A Holistic Framework Linking Environmental Practices to Business Performance and Sustainability: The Management Approaches

Ram Paudel[1,*], Vahick Yedgarian[2], Laba Kumar Shrestha[1], Mohammed Imam Hossain Tarek[2], Anamul Haque Sakib[2], Anita Pokhrel[2]

[1]American Management University, Utah, USA

[2]International American University, Los Angeles, California, USA

[*]Correspondence Author

Abstract

The problem of escalating degradation of the environment, scarcity of resources and the changing expectations of consumers in this global industry of restaurant has drawn attention on sustainability. The increasing awareness of integrated sustainability strategies like green technologies, circular economy models, and stakeholder engagement has proved to be the case, but there is a wide gap in knowledge about how these strategies are to be successfully implemented within the sector. The main purpose of this study is to find out critical challenges of sustainability and how strategic approaches can be taken by restaurants to deal with these challenges. The study explores current practices of sustainable restaurant operations using a secondary data and literature review supported by qualitative content analysis approach. It also reveals that since environmental, effective operational efficiencies can be mitigated through the participation of collaborative stakeholders and the refusal of the reduction, reuse, reduce, and recovery cycle (RTI). As such, these insights provide insight into the practical applicability to restaurateurs, policymakers and sustainability advocates for a greener future for the hospitality sector.

Keywords

Environmental Practices, Business Performance, Sustainability, Management Approaches

1. Introduction

The seemingly utopian achievements of modern food and beverage industry are today deeply tied to problems plaguing almost all the planet. The hidden cost of what it keeps billions fed is immense, and it is growing. However, the means it takes to produce our food: agriculture, accounts for 200 exajoules of energy annually [1] more than an entire nation like China or USA consumes. However, when considering processing, packaging, shipping, and consumption then food production contributes about a third of the global total energy consumption [2]. Everywhere it goes, land used for the global food system is the single largest land user on Earth. On more than two times the size of India, cereals alone occupy over 700 million hectares. The price to be paid for this scale is steep. This health crisis is compounded by the fact that the food industry is in love with convenience and profit. There are all sorts of processed meals and sugary drinks in supermarket shelves that are sold and designed to travel and to last, not to nourish. Worldwide [3], these products are fuel to obesity, diabetes and other preventable diseases. Even more disturbing is the level of waste that's astounding. [4] reports that more than a third of the food we grow grows never to be eaten. This is an obscene loss of nutrition, water and labors in a world where hunger persists. In fact, our food system is one of the embedded players in several planetary emergencies. [5] states that it is responsible for 60% of biodiversity loss and land conversion; 70% of nutrient pollution; and 30% of climate emissions. Total nitrogen from animal waste is the top contributor to the nutrient overloads that choke lakes and rivers, a process known as eutrophication [6]. The environmental problems are not unique; these are also economic and societal problems. Around two more dollars for every dollar we spend on food are created in hidden costs; those are costs for damaged ecosystems and the added burden of healthcare, lost productivity. The total bill? Around $5.7 trillion in 2019 alone [7]. The human toll, though, is also only expected to increase. Current trends could cost 5 million lives annually by 2050 and there are no areas of the globe entirely spared from the effects of climate change that could spawn these changes. The global economy relies upon the role that the restaurant industry has to offer in terms of employment and the local economies fostered by the variety of offerings it provides. This sector accounts for a fair part of the global employment and the GDP. But, as the industry expands, it's getting pushed harder to address its environmental side as food waste, water and energy consumption, greenhouse gas emissions.

To meet the demand for sustainability in the face of growing questioning from restaurants for these issues, never has it been crucial more [8]. The restaurant industry is in a multilayered battle with the environmental problems. Among the many issues, food waste with large quantity of edible food every single day and adding to landfill waste and carbon emissions remain the big issue. It also involves a high energy and water usage to the point of being almost operational cost already stressed the resources. Among other fine dining restaurants, known to offer a higher fare than most with a refined ambience and serving more than their fair share of energy, water, and ingredients, exacerbating their

environmental impact [9]. In reaction to these concerns the industry now has been seeing a growing shift towards sustainable practices. Some of these strategies are decided by several factors such as consumer demand for green options, competitive pressure, and government policies to curb negative environmental influence. Governments worldwide are implementing policies such as requiring restaurants to manage waste better, use less water and use less energy as until the government stepped in, there were no company regulations on how waste should be thrown away, water and energy consumed, or other greener sources should be used. Concurrently, people are growing more environmentally aware and better demanding for more environmentally sustainable food options and are increasingly taking environmental footprint of their dining decisions [10]. But while sustainability is now increasingly incorporated in different areas including Europe and North America, problems still exist in the areas not to the level of sustainability practices because of variations in regulations and consumer awareness.

The purpose of this study is to investigate integrated sustainability strategies that the restaurants, especially fine dining restaurants, can employ to tackle the above challenges. Some of these strategies are decided by several factors such as consumer demand for green options, competitive pressure, and government policies to curb negative environmental influence. This study's central research question is: What integrated sustainability strategies can restaurant operators adopt to reduce the environmental footprint of their operations? To answer this question, the research presents a fair framework that integrates all the sustainability practices to form a complete approach and provides actions for any restaurant's ecology all around the world. The principles of the circular economy and green accounting are the foundation on which this study is based, introducing how this can be done in the restaurant sector.

The holistic emphasis on sustainable restaurant management that the study provides is itself a prime mechanism to achieve the United States' environmental, performance, and public health goals. Mostly, the framework prescribes to the U.S. Environmental Protection Agency's (EPA) Food Loss and Waste 2030 goals, efforts by the U.S. Department of Agriculture (USDA) to empower sustainable food systems, and White House's major climate and sustainability agendas. This work lines up with and develops legislative acts such as California's SB 1383 focused on reducing food waste and promoting diversion of organic materials readily in commercial kitchens. The variety of restaurant forms incorporated into the framework, including fine dining and fast-food, endows it with usefulness in communities of both urban and rural landscapes. It is through the formulation of implementable means of energy savings, waste prevention, water management and community cooperation that this research arms food service operators with financially savvy and eco-friendly solutions. Using these methods, public expenses relating to landfill maintenance, health problems associated with emissions, and wasteful use of resources will be reduced.

This study also contributes to U.S. advancement in sustainable food system innovation since adopting sustainable practices in restaurants can spur new green jobs, cut costs, and fortify a resilient market-driven economy. This study contributes to the real-world competitiveness of the U.S. against the backdrop of rapid expansion of the green economy, through its investigation of novel environmental practices. While promoting a more sustainable, economically efficient and environmentally responsible restaurant sector, the outcomes facilitate national interests and enhance the U.S. efforts in global sustainability. This research presents the trend of how leading U.S. restaurant operators such as Panera Bread and Chipotle have adopted real-time intelligence (RTI) and circular economy model to promote energy conservation and waste minimization. Such case examples enhance the relevance of this research for application in the U.S. restaurant industry in dealing with similar issues. The scope of the framework is more than financial and operational gains to improve public health, through lessening environmental impact from food production, and nourishing more nutritious and socially conscious consumption, and bolstering the ability of regional economies to survive. The major priorities of the U.S. policy, which include developing sustainable food systems, reducing waste, and promoting responsible business practices, will be the central point of this research. Through the provision of clear guidance which will help the restaurants accept effective technology, minimize waste, conserve water and collaborate with stakeholders to achieve these American targets for climate action, public health; this research plays a role in helping these goals. Switching the restaurant industry to a more sustainable model has great potential to create jobs, promote public health, and save the environment, all of which will contribute to the buildup of sustainable economy among the global communities

The contribution of this study is that it tries to bridge the existing knowledge gap concerning integrated sustainability practices in the restaurant industry. While several studies have looked at sustainability practices, such as waste management or energy efficiency, research on a whole has been sparse in looking at how sustainability practices can be combined as one. This study is intended to provide an integrated tool for sustainability and provide insights of actionable recommendations for restaurant managers and policymakers on how to transition to greener future. The study also contributes to literature on the hospitality sector environmental stewardship, providing valuable insights which can help future research and the policy development. This research eventually contributes to the conversation about sustain ability in the restaurant industry that can lead ultimately to a green practice that could be economically feasible and environmentally responsible. In response to growing industry scrutiny about its environmental footprint, integrated sustainability strategies will be no longer an option for the industry's survival in the long run; rather it will help the industry to address the challenge of mitigating its climate and environmental impact on the global scale.

2. Literature Review

The restaurant industry has demanding challenges to sustainability given its use of resources. Key challenges related to environmental impacts include high energy consumption, wide water uses, obvious greenhouse gas emissions, and food waste. However, these challenges can only be solved by adopting an arsenal of sustainable strategies such as technological innovation, waste minimized practices, sustainable sourcing and policy support, etc. This section provides the sustainability strategy literature review with emphasis on how the strategies are applicable in the restaurant sector.

2.1 Sustainability Challenges in the Restaurant Industry

While there are several sustainability challenges facing the restaurant industry, a primary sector of concern is environmental due to food waste, lack of energy efficiency, wastewater, etc. The losses, and therefore the waste, throughout the food service chain are estimated at approximately 30 % of globally produced food, making food waste one of the most relevant issues that needs to be stopped, according to [10]. Apart from the environmental burdens it imposes, this is also a huge source of financial loss, as food is a large portion of a restaurant's expenditure. Sustainability efforts become more layered by the fact that more energy is being used. Electricity consumes 60% to 70% of the total energy and commercial kitchens are very energy intensive [11]. Typically, refrigeration systems consume as much as half the electricity used, and the increases predicted for their usage will result in larger energy impacts than those predicted from the remaining investments. Cooking appliances including, fryers, grills, and ovens also make a huge contribution, such as fryers alone accounting for approximately 13% of daily electricity usage [12]. Lesser contribution (about 6%) is made by lighting. Overall demand [11] in HVAC systems, especially those included to provide ventilation and cooling, is significantly increased. Gas is also central to the work of many restaurants, which require cooking, kitchen space heating, and some of their equipment. Because of being cheaper and more energetic and less energetic as their cost, natural gas and liquefied petroleum gas (LPG) are widely used. Yet despite the perceived cleanliness of gas as opposed to other fossil fuels, gas generates up to 38 % more energy than some electric options [13]. The main cooking equipment within this category is gas-fired stoves and ovens; in colder climates, there is further burden imposed by gas-based space heating. Reducing emissions and the operational cost of this equipment can be achieved by improving the efficiency of this equipment and trying cleaner technologies such as induction cooking [13]. There is another critical concern and that is water. In fact, many restaurants use vast quantities of water for dishwashing, food preparation, cleaning and sanitizing. Often dishwashing alone is a top water user. For example, it will be possible to reduce the consumption [14] using water efficient dishwashers and optimized rinse cycles. New and more efficient food preparation appliances as well as redesigning workflow cuts the amount of water used for preparing food. Such poor water management does not only overwork the environment but also costs a fortune to the operating account. Due to these issues, particularly in an urban context [15], systems for gray water reuse and wastewater treatment are becoming increasingly embraced. Also, encouraging water conservation has been shown to be effective by staff training and behavioral change campaign [16]. This overlapping challenge for restaurants is exposing them to the fact that piecemeal efforts on sustainability is no longer good enough. It is essential that integrated strategies to reduce and recover energy, water and food waste be developed together. Now that many off-the-shelf devices exist, though, there are policy incentives, industry standards, and a cultural shift in coalescing around long term responsibility in terms of the environment, to move forward and achieve real progress will require technological upgrades as well as all of these.

2.2 Strategies for a Greener Future: Sustainable Sourcing and Supplier Selection

With the organizations' aspiration to combine procurement with more generic environmental, social, and economic objectives, sustainable sourcing and supplier selection have become essential ingredients in responsible supply chain management. These strategies submit supplier selection decisions to include sustainability criteria, foster long term resilience of SR, and reduce operational risks as well as improve the company's corporate reputation. This takes care of the sustainable sourcing aspect of evaluating their supplier. In pursuit of these decisions, organizations often resort to multi criteria decision making framework like intuitionistic fuzzy AHP and multi objective genetic algorithms to assist with more inclusive view of the supplier's sustainability performance [17,18]. Lifecycle assessments (LCAs) are a cornerstone of sustainability at the organization level by quantifying environmental impacts through each stage of a product or service's lifecycle to set purse choices that are in line with organizational sustainability goals [19]. In addition, carbon footprint analyses are used to measure and manage greenhouse gas emissions associated with sourcing activities to meet emission reduction goals [19]. Today, supplier selection strategies incorporate both traditional and environmental, social, and economic dimensions, mainly cost and quality. It promotes the formation of long relationships with suppliers, based on mutual sustainability commitments [20]. Thus, enabling the always monitoring and evaluation of supplier's performance with respect to these dimensions [21] using such technological tools as decision support systems, data clustering techniques, and digital sustainability dashboards. Besides, fair labor practice and verification mechanism such as SA8000 certification requirement is being increasingly promoted to include in social responsibility and to keep the operation in the supply chain more ethical [19,22]. However, sustainable sourcing and supplier selection issues exist despite its benefits. The challenge of understanding the sustainability performance and region and industry varying standards limits its successful implementation. Additionally, as regulatory frameworks are evolving and stakeholder requirements continue to increase, there's even more goodwill in organizations to use their procurement strategies. To solve these challenges, robust assessment mechanisms need to be in place, there should be continuous supplier interaction and transparency and improvement among all the supply chain nodes.

2.3 Waste Minimization and Circular Economy Models

Waste minimization in circular economy model is an innovative approach to ease the environmental and resource inefficiencies of the conventional linear economic system. The circular economies are based on the extension of the life of the products (that extend their life cycles), minimization of the waste production (of materials) and regeneration of natural ecosystems through the reuse, recycling and reintegration of materials into production cycles. Besides soften environmental impacts, it additionally advances long time frame economical advantage and resource productivity. Hence, the designing circular economy principles favor the designing of goods and services with the minimization of the waste as well as maximization of the use of the material longevity, thereby limiting resource depletion and their associated ecological harm [23]. The cited models are inspired by the regenerative cycles in nature and aim to prolong the value of products and materials for as long as possible, so to speak [24]. Accordingly, the waste management activity is repositioned from a mere disposal-oriented activity to a value creation process. In terms of waste governance effectiveness, whether the materials are discarded or reabsorbed into productive use, uses [24]. To illustrate, the European Union has established circular economy strategies as the backbone of its waste management policies and countries such as Germany and France have advanced in the implementation as they have been having stronger policy frameworks [25].

Meanwhile, waste bioenergy (WtE) technologies also constitute part of the circular strategies by transforming residuals into renewable Energy. Organic waste stream energies are captured through technologies of anaerobic digestion, pyrolysis, gasification, not only reducing reliance on landfills but also decreasing emissions by essentially recycling the energy housed in organic waste. These innovations provide energy self-sufficiency opportunity and new economic opportunity and are important to the current circular waste management strategy. The waste minimization has been a focus point of sustainability programs in the food service sector. Organic waste management more effectively is an issue that restaurants are adopting circular economy models to deal with. Composting, recycling of food scrap, and the closed loop system are becoming a frequent practice. According to [26], an increasing number of restaurants are now adopting circular waste systems whereby the food waste is composted and later used as fertilizer of local agricultural land. For example, a closed loop model like Blue Hill at Stone Barns in New York integrates organic waste and supports sustainable agriculture via integration of organic waste to nearby farming operations [9]. Of course, technology also has a very important role in food waste reduction. Real time tracking and automated waste analytics with smart kitchen systems like real time monitoring helps in inventory and consumption patterns, which helps the restaurants reduce over production and improves efficiency.

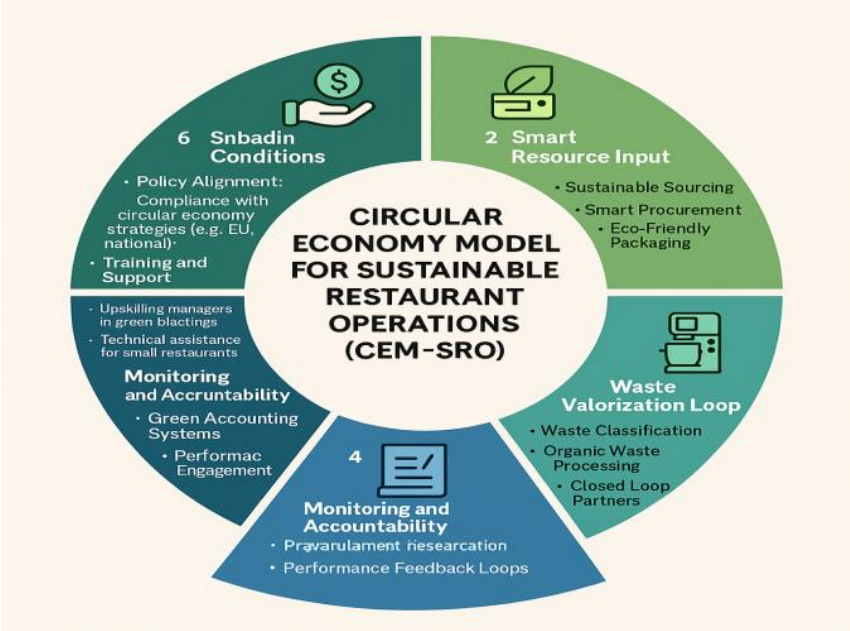

Figure 1. Circular economy model for sustainable restaurant operations (CEM-SRO)

Source: Synthesized by the author from multiple sources in the literature.

[27] mentions the use of real time intelligence (RTI) systems for food usage optimization, reduction of waste and reduction in operational costs. Such technological solutions help the environment while at the same time increasing the financial performance as well as the efficient operations. The second, adopting circular economy principles also helps restaurants to improve their market positioning. Over the past years, consumers increasingly seek brands involved in ethical and sustainable practices and circular initiatives can greatly improve a brand's image as well as customer [28]. This leads to the fact that the operations based on sustainability are not only decreasing environmental impact but also have a competitive edge amongst a rapidly evolving food industry. While there is no doubt of the benefits, however, implementing circular economy practices is problematic. Such include technological and infrastructure barriers, policy

and regulatory barriers and a mandatory need for a greater collaboration across the supply chain. To achieve the potential of waste minimization and circular economy framework, these obstacles must be overcome with cooperation from the policymakers, industry leaders and the local communities.

2.4 Energy Efficiency and Water Conservation

The sustainability challenges to growth are considerable and particularly relevant in the restaurant industry for issues such as energy and water and waste. Change to energy requirement of cooking, heating, cooling and lighting makes restaurant highly energy intensive with requirements of energy of up to 650 to 1000 kWh/m²/year [13]. Although it is slightly less polluting and cheaper than electric equipment, LPG fueled equipment has around 38% more energy requirements than electric. Integration of solar photovoltaic system presents both economic and environmental benefits; transition to high efficiency products such as condensing or tankless water heaters may save up to 19.5% in energy usage [29]. Other technologies such as real time intelligence (RTI) systems, give you the capacity to predict the energy usage and waste reduction [27]. There is also the issue of water conservation as restaurants, unlike households, are used to operating with inefficient usage practices. Great efficiency of the appliances and training of the staff is important to reduce water consumption in the future [22,30] and water recycling systems can further optimize resource use and save cost [31]. Circular economy strategies such as composting, anaerobic digestion, recycling, etc. reduce the effect of these considerations and can increase the rates of recycling more than 40% [31]. High upfront costs, minimal to non-awareness and the presence of regulatory barriers continue to impede the implementation of sustainable technologies and models even with their availability. However, city such as San Francisco which demands the diversion of food waste into recycling are providing examples which show that policies and innovation are playing a part in advancing sustainability in the restaurant industry. According to [10], monitoring and leveling down the water usage in the kitchens and bathrooms of a restaurant can help significantly reduce water bills and reduce the restaurant's environmental impact. San Francisco among many cities have also put up a law that makes it mandatory to divert organic waste and separate from it, this encourages restaurants to divert this waste to composting facilities, therefore, this regulation has encouraged restaurants to compost and improve their waste management tricks to achieve sustainability goals.

2.5 Consumer Behavior and Education

Consumer behavior plays a key part in motivating practices aimed at sustainability within restaurants. According to [9], the reasons restaurants should take into consideration to implement environmentally friendly practices include consumers becoming aware of and demanding environmentally friendly dining options. The right of consumers to take part in the green revolution has gone principally unfulfilled. Public awareness programs and sustainability certification programs through the restaurants can enable people to enjoy this right and can act as a support to the green revolution. For example, based on the sustainable efforts of restaurants, they can draw attention to their sustainability efforts through menu labeling on which the food they offer were prepared using sustainable ingredients or foods with a smaller carbon footprint. Additionally, restaurants must work with all stakeholders in the supply chain to achieve sustainability. As pointed out by [32], collaboration between the suppliers, the local communities and the policymakers can strengthen the sustainable practices within the foodservice sector. Such engagement empowers restaurants that are willing to add value to their supply chain activities to create more resilient and sustainable supply chains, leading to better environmental and economic outcomes of their operations.

2.6 Policy and Regulatory Frameworks

The sustenance of the restaurant industry depends on the government policies and regulations. [33] state that policy incentives like tax credit for restaurants who deploy energy efficient technologies as well as laws to reduce food waste can vastly ramp up the rate which sustainable practices are adopted. There are many regulations in place for many cities that have stipulated restaurants can separate organic waste, reduce food waste and participate in composting programs. Incentives and frameworks to help restaurants align their sustainability goals are these policies. Nevertheless, there is a remaining obstacle regarding standardized regulations between regions. [32] stated that several of the factors for why sustainability practices are not practiced routinely are inconsistent policy frameworks and regulatory hurdles. Barrier that governments need to overcome include lack of clear and consistent governments regulations supporting sustainability in the restaurant industry, and a level playing field for all businesses.

2.7 Sustainability Practices and Their Broader Implications

The role of sustainability as an essential part of the strategy particular for the restaurant sector has become increasingly significant for global environmental issues. While food waste and energy use are two significant concerns of the U.S. restaurant industry, the significant influence it has over these two issues make it a critical player in promoting national sustainability goals. According to the [34], foodservice establishments are expected to create enormous amounts of In this regard, the restaurants have widely embraced the use of composting, use of energy-saving machines and sustainable sourcing. Such steps are in line with more extensive national initiatives to reduce carbon emissions and improve resource efficiency across many industries. In addition to being eco-friendly, sustainability concept is applicable in restaurant industry to bring their economic gains. The use of sustainable methods is linked to reduced costs for businesses and increases the green jobs. There has been a considerable number of job creation in areas that study sustainability, and foodservice remains at the forefront, as reported by the [35]. The fact that restaurants can save on

costs while promoting economic growth objectives by using energy-efficient systems and procuring sustainable materials should be put into effect. These initiatives promote the interests towards a more powerful more flexible economy based on renewable energy, technological advancement as well as responsible business practice conforming to the environment. The pursuits for sustainability in the restaurant industry share a large portion with public health goals. Restaurants that practice good waste disposal and uphold a high level of food safety help to curb the rate of food borne illnesses and contributes to the cleanup of the environment against contamination. [36] believes that protecting food safety is necessary to prevent disease outbreaks, especially when food waste is not well managed. Sustainable restaurant operations support safer workplaces and customers in a way that complements public health efforts to curb pathogen spread and exposure to environmental contaminants.

The use of high-tech helps to greatly improve environmental performance of restaurants. Api innovations, such as smart refrigeration, energy efficient controls, and digital waste monitoring all give restaurants a chance to measure and enhance its environmental impact. Such innovations contribute to meeting national targets towards raising the energy efficiency and limiting greenhouse gas emissions while promoting economic development through supporting the expansion of green technologies. Enhancing promises of sustainability makes United States restaurant industry better positioned in the worldwide market. In response to heightened prospects for environmental stewardship, U.S. restaurants on the forefront of sustainable undertakings could lead best global practices. [37] highlights current increasing importance of environmental responsibility in the foodservice industry where the U.S. restaurants should set a new norm for global sustainability. U.S. restaurants become more competitive internationally by embracing sustainable sourcing, efficient use of resources, and waste reduction techniques such as in supporting wider international sustainability goals. Across the board, efforts at sustainability in the restaurant industry of the U.S. are deeply embedded in the country's goals for environmental stewardship, economic development, better public health outcomes and technological advancements. Adoption of these practices reduces the sector's environmental burden and encourages a stronger, sustainable economy and better public health. This research contributes toward our understanding of how sustainability affects the growth of the U.S. foodservice industry by exploring practices such as waste reduction, energy optimization, and the imposition of sustainable sourcing. This study presents evidence of the connection between industry sustainability and increased performance as well as general national goals.

2.8 Case Studies and Empirical Insights

Several case studies and empirical investigation contribute to the practical challenges and successes associated with the implementation of sustainable practices in restaurants which contributes immensely to the understanding of the practical issues and experiences faced by all foodservice businesses around the world. For instance, the role played in driving a sustainable food practice by customer and stakeholder behavior was noticeable in the case study of a restaurant in Saudi Arabia [38]. By promoting the involvement of the customers in sustainability initiatives and the support of the stakeholders in the green practices, this study emphasized the importance of engaging the customers and leveraging stakeholder support in increasing the effectiveness of green practices. [39] used the case of sushi restaurants to identify key drivers of sustainability such as the commitment of the restaurant operators, in their attempt to reduce the impact of climate change, as well as the role of the sustainability marketing in shaping customer perception about sustainability. Restaurants' strategic marketing to increase environmental responsibility level to that drives consumer willingness to pay premium on sustainability is the core finding of this research. Composting and surplus food donation were the most implemented strategies of food waste reduction [19] as was explained by the case study Dindigul restaurants in India. However, it identified several barriers to the effective implementation of the practices including lack of staff awareness, storage and customer resistance to portion control. Total solution for overcoming these barriers requires perfect training, efficient resource control and healthy customer involvement. There has also been shown on a case study basis how restaurants can use technological innovations to quantify and reduce food waste. The restaurant worked in cooperation with third party companies to be able to track this food waste in real time and adjust operations to reduce this [40]. It shows how technology implementation can improve operation effectiveness and sustainability in the restaurant context in this context. The case studies in these draw out the challenges and opportunities that present themselves in the restaurant sector regarding sustainability. By looking at these empirical examples, this research attempts to further explore how sustainability strategies could be fit into resto operations.

3. Methodology

This study adopts a rigorous qualitative literature review as method for adoption, systematically synthesizing and critically reviewing contemporary sustainability strategies from the industry of the restaurant. This is an analysis based on thorough review of peer reviewed journal articles and case studies, industry reports and theoretical publications in literature from 2020 up to 2024. For the sake of including recent advancements and emerging practices in sustainable food service, especially those stemming from the effects of the COVID-19 pandemic and acceleration of environmental sustainability, this timeframe was purposefully chosen.

3.1 Inclusion and Exclusion Criteria

To eliminate bias and ensure what is found to be relevant and rigorous, inclusion criteria were strictly defined. Only the sustainability practices of the restaurant industry were considered with respect to technological innovations, operational strategies, stakeholder engagements and policy frameworks. Priorities were given to the publications of both academic

and industry sources which provides practical insights on sustainability implementation. Articles that are not relevant to foodservice sector, not in English, and in non-peer reviewed, opinion pieces not backed with empirical data have been excluded as exclusion criteria. It makes sure a high standard of reliability and applicability for this selective process.

3.2 Data Collection and Search Strategy

Systematic search was made in reputable academic databases for data for the review. A variety of key search terms such as 'sustainable restaurants', 'green technology in restaurant', 'food waste management', 'circular economy in foodservice' and 'restaurant sustainability frameworks' that were used to achieve the maximum breadth of the relevant literature. For the search to be more relevant to the most recent and current contextually relevant trends and practices with the ever-changing landscape of the foodservice industry in the wake of the pandemic. Furthermore, grey literature including industry reports from recognized sustainability organizations as well as government publications, all of which broadly describe the state of the sector, was also included to achieve a holistic view of the trends observed in the sector. Multiple and various compared cited studies were cross refereed as part of the review process; plus, additional publications of this nature were sought that will make the analysis richer and more complete.

3.3 Data Synthesis and Thematic Analysis

The findings from the given studies were synthesized by means of a rigorous thematic analysis approach. The usefulness of this method was that it allowed one to identify recurring themes, trends and strategies across a myriad of geographical regions as well as operational scales. In terms of results, they were grouped into five primary thematic dimensions, which include:

i. Technological integration: This dimension is about improving green technologies and energy efficiency and sustainable sourcing practices implemented and adopted at the restaurant industry. The list includes renewable energy solutions, energy efficient kitchen appliances and sustainable sourcing of ingredients.
ii. Green accounting and tracking of the environmental cost track. Here, the study explains on operational aspects such as waste reduction operational aspects, supply chain management, and sustainable menu design. The paper focuses on how restaurants manage environmental costs like food waste, packaging and energy consumption in undertaking their sustainability agenda.
iii. Circular economy practices: Circular economy practices dimension examines ways in which circular economy principles are applied at the level of the restaurant operations. Practices such as food waste repurposing, composting, and closing the loop of systems that consume less resources and send less waste to landfills are believed to be included in this as well.
iv. Sustainability initiatives: Sustainability initiatives investigate the roles that stakeholders which can be customers, employees and suppliers have with such an initiative. The highlight is of how restaurants involve customers making eco-friendly choice, educating the staff about sustainable practices and solution-oriented collaboration with the suppliers with the aim of improving sustainability of the entire supply chain.

v. Regulatory and Policies Frameworks: This dimension concerns how the restaurant's sustainability practice is influenced by local, regional and global policies and regulations. For all restaurants regardless of ownership type, there is the influence from governmental incentives, sustainability certifications, and food safety rules on restaurant operations and environmental footprint.

By classifying this into thematic categories, this helps capture it in a systematic, structured, holistic manner of looking at sustainability practices in the restaurant industry with which we can get a more understanding of what practices are taking place in response to environmental, social and economic pressures. In addition, the thematic analysis not only develops emerging practices, but it also identifies knowledge gaps and what additional research may be required.

3.4 Quality and Validity Control

High impact journals and credible industry reports studies conducted recently were the exclusive sources considered to uphold the rigor and reliability of the finding. Where relevant, studies were assessed for quality according to generally accepted criteria for assessing research validity; these included methodological soundness and the quality of samples representing sampled groups and transparency of data collection process if applicable. Moreover, the research team processed to ensure consistency whether the studies included are biased by cross checking and validating the set to minimize bias in hygiene synthesis.

4. Result and Discussion

The main strategies of sustainability from the restaurant field, the fields where technology, green accounting, practices of circular economy, stakeholder engagement and regulatory frameworks concentrate have been analyzed using the scientific literature. To get a better sense of the impacts and challenges restaurants face when implementing these strategies, the theories of relevant sustainability were applied to analyze these strategies.

4.1 Technological Integration: Innovation Diffusion Theory

Real-Time Intelligence (RTI) systems and smart kitchen technology have been a by-word for operational efficiency in the restaurant industry and integration of these with each other as well as with other processes involved in the kitchen

has become a key driver. [27] and [41] report that when restaurants adopt these technologies, energy consumption and food waste, and overall operational inefficiencies in the restaurant, are significantly reduced. For example, restaurants can optimize its processes based on real-time data on energy use, quantities of waste, etc. that RTI systems provide. Secondly, their adoption conforms to [42]'s theories of diffusion of innovations, which states that innovations are accepted differently because they are considered beneficial and compatible with the existing system. Larger restaurant chains are very attracted to waste reduction and operational efficiency offered by RTI systems that clearly give a relative advantage compared with large generators. But smaller establishments have handicaps and include integration complexity and high upfront costs. For instance, such as an RTI system that will cost $5K to install and a monthly maintenance fee. These technologies are usually very expensive to the extent that any small business cannot afford one, thereby limiting restaurants with independent/low budget resources form adopting these technologies. To fill this gap, subsidies, grants, or tax incentives on small businesses can be used to leverage the adoption among various types of restaurants. It could also provide training programs to the restaurant managers regarding how best to use these technologies to their maximum efficiency.

4.2 Green Accounting and Environmental Cost Tracking: Ecological Modernization Theory

Tracking energy consumption, waste, and other environmental costs in the environment through green accounting practices has helped facilities in the restaurant industry be more sustainable. The restaurants, which practice the green accounting techniques, do not only decrease their environmental footprint but also, they save costs by optimizing resource use [10]. By recording and considering environmental costs, restaurants are prompted to become more efficient in using resources and reducing waste. For instance, restaurants that know how much energy they use can affect their operations to lower electricity use by 10 to 15%. As such, this is consistent with ecological modernization theory [43], in which ecological principles are cultivated in businesses' production processes to harmonize ecological protection and economic expansion. Thus, green accounting allows restaurants to consider the costs related to environmental damage and make them enter economic processes. Despite this, [10] also observed that restaurants with limited financial resources coupled with lack of managerial knowledge on sustainability find it a challenge to apply green accounting systems. The challenges are met with targeted training and support investments intended to create favorable conditions for green accounting incorporation into restaurant managers' operation to harvest the long run benefits. Take for example a small restaurant which may need funds to purchase energy efficient appliances, however, that money may further be recouped through many years of energy savings.

4.3 Circular Economy Practices: Systems Theory and Sustainable Development Theory

As a tool to reduce environmental impact, moving towards a circular economy mindset in the form of waste diversion, composting, food donation has become a popular trend in the restaurant industry. [2] and [26] provide documented implementations of closed loop systems where the waste is composted, reused or donated to local communities. Let's say some restaurants have composted food scraps and the compost is used to fertilize local farms, to reduce waste and strictly support and sustain the common practice of agriculture. Ultimately, these practices are in line with systems theory [36] those views restaurants as systems within systems. Restaurants apply the circular economy principles which are adopted to optimize the management of waste from there is a feedback loop aimed at sustainability. Furthermore, this idea of circular economy practices is consistent with ideas of sustainable development theory [44] that suggest that to realize a long-term goals of being sustainably developed while conserving resources, the businesses should embrace such modes of operation. While the first hurdle is the investment needed to set up circular systems, small restaurants will face this issue. Creating an infrastructure to compost or donate food systems may be expensive right out of the gate. Businesses may however need support in the development of such an infrastructure and operational changes to embed circular practices effectively. For example, a restaurant might spend $3,000 to set up a composting system, but the savings that come from not charging so many environmental costs and not paying a waste removal fee can wind up costing more than the $3,000 up front.

4.4 Stakeholder Engagement: Stakeholder Theory and Corporate Social Responsibility (CSR)

The role of engaging in stakeholders, such as local suppliers, farmers, and consumers in making sustainability happen in the restaurant industry is very important. Based on [45], restaurants partnering with stakeholders to co create the sustainable solutions exhibit better environmental performance and higher consumer's loyalty. It is restaurants that promote ethical sourcing and use of sustainable menu options and engage customers in effort towards sustainability that will succeed in building strong relationship with stakeholders, a finding congruent with stakeholder theory [46] that posits that companies should be concerned with the interest of all stakeholders in making decisions. By collaborating with local suppliers, restaurants can sustainably source of their ingredients, resulting in a resilient and ethical supply chain. In addition, Corporate Social Responsibility (CSR) strategies like educating consumers about sustainability also integrate with CSR frameworks [8] and control the consumer behavior and improve brand image. Unfortunately, the problem is how to keep long term engagement with stakeholders in territories with a fragmented supply chain. The presence of supply chains, however, doesn't always allow some restaurants to set consistent connections with local farmers. For example, the external factors can be weather or the fluctuations of the market. Farming in rural areas, or growing weather dependent crops, might make it hard to build long lasting relationships with local farmers because weather related crop failures can disrupt the regular supply of produce. Instead of these challenges, transparency in communication, as well as a diversification of supplier sources, can help reduce them.

4.5 Regulatory and Policy Frameworks: Institutional Theory

The restaurant sector has managed to create sustainability on the ground because of government regulations and policies. In areas like California and others that have more stringent regulations on the environment, waste diversion, energy efficient techniques and lower water use are required by restaurants. [33] confirm that regulatory pressures in combination with eco-certification have a large impact on the sustainability behavior of restaurants. This is consistent with Institutional Theory as suggested by [47] that could be explained by organizational being pressured to conform to institutional pressures from regulatory bodies, industry standard, and sociological expectations. In this regard, mandatory sustainability measures, including food waste diversion laws, shape the institutional environment capable of encouraging compliance and change in the industry. This implies regulation would also give a clear yardstick in which accountability can easily be settled such that restaurants can set separable sustainability goals and institute progress in such. The diversity of regulations is continued to be a challenge. For instance, California has extraordinarily stringent waste diversion regulations, while other states may have less sophisticated rules in place that make little sense to adopt sustainable practices in the U.S. It will be easier to overcome it if the governments to decide on creating standardized, consistent regulatory frameworks that foster and encourage the big adoption of sustainability practices in the industry to the large extent possible. Furthermore, certified eco programs, such as LEED or green restaurant certification programs, have been discovered to increase consumer trust and promote sustainable consumer behavior. This standardizing of such frameworks allows governments to encourage restaurants in different regions to practice the same types of sustainability practices.

The findings of this study demonstrate that technology integration, green accounting, circular economy, stakeholder engagement as well as regulatory framework in restaurant industry sustains it strategies. Theory perspectives used to shape these strategies' function deeper, and it is not difficult to see impact and challenges associated with these strategies. Smart kitchen technologies and real time intelligence (RTI) systems combined, constitute a main driver in operational efficiency in restaurants. These technologies are used by restaurants, who can then reduce their energy consumption, minimize their food waste, and optimize their restaurant efficiency. This adoption of these innovations is in accordance with innovation diffusion theory that technological innovations are adopted in stages and typically according to the perceived benefits and in accordance with existing systems. However, these technologies are hard to achieve by smaller restaurants due to their high costs and long integration processes. In the restaurant industry, green accounting practices of tracking the energy consumption, waste and other environmental costs have demonstrated achievements in both environmental outcomes and costs. This approach is done in line with ecological modernization theory that asserts that economy development and environmental protection can both be achieved if the businesses can integrate sustainable business practices into their business operations. However, despite these benefits, financial constrain and lack of managerial expertise remain substantial barriers for some restaurants to be successful in adopting green accounting system. Practicing circular economy, including waste diversion, composting, and food donation has become now a leading way in minimizing the environmental footprint in the restaurant industry. These practices align with Systems Theory and the notion of Sustainable Development Theory which see the operations of a restaurant as interrelated and the long-term benefits of conserving resources for sustaining the restaurant. These supply chain practices offer a great deal of environmental and economic benefits, but often too much investment at the beginning of creating a circular system is an obstacle to smaller entities that have limited financial means. To progress sustainability within the restaurant industry, stakeholder engagement is very important. Organizations that form sustainable solutions via co-creation with stakeholders like local suppliers, employees and customers tend to develop more tight relationships and have better sustainability outcomes. This practice is the same with the stakeholder theory (ST) and corporate social responsibility (CSR) frameworks which focus that business decisions must be for the sake of all the stakeholders. While restaurants can maintain long-term engagement, maintaining long engagement, and more notably maintaining long engagement in regions where supply chains are fragmented or unstable with regularity, remains a challenge going forward. Finally, government regulations and policies are responsible for the sustainability drive within the restaurant industry, especially in the region where regulations and policies are strict. According to institutional theory, these regulatory frameworks generate institutional pressures that force restaurants to support sustainable practices. Although eco-certifications and mandatory sustainability measures put some structure in place, the very nature of the regulations vary across the regions makes it a challenge, however, as the sustainability practices differ across the industry. Overall, the results of this study indicate that the sustainability practices begin to be integrated into restaurant operation, and that the integration of the sustainability practices is increasingly important. The identified strategies represent a substantial shift for more environmentally conscious business practices, however, there is a strong need for targeted support and resources to overcome barriers for smaller establishments.

4.6 Implications for the Industry

The findings from this study lend important explanations for how restaurant industry can become a more sustainable environment. For restaurants, this is one of the most important implications to integrate the technology not only in staffing, but also in smart kitchen technologies as well as Real-Time Intelligence (RTI) systems. In addition, these innovations improve operational efficiency and can lower the environment footprints. Policymakers and the industry bodies could take a role in helping smaller restaurants to afford these technologies by subsidizing, or in part, the development of them. The implication of this is that environmental costs need to be handled in terms of green accounting. Restaurant can keep the track over the energy consumption and waste to make the business better with their

resource efficiency and cut down on the operational cost. What this means is that restaurant managers, particularly in smaller businesses, need to be trained in and supported through the efforts that are involved in implementing green accounting in their businesses. More than being only an environmental tool, green accounting should be seen to generate cost savings as well as operational improvement. Another area where the restaurant can really make an impressive stride, albeit circular economy practices like waste diversion and food donation, is another. It is best that restaurants make alliances with local farms, food banks, or even composting services to prevent waste or re-purpose it. While these practices provide sustainability over the long term, restaurants might require external help to get over the start-up financial and operational challenges of moving to a circular model. The second critical factor of this was stakeholder engagement particularly with local suppliers, employees, and customers. Working with their stakeholders will lead to better outcomes for the sustainability of restaurants and consumer loyalty. Moreover, for instance, implementing Corporate Social Responsibility (CSR) in the way such as informing consumers on the choices that are sustainable will not only improve bobbing reputation, but also improves the degree of customer retention. Finally, regulatory frameworks have a significant role in defining this effort for sustainability. In this situation, restaurants are more likely to start taking environmental practices in regions that have strong environmental policies (e.g. California) because of regulatory pressures. All this shows the importance of stable and transparent regulations which would stimulate sustainability all the way through the industry. For uniformity of sustainability standards to apply to restaurants in all described regions, policymakers should aim at creating standardized regulations to all restaurants.

4.7 Contributions to the Literature

The contribution of this study to the literature on sustainability in the restaurant industry is numerous. It brings the consolidation of contemporary sustainability practices in relation with trends and innovations of 2020 to 2024, referring some reading of the state of the industry now. Considering a broad spectrum of sustainability strategies including technological, operational, and regulatory strategies as a whole, the restaurant industry can determine how to adapt to and mitigate environmental, social and economic pressures. Additionally, the study enhances existing theories that can be applied to real world sustainability practices, namely: innovation diffusion theory, ecological modernization theory and stakeholder theory. This finding helped to shed new light on how these theories can be used to explain the dilemmas and opportunities restaurants encounter when they choose to adopt sustainability strategies. For example, as applicable to innovation diffusion theory, this puts into focus barriers to the adoption of new technologies and as valid for ecological modernization theory, it speaks to the simultaneous economic and environmental objectives of sustainable business practice. In addition, the research fills the gap in the existing literature in that it also helps understand the implementation challenges faced by smaller restaurants in adopting sustainability practices. These gaps further reinforce the need for more research about how tailored solutions can be designed to fit different types of restaurants according to the different resource available they have. The study also introduces the idea of further testing for whether regulatory regimes and policy incentives can encourage the industry to become more sustainable. Finally, this study contributes to the literature by providing an overall picture of sustainability of a restaurant industry, incorporating theoretical understanding with the practical advice to both the industry professional and policymakers.

5. Conclusion and Future Work

The restaurant industry is in a perfect moment where sustainability is no longer a choice but a necessity. Specifically, this study discovered that, aside from reducing environmental impacts, the integration of sustainable practices also significantly aids in the development of operational efficiency, consumer loyalty, and long-term profitability of the firm. The industry has many strategies to use, amongst them: These include technological innovations, for instance, the RealTime Intelligence (RTI) system, as well as the adoption of green accounting and circular economy practices (called eco accounting and an eco-society). However, the barriers are only surmountable and in small organizations only with targeted support, investment in education, and a more supportive regulatory framework. However, in this era of the evolution of sustainability in restaurant sector industry leaders and policymakers should work together to allow the adoption of sustainable practices, which would be to the benefit of many types of businesses. These strategies' implementation not only pave a way to decrease the industry's environmental impact footprint but also to build up a more robust and ethical foodservice industry that fits the increasing consumer desires in sustainability. The importance of stakeholder engagement and collaboration comes to the forefront in this research on how the involvement of suppliers, customers and other players of the supply chain drive to sustainable practices. Looking ahead, more research must be done to assist the restaurant industry to address the challenges that evolve, as well as introduce creative solutions to reach the sustainability goals with a scalable way.

To address the findings, the following actionable recommendations are made for the different stakeholders:

5.1 For Restaurant Managers

i. Implement real time intelligence (RTI) systems and smart technologies: Both can increase the efficiency in the operations, reduce the energy consumption and food waste. This will lead to reducing energy operational costs and improving sustainability outcomes by priori tiding investments in energy efficient technologies.
ii. Integrate green accounting practices: By doing this, restaurants can establish how much they are impacting the environment, as well as inefficiencies within their operations. This will guarantee long term success in how business strategies are aligned with sustainability goals.

iii. Enter circular economy practices: Restaurants should implement waste diversion and composting, as well as food donation under closed loop waste system. Not only will these practices reduce waste and bring in revenue, but they will also stay true to the overall values of being an eco-friendly, community proud company that is trying to engage customers in the green scene.
iv. Partnership with local stakeholders: This enables the building of a strong and ethical supply chain through the building of strong relationships with local farmers, suppliers and businesses. Sustainability solutions can be co-created by the restaurants to have both an environment and a social impact.
v. Menu labeling, social media, eco certifications: The more transparent communication of sustainability initiatives such as menu labeling, social media, as well as eco certifications will aid in the development of loyal consumers and increase restaurants to be more committed to sustainability.

5.2 For Policymakers

Comprehensive and supportive regulatory frameworks for the restaurant industry serve the purpose of advancing sustainability within the industry and are the role of policymakers. Real estate developers, suppliers and their supply chains can all be introduced and incentivized to enact regulations that mandate or incentivize sustainable practices like food waste diversion, energy efficiency and sustainability required of sustainable packaging, to instantiate industry-wide standards. Financial support in addition to regulatory is as crucial as financial support in allowing small and medium sized restaurants to adopt sustainable practice. Therefore, governments should provide targeted financial incentives with subsidies, tax credits or low interest loans to offset the start-up cost of implementing sustainable technologies. By these means they can lower economic barriers and promote broader participation of the sector in sustainability activities. It is another effective strategy of encouraging sustainability by promoting eco-certification. Policymakers can encourage restaurants to gain public recognition and attract the interest of environmentally conscious consumers by establishing reputable programs that certify environmentally good practices. Finally, such certifications can always act as the benchmark of improvement and transparency. Finally, education and research play an important role for the development of a long-term culture of sustainability. Educational programs for restaurant operators and their staff, as well as government investment in research of sustainable foodservice innovation can increase industry knowledge and improve operational capabilities to obtain sustainable foodservice innovations. Collectively, these actions together help make restaurant industry more resilient, environmentally better and economically viable.

5.3 For Consumers

The role of consumers is to play a big part on sustainability in restaurant industry by what they choose and how. Engaging with restaurants with an environmental responsibility is one of the most impactful things that the consumer can do. With the intention to enhance its supply chain, the third way requires consumers to consciously support establishments that practice such sustainable measures as waste reduction, energy efficiency, and eco-friendly sourcing thus making a step towards generating environmental awareness towards industry standards. An additional way for the people to reduce their ecological footprint is by adopting sustainable eating habits. Restaurant marking has the added benefit of realizing its environmental benefits while causing the foodservice industry to demand sustainable offerings. Restaurant consumers are benefiting from the results of choosing plant-based offerings on menus, waste at the personal level by minimizing and favoring meals made with locally sourced, ethically sourced ingredients, as they drive demand of these offerings sought out by the food service industry. Additionally, consumers have the power to be voices for and use buying power for sustainability. By reviewing, direct feedback, and by engaging on social media, they can advocate for restaurants to make green initiatives an investment and encourage transparency in what they do to promote an environmental agenda. Given this, the consumer advocacy role of this form is crucial to effect business decisions and fostering of the culture of sustainability in the industry.

5.4 For Researchers and Academia

i. Future research should include conducting Empirical case studies and Surveys of the adoption of Sustainability practices in various restaurants at different geographical territories with an emphasis on barriers and enablers.
ii. Research should encompass exploring the technology adoption barriers in small and medium sized restaurants, within financial and logistical constraints, to solve the issues faced to make green technologies more readily used in restaurants.
iii. The quantitative studies should measure concrete corollaries of sustainability strategies on restaurant performance, consumers' behavior, and environmental impact so that one can determine whether these strategies work.

5.5 For Industry Associations

The restaurant sector is a multifaceted system, including nation and local level policies, industrial associations, research efforts, and collaborations between different stakeholders, which make it challenging to identify clear intermediary effects. Their main responsibilities include organizing events to promote knowledge sharing within the organization namely conferences, webinars and forums. By bringing together the restaurant operators and the policymakers and the sustainability experts, these platforms will enable the exchange of ideas by these stakeholders, exchange of successful practices, and planning collaborative strategies to increase environmental performance in the industry. In addition, the industry associations should provide active support as well as support and promote sustainability certification programs. Associations assist with the development of credible standards for certifications and by promoting their adoption, they

do set the bar for an acceptable standard for sustainable practices. But more importantly, these certifications help prevent dirty restaurant operations from being claimed as green and provide an edge to those that can prove they are.

5.6 Limitations of the Study

However, this study has some limitations, it can provide valuable insights on sustainability strategies in the restaurant industry. The biggest limitation that is relying on the secondary data sources such as articles, case studies and industry reports. This approach helps in getting a clear picture of what already exists in terms of literature however, it does not portray enough primary data such as direct field observations, interviews and surveys. Therefore, the findings may be biased or limited because of the sources that are reviewed. A second limitation focuses on a particular time (2020–2024). This period is in line with recent trends, but it may not represent the industry at large going back to long term sustainability practices or even to shift that started prior to the COVID-19 pandemic. Since sustainability is an area of research rapidly evolving, we cannot stop to investigate how the restaurant industry keeps adjusting to increasingly new environmental and social challenges. The study, for example, takes a wide view of sustainability strategies without diving into sector particular particulars. The findings are generalizable to other restaurant types but are not meant to capture the differences between fine dining, fast casual or quick service restaurants, which vary with respect to size, resources and customer base and which adopt sustainability practices differently based on those. Lastly, this research concerns, mostly, the restaurant industry of Western countries and that limits the understanding of sustainability practices in other areas of the world. There may be economic, cultural value and government policy constraints in such areas that require investigation to determine how they impact sustainability efforts.

5.7 Recommendations for Future Research

Future research in this area is proposed giving the limitations of this study, to better understand sustainability in the restaurant industry. Primary data should first be collected from the restaurant operators and consumers through case studies, interviews, or surveys before the combined data is used and analyzed after applying mathematical models. Such data would validate existing findings and serve to better understand practical challenges and successes of these data in real contexts. Other area that was explored was the sector level analysis to understand how sustainability practices change from different restaurant types such as fine dining versus fast casual. The result is that these studies could disclose how operational scale, consumer expectations and financial resources affect sustainability adoption. Also, its effectiveness of specific strategies such as waste reduction initiatives or energy efficient technologies can be assessed quantitatively by quantifying cost savings, consumer satisfaction and so on. An augmented field would be further enriched by bringing together qualitative and quantitative insights to get a fuller understanding of the sustainability practices and their long-term implications in a mixed methods approach. In terms of research minded, there is particular interest in investigating how sustainability labels and campaigns influence the decisions a consumer makes to eat out over time, and how marketing nudges behave with the eating out habits of consumers. The adoption of technology in small restaurants that are financially and operationally constrained needs to be studied further in future. This is important to understand in developing inclusive success strategies. In addition, assessing the impact of a regulatory framework, i.e. tax incentives and a food waste policy, would contribute to how policy effects industry behavior. Finally, it would offer global and longitudinal perspectives to the literature. These could also be looked at (cross culturally) how the local context affects sustainability efforts or, on a larger scale, how the sustainability efforts of a restaurant change over time.

5.7.1 Conflict of Interest

Authors must disclose that there is not any financial or non-financial conflicts of interest that could influence the interpretation of the current work.

5.7.2 Ethical Declaration

The sources of data used in this study are secondary and it involved literature analysis. There were no human or animal subjects. Ethical approval was not required. Also, this article was not generated by artificial intelligence. The author independently conceptualized, analyzed, and wrote the entire manuscript. AI tools (e.g., ChatGPT) were used only to support idea generation and structural planning. All final decisions regarding the content, methodology, and conclusions were made by the author in accordance with academic integrity standards.

References

[1] Ladha-Sabur, A., Bakalis, S., Fryer, P. J., & Lopez-Quiroga, E. (2019). Mapping energy consumption in food manufacturing. Trends in Food Science & Technology, 86, 270–280. https://doi.org/10.1016/j.tifs.2019.02.034

[2] Islam, M. T., Kumar, J., Soeiro, J. D., & Garg, A. (2024). Green revolution in the hospitality industry: A deep dive into sustainable food waste management. In Sustainable disposal methods of food wastes in hospitality operations (pp. 110–126). IGI Global. https://doi.org/10.4018/979-8-3693-2181-2.ch008

[3] Smith, E., Scarborough, P., Rayner, M., & Briggs, A. D. M. (2018). Should we tax unhealthy food and drink? Proceedings of the Nutrition Society, 77(3), 314–320. https://doi.org/10.1017/s0029665117004165

[4] Matheson, L. (1960). Engineering and medicine. The Medical Journal of Australia, 2(8), 281–284. https://doi.org/10.5694/j.1326-5377.1960.tb87242.x

[5] Carrero-Martínez, F., Kameyama, E., & Whitacre, P. T. (Eds.). (2019). Reducing Impacts of Food Loss and Waste. National Academies Press. https://doi.org/10.17226/25396

[6] Alsaffar, A. A. (2015). Sustainable diets: The interaction between food industry, nutrition, health and the environment. Food Science and Technology International, 22(2), 102–111. https://doi.org/10.1177/1082013215572029
[7] Ellen MacArthur Foundation. (2019). Cities and circular economy for food (pp. 1–66). Ellen MacArthur Foundation
[8] Bharati, A. (2024). Real-time intelligence in sustainable restaurant management. International Journal for Research in Applied Science and Engineering Technology, 12(7), 1058–1075. https://doi.org/10.22214/ijraset.2024.63706
[9] Grumadaite, K., & Babu, S. T. (2024). Sustainability trends in fine dining restaurants: A complex systems approach. Challenges in the Turbulent Economic Environment and Organizations' Sustainable Development, 45, 313–326. https://doi.org/10.18690/um.epf.5.2024.30
[10] Halim, A. B., Yantiana, N., & Muhsin, M. (2024). Enchancing sustainability: The impact of green accounting using green restaurant indicators. International Journal of Environmental Sustainability and Social Science, 5(4), 744–752. https://doi.org/10.38142/ijesss.v5i4.1103
[11] Barbara, T., Gatt, D., & Yousif, C. (2019). Prioritising energy efficiency measures in Maltese restaurants [master's dissertation]. OAR@UM Institutional Repository.
[12] Mudie, S., Essah, E., Grandison, A. S., & Felgate, R. (2013). Benchmarking energy use in licensed restaurants and pubs. https://centaur.reading.ac.uk/31481/
[13] Gunasegaran, M. K., Hasanuzzaman, M., Tan, C., Bakar, A. H. A., & Ponniah, V. (2023). Energy consumption, energy analysis, and solar energy integration for commercial building restaurants. Energies, 16(20), Article 7145. https://doi.org/10.3390/en16207145
[14] Pereira, L., Aguiar, V., & Vasconcelos, F. (2019). Future industrial kitchen: Challenges and opportunities. In Proceedings of the 6th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation (BuildSys'19) (pp. 163–164). Association for Computing Machinery. https://doi.org/10.1145/3360322.3360872
[15] Cîrstea, Ş. D. (2015). Why should restaurants go green? Main environmental practices in restaurants industry. Management Intercultural, 34, 331–338.
[16] Hackfurth, A. (2014). What's cooking guys? A study on responses to food waste and related energy & water consumption in the food service sector [bachelor's thesis, Lund University]. Lund University Student Papers. http://lup.lub.lu.se/student-papers/record/4693575/file/4693690.pdf
[17] Mukherjee, K. (2017). Modeling and optimization of strategic sustainable sourcing. Supplier Selection, 67–99. https://doi.org/10.1007/978-81-322-3700-6_4
[18] Mohamed, Z., Ismail, M. M., & Amal Abd El-Gawad. (2023). Sustainable supplier selection using neuromorphic multi-criteria decision-making methodology. Sustainable Machine Intelligence Journal, 3, 1–40. https://doi.org/10.61185/smij.2023.33102
[19] Shofiullah, S. (2024). Sustainable supplier selection in indirect procurement: Best practices and case studies in engineering. Deleted Journal, 1(4), 63–78. https://doi.org/10.62304/ijse.v1i04.189
[20] Özcan, Y., & İndap, Ş. (2024). Bibliometric analysis of publications on sustainable supplier selection in the context of supply chain management. International Review of Economics and Management, 12(1), 67–89. https://doi.org/10.18825/iremjournal.1506105
[21] Mukherjee, K. (2017). Modeling and optimization of strategic sustainable sourcing. Supplier Selection, 67–99. https://doi.org/10.1007/978-81-322-3700-6_4
[22] Maynard, D. da C., Zandonadi, R. P., Nakano, E. Y., Raposo, A., & Botelho, R. B. A. (2021). Green restaurants assessment (GRASS): A tool for evaluation and classification of restaurants considering sustainability indicators. Sustainability, 13(19), Article 10928. https://doi.org/10.3390/su131910928
[23] Jindal, P., & Harshit Gouri. (2024). Circular economy models. Advances in Business Strategy and Competitive Advantage Book Series, 53–78. https://doi.org/10.4018/979-8-3693-4338-8.ch003
[24] Stankovska, A., & Dimitrieska, S. (2017). Waste management and circular economy. Economics and Management, 13(2), 11–18.
[25] Gökgöz, F., & Yalçin, E. (2024). Analyzing the circular economies and waste management of European countries via decision models. Present Environment and Sustainable Development, 18(1), 33–50. https://doi.org/10.47743/pesd2024181003
[26] Renfors, S.-M., & Wendt, T. (2024). Restaurants without bins: How does a circular restaurant operate? Sustainability, 16(6), 2312–2312. https://doi.org/10.3390/su16062312
[27] Bharati, A. (2024). Real-time intelligence in sustainable restaurant management. International Journal for Research in Applied Science and Engineering Technology, 12(7), 1058–1075. https://doi.org/10.22214/ijraset.2024.63706
[28] Maia, B., Silva, S., Melo, A., Silva, G., Azevedo, D., Camões, H., & Melo, C. (2024). Cooking up a sustainable future: insights of circular economy in the restaurants. Proceedings of the 7th International Conference on Tourism Research, 7(1), 173–179. https://doi.org/10.34190/ictr.7.1.2131
[29] Fisher, D., & Pietrucha, B. (2008). Water heater energy use in restaurants: Development and evaluation of a field test protocol. American Council for an Energy-Efficient Economy (ACEEE) Summer Study on Energy Efficiency in Buildings.
[30] Oliveira, A., Ribeiro, M., Martins, R., Morais, G., Morais, H., & Pereira, L. (2023). On the role of industrial kitchens in sustainable energy systems: the nexIK vision. IET Conference Proceedings., 6, 686–690. https://doi.org/10.1049/icp.2023.0462
[31] Gruia, R., Florescu, G.-I., Gaceu, L., Oprea, O. B., & Ţane, N. (2021). Reducing environmental risk by applying a polyvalent model of waste management in the restaurant industry. Sustainability, 13(11), Article 5852. https://doi.org/10.3390/su13115852
[32] Winowatan, W. J., Suarta, I. P., Indra, B., Anneke W, J. P., & Ridwan, M. (2024). Roles and responsibilities of stakeholders in implementing green tourism practices in restaurants: A global perspective on ecological and social impacts. Indonesian Journal of Social and Environmental Issues (IJSEI), 5(2), 230–241. https://doi.org/10.47540/ijsei.v5i2.1549
[33] Bux, C., & Amicarelli, V. (2022). Circular economy and sustainable strategies in the hospitality industry: Current trends and empirical implications. Tourism and Hospitality Research, 23(4), 624–636. https://doi.org/10.1177/14673584221119581
[34] Stankovska, A., & Dimitrieska, S. (2017). Waste management and circular economy. Economics and Management, 13(2), 11–18.
[35] U.S. Bureau of Labor Statistics. (2023). Industry and occupational employment projections overview and highlights, 2023–33. https://www.bls.gov/opub/mlr/2024/article/industry-and-occupational-employment-projections-overview-and-highlights-2023-33.htmBureau of Labor Statistics+1Bureau of Labor Statistics+1

[36] U.S. Food and Drug Administration. (2022). Food loss and waste. https://www.fda.gov/food/consumers/food-loss-and-wasteU.S. Food and Drug Administration+1USDA+1
[37] National Restaurant Association. (n.d.). Sustainability. https://restaurant.org/education-and-resources/learning-center/business-operations/sustainability/
[38] Abdou, A. H., Hassan, T. H., & Salem, A. E. (2023). Promoting sustainable food practices in food service industry: An empirical investigation on Saudi Arabian restaurants. Sustainability, 15(16), Article 12206. https://doi.org/10.3390/su151612206
[39] Hamada, I. (2023). The global rise of "sustainable sushi" practices: Restaurant responses and challenges. Food and Foodways, 32(1), 56–78. https://doi.org/10.1080/07409710.2024.2298176
[40] Martin-Rios, C., Hofmann, A., & Mackenzie, N. (2020). Sustainability-Oriented innovations in food waste management technology. Sustainability, 13(1), Article 210. https://doi.org/10.3390/su13010210
[41] Chhikara, S., Dighliya, B., Panwar, S., & Kadiyan, H. (2024). Innovative technologies for sustainable food waste disposal in hospitality operations (pp. 269–286). In Handbook of research on innovative approaches to food waste management in the hospitality sector. IGI Global. https://doi.org/10.4018/979-8-3693-2181-2.ch018
[42] Rogers, E. M. (2003). Diffusion of preventive innovations. Addictive Behaviors, 27(6), 989–993. https://doi.org/10.1016/s0306-4603(02)00300-3
[43] Mol, A. P. J., & Spaargaren, G. (2000). Ecological modernization theory in debate: A review. Environmental Politics, 9(1), 17–49. https://doi.org/10.1080/09644010008414511
[44] WCED. World Commission on Environment and Development. (1987). Our common future: Report of the World Commission on Environment and Development. Oxford University Press.
[45] von Bertalanffy, L. (1968). General system theory: Foundations, development, applications. George Braziller.
[46] Freeman, R. E. (1984). Strategic management: A stakeholder approach. Boston: Pitman.
[47] DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147–160. https://doi.org/10.2307/2095101