the pivotal role of consistent leadership and the importance of robust ownership and support at both political and managerial levels.

In manufacturing industry, Verrier et al., (2014) explored how to enhance companies' performance by mixing Lean Manufacturing with ideas of sustainability. Their research is unique because it investigate how companies can gain economically from Lean practice while also caring for the environment and society. They studied 21 industrial companies in Alsace by looking at literature and what these companies do. Their results show that combining Lean (efficiency-focused) and Green (environment-focused) actions can make companies perform better and be more sustainable. They created a new framework that helps companies measure their Lean and Green efforts. This study is about finding a balance between being efficient and being environmentally friendly, suggesting that companies can do well by doing good.

Similarly, Singh and Kumar (2020) conducted an extensive study on the influence of lean methodologies on organization sustainability in the Indian industrial and service sectors, with green supply chain management (GSCM) serving as a mediating element. The authors employed a mixed-methods approach, including organised interviews and a questionnaire survey with academics and business experts, to evaluate the significance of different lean approaches in achieving sustainability objectives. The study's results, derived from the application of structural equation modeling and various statistical analyses, demonstrate that the execution of Kaizen and innovation organization practice has a favorable influence on Green Supply Chain Management (GSCM). This, in turn, leads to substantial enhancements in economic, environmental, and competitive performance, thereby contributing to the overall sustainability of the organization. However, it was shown that the inclusion of environmental considerations in supply chain management was negatively impacted by the combined influence of government law, innovation management, and kaizen.

The authors emphasize the need of optimizing human resources, fostering employee trust and collaboration, enhancing communication and integration, securing support from senior management, and motivating leaders to effectively implement lean and green techniques. The research also underscores the respondents' dissatisfaction with government policies on pollution management, emphasizing the need for improved policies to mitigate environmental issues and promote sustainable development. This study gives to the increasing body of literature on the influence of lean methods and Green Supply Chain Management in fostering organization sustainability. It highlights the practical significance of incremental enhancements and innovative initiatives in both manufacturing and service industries.

In the same vein, Nawanir et al. (2020) investigate how lean manufacturing techniques impact Malaysian small and medium-sized manufacturing companies' triple bottom line—the three pillars of sustainability. The study analyzed survey data from 159 small and medium-sized businesses via structural equation modeling (SEM). The study's conclusions provide credence to the idea that lean manufacturing techniques are interrelated and ought to be used extensively. The findings show that lean manufacturing adoption improves sustainability performance in the social, environmental, and economic spheres. They propose that small and medium-sized firms should prioritize the elimination of the eight prevalent lean manufacturing wastes, while also taking into account the incorporation of environmental waste. It is advisable to combine Lean Manufacturing with green techniques in order to effectively reduce waste in both lean and green processes, hence improving overall sustainability performance. This study provides vital information for experts in the industry by presenting hard evidence that backs up the potential effects of lean manufacturing on sustainability in small and medium-sized manufacturing businesses.

In Kovilage's (2021) study, the author examines the associations between lean practice, green practice, and organization sustainable performance metrics in Sri Lanka. The research used Interpretive Structural Modeling (ISM) and focus group interviews to analyze these interactions. The study analyzes the most influential lean and green practice as well as the measures of sustainable performance. It constructs a model based on the Interpretive Structural Modeling (ISM) method, which consists of eight levels. The model comes to the conclusion that green practice are directly impacted by lean practice, which in turn affect the overall sustainable performance. The MICMAC analysis classifies these components and shows that sustainable performance metrics depend on lean techniques, while green practice operate as moderators. The research presents a detailed model that explains the association between lean practice and green practice, and how this relationship affects the overall sustainability performance of organizations. The study suggests that organizations should start by implementing lean practice and then integrate green practice through a single functional unit. This approach helps to improve sustainability while minimizing redundant efforts and costs associated with implementation.

Jum'a et al. (2021) examine how lean manufacturing strategies affect the triple bottom line (TBL) of sustainability in manufacturing businesses in Jordan. They also explore the role of sustainability-oriented innovation (SOI) as a mediator in this relationship. Structural equation modelling was employed in the investigation to analyze survey data collected from 392 managers. The findings indicate that both lean techniques and SOI (Socially Responsible Investment) have substantial beneficial impacts on TBL (Triple Bottom Line). According to the study, there is a moderating effect of sustainability-oriented innovation on the relationship between lean manufacturing and sustainable development. The authors contend that the

amalgamation of lean methods and SOI effectively guarantees sustainability. They fill a research void by investigating the interconnectedness of lean manufacturing with environmental, economic, and social sustainability dimensions. This study is the inaugural examination of these connections within the setting of Jordan as an emerging nation. It adds to the existing body of knowledge by creating a comprehensive framework and emphasizing the significance of lean practice and SOI in attaining sustainability in manufacturing organizations.

Lizarelli et al. (2022) investigate how lean practice, both technically and socially, affect the long-term performance of service organisations. The researchers polled 139 managers worldwide in a thorough study in order to collect data. The purpose of the study is to clarify the social, economic, and environmental effects of these practice. Regardless of the size of the organisation or the length of time that lean implementation has been in place, the study shows that lean practice are helpful for all three aspects of sustainable performance. Technical and social lean practice both affect economic and environmental performance in similar ways, while social lean practice have a greater effect on social performance. The authors emphasize the lack of research on the relationship between lean, sustainability, and services, specifically in terms of all aspects of sustainability. The results revealed the positive impact of applying lean practice in the service sector. They reveal that lean efforts not only improve economic outcomes but also help to improved environmental performance and social performance.

Klein et al. (2021) employ structural equation modeling to observe the associations between lean techniques and sustainable methods in higher educational institutions in Brazil (HEIs). Based on survey data gathered from 454 staff members employed by both public and private HEIs, the analysis was conducted. The study

provides evidence that the application of HEI lean practice is favorably correlated with environmental, economic, and social practice. The authors emphasize the significance of leadership endorsement, ongoing enhancement, and a concentration on students as fundamental elements for enhancing performance in higher educational institutions (HEIs). The results offer novel measurement models and structural methods for examining lean practice as indicators of sustainability performs. This helps higher educational institutions (HEIs) in prioritizing strategies and activities to achieve exceptional decision-making outcomes. The study provides empirical data that may be applied to different higher educational institution (HEI) settings.

Dey et al. (2019) examine the linked influence of sustainable practice, lean practice, and process improvement on the sustainability performance of small and medium firms (SMEs) in the manufacturing sector of United Kingdom. The authors utilized structural equation modeling to study survey data from 119 small and medium enterprises (SMEs) and qualitative case studies. Their findings indicate that sustainability practice, LP, and PI are crucial in attaining sustainable performance. The mediating influence of LP is larger than that of PI in the link between sustainable practice and performance. Small and medium-sized enterprises (SMEs) embrace lean production (LP) when they prioritize economic considerations and execute process improvement (PI) when they face pressure from consumers or regulators. The study seeks to address a gap in research by examining the effects and mediating roles of Lean Practice (LP) and Process Improvement (PI) on sustainable performance.

Ruiz-Benitez et al. (2019) examine the influence of lean and resilient supply chain methods on the three aspects of sustainability in the aerospace industry through the application of Interpretive Structural Modeling (ISM). The findings demonstrate the synergistic impact of lean and resilient practice, where lean methods serve as

catalysts for resilient practice. Therefore, the implementation of lean methods results in both immediate and indirect impacts on the attainment of supply chain sustainability. The study examines the correlation between efficient and adaptable supply chain methods and their influence on sustainability, offering practical insights for managerial decision-making. Nevertheless, the authors acknowledge that various sectors may provide divergent outcomes as a result of disparities in crucial methodologies and their execution.

By conducting a questionnaire survey and statistical analysis with SPSS, Abdul Ghafar and Mohd Razali (2022) evaluate the significance of lean methods in the Malaysian automobile manufacturing industry with respect to sustainability performance. The research centers on four automobile manufacturing enterprises in peninsular Malaysia. Questionnaires were provided to upper management, executives, and shop floor personnel. The results demonstrate elevated Cronbach's Alpha values, signifying the presence of genuine and dependable data. By using lean methodologies, all organizations achieved substantial improvements in their environmental sustainability performance. The tools that were most often utilized by the four firms included kaizen, 5S, kanban, employee promise, and collaboration. Multiple regression analysis demonstrates that the implementation of lean principles has a substantial and favorable impact on sustainability performance within the automobile manufacturing sector. The study offers firms valuable insights into the scope of lean manufacturing processes and their influence on the triple bottom line of sustainability performance.

Foo et al. (2022) investigates the influence of leadership, green and lean techniques, and guanxi on the sustainability performance of manufacturing organizations. They employ (PLS-SEM) on survey data collected from 160

enterprises. The results show that leadership have an influence on the adoption of environmentally-friendly and efficient methods, which in turn have a favorable effect on sustainability performance. Leadership and management have a good impact on guanxi. Nonetheless, the elements of leadership, management, don't have a direct influence on sustained performance. This research enhances the resource-based viewpoint by analysing the importance of leadership and management, alongside green and lean methodologies, as capabilities and competencies that facilitate sustainable performance. Examining the influence of dual mediators augments the study's utility.

De et al. (2018) investigate how small and medium-sized companies' supply chain sustainability performance is impacted by the combination of lean approaches and sustainability-oriented innovation in Eastern India. They use a methodology based on Data Envelopment Analysis (DEA) to conduct their investigation. The study looks at operational, economic, environmental, and social aspects as output variables and lean and SOI as contributing factors. The DEA approach suggests using benchmarking in addition to identifying and classifying inefficient small and medium-sized businesses (SMEs). After that, a qualitative approach is used to offer tactics for refining the performance of ineffective small to medium-sized businesses (SMEs). The results show that small to medium-sized businesses (SMEs) may achieve supply chain sustainability by combining lean and supplier orientation activities. By investigating the impacts of combining lean and SOI on sustainability, utilizing DEA-based approach adds to the existing knowledge now available and improves the sustainability performance of SMEs.

The effect of lean management systems on sustainability practice at Higher Educational Institutions (HEIs) in Brazil and Portugal is evaluated by Klein et al.

(2021). Structural equation modeling is used to examine survey information gathered from 966 academic staff members. The finding spectacle a strong association between environmental, social, and economic activities and HEI lean practice. Furthermore, a moderating effect between social and lean behaviors was seen. The results demonstrate that in order for Higher Educational Institutions (HEIs) to successfully promote sustainable practice and thinking, they need to have support from the leadership, continuous improvement, waste reduction, long-term thinking, and student-centeredness. To examine the connection between lean thinking strategies and sustainability practice in higher educational institutions (HEIs), the study offers new measurement and structural models.

Díaz-Reza et al. (2024) examine the effect of lean manufacturing (LM) methods on social sustainability (SOS) in Mexican maquiladora (MM) enterprises. They employ a structural equation model (SEM) and analyze data from 411 questionnaire responses. The study also utilizes system dynamics to model the long-term effects of LM practice on SOS. The results emphasize the crucial importance of 5S approach in promoting the use of techniques such as Total Productive Maintenance, One-piece Flow, and Quick changeover which have a good influence on SOS. The estimations indicate that it will take approximately 6.5 years to fully apply these technologies and 11.75 years to achieve complete SOS. The study provides valuable information on the possible changes over time in the usage of LM techniques and the implementation of SOS in industrial settings.

In their 2021 study, Al-Rusheidi and Supian investigate the relationship between the National Bank of Oman's sustainability performance, Gemba practice, and lean management strategies. They also investigate the function of lean leadership as a mediating variable. The study utilizes PLS-SEM and used survey to gather data

from a sample of 30 participants, consisting of 15 individuals in management positions and 15 employees. The results indicate that the use of Gemba principles, lean leadership, and lean management practice may account for 39.4% of the differences seen in sustainability performing. Gemba techniques have a moderate impact on sustainable performance, although both Gemba practice and lean management practice have a little impact on lean leadership. Lean leadership has a little effect on sustainability performance, but lean management approaches do not have any impact on sustainability performance.

Literature Review Summary

The literature review investigate the correlation between lean practice and organization sustainability within Higher Educational Institutions (HEIs), emphasising the rapid transformations occurring in Qatari higher educational sector. Qatar has invested significantly in education to diversify its economy and position itself as a regional educational hub. Nonetheless, the assessment indicates that considerable knowledge gaps remain regarding the use of lean practice to enhance the sustainability of Qatari higher educational institutions.

Despite extensive study on lean methods across several sectors, including industry, services, and some higher educational institutions globally, there is a paucity of official studies investigative their use and effect on Qatari higher educational institutions.

Numerous significant domains require more investigation. This encompasses the measurement of lean practice and their effect on the long-term health of an organisation, the society, economy, and the environment, as well as the interrelation and significance of various aspects of lean practice within Qatari higher educational institutions. Researcher wants to address these gaps with a cross-sectional survey

employing a structured instrument to examine six dimensions of lean practice and three dimensions of organization sustainability. The research will employ structural equation modelling (SEM) to examine the interrelationships amongst these parameters. This will facilitate our comprehension of the use and efficacy of lean methods within the distinct organization context of Qatari higher education institutions.

This work presents a significant opportunity to offer essential information to higher educational institutions, legislators, and the general populace of Qatar. The findings may significantly aid in formulating evidence-based strategies and policies for the sustainable enhancement of Qatar's higher educational industry. The study will significantly impact lean practice and sustainability in higher education, particularly in Qatar and maybe throughout the Middle East, by providing empirical examples of how these practice influence sustainability in this specific context.

Research Framework

The research framework illustrates the relationship between lean practice in higher educational institutions and their effect on organization sustainability across economic, environmental, and social dimensions. Lean practice in HEIs are characterized by several key elements, including leadership support, empowerment and collaboration, continuous improvement, student value, long-term thinking, and waste elimination.

Leadership support ensures that the institution is committed to adopting sustainable practice by providing the necessary guidance and resources. Empowerment and collaboration emphasize the involvement of faculty, staff, and students in sustainability efforts, enhancing a culture of common responsibility and

teamwork. Continuous improvement drives the institution’s ongoing efforts to refine processes and enhance sustainability outcomes by reducing inefficiencies. Student value focuses on aligning institutional practice with student needs, promoting sustainability as a core educational objective that benefits the academic community. Long-term thinking encourages the institution to implement strategies that prioritize sustainability for future generations, ensuring lasting impact. Waste elimination plays a direct role in the reduction of resource consumption and minimizing the environmental impact of institutional operations. The framework posits three key hypotheses:

- 1) There is a positive effect of lean practice on environmental sustainability of Qatari higher educational institutions
- 2) There is a positive effect of lean practice on economic sustainability of Qatari higher educational institutions
- 3) There is a positive effect of lean practice on social sustainability of Qatari higher educational institutions

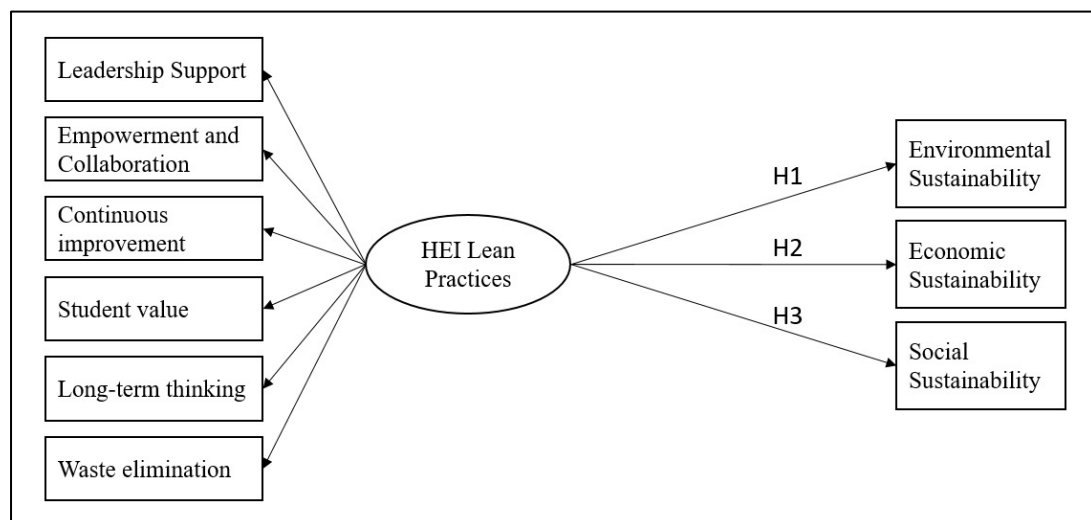


Figure 1. Framework for the Study

CHAPTER 3: METHODOLOGY

Introduction

This section delineates the many methodologies used to attain the study's objectives. The document commences with an clarification of the research paradigm, followed by a delineation of the used study approach. The study methodology is then detailed, highlighting its congruence with the selected research philosophy. The population frame is addressed thereafter, followed by a summary of the data gathering technique. Furthermore, statistical analysis are comprehensively elucidated.

Research Paradigm

This study is grounded in the positivist paradigm, which aligns with the quantitative, descriptive, cross-sectional research design employed. As a research philosophy, positivism maintains that there is an objective reality that exists apart from human experience and can be investigated using scientific techniques (Creswell & Creswell, 2018). This paradigm emphasizes empirical observation, measurement, and the use of statistical analysis to uncover objective truths about social phenomena.

A quantitative approach was chosen as it allows for objective measurement and statistical analysis of the relationships between lean practices and organizational sustainability. This method ensures the collection of standardized data, making the results generalizable across Qatari HEIs. Additionally, the structured survey design aligns with the study's aim to evaluate specific constructs systematically and derive actionable insights.

Positivism holds that knowledge is derived from sensory experience and can be verified through empirical testing (Phillips & Burbules, 2000). This stance supports the study's approach of using a structured questionnaire to collect data on lean practice and organization sustainability in Qatar's higher educational institutions.

The positivist paradigm assumes that the investigator can study the object of interest without influencing it or being influenced by it, maintaining objectivity throughout the research process.

Positivism adopts a realist perspective, asserting that reality exists externally and independently of our thoughts or beliefs (Saunders et al., 2019). This aligns with the research's aim to objectively measure lean practice and organization sustainability, viewing these constructs as tangible and measurable entities within the context of Qatar's higher educational sector.

Methodologically, positivism emphasizes hypothesis testing, variable measurement, and statistical analysis (Creswell & Creswell, 2018). This is reflected in the study's use of a structured questionnaire and structural equation modeling for analysis the data. The positivist approach allows for the quantification of phenomena and the examination of causal relationships between variables, supporting the study's objectives to investigate the impact of lean practice on organization sustainability.

The choice of a positivist paradigm for this study offers several advantages. This establishes a structured approach for the organised gathering and examination of quantitative data, enabling the identification of patterns and relationships that can be generalized to a broader population. It also supports the development and testing of theories, contributing to the existing literature on lean practice and sustainability in higher education.

The focus on quantitative methods may not acquire the full complexity of organization dynamics or individual experiences. Additionally, the assumption of a single, objective reality may oversimplify the nuanced nature of social phenomena.

Despite these limitations, the positivist paradigm was appropriate for this research given its purposes to quantitatively assess the correlation between lean

practice and organization sustainability in Qatar's higher educational institutions. This approach allows for the generation of empirical evidence that can inform policy and practice in the sector, while contributing to the theoretical understanding of lean practice and sustainability in higher education contexts.

Research Approach

Research methodologies are primarily classified into three categories: deductive, inductive, and abductive (Saunders et al., 2019). This study utilises a deductive methodology, consistent with its quantitative research framework and post-positivist worldview. The deductive approach, as articulated by Creswell and Plano (2007), denotes a research technique wherein the researcher begins with a theory, formulates hypotheses derived from that theory, and subsequently gathers evidence to evaluate these hypotheses. This hierarchical method progresses from the general to the specific, facilitating the examination of known theories in novel circumstances.

This study employs a logical approach using a systematic method. The study starts with recognised notions regarding lean practice and organization sustainability within higher education. Hypotheses are developed on the correlations between lean practice and other facets of organization sustainability within higher educational sector, grounded in these theories. A standardised questionnaire is employed to gather quantitative data from personnel at Qatar University and the Community College of Qatar. The data is analysed by structural equation modelling to evaluate the hypotheses and investigate the correlations among variables. Ultimately, the analytical results either corroborate or refute the basic ideas, therefore enhancing or expanding current views.

The rationale for employing a deductive method in this investigation is many. Firstly, it strongly corresponds with the quantitative research methodologies that underpin the design of this study. Furthermore, it facilitates the examination of established ideas about lean practice and organization sustainability within the particular framework of Qatar's higher educational sector. Thirdly, the deductive technique facilitates a more objective perspective, consistent with the post-positivist paradigm employed in this research. Ultimately, it seeks to provide findings that may be extrapolated to a wider population, which is crucial for informing policy and practice in the higher educational sector. Nevertheless, it is crucial to recognise the constraints of this methodology. It may fail to encompass the complete intricacies of organization dynamics and may disregard unforeseen results that do not conform to the established theoretical framework. Notwithstanding these constraints, the deductive method was considered appropriate for this study due to its aim to quantitatively evaluate the correlation between lean practice and organization sustainability in Qatar's higher educational institutions.

Research Method

The research methodology is primarily categorised into three types (Creswell, 2017 et al): quantitative, qualitative, and mixed methods. The qualitative research method gathers non-numeric data, including observations, images, and narratives (Muijs, 2010); The quantitative research approach utilises statistical or mathematical techniques by gathering numeric data (Creswell, 2008), while mixed methods research combines both quantitative and qualitative data, collecting it either at the same time or in a sequence (Creswell & Plano Clarke, 2011).

This research utilised a quantitative, descriptive, cross-sectional approach, operationalized through a survey questionnaire applied to HEI staff in Qatar. The

research focused on two key higher educational institutions: Qatar University and the Community College of Qatar. These institutions were selected for their representativeness of different types of public higher education offerings in Qatar. The study faced time limitations, with data collection conducted in one month during September 2024. The research acknowledged the lengthy process of obtaining necessary approvals and permissions for data collection within these institutions, which impacted the study's timeline and scope. These constraints influenced the choice of institutions and the overall research design, aiming to balance comprehensive examination with practical feasibility. Despite these challenges, the researcher were able to complete the data collection and analysis within the specified timeframe, providing valuable insights into lean practice and organization sustainability in Qatar's higher educational sector.

The data collection took place in September 2024, using a convenience sampling method. The researcher communicated the appropriate administrative units of the targeted universities and requested their assistance in distributing the online forms questionnaire to their staff members via email. This approach relied on the universities' willingness to facilitate the survey distribution, making it a convenient method for the researcher to access potential respondents.

The survey was designed to evaluate the causal connections among the elements of lean practice and organization sustainability dimensions, taking into account the theoretical framework that was established through the literature review. The data analysis was conducted using structural equation modelling, as per the principles outlined by Hair et al. (2014). This method made it possible to investigate the causal connections between many constructs inside of a single integrated model. The Smart-PLS (v4) software, in conjunction with the SPSS (v22) application, was

employed to conduct confirmatory factor analysis (CFA), which is a critical component of the SEM method.

Study Population

The study population consists of faculty members, administrative technicians, and managers employed in higher educational institutions in Qatar. The two institutions included in the study are Qatar University, with approximately 3,162 staff members and Community College of Qatar, with 349 staff members. The total population size is estimated to be 3,510 staff members. (see Table 1).

Table 1. Total Number of Study Population

Institution	Admin Staff	Faculty Members	Total
Qatar University	1574	1588	3,162
Community College of Qatar	205	144	349
Total			3,510

Source: Research Data

Sampling Strategy

This research used a non-probability sampling strategy, particularly convenience sampling, to select participants from the study population. The population consists of faculty members, administrative technicians, and managers employed in two higher educational institutions in Qatar: Qatar University, with approximately 3,162 staff members, and Community College of Qatar, with 349 staff members, totaling an estimated 3,510 staff members. Convenience sampling, as defined by Etikan et al. (2016), involves selecting participants who are accessible, willing to participate, and convenient to sample. This method was chosen due to practical constraints in accessing staff members across different departments and roles within the institutions, as well as time and resource limitations of the study.

The sampling approach involved distributing the survey questionnaire through institutional email systems, allowing staff members who were willing and available to participate. While convenience sampling has limitations in terms of representativeness and potential bias (Etikan et al., 2016), it was deemed the most feasible approach for this study given the institutional context and research constraints. To mitigate potential bias, an attempt was made to assure a broad range of participants across various roles and departments. In reporting the results, the limitations of this sampling strategy will be clearly stated, and caution will be exercised in generalizing the findings. Despite these limitations, the convenience sampling approach allowed for the collection of meaningful data to address the research questions regarding lean practice and organization sustainability in Qatar's higher educational institutions.

Data Collection Procedure

The researcher developed a survey questionnaire based on the theoretical framework established through the literature review, measuring the constructs of lean practice and organization sustainability. This questionnaire was created using Microsoft Form, an online survey platform, to facilitate electronic distribution and data collection.

Prior to commencing the study, the researcher obtained approval from Qatar University Institutional Review Board (IRB), receiving the approval number QU-IRB 155/2024-EM. Following this, the researcher contacted the Communication and Public Relations Department at Qatar University and the Planning & Quality Assurance Department at Community College of Qatar via email, requesting their assistance in distributing the questionnaire to their staff members.

An overview of the study, its goals, the significance of involvement, and guarantees of participant confidentiality and anonymity were all included in the email.

After receiving approval from both institutions (documentation attached in the appendix), the researcher provided clear instructions regarding the desired sample composition, emphasizing the need for representation from various job roles (faculty members, administrative technicians, and managers) and departments. The universities were asked to distribute the online Form questionnaire link to their staff members via email, along with the study introduction and participation instructions. Participants could access and complete the questionnaire, designed to take approximately 15-20 minutes, through the provided link at their convenience.

The online Form platform automatically collected and stored responses in a secure, password protected database accessible only to the researcher. The data collection period took place in September 2024, allowing sufficient time for questionnaire distribution and participant response. Throughout this period, the researcher monitored the response rate and sent follow-up emails to the universities to encourage participation when needed. Upon completion of the data collection period, the researcher closed the online Forms questionnaire and exported the data in a compatible format (CSV or XLSX) for further analysis.

Research Instruments

The questionnaire is drawn to gather information as details below:

Demographic Information

This information includes the personal data characteristics such as age, gender, nationality, institution, years of experience in the higher educational sector, occupation, and highest academic qualification.

Lean Practice

Twenty-three items that have already been examined in multiple studies will be used to measure lean practice as indicated by Klein et al. (2022). The scale is

composed of six dimensions of lean practice: Leadership support (five items); empowerment and collaboration (four items); continuous improvement (three items); student value (five items); long-term thinking (three items); and waste elimination (three items).

The survey was chosen because it provided a validated framework for assessing the relationships between lean practices and sustainability dimensions, ensuring reliability and rigor in data collection. While the context differs from the GCC, adjustments were made to the survey items to reflect local cultural and institutional characteristics, ensuring relevance to Qatari higher education institutions. These modifications align with Kline's (2023) recommendations for adapting measurement instruments to suit different cultural and contextual settings

Table 2. Lean Practice Questionnaire

Constructs	No of items	References
Leadership Support	5	Ingelssan and Mårtenssan (2014);
Empowerment and Collaboration	4	Salhiah and Abdullah (2019);
Long Term Thinking	3	
Waste Elimination	3	Sfakianki and Kakoures (2019);
Continuous Improvement	3	
Student's Value	5	Sajin et al. (2017).

Organization Sustainability

Organization Sustainability was measured with 21 items (Berchin et al.2017; Sajin et al. 2017). The instrument measures perception of sustainability within educational setting. The scale is composed of three dimensions: environmental practice (eight items); economic practice (seven items); and social practice (six items).

Table 3. Sustainability Questionnaire

Constructs	No of items	References
Environmental Practice	21	- Aleixo et al. (2018);
Economic Practice		- Berchain et al. (2017);
Social Practice		- Sajin et al. (2017).

Data & Statistical Analysis

The data analysis process for this study followed a structured approach to confirm the reliability and validity of the results. Initially, data preparation involved checking for missing data, outliers, and entry errors. Missing data was examined as well.

Descriptive statistics were performed to understand the sample demographics. Following data preparation, Confirmatory Factor Analysis (CFA) was conducted using SMART-PLS (v4) to assess the measurement model, checking the reliability and validity of constructs. The core analysis employed SEM (Structural Equation Modeling) to examine the hypothesized impact of lean practice and organization sustainability. The structural model was defined based on these hypothesized effect.

Model fit was determined, and path coefficients were examined to test the study's hypotheses. The model's explanatory power was assessed using R-squared values. Finally, the findings were interpreted in light of the research questions and hypotheses, providing a comprehensive understanding of the relationships between lean practice and organization sustainability in Qatar's higher educational institutions. This analytical approach ensured a rigorous examination of the data, allowing for robust conclusions to be drawn from the study.

CHAPTER 4: DATA ANALYSIS AND FINDINGS

Introduction

This section show the result of the data analysis. The chapter first discusses the response rate and the demographics of the respondents, containing their gender, age, education level, academic rank, and tenure at their present employment and institution. The subsequent phase involves examining the data to evaluate the efficacy of the measures used to assess the validity and reliability of the research variables. Subsequently, the study's findings are presented, emphasising the relationships between the indicators and criteria elements. The outcomes of the hypothesis testing are reported.

Profiles of Respondents

The respondents' profiles in this survey are summarised using fundamental descriptive statistics, including frequencies and percentages. Table 4 presents a summary of the respondents' attributes. Regarding gender distribution, 70 participants (56.5%) identified as male, whilst 54 participants (43.5%) is female. The respondents' ages were distributed as follows: 9.7% were aged 18 to 30 years, 24.2% were 31 to 40 years, 34.7% were 41 to 50 years, 26.6% were 51 to 59 years, and 4.8% were beyond 60 years.

Concerning nationality, 29.8% of the respondents identified as Qatari, but the majority, 70.2%, were non-Qatari. The participants exhibited diverse academic qualifications: 46.0% had a PhD, 34.7% held a Master's degree, 16.1% obtained a Bachelor's degree, and 3.2% acquired a diploma certificate. Regarding professional experience, 27.4% had 1 to 5 years, 22.6% had 6 to 10 years, 19.4% had 11 to 15 years, and 29.8% had 16 years or more. The bulk of participants were employed at Qatar University (65.3%), while the remainder 34.7% were affiliated with the

Community College of Qatar. Of the total, 60.5% were academic personnel, whilst 39.5% had administrative jobs.

Table 4. Respondents' Profile of (N = 124)

Demographic Item		Frequency	Percentage (%)
Gender	Male	70	56.5
	Female	54	43.5
Age	From 18 to 30	12	9.7
	From 31 to 40	30	24.2
	From 41 to 50	43	34.7
	From 51 to 59	33	26.6
	Older than 60 years	6	4.8
Nationality	Qatari	37	29.8
	Non-Qatari	87	70.2
Academic Qualification	Diploma	4	3.2
	Bachelor's degree	20	16.1
	Master's degree	43	34.7
	PhD degree	57	46
Years of Experience	Less than 1 year	1	0.8
	1-5 years	34	27.4
	6-10 years	28	22.6
	11-15 years	24	19.4
	16 years and above	37	29.8
HE institution	Qatar University	81	65.3
	Community Collage of Qatar	43	34.7
Occupation	Academic staff	75	60.5
	Administrative staff	49	39.5

Assessment of Multivariate Outliers

Samples with an abnormal value for a single variable are called outliers (Tabachnick and Fidell, 2012). Furthermore, they may be recognised by their unique properties, like extreme values on a variable or positions at the outside limits of the distribution (Hair et al., 2010). Outliers in the dataset are extreme replies from respondents about the variables that may distort the findings (Hair et al., 2017). The multivariate outliers were analysed using SPSS by calculating the Mahalanobis

distance for each participant. The number of respondents was designated as the dependent variable (DV), while all other factors were classified as independent variables (IV) to assess multivariate outliers. “At an alpha level of 0.001, the maximum Mahalanobis distance should not be greater than the critical chi-square value, with degrees of freedom equivalent to the number of predictors” (Tabachnick and Fidell, 2007). This research employs six independent variables, resulting in a critical value of 22.458, based on an alpha level of 0.001 (Tabachnick and Fidell, 2007). Should the Mahalanobis score exceed the critical threshold, the case is deemed an outlier and will be excluded from further analysis. The results indicated that there are four multivariate outliers in the data set of this investigation (refer to Table 5) and Appendix A.

Table 5. Examining Existence of Significant Outliers

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value.	1.4239	4.6515	3.5898	.52815	128
Std. Predicted Value.	-4.101	2.010	.000	1.000	128
Standard Error of Predicted Value.	.048	.200	.087	.031	128
Adjusted Predicted Value.	1.4228	4.6505	3.5928	.52913	128
Residual	-1.38106	.87809	.00000	.38683	128
Std. Residual.	-3.485	2.216	.000	.976	128
Stud. Residual.	-3.554	2.417	-.004	1.011	128
Deleted Residual.	-1.43641	1.04515	-.00310	.41578	128
Stud. Deleted Residual.	-3.740	2.468	-.006	1.023	128
Mahal. Distance.	.838	31.471	5.953	5.396	128
Cook's Distance.	.000	.235	.011	.028	128
Centered Leverage Value.	.007	.248	.047	.042	128

Descriptive Analysis

Table 6 show the means and standard deviations of the variables under study. The construct Leadership Support recorded the highest mean of 4.0048, with a standard deviation of 0.677, indicating that the respondents generally agreed on the significance of support provided by their leadership. Student Value also ranked high, with a mean of 3.9597 and a standard deviation of 0.575, reflecting that respondents strongly valued students' learning and satisfaction.

On the other hand, Continuous Improvement have a mean score of 3.5349 and a higher standard deviation of 0.854, proposing more variability in responses regarding the consistency and importance of continuous development in their institutions. Long-term Thinking recorded a mean of 3.4946 with a standard deviation of 0.767, highlighting that while respondents recognized the importance of sustainability, opinions varied on the extent to which long-term strategies are prioritized. Similarly, Waste Elimination showed a positive trend with 3.8306 as mean and a standard deviation of 0.768, indicating that participants agreed on its importance, though there was some variation in their perceptions.

In terms of sustainability practice, Environmental Practice had the lowest mean score at 3.4607, with a standard deviation of 0.784, suggesting that this area might require more attention and improvement. Economic Practice and Social Practice were rated slightly higher, with mean scores of 3.7039 and 3.7446, respectively, indicating that respondents found economic and social sustainability to be important, but there is chance for improvement in alignment across these parts.

Table 6. Descriptive Statistics

Constructs	N	Mean	Standard Deviation
Leadership Support	124	4.0048	.67738
Continuous Improvement	124	3.5349	.85415
Empowerment and Collaboration	124	3.6512	.66091
Student Value	124	3.9597	.57536
Long-term Thinking	124	3.4946	.76684
Waste Elimination	124	3.8306	.76803
Environmental Practice	124	3.4607	.78385
Economic Practice	124	3.7039	.61403
Social Practice	124	3.7446	.61904

Pearson's coefficient was utilised to examine the correlations among the research variables. The correlation analysis findings shown in Table 7 indicate the interpretations of the links between Environmental Practice (EnP), Economic Practice (EcP), and Social Practice (SoP) with other variables as follows:

Table 7 demonstrates a positive and substantial correlation between Environmental Practice (EnP) and Waste Elimination (WE). The correlation value is 0.675, suggesting a robust link. This indicates that when environmental practice improves, organisations are more inclined to adopt efficient waste reduction techniques.

Economic Practice (EcP) have a robust and substantial link with Continuous Improvement (CI), shown by a correlation value of 0.640. This suggests that organisations with robust economic procedures are more likely to prioritise the ongoing improvement of processes and efficiency.

Table 7 shows a positive correlation between Social Practice (SoP) and Leadership Support (LS), with a value of 0.426. This modest correlation indicates that effective leadership is essential for promoting social responsibility in organisations.

Social Practice (SoP) have a positive link with Waste Elimination (WE), shown by a correlation value of 0.470, indicating a moderate association.

Organisations emphasising social behaviours are likely to prioritise waste management within their sustainability initiatives.

Table 7. Correlation between Factors

	LS	CI	EC	StV	LTT	WE	EnP	EcP	SoP
LS	1								
CI	.667**	1							
EC	.718**	.619**	1						
StV	.395**	.389**	.515**	1					
LTT	.565**	.652**	.554**	.394**	1				
WE	.510**	.592**	.581**	.522**	.467**	1			
EnP	.271**	.502**	.487**	.439**	.399**	.675**	1		
EcP	.569**	.640**	.600**	.593**	.545**	.697**	.655**	1	
SoP	.426**	.426**	.524**	.437**	.270**	.470**	.761**	.618**	1

** . Correlation is significant at the 0.01 level.

Measurement Model Assessment

Construct Reliability

This research evaluated Cronbach's alpha coefficients to evaluate the construct reliability of the fundamental variables in the measurement model. The findings showed that all Cronbach's alpha values varied from 0.749 to 0.908, above the advised minimum of 0.7 as proposed by Hair et al. (2010). This indicates that the constructions are measured with reliability.

The composite dependability (CR) values for each construct varied from 0.842 to 0.926, above the 0.7 threshold established by authors such as Gefen et al. (2011), Kline (2010), and Werts et al. (1974). The results are encapsulated in Table 8. The adequate values of Cronbach's Alpha and CR for all constructs demonstrate that the measurement model is mostly devoid of measurement error, hence enhancing the reliability and validity of the constructs used in this work.

Table 8. Composite Reliability and Cronbach's Alpha

First-order Constructs	Second- order Constructs	Cronbach's alpha (> 0.7)	Composite Reliability (> 0.7)
Leadership Support (LS)		0.870	0.906
Continuous Improvement (CI)		0.842	0.904
Empowerment and Collaboration (EC)		0.749	0.842
Long-term Thinking (LT)		0.844	0.905
Student Value (StV)		0.801	0.863
Waste Elimination (WE)		0.750	0.858
	Lean Practice	0.848	0.858
Environmental Practice (EnP)		0.872	0.904
Economic Practice (EcP)		0.908	0.926
Social Practice (SoP)		0.827	0.874

Indicator Reliability

Factor loading analysis was applied to evaluate the reliability of the items within each construct. Elevated loadings indicate a robust association between the indicators and their corresponding constructs, confirming that they together encapsulate the core of the construct (Hair et al., 2017). Hair et al. (2010) assert that a factor loading more than 0.70 is deemed extremely significant, indicating a robust association. Moreover, loadings between 0.60 and 0.70 are deemed appropriate, especially in exploratory research settings or when evaluating intricate structures.

Table 9 indicates that the majority of factor loadings for the indicators were satisfactory. Nonetheless, the EcP4 indicator exhibited minimal loading, necessitating its exclusion from the scale owing to inadequate dependability. The remaining indicators surpassed the 0.70 barrier, affirming their compliance with the requisite criteria for model inclusion.

The results indicate that the constructs of Leadership Support, Empowerment and Collaboration, Continuous Improvement, Student Value, Long-term Thinking, Waste Elimination, Environmental Practice, Economic Practice, and Social Practice exhibit robust indicator reliability, validating the efficacy of the measurement model employed in this study.

Table 9. Factor Loading

Constructs	Indicators	Loading (> 0.7)
Leadership Support	LS1	0.781
	LS2	0.663
	LS3	0.855
	LS4	0.906
	LS5	0.841
Empowerment and Collaboration	EC1	0.802
	EC2	0.721
	EC3	0.666
	EC4	0.829

Constructs	Indicators	Loading (> 0.7)
Continuous Improvement	CI1	0.868
	CI2	0.887
	CI3	0.859
Student Value	StV1	0.717
	StV2	0.736
	StV3	0.836
	StV4	0.742
	StV5	0.697
Long-term Thinking	LTT1	0.880
	LTT2	0.900
	LTT3	0.838
Waste Elimination	WE1	0.915
	WE2	0.608
	WE3	0.906
Environmental Practice	EnP1	0.751
	EnP2	0.791
	EnP3	0.757
	EnP4	0.657
	EnP5	0.823
	EnP6	0.741
	EnP7	0.854
	EnP8	0.858
Economic Practice	EcP1	0.820
	EcP2	0.793
	EcP3	0.672
	EcP4	Deleted
	EcP5	0.843
	EcP6	0.722
	EcP7	0.831
Social Practice	SoP1	0.678
	SoP2	0.798
	SoP3	0.847
	SoP4	0.679
	SoP5	0.635
	SoP6	0.748

In this study, a 5-point Likert scale was utilized to measure the constructs.

Convergent Validity

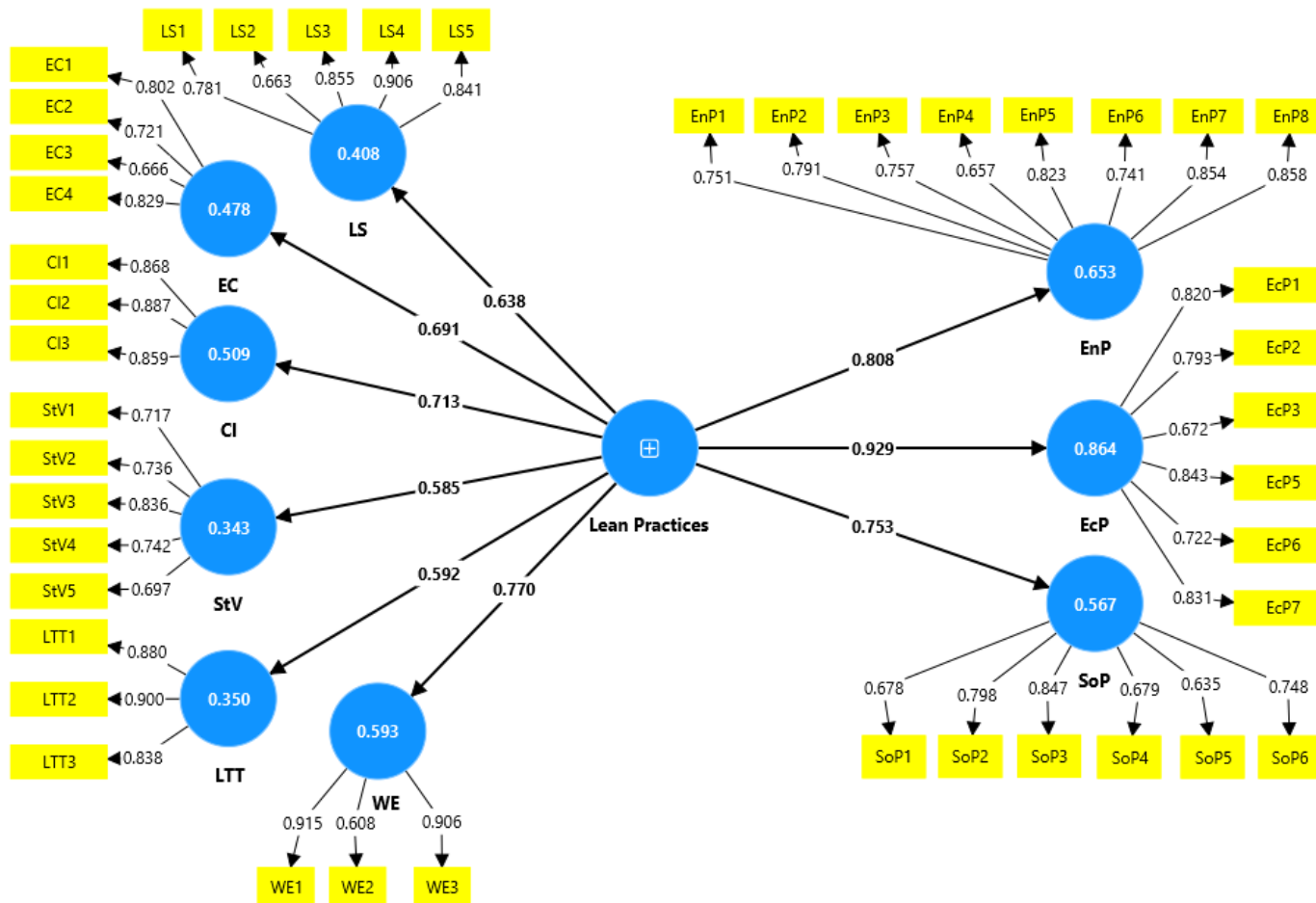
This study assessed convergent validity, defined as the extent of positive correlation between a measure and other measures of the same construct, by utilising the average variance extracted. The results demonstrated that all AVE values

exceeded the recommended threshold of 0.50 (Hair et al., 2010), with values ranging from 0.539 to 0.762 (refer to Table 10).

Table 10. Convergent Validity

First-order Constructs	Second-order Constructs	AVE (> 0.5)
Leadership Support		0.662
Continuous Improvement		0.759
Empowerment and Collaboration		0.573
Long-term Thinking		0.762
Student Value		0.559
Waste Elimination		0.675
	Lean Practice	0.663
Environmental Practice		0.613
Economic Practice		0.611
Social Practice		0.539

Note: AVE = Average Variance Extracted



Key: LS: Leadership Support, EC: Empowerment and Collaboration, CI: Continuous Improvement, StV: Student Value, LTT: Long-term Thinking, WE: Waste Elimination, EnP: Environmental Practice, EcP: Economic Practice, SoP: Social Practice

Figure 2. Research Model

Discriminant Validity

Three criteria were used to evaluate the measurement model's discriminant validity: the Heterotrait-Monotrait Ratio (HTMT), cross-loadings, and the Fornell-Larcker criterion. Based on Hair et al. (2017), cross-loadings are frequently the main technique used to assess an indicator's discriminant validity. Table 11 shows that the cross-loading criteria satisfies the requirements because all of the indicators' outer loadings on a construct (bold values) are greater than their cross-loadings with other constructs.

Table 11. Cross Loading - discriminant Validity

	CI	EC	EcP	EnP	LS	LTT	SoP	StV	WE
CI1	0.868	0.492	0.519	0.308	0.574	0.530	0.270	0.289	0.400
CI2	0.887	0.553	0.583	0.464	0.597	0.646	0.368	0.306	0.507
CI3	0.859	0.575	0.600	0.534	0.565	0.532	0.475	0.453	0.596
EC1	0.393	0.802	0.556	0.428	0.609	0.436	0.498	0.455	0.489
EC2	0.462	0.721	0.424	0.352	0.427	0.422	0.251	0.357	0.449
EC3	0.607	0.666	0.467	0.327	0.594	0.407	0.297	0.305	0.449
EC4	0.441	0.829	0.455	0.281	0.638	0.464	0.367	0.414	0.422
EcP1	0.551	0.576	0.820	0.566	0.572	0.480	0.498	0.462	0.633
EcP2	0.459	0.502	0.793	0.511	0.449	0.402	0.489	0.504	0.533
EcP3	0.396	0.302	0.672	0.518	0.263	0.285	0.378	0.539	0.486
EcP5	0.541	0.541	0.843	0.596	0.496	0.450	0.468	0.456	0.634
EcP6	0.511	0.377	0.722	0.362	0.396	0.374	0.379	0.496	0.446
EcP7	0.599	0.622	0.831	0.524	0.571	0.550	0.471	0.457	0.662
EnP1	0.321	0.392	0.586	0.751	0.256	0.285	0.503	0.523	0.626
EnP2	0.339	0.298	0.476	0.791	0.189	0.334	0.603	0.352	0.510
EnP3	0.305	0.244	0.370	0.757	0.031	0.225	0.599	0.329	0.404
EnP4	0.331	0.293	0.391	0.657	0.146	0.171	0.551	0.315	0.347

	CI	EC	EcP	EnP	LS	LTT	SoP	StV	WE
EnP5	0.318	0.339	0.550	0.823	0.119	0.252	0.538	0.333	0.552
EnP6	0.505	0.452	0.532	0.741	0.334	0.439	0.532	0.271	0.553
EnP7	0.552	0.446	0.622	0.854	0.338	0.374	0.667	0.350	0.620
EnP8	0.455	0.375	0.532	0.858	0.270	0.397	0.645	0.336	0.605
LS1	0.513	0.563	0.478	0.243	0.781	0.476	0.460	0.345	0.289
LS2	0.382	0.445	0.341	0.118	0.663	0.258	0.240	0.258	0.327
LS3	0.610	0.671	0.544	0.214	0.855	0.515	0.329	0.377	0.494
LS4	0.572	0.642	0.490	0.191	0.906	0.536	0.341	0.330	0.355
LS5	0.583	0.713	0.536	0.342	0.841	0.448	0.442	0.377	0.471
LTT1	0.528	0.502	0.411	0.327	0.480	0.880	0.199	0.233	0.354
LTT2	0.572	0.476	0.554	0.424	0.470	0.900	0.212	0.378	0.484
LTT3	0.613	0.523	0.461	0.304	0.523	0.838	0.268	0.467	0.342
SoP1	0.184	0.200	0.299	0.519	0.150	0.053	0.678	0.234	0.157
SoP2	0.408	0.429	0.651	0.755	0.353	0.256	0.798	0.377	0.499
SoP3	0.336	0.346	0.390	0.508	0.416	0.086	0.847	0.313	0.345
SoP4	0.403	0.417	0.406	0.446	0.438	0.307	0.679	0.332	0.299
SoP5	0.297	0.310	0.381	0.364	0.322	0.206	0.635	0.367	0.350
SoP5	0.297	0.310	0.381	0.364	0.322	0.206	0.635	0.367	0.350
SoP6	0.220	0.345	0.302	0.618	0.259	0.176	0.748	0.269	0.322
StV1	0.207	0.312	0.449	0.356	0.217	0.225	0.337	0.717	0.330
StV2	0.493	0.297	0.519	0.383	0.279	0.321	0.283	0.736	0.392
StV3	0.216	0.463	0.468	0.410	0.322	0.317	0.447	0.836	0.514
StV4	0.187	0.298	0.396	0.261	0.213	0.201	0.286	0.742	0.398
StV5	0.395	0.517	0.447	0.248	0.514	0.464	0.267	0.697	0.349
WE1	0.472	0.542	0.659	0.709	0.383	0.355	0.483	0.501	0.915
WE2	0.428	0.327	0.393	0.300	0.402	0.202	0.298	0.269	0.608
WE3	0.550	0.571	0.700	0.607	0.430	0.521	0.360	0.507	0.906

Key: LS: Leadership Support, EC: Empowerment and Collaboration, CI: Continuous Improvement, StV: Student Value, LTT: Long-term Thinking, WE: Waste Elimination, EnP: Environmental Practice, EcP: Economic Practice, SoP: Social Practice.

The findings of the discriminant validity analysis, as shown by Table 12 Fornell-Larcker criteria, indicate that the square roots of the AVEs, which are highlighted by the bolded font on the diagonals, are larger than the links between the constructs. In comparison to other variables in the model, this shows that the dimensions have a strong association with their corresponding indicators, suggesting substantial discriminant validity. Exogenous construct correlation is less than 0.85 (Awang, 2012). Consequently, all conceptions' discriminant validity is met.

Table 12. Fornell-Larcker criterion

		1	2	3	4	5	6	7	8	9
		CI	EC	EcP	EnP	LS	LTT	SoP	StV	WE
1	CI	0.871								
2	EC	0.624	0.757							
3	EcP	0.655	0.635	0.783						
4	EnP	0.511	0.462	0.658	0.782					
5	LS	0.664	0.758	0.597	0.283	0.814				
6	LTT	0.655	0.571	0.549	0.407	0.561	0.873			
7	SoP	0.435	0.479	0.575	0.743	0.454	0.259	0.734		
8	StV	0.408	0.511	0.613	0.448	0.420	0.415	0.437	0.747	
9	WE	0.585	0.599	0.730	0.685	0.482	0.456	0.468	0.535	0.822

Key: LS: Leadership Support, EC: Empowerment and Collaboration, CI: Continuous Improvement, StV: Student Value, LTT: Long-term Thinking, WE: Waste Elimination, EnP: Environmental Practice, EcP: Economic Practice, SoP: Social Practice

This research further evaluated the discriminant validity by HTMT. Discriminant validity is compromised when the HTMT value exceeds 0.90 (Gold and Arvind Malhotra, 2001) or 0.85 (Kline, 2010). Table 13 demonstrates that all values fell below the suggested threshold of 0.85, confirming the establishment of discriminant validity.

Table 13. Discriminant Validity by HTMT

Factors		1	2	3	4	5	6	7	8	9
		CI	EC	EcP	EnP	LS	LTT	SoP	StV	WE
1	CI									
2	EC	0.787								
3	EcP	0.756	0.765							
4	EnP	0.560	0.548	0.729						
5	LS	0.766	0.618	0.664	0.305					
6	LTT	0.774	0.722	0.626	0.449	0.644				
7	SoP	0.493	0.577	0.650	0.845	0.512	0.296			
8	StV	0.479	0.648	0.741	0.524	0.491	0.494	0.526		
9	WE	0.734	0.783	0.579	0.789	0.613	0.547	0.569	0.667	

Key: LS: Leadership Support, EC: Empowerment and Collaboration, CI: Continuous Improvement, StV: Student Value, LTT: Long-term Thinking, WE: Waste Elimination, EnP: Environmental Practice, EcP: Economic Practice, SoP: Social Practice

Goodness of Fit (GoF) of the Model

According to Ramayah et al. (2018), Goodness of Fit (GoF) is still in its infancy and is not required for usage in Partial Least Squares Structural Equation Modelling (PLS-SEM). Furthermore, investigators should depend on on measures that represent the model's predictive power in order to assess the model's quality in PLS-SEM (Henseler et al., 2014). However, in order to validate the model, the researcher assessed the Goodness of Fit.

According to Tenenhaus et al. (2004), the average communality geometric of the mean from the outer measurement model and the average R^2 value for the endogenous components represents the Goodness of Fit (GoF) for Partial Least Squares (PLS) route

modelling. Tenenhaus et al. (2004) employed a goodness of fit metric (GoF) to evaluate the model fit. Using Wetzels et al. (2009) guidelines, the GoF value was computed in order to validate the PLS model. A GoF value close to 1 denotes a better model fit, with GoF ranging from 0 to 1. The formula below was used to calculate the model's GoF value.

$$Gof = \sqrt{(R^2 \times AVE)}$$

The computed GoF value for this inquiry was 0.583 (average AVE was 0.642, average R2 was 0.529). Using the GoF baseline values “(GoF < 0.1 is Poor fit, 0.1 ≤ GoF < 0.25 is Small, 0.25 ≤ GoF < 0.36 is Medium, GoF > 0.36 is Large)”, a comparison was carried out. The outcome showed that the global PLS model has sufficient validity.

Establishment of Second-Order Constructs

In this research, lean procedures are seen as signs of a second-order construct. The repeating indication was used for the second-order structures. This is the stage where all first-order constructs are extracted and used as indicators of the second-order constructs inside the model.

The variable of lean practice was measured by six first-order constructs (Klein et al., 2022), namely leadership support, empowerment and collaboration, continuous improvement, student value, long-term thinking, and waste elimination. These constructs explained well the lean practice variable, as illustrated by the R square which ranged from 0.342 to 0.593. Moreover, all route coefficients from lean techniques to their dimensions are significant at P<0.01 (refer to Table 14). Table 14 illustrates the strong

relationships across all six characteristics of lean practice inside the first-order construct. Consequently, all six characteristics of lean practises were evaluated using the second-order construct methodology.

Table 14. Second-Order Constructs Analysis

Second-order Constructs	First-order Constructs	R Square	Beta	SE	T-value	P- value
Lean Practice	Leadership Support	0.407	0.638	0.068	9.453	0.000
	Continuous Improvement	0.509	0.714	0.045	15.921	0.000
	Empowerment and Collaboration	0.478	0.691	0.045	15.318	0.000
	Long-term Thinking	0.351	0.593	0.069	8.621	0.000
	Student Value	0.342	0.585	0.063	9.330	0.000
	Waste Elimination	0.593	0.770	0.043	17.940	0.000

Structural Model Assessment

According to Hair et al. (2017), “a bootstrapping technique with a 5,000 resample should be used to examine the beta (β), R^2 , and the corresponding t-values in order to evaluate the structural model”. Moreover, they support impact sizes (f^2) being reported. According to Sullivan and Feinn (2012), the p-value reveals the presence of an impact but not its size.

Direct Effect

The structural assessment started with an analysis of the path coefficients and R^2 values. Following the path estimates' computation in the structural model, a bootstrap

analysis was carried out to determine the route coefficients' statistical significance. The relationships between the topics put forward in the study are represented by path coefficients. “Standardised path coefficient values close to +1 signify an almost substantial, strong positive connection” (Hair et al., 2014). The route coefficients for this investigation are displayed in Table 15 and Figure 2.

Table 15. Direct Effect

H	Relationship	Std. Beta	Std. Error	t-value	p-value.	Decision
H1	Lean Practice →EnP	0.808	0.041	19.615	0.000	Accepted
H2	Lean Practice →EcP	0.929	0.013	73.499	0.000	Accepted
H3	Lean Practice →SoP	0.753	0.052	14.424	0.000	Accepted

Key: EnP: Environmental Practice, EcP: Economic Practice, SoP: Social Practice

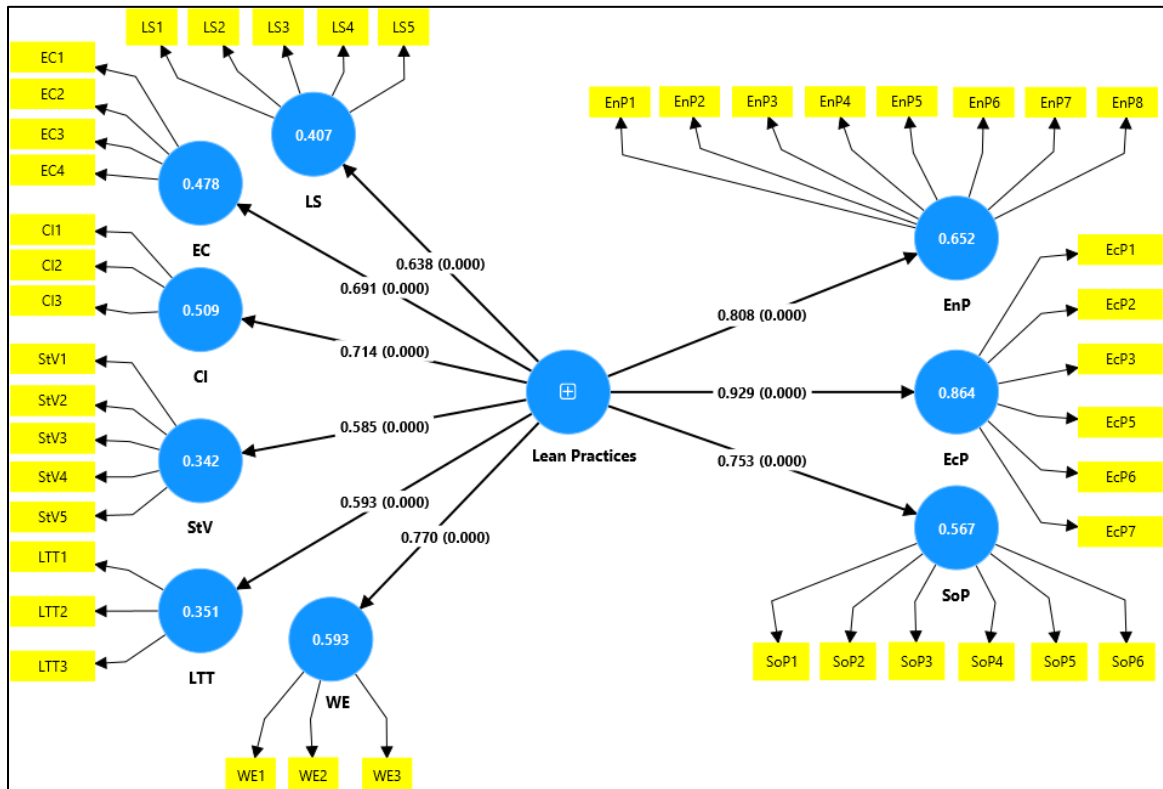


Figure 3. Structural Model

This was followed by examining the coefficient of determination, or R^2 . The R^2 statistic signifies the extent to which the variation in the dependant variable, or dependent variable, is elucidated by the independent factors, or independent variables. The optimal level of R^2 for the primary construct should be elevated (Hair et al., 2014).

Three direct hypotheses are presented in the structural model assessment, which is displayed in Figure 3 and Table 15. Environmental practice were found to be significantly impacted by lean practice ($\beta = 0.808$, $t= 19.616$, $p <0.001$). Hence, H1 is supported. Likewise, lean practice significantly predicts economic practice ($\beta = 0.929$, $t= 73.499$, $p <0.001$). Hence, H2 is supported. These are similar to lean practice which was found to significantly influence social practice ($\beta = 0.753$, $t= 14.424$, $p <0.001$). Hence, H3 is supported.

Furthermore, the result showed that lean practice explained 65.2 % of the variance in environmental practice. Lean practice also explained 86.4 % of the variance in economic practice. 56.7% of the variation in social practice was explained by lean practice. The obtained R^2 values exhibit a considerable model since they meet the recommendations of Cohen (1988) and Chin (1998) for an acceptable level of explanatory power.

According to Cohen (1988), “ R^2 value of 0.26 or higher is considered significant, meaning that the estimated model has a good fit to the data”. According to this study, the endogenous variables had R^2 values of 0.864, 0.567, and 0.652 (see Table 16). On the

other hand, Chin (1998) proposed that “endogenous latent variables in the inner route model have R2 values of 0.67, 0.32, and 0.19, respectively, which are considered significant, moderate, and weak”. As a result, the expected model fit may be classified as moderate to significant (Chin, 1998).

Table 16. R2 of Endogenous dependent Variables

Construct	R ²	Result	
		Cohen (1988)	Chin (1998b)
Environmental Practice	0.652	Substantial	Substantial
Economic Practice	0.864	Substantial	Substantial
Social Practice	0.567	Substantial	Moderate

Effect Size

This study assessed the impact sizes (f^2) as well. According to Gefen et al. (2011), “the impact size f^2 measures the degree of influence an external latent construct has on a particular endogenous latent construct”. Hair et al. (2017) recommend investigating the variation in the R2 value in this situation. Cohen (1988) suggested the following criteria to determine the value of f^2 ”0.02 represents small effects, 0.15 shows medium effects, and 0.35 indicates significant impacts”. Lean practice and environmental practice have a significant impact size ($F^2 = 1.878$) and lean practice and economic practice have a significant effect size ($F^2 = 6.344$), according to the results of f^2 displayed in Table 17. In the end, the association between lean techniques and social practice has a significant impact size ($F^2 = 1.310$).

Table 17. The Effect Size of the Model

Relationship	F ²	Result
Lean Practice - Environmental Practice	1.878	Larg
Lean Practice - Economic Practice	6.344	Larg
Lean Practice - Social Practice	1.310	Larg

Summary of Research Hypotheses

This research evaluated three proposed connections. The findings supported all accepted assumptions. Table 18 encapsulates the findings of the study hypothesis evaluation.

Table 18. Summary of Hypotheses Testing

Hypotheses	Result
There is a positive effect of lean practice on environmental sustainability of Qatari higher educational institutions	Supported
There is a positive effect of lean practice on economic sustainability of Qatari higher educational institutions	Supported
There is a positive effect of lean practice on social sustainability of Qatari higher educational institutions	Supported

Summary

This section showed the results of the data analysis. The conclusive sample for data analysis comprises 124 staff members. The analyses conducted using SPSS emphasised frequencies and percentages to delineate the respondents' profiles. The program was used to do descriptive analysis to evaluate the data distribution of the primary constructs. This research used SPSS to analyse assumptions, specifically outliers. This research used PLS-SEM to evaluate the measurement and structural models.

Subsequently, the evaluation of the structural model included determining the route coefficient (β), variance explained (R^2). Bootstrapping was conducted, and the PLS-derived t-value for each route was used for hypothesis testing. The outcomes of the hypothesis testing demonstrate that all three research hypotheses were validated. Chapter five will address the results, consequences, limitations, and recommendations for further study.

CHAPTER 5: DISCUSSION, RECOMMENDATIONS, AND CONCLUSION

Introduction

This chapter shows an analysis of the research findings on lean techniques and the long-term sustainability of organisations within higher educational institutions in Qatar. The first part reiterates the objectives and methodologies of the research. The following section elaborates on the main findings, emphasising their connections to environmental, economic, and social resilience. The chapter then discusses the implications of these discoveries for theory and practice, providing novel perspectives on educational settings and our everyday responsibilities as higher educational administrators. The chapter provides a summary of the study's shortcomings and suggestions for further research, along with recommendations for legislators and organization leaders. A summary of the key contributions of this research to the domains of higher educational management and sustainability in Qatar is provided at the conclusion of the chapter.

Recapitulation of the Study

This study aimed to evaluate the suggested research framework integrating lean practice and organization sustainability within Qatari higher educational institutions.

This study specifically attempted to accomplish the following research objectives:

1. To examine the impact of lean practice on environmental sustainability of Qatari higher educational institutions
2. To examine the impact of lean practice on economic sustainability of Qatari higher educational institutions

3. To investigate the impact of lean practice on social sustainability of Qatari higher educational institutions.

The research used a quantitative methodology, collecting data from personnel at Qatari higher educational institutions, namely Qatar University and the Community College of Qatar. The study used a cross-sectional survey approach, with data collecting occurring during a one-month timeframe on September 2024.

A systematic questionnaire was created in the light of the theoretical framework resulting from the literature study, assessing the components of lean practice and organization sustainability. The questionnaire was sent online using Microsoft Forms.

PLS-SEM was used for data analysis, using Smart-PLS (v4) software in conjunction with SPSS (v22). This methodology facilitated the examination of causal links across several components within a unified model, including the assessment of both the measurement model and the structural model.

Discussion

The Effect of Lean Practice on Environmental Sustainability

The first research objective of this study was to examine the effect of lean practice on environmental sustainability in Qatari higher educational institutions. To achieve this, the regression paths were examined. Lean practice refer to a set of principles and tools aimed at maximizing efficiency and minimizing waste in organization processes. In the context of this study, lean practice encompass leadership support, empowerment and collaboration, continuous improvement, student value, long-term thinking, and waste

elimination. Environmental sustainability is defined as practice that contribute to the maintenance of natural resources, reduction of environmental impact, and promotion of eco-friendly behaviors within the institution.

This study found that lean practice significantly affect environmental sustainability ($\beta= 0.808$, $t=19.615$, $p<0.001$). This finding aligns with prior results reported in several studies (Verrier et al., 2014; Nawanir et al., 2020). All these studies reported that lean practice have a significant positive effect on environmental sustainability outcomes.

The strong relationship between practice of lean and environmental sustainability suggests that as higher educational institutions in Qatar implement more lean principles, they tend to achieve better environmental performance. One possible reason for this is that lean practice, particularly waste elimination and continuous improvement, naturally align with environmental goals such as resource conservation and pollution reduction. For instance, efforts to streamline processes and reduce waste in academic and administrative operations can lead to reduced energy consumption and material use, directly contributing to environmental sustainability.

This work indicated that the proper employment of lean practice among Qatari higher educational institutions, through mechanisms such as leadership support for sustainable initiatives and long-term thinking in resource allocation, can significantly enhance their environmental sustainability performance. Moreover, staff members in these institutions perceived that such lean practice increased their awareness and commitment to environmental sustainability efforts.

The Effect of Lean Practice on Economic Sustainability

The second research objective of this work was to determine the influence of lean practice on economic sustainability in Qatari higher educational institutions. Economic sustainability in this context refers to the institution's ability to use its resources well, maintain financial stability, and create long-term economic value while meeting the present and future needs of stakeholders.

The result of this study confirmed that there is a significant influence of lean practice on economic sustainability ($\beta= 0.929$, $t=73.499$, $p<0.001$). This result is consistent with the findings of several previous studies (Dey et al., 2019; Foo et al., 2022; Abdul Ghafar & Mohd Razali, 2022). Such previous studies reported that lean practice have strong predictive power on economic sustainability outcomes.

In other words, this study found that when higher educational institutions in Qatar implement lean practice effectively, they concurrently improve their economic performance. This implies that as institutions focus on eliminating waste, improving processes, and maximizing value for students (key aspects of lean practice), they also enhance their financial efficiency and long-term economic viability.

A possible explanation for this might be that lean practice, by their nature, focus on optimizing resource use and eliminating non-value-adding activities. This optimization can resulting in cost savings, enhanced operational efficiency, and better allocation of resources, all of which contribute to the economic sustainability of the institution. Furthermore, the emphasis on continuous improvement in lean practice can drive ongoing enhancements in financial performance over time.

Kline's study observed that leadership support had a balanced influence across all sustainability dimensions in Brazilian HEIs. In contrast, my findings revealed a stronger emphasis on economic and environmental sustainability in Qatari HEIs, with social sustainability receiving less direct impact. This difference may be attributed to cultural and operational priorities in the GCC region, where economic efficiency and resource optimization are often prioritized over social dimensions.

The Effect of Lean Practice on Social Sustainability

With respect to the third research objective of the study, it was found that lean practice significantly influence social sustainability in Qatari higher educational institutions ($\beta= 0.753$, $t=14.424$, $p<0.001$). Social sustainability in this context encompasses practice that contribute to the wellbeing of employees, students, and the wider community, including aspects such as equity, diversity, work-life balance, and community engagement.

This result is in agreement with the previous findings of several researchers (Klein et al., 2021; Jum'a et al., 2021; Díaz-Reza et al., 2024) which showed that lean practice are positively related to social sustainability outcomes. The positive relationship between lean practice and social sustainability means that as institutions implement more lean principles, they tend to demonstrate improved social sustainability performance.

The results propose that lean practice, particularly those focusing on empowerment and collaboration, student value, and long-term thinking, can contribute

significantly to social sustainability outcomes. For instance, empowerment and collaboration practice can lead to improved employee satisfaction and engagement, while a focus on student value can enhance the overall educational experience and student wellbeing.

This result could be explained by the lean philosophy's emphasis on respect for people and continuous improvement. Lean practice often involve engaging employees in problem-solving and decision-making processes, which can lead to a more inclusive and participatory organization culture. Furthermore, the focus on long-term thinking in lean practice aligns well with the long-term perspective required for social sustainability initiatives.

Implications of the Study

Theoretical Implications

Drawing upon lean management and organization sustainability theories, this study investigated the effect of lean practice on environmental, economic, and social sustainability in Qatari higher educational institutions. There are only a limited studies which have examined the impact of lean practice on comprehensive organization sustainability in higher education settings so far (Klein et al., 2021; Lizarelli et al., 2022). Thus, the current study adds to the existing body of knowledge by investigating the multifaceted impact of lean practice on sustainability outcomes in the context of Qatari higher education.

Moreover, this work contributes to the literature by examining the predictors of sustainability performance in the higher education setting. Despite the fact that many

studies have examined lean practice and sustainability relationships in various sectors (e.g., Nawanir et al., 2020; Dey et al., 2019; Foo et al., 2022), this study is among the first that has identified these relationships in the Qatari higher educational institutions. The present study extends previous research (Verrier et al., 2014; Piercy & Rich, 2015) by developing a more comprehensive model that incorporates various sustainability perspectives. Based on the findings, lean practice enhance the environmental, economic, and social sustainability of higher educational institutions, which further shapes the overall sustainability performance of these institutions.

Furthermore, the study has some contributions to theory development. First, we found that lean practice significantly influence all three dimensions of sustainability - environmental, economic, and social. These findings may help better understand the relevant antecedents of organization sustainability in higher education. Such findings have important implications for enhancing sustainability performance. The Qatari higher education setting emphasized that sustainability performance was significantly influenced by lean practice, suggesting that institutions are more likely to show positive sustainability outcomes when implementing lean principles.

The combination of the findings provides insights into the mechanisms underlying the impact of lean practice on organization sustainability. The strong positive relationships revealed that lean practice affect environmental, economic, and social sustainability via various mechanisms such as waste reduction, process optimization, and stakeholder engagement. These findings provide a clear picture of the effect of lean management on institutions' sustainability performance. Additionally, the findings

emphasize the generalizability of the effect of lean practice to the Middle Eastern cultural context.

Despite the consistent results of previous studies on the influence of lean practice on sustainability in Western and Asian contexts (e.g., So & Sun, 2015; Singh & Kumar, 2020), there has been a lack of empirical evidence in the Qatari culture. Thus, testing the proposed hypotheses of the study among the staff in Qatari higher educational institutions added additional knowledge and contribution to literature in that area of study.

Practical Implications

From the practical perspective, the results of the current study have important implications for leaders in Qatari higher educational institutions. As indicated in Qatar's National Vision 2030, institutions are expected to affect sustainable development and environmental. Hence, the findings of the present study may help Qatari higher education leaders understand the crucial role of lean practice, which can influence the environmental, economic, and social sustainability performance of their institutions. In other words, this study provided Qatari higher education leaders with better evidence and knowledge about the role of lean practice in enhancing sustainability outcomes, as well as to encourage employees to be more willing to work efficiently and contribute positively to achieve organization sustainability objectives.

The current study also suggests that leaders in Qatari higher educational institutions could adopt a strategy that enhances the implementation of lean practice in order to maintain high levels of sustainability performance, which in turn, will enhance the overall effectiveness and long-term viability of these institutions in the Qatari context.

Furthermore, the current study's findings are more relevant to the Ministry of Education and Higher Education in Qatar, which is responsible for developing and strengthening the performance of Qatar's higher educational sector. Since the results have shown that lean practices are a significant mechanism to increase sustainability performance, leaders in Qatari higher education should introduce and promote lean management principles in the context of higher education.

With respect to the results of this study, if the leaders in Qatari higher educational institutions utilize these findings by setting up strategies to promote lean practices and maximize their implementation across all levels of the organization, this will enhance the overall sustainability performance of these institutions. The results can also be useful for supporting Qatari higher educational institutions to increase and upgrade their status as centers of excellence in education and eventually to assist Qatar in achieving its vision for sustainable development.

These implications underscore the potential for lean practices to drive significant improvements in the sustainability performance of Qatari higher educational institutions. By implementing and refining lean principles, these institutions can enhance their operational efficiency, reduce their environmental impact, improve their economic sustainability, and contribute positively to social wellbeing, thereby aligning more closely with national development goals and global sustainability imperatives.

Limitations and Suggestions for Future Research

Although all objectives of this study are achieved, there are some limitations that should be addressed and useful suggestions should be offered for future research. The

first limitation is that the current work applied a cross-sectional design methodology by which the data were gathered at one point in time. This type of studies limits the ability to establish a fundamental relationship of all the variables in the study because it is not possible to make causal inferences from the population. Therefore, future researchers may consider a longitudinal study to validate the current findings in relation to the link between lean practice and organization sustainability in higher educational sector.

Second, this study only concentrated on the higher educational sector (specifically Qatar University and the Community College of Qatar) and did not include employees from other sectors such as private universities, or other educational institutions. Thus, the results of this study may not be generalized to employees in other educational settings as they might have different characteristics and work cultures which may require different approaches to lean practice and sustainability. Therefore, a sector-level study should be considered in future research which includes different domains to generalize the findings among different types of educational institutions.

Third, it is difficult to offer generalizability of the results of the current study as the sample was mainly drawn from two institutions in Qatar. Accordingly, future studies could extend the sample by including all higher educational institutions in Qatar for better generalization of the findings. Additionally, comparative studies with other Gulf Cooperation Council (GCC) countries could provide valuable insights into regional trends and variations in lean practice and sustainability in higher education.

The present research used a quantitative methodology, distributing questionnaires to personnel at Qatari higher educational institutions. Consequently, future researchers

could consider gathering more profound qualitative data from both personnel and executives inside these organisations. Utilising qualitative data may enhance comprehension of fundamental reasons, views, and motives, hence revealing patterns in ideas and perspectives and exploring the intricacies of executing lean techniques and attaining sustainable objectives.

Fifth, while this study found significant link between lean practice and dimensions of sustainability, it did not explore the potential variations in the strength of these relationships across different institutional contexts or types of lean practice. Future research could investigate which specific lean practice have the strongest impact on each dimension of sustainability, potentially leading to more targeted implementation strategies.

Finally, this work focused on the direct effects of lean practice on sustainability outcomes. Future research should consider potential mediating or moderating variables that might play a role in affecting these relationships. For example, this study could be extended by considering the role of organization culture, leadership styles, or institutional size as mediators or moderators in the relationship between lean practice and sustainability outcomes. Future research could also consider other variables such as stakeholder engagement, innovation capacity, and external pressures as antecedents or influencing factors in the adoption of lean practice and pursuit of sustainability in higher educational institutions.

Additionally, given the unique cultural and economic context of Qatar, future studies could explore how national policies, societal expectations, and the country's rapid

development influence the implementation of lean practice and sustainability initiatives in higher education. This could provide valuable insights for policymakers and institutional leaders in aligning educational practice with national development goals.

Conclusion

The objective of the present study was to explore the effect of lean practice on environmental, social and economic sustainability in Qatari higher educational institutions. The study examined the direct affect of lean practice on organization sustainability dimensions in the context of Qatari higher education.

Cross-sectional data consisting of 124 staff members were collected from two Qatari higher educational institutions (Qatar University and the Community College of Qatar). PLS-SEM was employed for assessing the overall fit of the research model and testing the structural model all together, which is recognised one of the most powerful statistical methods in social science research that is intended to examine several links simultaneously.

The findings of this study highlight the varied effects of lean practices on the three dimensions of sustainability. Leadership support had the strongest impact on economic sustainability, primarily through cost-saving measures and efficient resource utilization. Waste elimination showed significant contributions to environmental sustainability by reducing non-value-added activities and optimizing processes. However, the impact on social sustainability was less pronounced, suggesting that additional efforts are needed to address staff well-being, satisfaction, and engagement. These results

provide valuable insights into how lean practices can be tailored to enhance all aspects of sustainability in Qatari HEIs.

The results indicate that lean practice have a significant positive influence in all three dimensions of sustainability: environmental, economic, and social. Lean practice were found to have a strong influence on environmental sustainability ($\beta= 0.808$, $t=19.615$, $p<0.001$), economic sustainability ($\beta= 0.929$, $t=73.499$, $p<0.001$), and social sustainability ($\beta= 0.753$, $t=14.424$, $p<0.001$). These findings suggest that the implementation of lean practice in Qatari higher educational institutions can lead to substantial enhancement in overall organization sustainability.

The study has some contributions to theory development. First, this study provides empirical evidence about the role of lean practice in enhancing organization sustainability in the higher educational sector, particularly in the context of Qatar. Second, this study has provided empirical evidence about the link between lean practice and the three dimensions of sustainability - environmental, economic, and social - in the context of higher educational institutions in Qatar.

In practice, the current study suggests that leaders in Qatari higher educational institutions should adopt a strategy that improves the implementation of lean practice in order to improve sustainability performing across all three dimensions. This, in turn, will enhance the overall performance and long-term viability of Qatari higher educational institutions.

Furthermore, the findings of this study have implications for policymakers and institutional leaders in Qatar's education sector. By highlighting the positive impact of

lean practice on sustainability outcomes, this research provides a strong rationale for integrating lean management principles into institutional strategies and operations. This alignment could contribute significantly to Qatar's broader goals of sustainable development and creating a knowledge-based economy.

In conclusion, this study underscores the potential of lean practice as a powerful tool for enhancing organization sustainability in Qatari higher educational institutions. By demonstrating the positive effects of lean practice on environmental, economic, and social sustainability, this research provides a foundation for future studies and practical initiatives aimed at improving the sustainability performance of higher educational institutions, not only in Qatar but potentially in the broader Gulf region and beyond

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APPENDIX:

Appendix A: Mahalanobis distance test

The screenshot displays the IBM SPSS Statistics Data Editor interface. The main window shows a dataset with 64 variables and 19 rows of data. The variables are: SoP5, SoP6, ID, Gender, Age, Nationality, Academic Qualification, Years of Experience, HE Institute, Occupation, LS, CI, EC, StV, LTT, WE, EnP, EcP, SoP, Sus, MAH_1, probability MD, and var. The data is presented in a grid format with columns for each variable and rows for each case. The bottom of the window shows the 'Data View' tab selected, and the status bar indicates 'IBM SPSS Statistics Processor is ready' and 'Unicode OFF'.

ID	SoP5	SoP6	ID	Gender	Age	Nationality	Academic Qualification	Years of Experience	HE Institute	Occupation	LS	CI	EC	StV	LTT	WE	EnP	EcP	SoP	Sus	MAH_1	probability MD	var
1	4	1	27	2	4	2	4	5	2	1	1.00	1.00	3.00	1.60	2.67	2.33	1.00	1.14	2.33	1.49	31.47073	.00002	
2	4	4	123	1	4	2	3	3	1	1	2.00	2.00	3.75	4.00	1.67	1.67	2.50	2.71	3.17	2.79	24.14896	.00049	
3	3	3	78	2	4	1	4	5	1	1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.29	2.00	1.43	23.61504	.00061	
4	4	2	32	2	3	1	4	3	2	1	4.20	3.33	2.75	5.00	5.00	2.33	2.13	3.29	3.17	2.86	23.34715	.00069	
5	4	3	6	1	5	2	4	5	2	1	2.40	4.33	3.75	4.40	4.33	4.33	4.38	4.43	2.83	3.88	20.62589	.00214	
6	5	5	44	2	2	2	3	3	1	1	4.40	1.67	3.50	2.60	3.33	2.67	3.13	2.43	4.83	3.46	19.30843	.00367	
7	4	4	49	1	4	2	4	5	1	1	2.20	1.67	3.50	2.80	2.67	1.33	2.13	2.43	3.83	2.80	17.60860	.00729	
8	2	4	71	2	5	2	4	5	1	1	4.60	3.33	3.50	3.00	2.00	2.33	1.38	2.29	3.17	2.28	15.59406	.01611	
9	5	5	82	1	3	2	3	2	1	2	5.00	4.33	4.25	4.40	4.67	2.33	3.63	3.71	4.50	3.95	15.54087	.01644	
10	4	4	111	1	3	2	4	5	1	1	2.00	1.00	2.25	4.00	1.67	1.67	2.50	2.71	3.17	2.79	14.25404	.02692	
11	4	4	112	1	3	2	4	5	1	1	2.00	1.00	2.25	4.00	1.67	1.67	2.50	2.71	3.17	2.79	14.25404	.02692	
12	4	4	17	2	2	1	1	3	2	2	2.80	1.33	2.75	3.00	2.00	4.00	3.63	2.14	3.17	2.98	12.69621	.04812	
13	5	4	54	1	5	2	4	4	1	2	4.40	2.33	3.50	4.00	2.00	4.33	2.88	3.86	3.50	3.41	12.51663	.05139	
14	4	4	47	2	2	1	3	3	1	1	4.80	2.33	4.25	3.80	3.33	4.00	2.88	4.57	3.83	3.76	12.04312	.06101	
15	3	2	19	2	1	1	2	1	2	2	4.40	4.33	3.50	3.00	3.00	5.00	2.38	4.00	3.00	3.13	11.77953	.06707	
16	2	3	57	1	2	1	4	3	1	2	4.20	3.00	3.25	2.60	4.00	2.67	2.75	3.00	3.33	3.03	10.35655	.11042	
17	4	3	18	1	4	2	3	5	2	1	4.20	2.33	4.00	5.00	3.00	3.33	2.75	3.57	3.33	3.22	10.33776	.11113	
18	4	2	76	2	3	1	4	5	1	1	2.40	2.67	2.00	4.00	2.67	3.33	3.75	3.43	3.67	3.62	10.26726	.11384	
19	3	3	61	2	2	2	3	2	1	1	5.00	4.33	4.00	3.80	5.00	3.00	3.00	3.00	3.00	3.00	10.13639	.11902	

Appendix B: Survey Questionnaire

Lean Practices and its Impact on Organizational Sustainability of Qatari HEIs

Lean Practices and its Impact on Organizational Sustainability of Qatari HEIs



Dear Faculty/ Staff /Administrative

You are invited to participate in a research study. Please read the information below to understand the purpose and what your participation will involve.

This study aims to examine the impact of lean practices on the sustainability of higher education institutions (HEIs) in Qatar. You will complete a survey on lean practices and organizational sustainability in your institution, which will take about 10 -15 minutes. The study will run from June 20, to September 27, 2024.

The risks are minimal, mainly the time required and possible discomfort in answering questions. While there may be no direct benefits to you, the results could improve sustainability practices in HEIs.

Your data will be anonymized, securely stored, and only accessible to the research team. It will be retained for five years and then deleted or anonymized. Only group data will be shared.

Participation is voluntary, and you can withdraw at any time without penal

The study is approved by Qatar University Institutional Review Board with the approval number [QU-IRB 155/2024-EM]; If you have any question related to ethical compliance of the study you may contact them at QU-IRB@qu.edu.qa or at 4403 5307 .

1. **Consent:** I have read and understood the information provided above, and I voluntarily agree to participate in this research study. I understand that I am free to withdraw from the study at any time without consequence.

- I agree to participate in this study.
- I do not agree to participate in this study

Demographic Questions

2. Gender

Male

Female

3. Age Group

From 18 to 30

From 31 to 40

From 41 to 50

From 51 to 59

Older than 60 years

4. Nationality

Qatari

Non-Qatari

5. Academic Qualification

Diploma

Bachelor's degree

Master's degree

PHD degree

Other

6. Years of Experience in the Higher Education Sector

- Less than 1 year
- 1-5 years
- 6-10 years
- 11-15 years
- 16 years and above

7. Name of Higher Education institute

- Qatar University
- Community Collage of Qatar

8. Occupation

- Academic staff
- Administrative staff

Leadership support (LS)

9. At my HEI, managers take responsibility for their actions and decisions

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

10. In my HEI, managers are present (in person or remotely) in their daily work

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

11. There is support from the managers of my HEI to work with continuous improvements

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

12. Managers recognize the importance of employees (administrative technicians, teachers and contractors) to achieve goals and objectives

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

13. In my HEI, managers provide support, direction and encouragement for the work of employees

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Empowerment and Collaboration (EC)

14. In problem-solving situations, the ideas and opinions of employees in the sector are considered before a decision is taken.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

15. In my HEI, employees have the autonomy to develop their daily activities and work

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

16. In my HEI, employees understand the processes in their work sector.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

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Lean Practices and its Impact on Organizational Sustainability of Qatari HEIs

17. In my HEI, employees feel encouraged to give suggestions to improve activities without fear of reprimand

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

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Continuous Improvement (CI)

18. In my HEI, we constantly work to improve everything that is done

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

19. In my HEI, there is a standardized way of working with improvements in daily work

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

20. In my HEI, we are more concerned with how we can improve things and not find out who made a mistake

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Student Value (StV)

21. In my HEI, management maintains close contact with students

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

22. In general, my HEI supports students' needs and expectations

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

23. In my HEI, students are the center of activities

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

24. At my HEI, students are encouraged to submit complaints and suggestions for quality improvement

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

25. In my HEI, communication between students and employees (professors and technicians) is considered a tool for continuous improvement

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Long-term Thinking (LT)

26. In my HEI, actions and projects are carried out that will only have returns in the long term (five years) even though they know that they will not generate returns in the short term (one or two years)

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

27. Top management decisions at this HEI are based on LT, even at the expense of short-term "financial capital"

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

28. In my HEI, employees have the understanding that some activities will not generate returns and results in the short term, only in the long term

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Waste Elimination (WE)

29. In my HEI, eliminating or reducing waste is something that we work with continuously

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

30. I try to reduce waste in my work sector at HEI

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

31. Waste of any kind is constantly "fought" in the HEI

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Environmental Practices (EnP)

32. My HEI promotes and encourages biodiversity conservation around the campus.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

33. My HEI promotes the separation of waste and its forwarding for recycling (for example, paper, plastic, metal, oils, batteries).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

34. My HEI already has (or is adopting) mechanisms to reduce water consumption and avoid waste (eg. taps with timer function, flushing with less water, etc.).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

35. My HEI uses mechanisms to reduce energy consumption (ex: lights with presence sensors, computers "hibernation" after some time without use, energy-saving lamps, etc.).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

36. My HEI encourages practices to reduce energy consumption (eg. opening windows instead of turning on the air conditioning, turning off lights and other equipment when leaving a room, etc.).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

37. My HEI encourages the use of sustainable transport for commuting to campus (eg. bicycle, scooter, public transport, electric vehicles, rides, etc.).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

38. My HEI promotes practices, actions, and events to make people aware of the importance of using water sustainably and reducing energy consumption.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

39. My HEI promotes actions to raise awareness and encourage people to separate garbage and waste and send them for recycling.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

Economic Practices (EcP)

40. My HEI promotes the management and improvement of processes and daily work activities.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

41. My HEI promotes the provision of services to the community.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

42. My HEI always promotes cost reduction in all its activities.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

43. This HEI offers residence and/or student assistance services.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

44. My HEI encourages policies and initiatives to promote equality and diversity and social inclusion at work.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

45. My HEI promotes professional and personal development and employee recognition.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

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Lean Practices and its Impact on Organizational Sustainability of Qatari HEIs

46. My HEI promotes initiatives and activities for development of a healthy lifestyle.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

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Social Practices (SoP)

47. My HEI provides health services to the academic community (for example, psychological or medical or dental or therapeutic services, among others)

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

48. This HEI promotes events on sustainable education for the university community.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

49. My HEI provides student support services (eg. pedagogical support, psychological support, student reception and integration).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

50. My HEI cultural or scientific initiatives aimed at the community in general (eg. cultural or sporting events, lectures, concerts, scientific week).

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

51. My HEI provides access and facilities suitable for people with special needs.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

52. My HEI has gardens or spaces in nature for rest and entertainment.

- Strongly agree
- Agree
- Neutral
- Disagree
- Strongly disagree

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