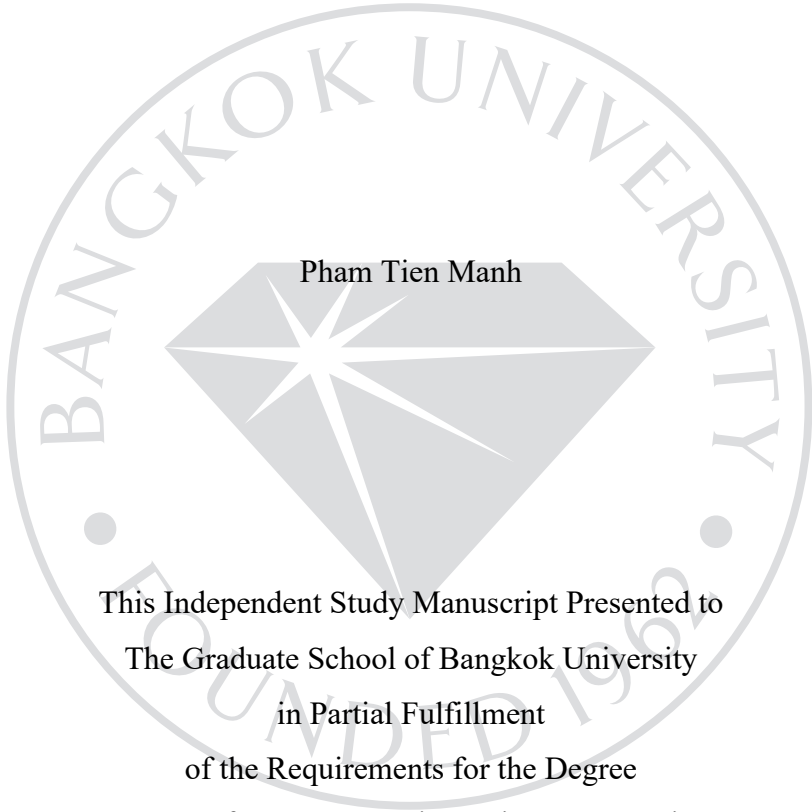


**THE ROLE OF SUSTAINABLE INNOVATION IN THE SUPPLY  
CHAIN OF TRADITIONAL MANUFACTURING FIRMS: A CASE  
STUDY OF SOUTH-EAST ASIA'S BIGGEST BEVERAGE  
PRODUCER**



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TRADITIONAL MANUFACTURING FIRMS: A CASE STUDY OF SOUTH-EAST  
ASIA'S BIGGEST BEVERAGE PRODUCER

The logo of Bangkok University is a large, light gray watermark in the background. It is circular with the words "BANGKOK UNIVERSITY" around the top half and "FOUNDED 1962" around the bottom half. In the center is a diamond shape with a starburst design inside.

Pham Tien Manh

This Independent Study Manuscript Presented to  
The Graduate School of Bangkok University  
in Partial Fulfillment  
of the Requirements for the Degree  
Master of Management in Business Innovation

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Title: The Role Of Sustainable Innovation In The Supply Chain Of  
Traditional Manufacturing Firms: A Case Study Of South-East Asia's  
Biggest Beverage Producer

Author: Pham Tien Manh

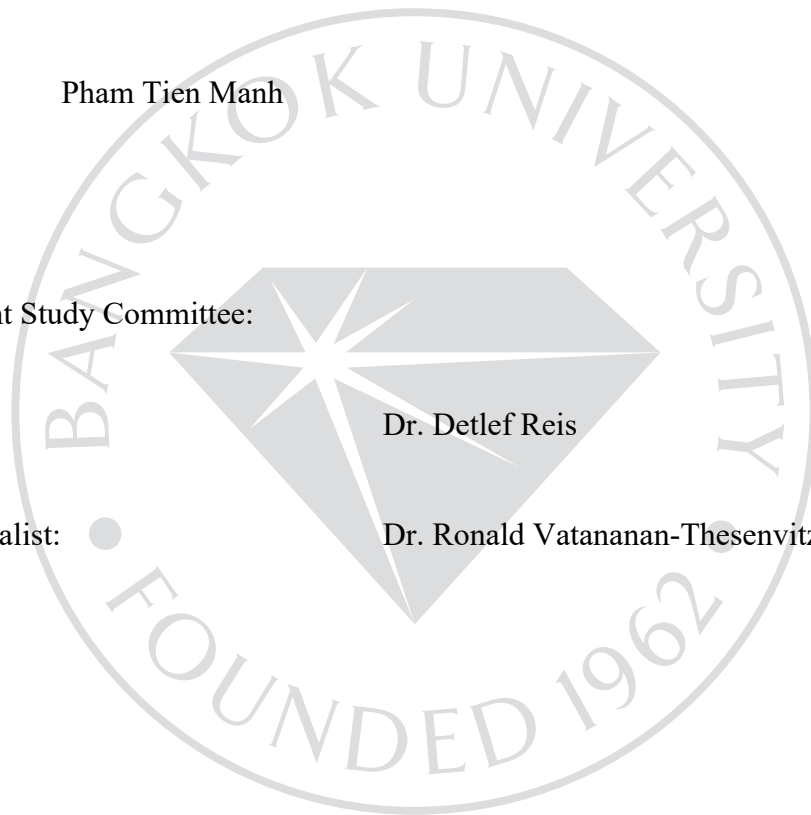
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### **ABSTRACT**

In recent years, sustainable innovation research has received a lot of attention since it requires organizations and supply chains to create circular business models and strategies to address environmental, financial, and social challenges. Yet, earlier research has fallen short in understanding how traditional manufacturing firms are transforming themselves to become more sustainable and innovative. Furthermore, few scientific studies looked at which sustainable innovation projects big manufacturing companies prioritize, where such initiatives are executed in the company's value chain, what the drivers are, and what the benefits are.

This study uses the single-case study method to investigate Thai Beverage Public Company Limited ("ThaiBev"), one of Thailand's largest and most successful food and beverage corporations, in terms of sustainability and sustainable innovation. To gather helpful information and novel insights, the author of this study performed a series of semi-structured interviews (using open-ended questions) with ThaiBev's professionals and specialists and also reviewed public and internal documents. Then, the researcher analyzed the collected data to gain novel insights into the research topic and the related Sustainable Innovation Framework that are presented in the research findings. The concluding suggestions derived from the key findings of this study can guide academics in expanding their knowledge of sustainable innovation and can also serve as a useful resource for practitioners looking to implement sustainable innovation initiatives in their firms.

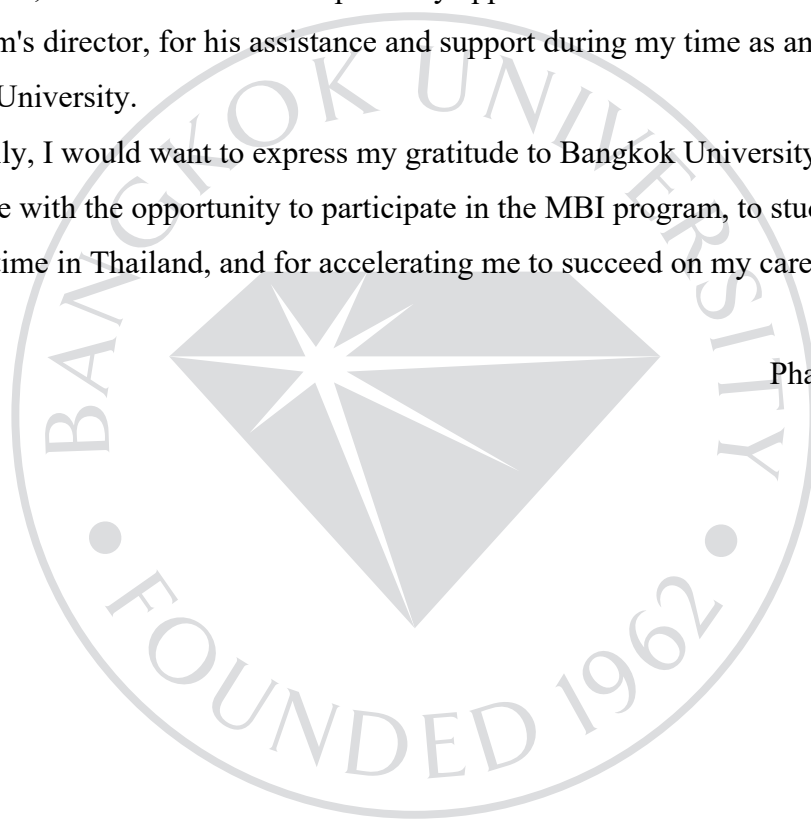
*Keywords: Sustainability, Sustainable Development, Sustainable Innovation.*

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Pham Tien Manh



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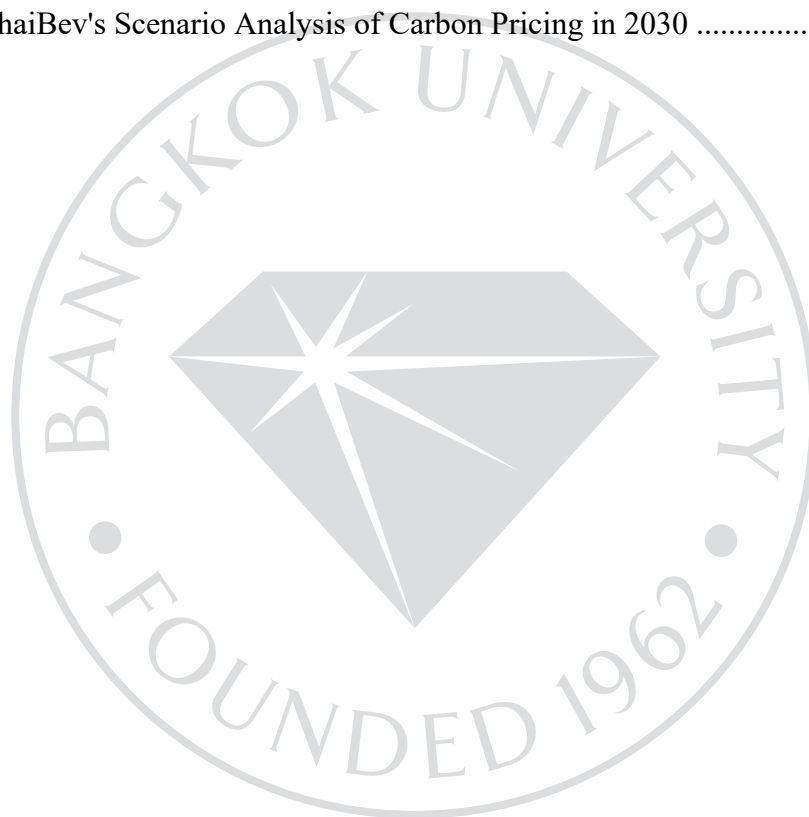
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## CHAPTER 1

### INTRODUCTION

#### 1.1 Research Background

Climate change, global population growth, gender equity, natural resource scarcity, and deadly pandemics are among concerns that the world is now dealing with. It is true that corporations must become more sustainable to survive and develop in today's world (Boons et al, 2013). A sustainable business must meet the requirements of all three components of the Triple Bottom Line: environmental, social, and economic. (Elkington, 1997; Dao et al; 2011). On one hand, businesses perceive sustainability as a goal that can be attained through the use of sustainable innovation initiatives in order to meet the growing needs of foreign investors, green consumers, and environmentally sensitive governments (Staples et al, 2020). On the other hand, businesses see sustainable innovation as a natural outcome of the successful transition from traditional manufacturing to high-tech sustainable businesses (Lim & Sonko, 2019). Firms that quickly implement sustainable innovation solutions into their processes are more likely to achieve enormous competitive advantages in their industry in one way or another (Severo et al, 2020).

According to previous studies, traditional manufacturing organizations that aspire to transition to high-tech sustainable ones must implement sustainable innovation initiatives throughout their value chain (Todeschini et al, 2020). Artificial intelligence (A.I.), blockchain technology, cloud computing technology, and the internet of things (IoT) are just a few of the sustainable advancements that have emerged as a result of the Fourth Industrial Revolution (or Industry 4.0) (Thoben et al, 2017). However, little study has been done to determine which phases of the traditional manufacturing business's value chain such sustainable innovations occur in, and how those solutions help the organization in terms of cost and effectiveness (Fichter & Clausen, 2016).

## 1.2. Research Questions

Using a single-case study technique, this study examines the success of Thai Beverage Public Limited Company, one of Thailand's largest beverage makers in terms of innovation and sustainability. Since 2018, this company has been the Dow Jones Sustainability Indices' ("DJSI") Global Beverage Industry Leader (S&P, 2020). ThaiBev's PASSION 2025 strategy aims to transform the company from a traditional manufacturing company on a local basis to a high-tech, sustainable corporation on a global scale (Tangsiri, 2021). To investigate this case, information was gathered through semi-structured interviews with ThaiBev's professionals and specialists and through secondary research using public documents such as ThaiBev's annual reports and sustainability reports. The data was then examined using a sustainable innovation framework to gain novel insights and draw conclusions. The outcomes of this study answer the following research questions:

Research question 1: "Which stages in ThaiBev's value chain do sustainable innovation initiatives generally involve?"

Research question 2: "What cost and effectiveness benefits do such sustainable innovation solutions provide to ThaiBev?"

## 1.3 Research Objectives

The following are the objectives of this research:

Research objective 1: To look at ThaiBev's value chain's successful projects in terms of sustainability and innovation.

Research objectives 2: To assess the outcomes of implementing sustainable innovation initiatives throughout ThaiBev's value chain.

## 1.4 Contribution of Study

In terms of sustainable development and innovation, the findings of this study can be a good source of reference for traditional manufacturing enterprises in Southeast Asia.

The outcomes of this research can assist business owners in shifting their perspective toward long-term advantages and sustainable development. They can possibly also support them in avoiding climate-related risks and maximizing future climate-related opportunities.

For internal innovation, the findings of this study can assist technology managers in traditional manufacturing in determining which new projects to fund and which phases of the value chain to focus on. Businesses can minimize unnecessary costs, optimize procedures, and better deploy resources within their organizations.

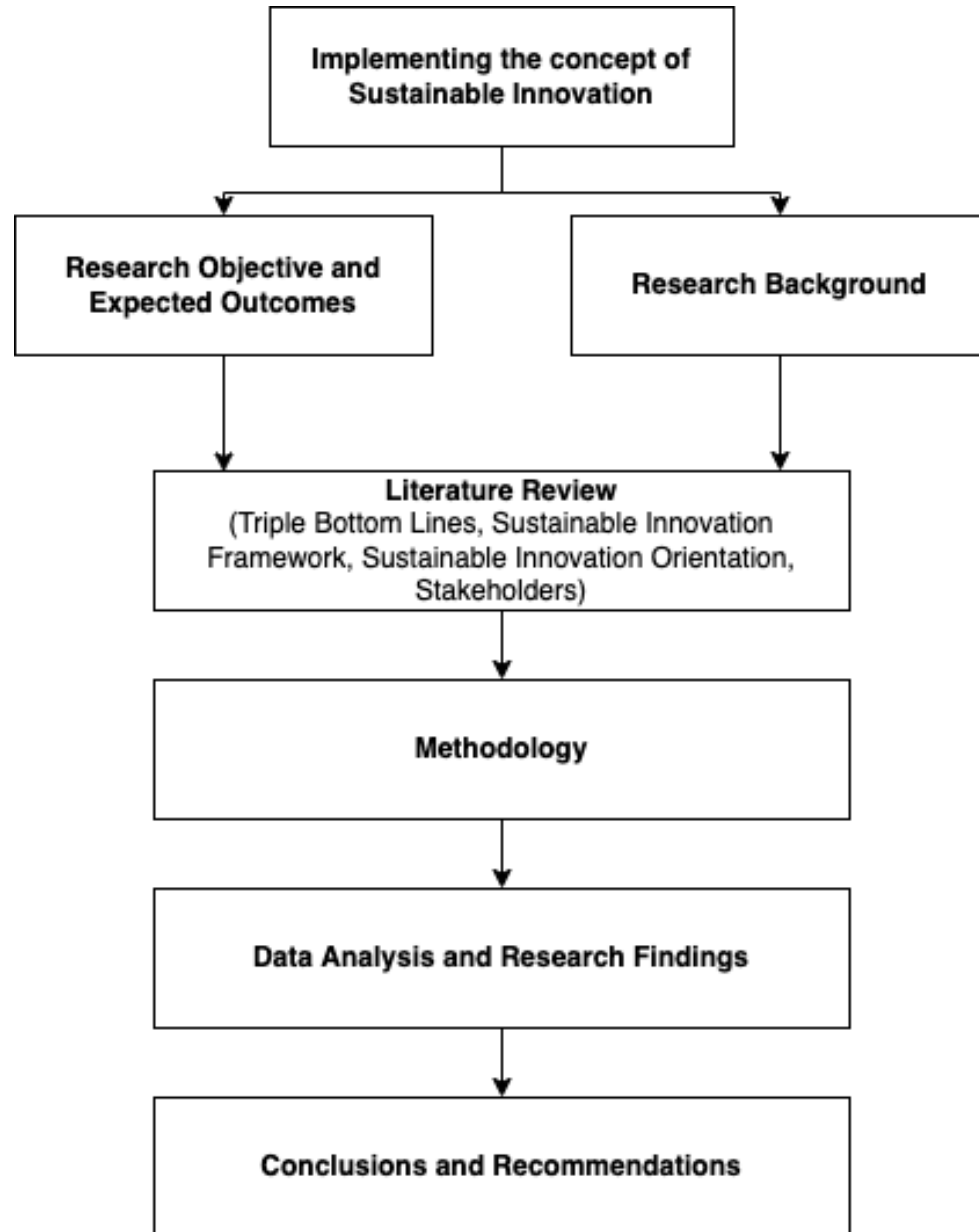
### **1.5. Research Limitations**

The study's first limitation is that it only investigates one traditional Thai manufacturing company. ThaiBev is one of Thailand's largest corporations, however, it mostly operates in the food and beverage industry. As a result, the conclusions may not be applicable to other traditional manufacturing enterprises in different industries. Furthermore, because ThaiBev is a family-owned business, its business philosophy and characteristics may differ from those of startup and publicly-owned businesses in Thailand or other nations.

Second, ThaiBev's top management is extremely conservative, and numerous internal documents have been denied full public disclosure. This issue has no impact on the research outcomes, although it may cause people to be hesitant to check the references. Furthermore, because to the Covid-19 situation in Thailand, the study was done with 5 interviewees who are senior managers rather than field practitioners. As a result, they have a strategic understanding of the situation but not a practical understanding.

Finally, due to language barriers, the study had to be conducted in English with some translation into Thai for the interviews. As a result, some terminology and ideas may not be completely conveyed, thereby lowering the quality of the final research results (compared to same language interviews).

Figure 1.1: Research Structure



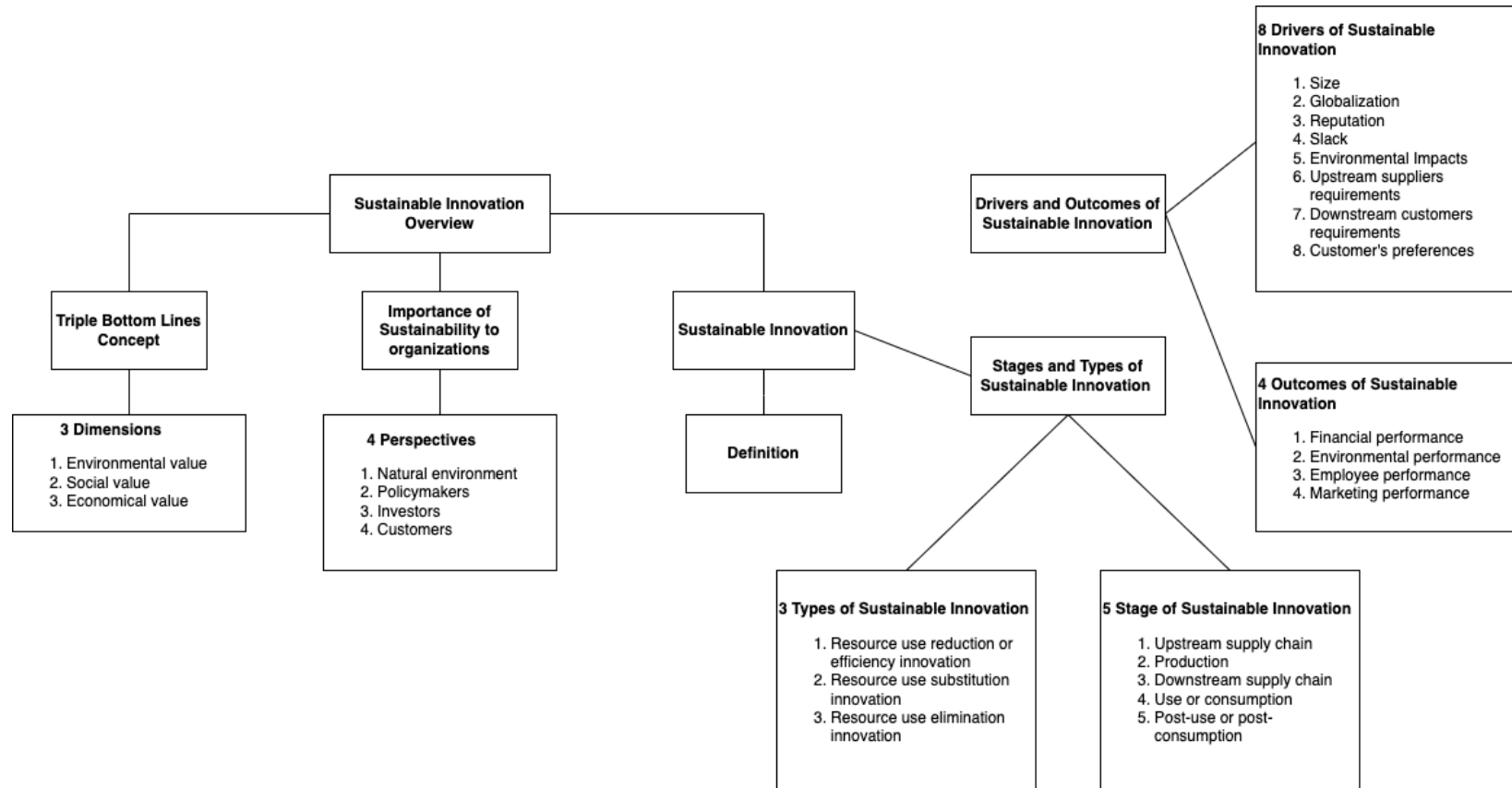
## **CHAPTER 2**

### **LITERATURE REVIEW**

The literature review methodology was used to perform this study. In order to find connected material, documents, journal articles, and research papers were examined. The content of the questionnaire, the research questions, and the conceptual framework were all created as a result of this procedure.



Figure 2.1: Literature Review Structure

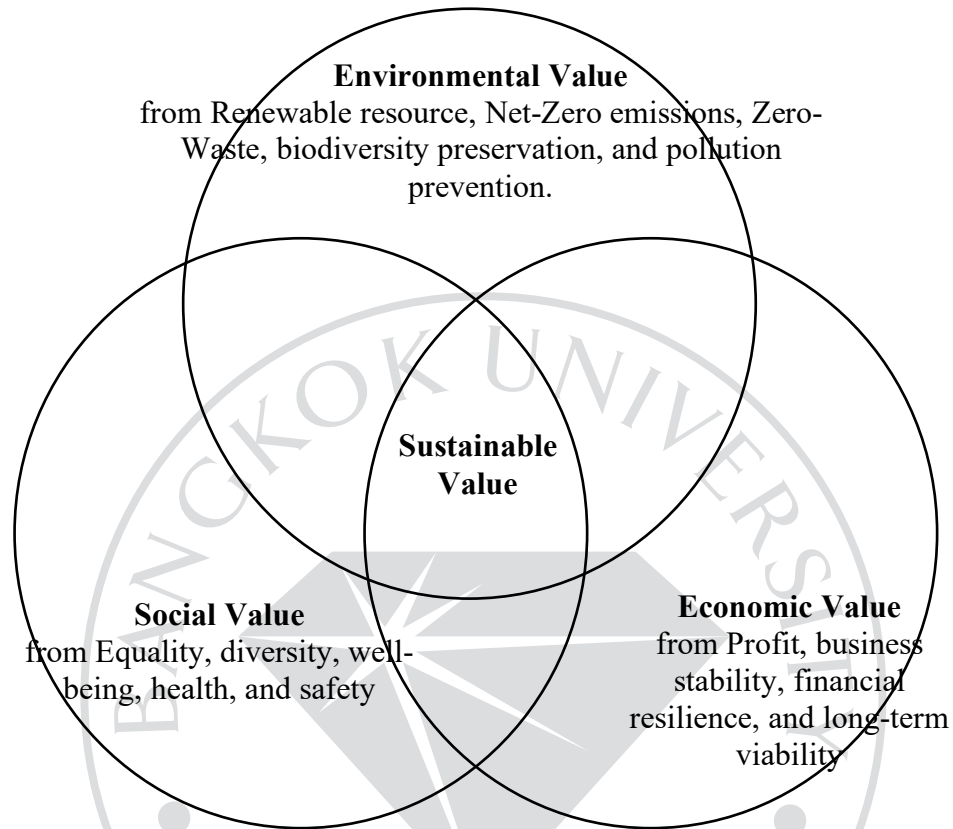


## 2.1 The Triple Bottom Line Concept

The term "sustainability" was originally introduced by the United Nations World Commission on Environment and Development in 1987, and it has since gained widespread use in a variety of contexts (Brundtland, 1989). People at the time saw sustainability as a form of business strategy that attempted to "meet the requirements of the present generation without jeopardizing future generations' ability to fulfill their own needs." The original version of sustainability assures that humans in today's world use natural resources in a sustainable and optimal way to improve their quality of life (Kuhlman & Farrington, 2010). As a result, the subsequently following generations will not face any challenges in obtaining natural resources or will face resource scarcity in meeting their needs. Social solidarity, economic efficiency, and environmental responsibility are the three dimensions of sustainable development (Elkington, 1997; Dao et al; 2011). To put it another way, sustainability resides in the intersection of environmental, social, and economic factors, as represented by the Triple Bottom Line concept.



Figure 2.2: Triple Bottom Line Concept (Brundtland, 1989)



The Environmental Responsibility or Environmental Dimension of the Triple Bottom Line focuses on balancing natural resource consumption and nature's ability to recover. The eyes of corporations, emphasizes the ability to utilise natural resources indefinitely without disrupting the natural balance. Many approaches, such as recycling wastes, eliminating leakage, mending fixable items, reusing side-products, and substituting non-recyclable materials with recyclable ones, have been used in manufacturing for years. Furthermore, a sizeable number of companies are restructuring their products and processes to be able to recycle such materials chemically as well as physically. (Glavic & Lukman, 2017; Ruggieri et al, 2016; Resnitzky et al, 2021; D'Amato et al, 2019).

The Triple Bottom Line's Social Solidarity or Social dimension aids the organization's decision-making process in maintaining and supporting community values in which it operates (Dyllick & Hockerts, 2002). A few indicators reflect the level of satisfaction of individuals in the community, such as job satisfaction, quality of life, gender equity, equity in opportunity distribution, accessibility to products and services, and freedom to pursue education, to fully analyze the social component (Littig & Griessler, 2005; Kiel et al, 2020).

Finally, the Economic Efficiency or Economic dimension of the Triple Bottom Line demonstrates the efficiency of corporate activities in balancing expenses of value creation and revenues (Bansal, 2005). Organizational performance and financial position must be measured and reported on annually to claim the designation of economic sustainability. Economic efficiency, on the other hand, promotes all sectors of society, including the private and public sectors, to better their activities through innovative technologies. These technological advancements can aid the economy's transition from a heavily reliance on natural resources to a more sustainable economy, as well as contribute directly to economic growth (Govindan & Hasanagic, 2018).

The Triple Bottom Line demonstrates that all three dimensions are not only interconnected but also overlap (Norman & MacDonald, 2004). Organizations may have to scarify one to attain the other in some circumstances. For example, in order to meet environmentally sustainable goals, businesses must spend a portion of their profits into improving processes and products. These "green and environmentally friendly" enhancements limit short-term gains while ensuring long-term success for businesses (Schulz & Flanigan, 2016) Refusing to include the Triple Bottom Line into an organization's strategy, on the other hand, could put enterprises at risk (Amini & Bienstock, 2014). Although there are numerous advantages to being sustainable, research suggests that some businesses are still unfamiliar with the Triple Bottom Line concept, and their implementation of sustainable solutions is inefficient (Lovisceck, 2020).

## **2.2 The Importance of Sustainability to Organizations**

### **2.2.1 Definition of the Stakeholder**

Business partners (including upstream suppliers and downstream customers), the government, investors, consumers, the surrounding local community, and even competitors are all examples of stakeholders. All of these parties play an important role in the organization's existence and growth (Kolk & Pinkse, 2006).

Many firms undertake periodical resource dependence assessments to better understand the role of their stakeholders in the value chain. The corporation pays more attention to external actors who control and manage the main resource. Sustainable businesses, on the other hand, are usually aware of all stakeholders and treat them equally.

### **2.2.2 The Natural Environment's Perspective**

For years, experts have debated whether the natural environment should be considered a stakeholder because they believe climate change has had a greater negative and positive impact on businesses' activities than any other human-typed stakeholder (Mitchell et al, 1997). If the natural environment is a type of stakeholder, the only way to work with it is to build enterprises in a sustainable manner (Frooman, 1999). Extreme weather occurrences, for example, will have a damaging effect on many manufacturing firms' logistic systems if global temperatures rise more than 2°C in 2050 compared to the pre-industrial era.

### **2.2.3 The Government's Perspectives**

Policymakers are increasingly paying attention to the sustainability-oriented sector at the macro level in order to keep the national economy stable (Kuhlman & Farrington, 2010). To meet the United Nations Sustainable Development Goals, policymakers have imposed additional restrictions on natural resource consumption for economic objectives, such as taxes or regulations (Bostan, 2016). Many countries' development objectives include the goal of becoming the first completely Net-Zero country (Lowes & Woodman, 2020). It is true that this race for sustainability among countries is helpful to humanity in every way.

On a micro scale, an organization's resilience is highly influenced by its qualities and the industry it operates in (Kolk & Pinkse, 2006). Many businesses consider the government as the most important stakeholder because the government can establish policies and regulations that are beneficial or detrimental to their operations. Many corporations' goals have been disrupted in recent decades by government-issued laws and regulations on natural resource consumption, such as Green House Gas (GHG) emission trading programs, water tariffs, and fossil fuel taxes (Sorrell & Sijm, 2003). Companies that fail to take into account the government's relevance are more likely to lose their competitive advantages over time.

#### 2.2.4 Investor's Perspective

Before making any investment decisions, foreign investors from the world's largest venture funds examine not only the financial state of prospective companies, but also their sustainability reports. The annual sustainability reports reveal investors not just the target companies' resilience capabilities, but also their long-term ambitions. This information is critical in lowering the danger of company fraud and investment risk for investors (Berthelot, 2012; Hawn et al, 2018).

#### 2.2.5 Customer's Perspective

According to studies, young people are voluntarily changing their consumption habits from unsustainable to sustainable (Reisenwitz & Iyer, 2019). In detail, a part of the population identifies as "green" or "environmentally conscious" consumers by purchasing products with the words "green" or "ecologically friendly" on them, opting for recycled or reusable items, purchasing goods from companies with a green image or good environmental reputation, and refusing to buy goods from companies that purposefully pollute the natural environment (Eckhardt et al., 2010; Fowler & Close, 2012; Reijonen, 2011). Green customers are believed to strike a balance between their financial concerns, personal social responsibility, microenvironmental accountability, and personal wellness (Sikdar, 2003). It serves as a reminder to corporate leaders around the world that they must seriously consider sustainability before losing their loyal clients and consumers.

## 2.3. Sustainable Innovation

### 2.3.1 Definition of Sustainable Innovation

There are various definitions of sustainable innovation, and by the time they are all combined, the whole explanation for sustainable innovation has formed. To begin, Fussler and James (1996) defined sustainable innovation as a product or process that gives value to customers while also reducing negative environmental impacts. Second, according to Johansson and Magusson (1998), giving incentives to customers and enterprises in order to prevent adverse consequences on the natural environment is insufficient. Businesses must be able to generate the same customer value with less natural resource input under the sustainable innovation strategy in order to reduce negative environmental consequences in their manufacturing. Rennings et al. (2000) added the notion that sustainable innovation includes not only the product and process, but also the attitude, practice, and system that are aimed to enhance the organization's performance and its consumers. According to Rennings et al. (2000), the goal of sustainable innovation is to prevent causing harmful changes to the natural environment. However, the most accurate definition of sustainable innovation is everything that contributes directly or indirectly to the performance and growth in the sustainability aspect, including the process, the product, the new findings, the improvement initiative, the production, the service, and the management approach. These solutions help organizations go from having a low level of resilience and a high reliance on non-renewable resources to having a high level of resilience and a lower demand for non-renewable resources (Buttol et al, 2012).

### 2.3.2 Types of Sustainable Innovation

Prior research has identified and classified several types of sustainable innovation, as well as proposed how organizations might capitalize on such opportunities. On the one hand, sustainable innovation solutions allow businesses to lower production expenses, such as operational costs, energy production costs, and labor costs, while also increasing annual income (Ambec & Lanoie, 2008). Sustainable innovation can be defined as advanced thinking on process and product improvement with the goal of reaching a

diverse client base and expanding the firm into new markets. On the other hand, Mariadoss et al. (2011) classified sustainable innovation into two categories, namely technical and non-technical innovations. The first category (technical-oriented innovation) tries to use improved technology to create a new product with higher quality but less raw material input. The second type of innovation (non-technical innovation) aims to shift consumers' attitudes and actions toward sustainability and innovation. For example, an efficient and sustainable product, such as recycled plastic goods, may be well-accepted by the majority of the population, allowing businesses to reduce the usage of virgin plastic in their manufacturing while still serving their loyal customers.

Adams et al. (2012) generalized the phrase "sustainable innovation" and divided it into three categories. This categorisation can assist firms in fully comprehending long-term innovation and is outlined below.

#### 2.3.2.1 Resource use reduction or efficiency innovation

The goal of the resource use efficiency innovation is to lessen the environmental damage caused by the company's operations. Manufacturing companies can increase production while lowering their use of natural resources and energy through efficiency innovation.

#### 2.3.2.2 Resource use replacement or substitution innovation

The resource use substitution innovation tries to employ non-harmful and renewable resources to substitute fossil or non-renewable resources as inputs for manufacturing operations. Manufacturing companies can use substitution innovation to reduce their reliance on more difficult-to-find fossil fuels.

#### 2.3.2.3 Resource use elimination innovation

The resource use elimination innovation attempts to avoid generating environmental damage as a result of the company's operations. Under the resource-use limitation, elimination innovation provides new alternatives by forcing enterprises to quit using virgin natural resources as a production input while maintaining product functionality and performance.

## **2.4 The Value Chain of Company**

The supply chain is the set of essential activities carried out by a company to ensure that finished goods and services reach the client. Sarkis (2003) defined supply chain management as the control of commodities, information, and money movements along the supply chain. Because the original form of supply chain management was to ensure that resources were used efficiently and optimally at all stages of the value chain, it is intimately linked to the Triple Bottom Line (Seuring & Müller, 2008). According to Hansen et al. (2009), there are aspects in a manufacturing company's supply chain that can be counted widely, such as raw materials (for example, natural minerals, agricultural goods), machine parts, ingredients, and production components. Critical tier 1 vendors or even further upstream sellers can provide these materials. However, before those materials can be used in the manufacturing process, they must all meet certain firm requirements.

## **2.5 The Sustainable Innovation Framework**

In his sustainable innovation framework, Varadarajan (2017) introduced different types of sustainable innovation and conceptually organized these into similar value chain value stages. There are three forms of sustainable innovation: resource use reduction, resource use elimination, and resource use substitution, with five stages of the value chain: upstream supply chain, production, downstream supply chain, use or consumption, and post-use or post-consumption. Although it lacks simplicity, the sustainable innovation framework can nonetheless be used by businesses to identify sustainable innovation opportunities in their value chains.

Figure 2.3: Sustainable Innovation Framework (Varadarajan, 2015)

		<b>B. Sustainable Innovation Opportunities Stage</b>				
		1. Upstream Supply Chain	2. Production	3. Downstream Supply Chain	4. Use/ Consumption	5. Post Use/ Post Consumption
<b>A. Sustainable Innovation Type</b>	1. Resource Use Reduction/Efficiency Innovation					
	2. Resource Use Elimination Innovation					
	3. Resource Use Substitution Innovation					

## 2.6. Sustainable Innovation Orientation

### 2.6.1 Definition of Sustainable Innovation Orientation

A collection of shared views about sustainability might be defined as a sustainable innovation orientation. These ideas encompass all organizational strategies and actions, including both formal and informal structures, competencies, processes, and behaviors, as well as boosting organizations' ability to be innovative on a constant basis (Siguaw et al, 2006). Sustainable innovation-oriented companies invest more resources, upgrade technologies, properly train workers, optimize operations, and develop markets to increase their competitive advantages.

### 2.6.2 The Conceptual Model of Sustainable Innovation Orientation

A collection of shared views about sustainability might be defined as a sustainable innovation orientation. These ideas encompass all organizational strategies and actions, including both formal and informal structures, competencies, processes, and behaviors, as well as boosting organizations' ability to be innovative on a constant basis (Siguaw et al, 2006). Sustainable innovation-oriented companies invest more resources, upgrade

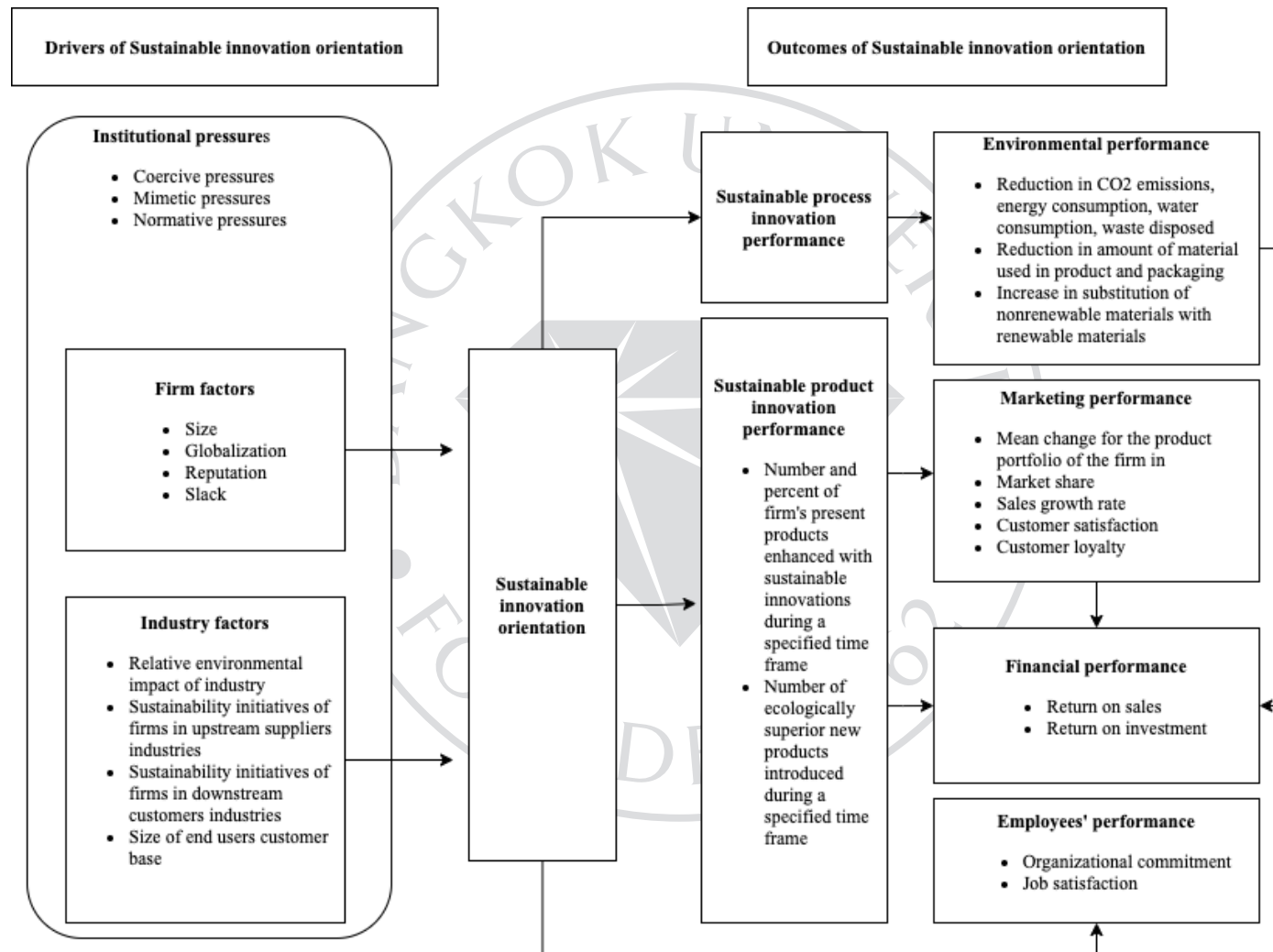


technologies, properly train workers, optimize operations, and develop markets to increase their competitive advantages.

#### 2.6.2 The conceptual Model of Sustainable Innovation Orientation

According to Varadarajan (2017), the conceptual model of sustainable innovation orientation presents the overall picture of drivers and outcomes that sustainable innovation-oriented enterprises are impacted by and receive. There are firm and industry elements that influenced whether or not business leaders adopted sustainable innovation in their organizational qualities. Furthermore, institutional pressures such as coercive, mimetic, and normative pressures may force enterprises to be sustainable producers, or they risk losing their current competitive advantages. As a result, corporate executives may find the outputs of a sustainable innovation orientation appealing in terms of stakeholder satisfaction. Several advantages for successful sustainable-innovative businesses can be stated, including reduced negative environmental consequences, increased market share, improved financial performance, and increased overall worker productivity.

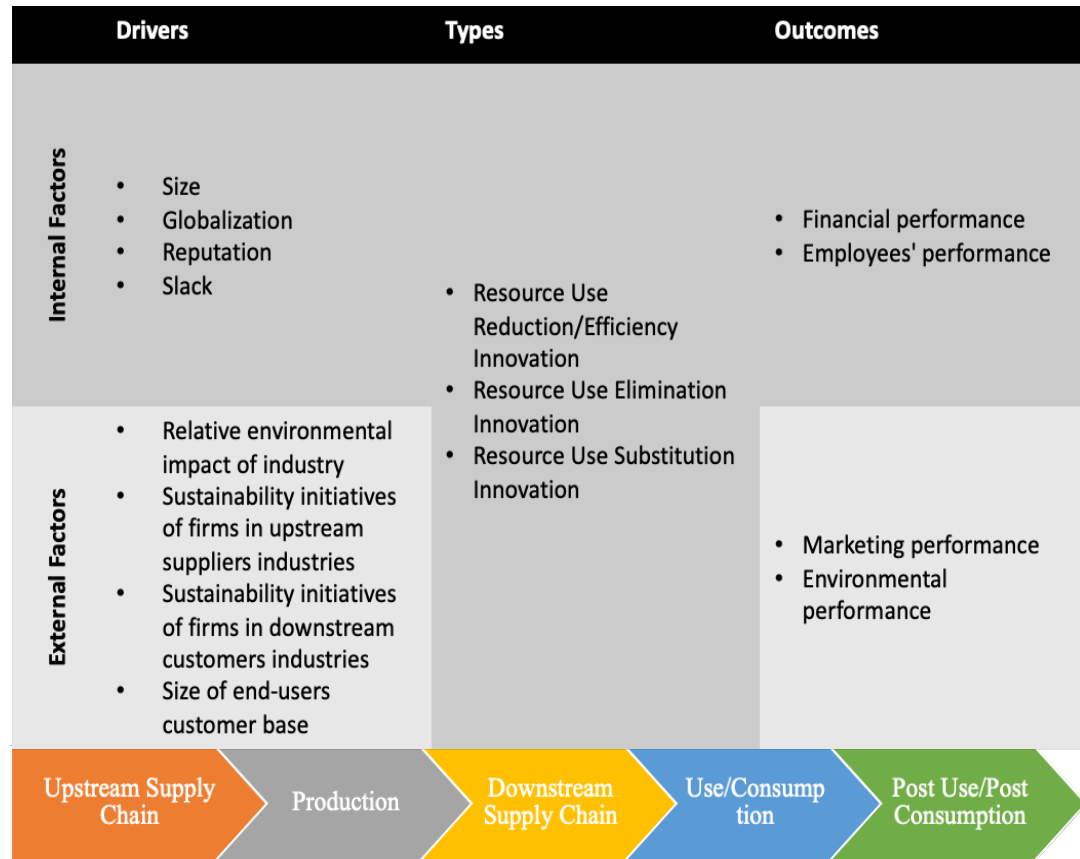
Figure 2.4: The Sustainable Innovation Orientation (Varadarajan, 2017)



## **2.7 The Relationship between the Sustainable Innovation Framework and the Sustainable Innovation Orientation**

The Sustainable Innovation Framework and Orientation (Figure 2.5) combines the Sustainable Innovation Framework (Figure 2.3) and the Sustainable Innovation Orientation (Figure 2.4). Figure 2.5 presents how, depending on the company's characteristics and businesses, sustainable innovation projects occur at one or multiple stages along the value chain: upstream supply chain, production, downstream supply chain, use/consumption, and post-use/post-consumption. Internal and external factors such as extending the company's size, accessing new markets, and minimizing environmental consequences are all drivers that promote sustainable innovation. The organization can improve one or more of its financial, employee, marketing, and environmental performances by implementing one of the three most popular types of sustainable innovation, which include resource use reduction/efficiency, resource use elimination, and resource use substitution.

Figure 2.5: Combined Sustainable Innovation Framework and Orientation



## 2.8 Literature Review Conclusions

The literature review provides a summary and analysis of existing research findings in connection to the research topic and questions. The literature review serves as the foundation for gathering data and insights for this study's research findings, conclusions, and recommendations. Through the Triple Bottom Lines concept, the literature review reveals the origins of the term "sustainability" and the philosophy of "sustainable development." The relevance of sustainable development is then explained through the views of human-typed and non-human-typed stakeholders in organizations. Next, this literature review presented the sustainable innovation framework to illustrate the link between sustainability and innovation; this framework reflects the various types and stages of innovative projects that occurred as the company's value chain progressed

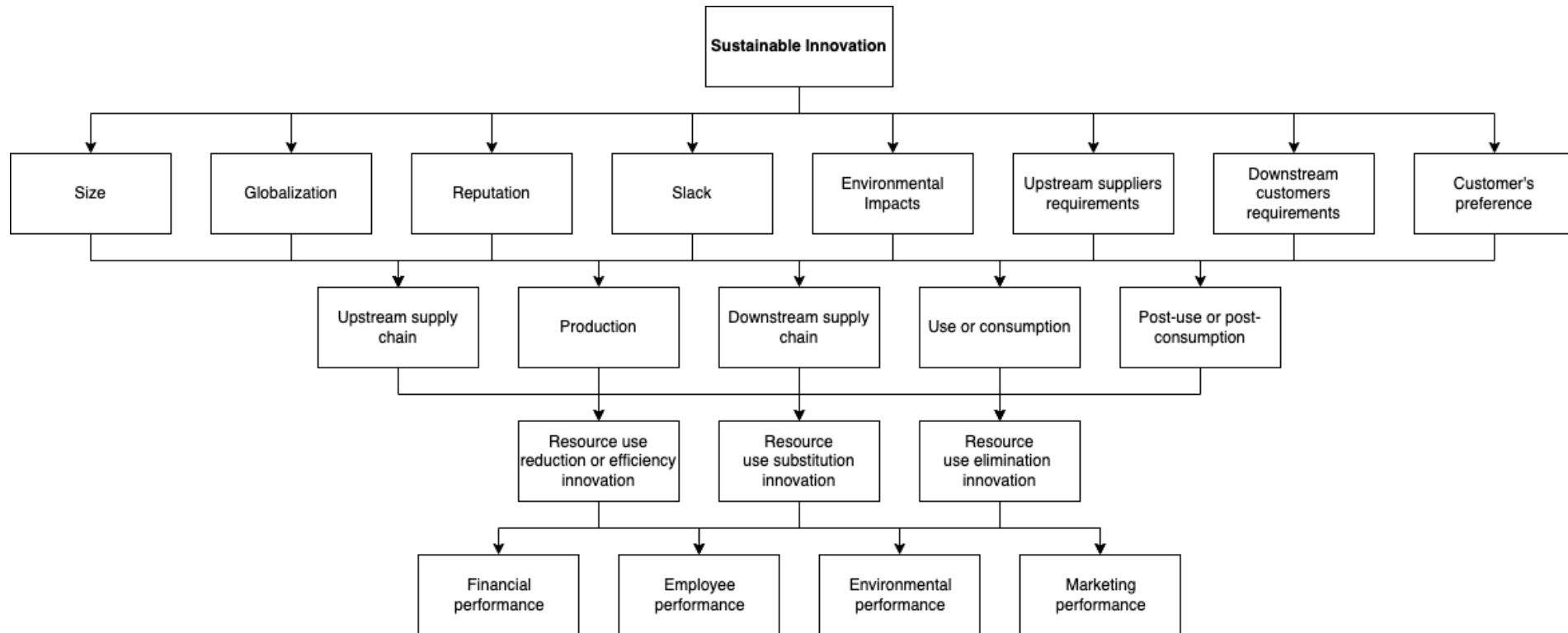
toward sustainable development. In addition, the literature review looked at the drivers of sustainable innovation initiatives as well as the potential benefits that firms can get after putting those initiatives into action.

## **2.9 Research Framework**

To begin, the interviewee will determine whether projects within the target organization are either sustainable, creative, or both. Second, respondents will choose one or more sustainable innovative project drivers. Next, the interviewee will classify which types of sustainable innovation projects are involved. In addition, interviewees will place the company's sustainable innovation projects into appropriate phases of the value chain. Fourth, respondents must select the outcomes of those sustainable innovation projects and explain why they believe those are successful. Finally, the interviewees will have the opportunity to discuss their findings and thoughts on sustainable innovation initiatives.

The research framework will be used to analyze all information and insights collected from the target company's interviews and public documents. The coding process will identify the research findings' general patterns and similarities. Ultimately, the research findings will be used to present research findings and recommendations to practitioners and academics.

Figure 2.6: Research Framework



## **CHAPTER 3**

### **METHODOLOGY**

#### **3.1 Research Method**

This research uses a single case study technique with quantitative data collection (expert interviews with managers involved in ThaiBev's sustainable innovation projects) and secondary data research (internal documents as well as publicly available materials). Using the conceptual framework of the sustainable innovation theory, this study explores the role of sustainable innovation in the supply chain of traditional manufacturing firms from a sustainable innovation's perspective.

#### **3.2 Research Design**

To acquire primary data, this study adopts a single case study approach. Open-ended questions were asked to ThaiBev professionals, specialists, and managers in a series of semi-structured interviews. All interviews were conducted in English, taped, and transcribed into documents. Finally, using the research-guiding framework, these materials were examined and interpreted to come up with the research findings, insights, and recommendations.

##### **3.2.1 Primary Source**

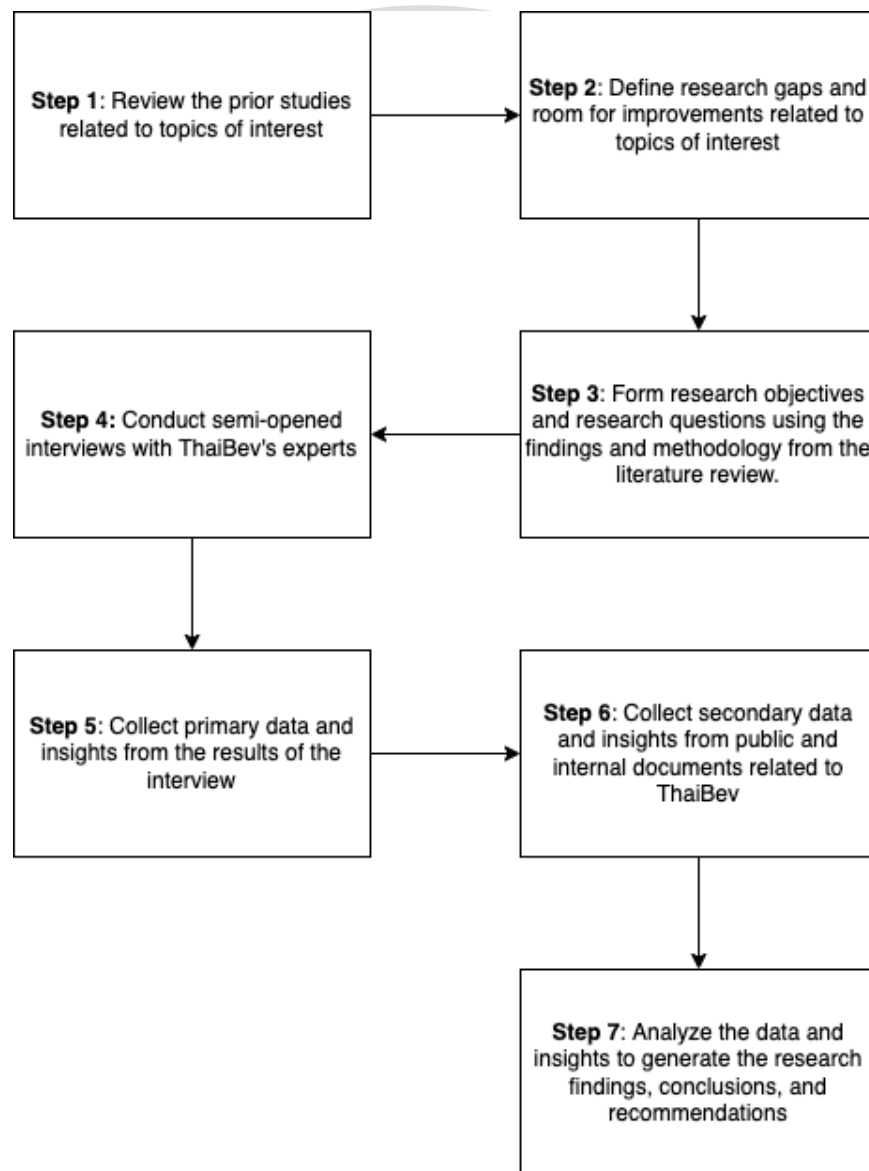
The primary source of information came from the interviewing procedure. In late March 2022, the author of this study conducted five face-to-face interviews with ThaiBev's internal experts, specialists, and managers involved in the topic of sustainable innovation practices. The interviewees' years of service and experiences ranged from 2 to 10 years. All interviewed professionals, specialists, and managers were highly involved in sustainable innovation projects, including acting as direct project managers and project sponsors. To discover patterns and similarities in the responses of the research interviewees, the findings were acquired and evaluated using a coding system.

##### **3.2.2 Secondary Source**

The secondary data was gathered through a literature review, public papers, and ThaiBev internal documents. In addition to the data from the primary source, the analysis of prior studies and ThaiBev-related materials helped create the final conclusions and generate effective research recommendations.

The research procedure is shown in the figure below:

Figure 3.1: Research Process





### 3.3 Data Collection and Analysis

Since this study is based on a single case study, a series of 14 semi-opened interview questions was developed to collect information, data, and insights from ThaiBev's experts. The questionnaire was separated into three parts in order to capture more useful information. The first section focused on the profiles, level of engagement, and year of service of the interviewees. The second part, which aimed to provide a general knowledge of the research, explained the research objectives and introduced the sustainable innovation framework. The questions then focused on identifying sustainable innovation projects inside ThaiBev that matched the research objectives' criteria. The respondents were asked to categorize the above-mentioned sustainable innovation project according to the research framework in the third section of the questionnaire. Finally, the interviewees were given the opportunity to give feedback, make recommendations, and provide evidence to back up their claims.

All five interviews were conducted face-to-face in English and recorded. The responses were then transcribed. The interviews and document findings remained confidential and were only used for research purposes.

## **CHAPTER 4**

### **FINDINGS**

#### **4.1 Thai Beverage Public Company Limited (ThaiBev)**

##### **4.1.1 The Company Profile**

ThaiBev Holding was created in Thailand in 2003 by a group of 58 major shareholders associated to ThaiBev's chairman, Mr. Charoen Sirivadhanabhakdi (born in 1944), one of Thailand's wealthiest billionaires with a net worth of over US\$13.8 billion. Prior to the Initial Public Offering, billionaire Charoen Sirivadhanabhakdi, his family, and the companies he owns owned more than 78 percent of ThaiBev shares, according to the listing prospectus filed with the Singapore Stock Exchange (SGX-ST) in 2006.

ThaiBev was created in 2003, however its subsidiaries have a long history of operation and are tied to billionaire Charoen. Sangsom Co., Ltd is one of the group's oldest businesses, having been purchased in 1977 by ThaiBev's owners. This is the company that produces Sangsom liquor, which is one of Thailand's most well-known alcoholic beverages.

As of the end of fiscal year 2017, ThaiBev had 132 companies in its portfolio, including manufacturing, marketing, and sales organizations. ThaiBev owns 3 breweries, 18 distilleries, 11 non-alcoholic beverage plants, and 6 overseas whiskies in Scotland. Furthermore, with over 400,000 locations across Thailand, the corporation has a massive distribution network that allows it to sell products faster and more efficiently than its competitors.

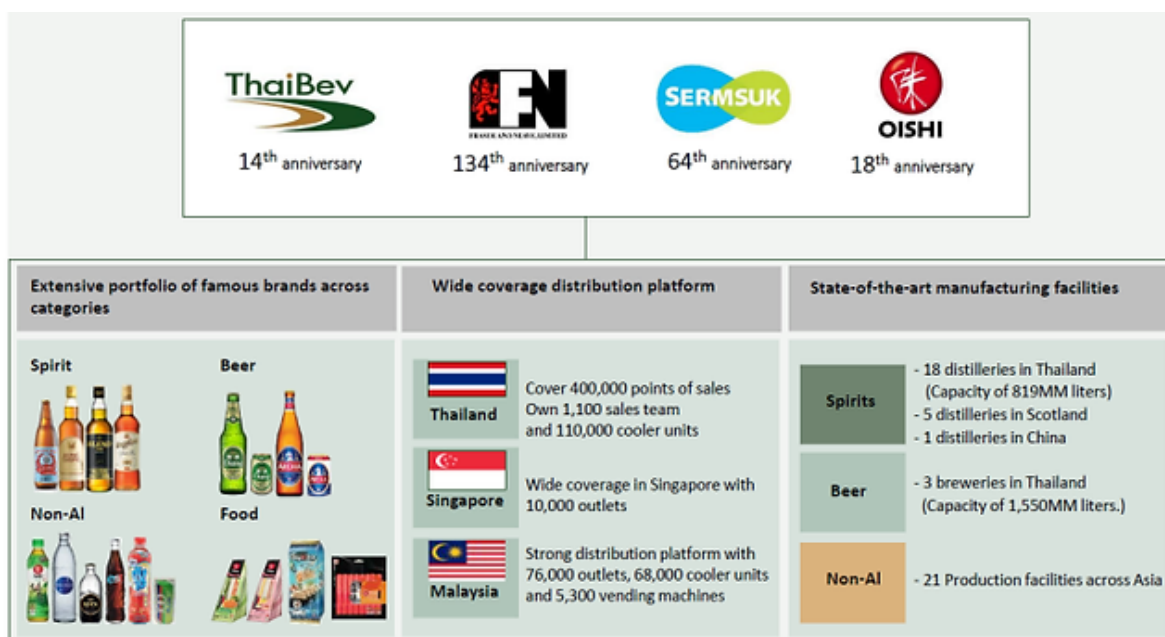
##### **4.1.2 Company's Business**

ThaiBev divides its operations into four categories: (1) alcoholic beverages, (2) beer, (3) non-alcoholic beverages, and (4) food. ThaiBev's group of original proprietors began their business with liquor and beer, and they continue to play an important role in the company's revenue and profit structure. In 2017, the liquor industry accounted for 57.5 percent of total revenues, with beer accounting for 30 percent, non-alcoholic beverages accounting for 8.8 percent, and food and beverage accounting for 3.7 percent.

According to ThaiBev's financial disclosures, its consolidated revenue in 2017 was THB189,997 billion, or US\$6.2 billion. The profit after tax for this company was THB22.799 billion, or more than US\$746 million.

#### 4.1.3 ThaiBev's Business Strategy

Figure 4.1: ThaiBev's Business Structure



To consolidate its leading position in Thailand's beer business, ThaiBev is following a strategy of acquiring competitor companies and manufacturing companies along the value chain. ThaiBev bought Pacific Spirits (UK) Limited in 2006, giving it indirect ownership of five Scottish whisky distilleries. In 2009, ThaiBev continued to purchase Yunnan Yulinquan Liquor Co., Ltd, giving the company indirect ownership of the Chinese distillery. In 2011, ThaiBev purchased a 64.66 percent stake in Sermsuk Public Company Limited, Thailand's largest beverage distribution network. ThaiBev has also ventured into the non-alcoholic beverage and food industries to broaden its revenue base. This group purchased more than half of Oishi Group Public Company Limited ("Oishi") in 2008, a Thai company with over 239 Japanese restaurants and a well-known

international brand name. Oishi is famous for its Ready-to-Drink green tea, herbal tea, and Crystal water. After establishing a strong presence in the home market, ThaiBev continues to expand its influence in Southeast Asia by acquiring F&N Group, one of the world's largest beverage companies, and it is the market leader in Singapore and Malaysia. Although ThaiBev holds 28.53 percent of F&N shares, TCC Assets Limited, Siritwana Company Limited, and MM Group Limited, all of which are tied to billionaire Charoen, possess the remaining 59.35 percent. ThaiBev declared a goal of being the biggest beverage company in Southeast Asia by 2020 after acquiring F&N in 2013.

#### 4.1.4 ThaiBev's Sustainable Development

ThaiBev continues to source responsibly and efficiently use resources in terms of the environment. Renewable energy and reused or recycled packaging continue to account for a bigger percentage of the company's energy and packaging usage. Sustainable environmental assessments have also been conducted frequently in order to detect and mitigate risks linked with climate change. Also, ThaiBev worked with partners from a variety of businesses to create social value through initiatives in five primary areas: education, public health, sports, arts and culture, and community development. The corporate mission of ThaiBev is to "Share the Value of Growth" with all of its stakeholders, and these actions support that purpose. In relation to economic aspect, ThaiBev is committed to fostering innovation, professionalism, corporate governance, and transparency in order to achieve a healthy financial bottom line. It has taken initiatives to manufacture low-carbon products in response to changing customer preferences, which are progressively shifting toward healthier options, in order to provide consumers with enjoyable and delightful options while also ensuring the company's leadership position. Furthermore, the Company has formed partnerships with a number of stakeholders to begin projects targeted at developing a sustainable supply chain.

## 4.2 Demographics of Interviewees

The information and insights were gathered from five individuals who held various roles. Based on the research questionnaire framework, each of the five interviews completed a series of ten questions organized into three sections.

Table 4.1: Demographic Information of Interviewees

Demographic Variable	Years of service	Posstions	Level in ThaiBev	Percentage
1	10	Corporate Sustainable Development Assistant Manager	9	20%
2	7	CEO Executive Assistant	8	20%
3	6	Process Improvement Manager	8	20%
4	6	Data Analysis Assistant Manager	7	20%
5	3	Senior Supply Chain Specialist	5	20%

Table 4.2: Sustainable Innovation Projects were Mentioned by Interviewees

<b>Sustainable innovation projects</b>	<b>Corporate Sustainable Development Assistant Manager</b>	<b>CEO Executive Assistant</b>	<b>Process Improvement Manager</b>	<b>Data Analysis Assistant Manager</b>	<b>Senior Supply Chain Specialist</b>
<b>Biogas plants</b>	S	S			
<b>Solar rooftop system</b>	S	S		S	
<b>Octopus project</b>			IS		IS
<b>Oracle project</b>			I	I	I
<b>Electrical Vehicles</b>	IS				IS
<b>Chang Eyes</b>			I		

Note: I is “innovative”, S is “sustainable”, and IS is both “sustainable” and “innovative”.

The table above shows that the interviewees' sustainable innovation projects met either the sustainable or innovative category. The Solar Rooftop System and Oracle projects received the greatest attention since they were well-known within ThaiBev and required collaboration from a number of stakeholders. The Octopus and Biogas Plants received less attention from ThaiBev's professionals and specialists, but they were critical to the company's long-term success. Electrical Vehicles and Chang Eyes were both innovative and sustainable, but they were still in the early stages of development, so the author could not learn anything from them. As a result, the study focused on four sustainable innovation projects: the Solar Rooftop System, the Octopus, the Oracle, and Biogas Plants.



### 4.3 ThaiBev's Sustainable Innovation Projects

#### 4.3.1 The Renewable Energy from Distillery Slop Project

##### 4.3.1.1 Description

Figure 4.2: ThaiBev's Biogas Plant



ThaiBev recognized the urgency of climate change's global warming effect, which is exacerbated by growing Green House Gas emissions (“GHG”) and limited natural resources. As a result, the company used technology to start new production processes and continuously improve energy efficiency by increasing the use of alternative and environmentally friendly energy and developing more low-carbon products in order to reduce Green House Gas emissions from energy use to the greatest extent possible. In addition to the five existing biogas plants, two more will be erected at distilleries in Nong Khai and Nakhon Sawan provinces. Vinasses are be used to produce biogas for steam production. It also eliminates the requirement for the factory to purchase fossil fuel. This

project minimizes annual fuel oil usage and GHG emissions. Furthermore, surplus biogas from steam generation are being used to generate electricity, which is sold to the local grid.

#### 4.3.1.2 Stage of sustainable innovation

In the value chain, this project was in the production and post-consumption phases. The waste from the distillery process is recycled to make biogas, which is used as a raw material for steam production in the post-consumption stage.

#### 4.3.1.3 Drivers of sustainable innovation

ThaiBev has a high demand for fossil fuels like coal or gasoline to create steam and energy for its beverage production. Furthermore, ThaiBev has disposed of a significant amount of waste during the distillation process, which can be recycled to make methane (“CH<sub>4</sub>”), which is the primary component of biogas. That is why ThaiBev's top management agreed to invest in a biogas system in several of its manufacturing facilities, motivated by environmental impacts. This endeavor also helps ThaiBev maintain its reputation as a green beverage producer.

#### 4.3.1.4 Types of sustainable innovation

This biogas initiative falls under the heading of resource efficiency innovation. The success of this biogas project will help ThaiBev lessen its reliance on nonrenewable resources while also providing a renewable source of burning materials. This biogas facility is expected to save ThaiBev roughly 2 million liters of heavy fuel oil per year.

#### 4.3.1.5 Outcomes of sustainable innovation

This project reduces ThaiBev's GHG emissions by about 38,035 tCO<sub>2</sub>e per year, directly contributing to the company's environmental performance. It also reduced the cost of purchasing fossil fuels for its production, improving its financial performance.

### 4.3.2. Project Oracle

#### 4.3.2.1 Description



Figure 4.3.: The A.I system



Project Oracle is an AI-based automated system that detects damaged bottles at recycling facilities before sending accepted reusable bottles to breweries. Four cameras inspect each bottle from the top, bottom, and side. The system sorts bottles into three categories: reusable, clean before reusing, and non-reusable. This is a necessary automation system that incorporates both software and structural design. Almost 120,000 bottles are split into three groups every day. The conveyor belt's automated system is linked to the hardware structure, which tries to eliminate non-reusable bottles and distribute clean-before-reusing bottles into different lanes.

#### 4.3.2.2 Stage of sustainable innovation

Thai Beverage Recycle (“TBR”), one of ThaiBev's subsidiaries that handles post-consumption products, separates the used bottles after purchasing them from local collectors. TBR must examine whether the used bottle is in overall good condition. If the

bottle is good, it will be sent to the brewery to be washed and reused; if it isn't, it will be sent to recycling facilities to be melted down and used to manufacture new bottles.

#### 4.3.2.3 Drivers of sustainable innovation

Because the expenses of producing new bottles are significantly higher than those of reusing old bottles, ThaiBev's top management chose to invest in the Oracle system. With the success of this project, fewer faulty bottles are misplaced and shipped to the brewery incorrectly, and the brewery does not have to return them back to TBR's plant to be disposed of. Not only that, but this initiative also improves the computer science skills and expertise of ThaiBev employees. Workers will now be able to do challenging tasks more efficiently.

#### 4.3.2.4 Types of sustainable innovation

This Oracle project falls into the category of resource use efficiency innovation because of the more percentage of the accurate bottles the A.I can detect, that less fine bottles are being disposed.

#### 4.3.2.5 Outcomes of sustainable innovation

This Oracle project contributes to multiple aspects for ThaiBev, including financial, employee and environmental performance. To begin with, the brewery saves THB6,360,000 per year on bottle washing, which results in fewer faulty bottles. Second, the recycling facility saved THB7,880,000 per year by eliminating three personnel every shift, from 36 inspectors to 24 re-checkers. Third, by decreasing transportation expenses connected with shipping damaged bottles to the brewery, the recycling plant saves THB590,000 per year. Fourth, by minimizing the cost of re-inspection, which was a temporary process for rejected bottles, the recycling facility saved THB160,000 per year.

### 4.3.3 Octopus project

#### 4.3.3.1 Description

Figure 4.4: The Automatic Robot



The Octopus project is a massively scaled automated sorting system that optimizes productivity by sorting returnable bottles. Because of the machine, employees who previously manually sorted used bottles can now advance to become machine operators.

#### 4.3.3.2 Stage of sustainable innovation

This Octopus project is currently in the post-consumption stage, which involves the transportation of old bottles. TBR plant uses the mechanical robotic arm to unpack and move used bottles to the processing line.

#### 4.3.3.3 Drivers of sustainable innovation

The Octopus project was created out of the necessity for ThaiBev to expand its production capacity. ThaiBev is indeed be able to sort bottles more quickly as a result of this project, in order to meet the demand of downstream customers, in this situation the



brewery. The Octopus project was also expected to make good use of the fuels. As a result of the Octopus project, overall fuel consumption and GHG emissions are lowered.

#### 4.3.3.4 Types of sustainable innovation

The Octopus project is classified as a resource use efficiency innovation. Workers had to carry and transport thousands of used bottles by hand and inefficient machinery before the Octopus project. Even though TBR had to spend a lot of money for gasoline, it did not meet the needs and demands of downstream consumers. With the help of the Octopus projects, the system can now process significantly better while using less fuel.

#### 4.3.3.5 Outcomes of sustainable innovation

ThaiBev's staff have been up-skilled and can now undertake more complicated assignments in the field of electrical engineering as a result of the Octopus project's success. Workers no longer need to stand near the processing line or manually sort used bottles; instead, they can control the entire system from the control room. These projects lower the amount of work ThaiBev workers have to do while also improving overall job satisfaction.

### 4.3.4 Solar rooftop project

#### 4.3.4.1 Description

Figure 4.5: Solar Rooftop System



The solar rooftop project includes the installation of solar panels on the roofs of 27 Thai factories and one Myanmar factory in order to generate electricity for the factories. By 2025, the installation will be complete. Phase 1 began installation at five plants in 2020. The entire production capacity is 5 megawatts, lowering GHG emissions and reducing electricity consumed from the Provincial Electricity Authority. Phase 2 will focus on the distilleries, with a goal of 15 MWp, or 19,500 MWh of electricity generated per year.

#### 4.3.4.3 Stage of sustainable innovation

The solar rooftop installation is currently in production stage, providing green electricity for the company's operations.

#### 4.3.4.3 Drivers of sustainable innovation

This project is an attempt to provide ThaiBev with clean, renewable energy. At the same time, this initiative assists ThaiBev in diversifying its energy sources and

reducing its reliance on fossil fuels. As a result, the solar rooftop project intends to reduce environmental impact while also strengthening the image of the environmentally conscious organization.

#### 4.3.4.4 Types of sustainable innovation

The solar rooftop project relates to the resource use substitution innovation category. ThaiBev is then able to replace government-supplied electricity with its own renewable energy created through this project.

#### 4.3.4.5 Outcomes of sustainable innovation

ThaiBev has finished the first phase of its long-term solar rooftop project, which has a total capacity of 5 MW. Over the following three years, ThaiBev plans to build three more phases, totaling 20.6 MW and lowering CO<sub>2</sub> emissions by 13,800 tCO<sub>2</sub>e per year. The solar rooftop project benefits ThaiBev's financial and environmental performance. Electricity purchase costs are lowered, resulting in improved profit. This strategy also reduced the company's carbon footprint while enhancing its resilience.

### 4.4 Summary of Sustainable Innovation Projects

Table 4.3: Summary of ThaiBev's Sustainable Innovation Projects

Project	Stage(s)	Driver (s)	Type(s)	Outcome(s)
Biogas	Production Post-consumption	Environmental impact Reputation	Resource use efficiency innovation	Environmental performance Financial performance
Oracle	Post-consumption Downstream supply chain	Environmental impact	Resource use efficiency innovation	Environmental performance Employee performance

(Continued)

Table 4.3 (Continued): Summary of ThaiBev's Sustainable Innovation Projects

<b>Project</b>	<b>Stage(s)</b>	<b>Driver (s)</b>	<b>Type(s)</b>	<b>Outcome(s)</b>
Octopus	Post-consumption Downstream supply chain	Environmental impact Size	Resource use efficiency innovation	Employee performance
Solar rooftop	Production	Environmental impact Reputation	Resource use substitution innovation	Environmental performance Financial performance

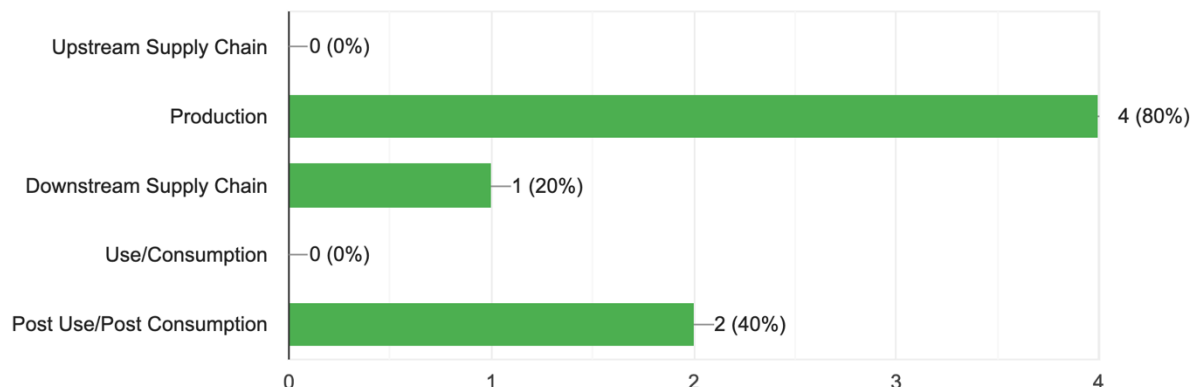
The majority of ThaiBev's sustainable innovation projects take place throughout the production and post-consumption stages of the value chain. Due to rising demand for green energy and carbon-related taxes, ThaiBev is investing in a number of sustainable innovation projects to improve its environmental performance while avoiding financial risks in the future. Furthermore, projects that are classified as sustainable innovation improve employee performance and working circumstances. Resource use efficiency and resource use substitution are the most common types of sustainable innovation adopted by ThaiBev to improve the factory's operating process. Greenhouse gas emissions from direct company activity are categorised as scope 1 under DJSI's recommendations. Scope 2 includes greenhouse gas emissions from indirect activities such as purchased electricity or steam production. As a result, the biogas project is expected to save 38,035 tCO<sub>2</sub>e per year, while the solar rooftop project is expected to save 13,800 tCO<sub>2</sub>e per year. Both projects directly contributed to ThaiBev's overall emission reduction.

#### 4.3.1 Stages of Sustainable Innovation Projects

Figure 4.6: Responses of ThaiBev's Professionals and Specialists to Stages of Sustainable Innovation Projects in ThaiBev's Value Chain

What stages of the value chain the project(s) were located?

5 responses



The production, downstream supply chain, post-consumption stages, according to ThaiBev's professionals and specialists, have a lot of space for development. The first reason is that as a traditional manufacturing company, ThaiBev focused on the linear economy principle of take-make-dispose in the past. However, in the modern period, this was an unsustainable method of doing business. Hence ThaiBev's top management is switching to a circular economy approach.

The first stage in transitioning to a circular economy model is to decrease and eliminate waste in production, implement efficient delivery alternatives to save unnecessary operating expenses, and improve end-of-life product management to avoid paying environmental taxes.

Second, a major portion of energy generation is required in the production, downstream supply chain, and post-consumption stages, which is primarily derived from the combustion of fossil fuels. If ThaiBev can make all three stages sustainable through innovative projects, the company's financial performance will improve significantly in the long run.



Finally, ThaiBev has included the Triple Bottom Lines principle into its business decision-making process, carefully considering the effects of its activities on all stakeholders. Most ThaiBev stakeholders, including the local community, governments, employees, business partners, and the natural environment, are involved in the production, downstream supply chain, and post-consumption stages. Furthermore, the three stages of ThaiBev's value chain indicated above are closely linked to the environment, society, and economics. As a result, they can serve as the foundation for ThaiBev's new Triple Bottom Lines strategy.

In conclusion, ThaiBev is changing many aspects of its business to make it more sustainable, more energy effective, and waste-free. ThaiBev also has to manage its end-of-life product due to increased demand from stakeholders and the government, resulting in a higher percentage of reused and recycled packaging materials. ThaiBev will continue to invest in more sustainable innovation projects in the stages of production and post-consumption in their value chain in the near and medium term.

#### 4.3.2 Drivers of Sustainable Innovation Projects

For the last four years, from 2017 to 2021, ThaiBev has been the most successful corporation in the Global Beverages Industry in DJSI, according to the S&P Global Corporate Sustainability Assessment. ThaiBev has established a Climate Strategy based on a natural hazard and physical risk assessment, as well as a risk and opportunity assessment related to the transition to a low-carbon economy. It can be claimed that ThaiBev is conscious of its environmental impact, both climate-related risks and opportunities, and it is one of the company's top priorities when it comes to investing in innovative projects.

Table 4.4: Climate Risks and Opportunities of ThaiBev

Climate Risks & Opportunities	Timeframe	Description
<b>1. Physical Climate Risk</b>		
<b>1.1 Acute</b>	Long term (>10 years)	Natural disasters and the rising number of extreme weather events, including as flooding, thunderstorms, and landslides, can affect ThaiBev's processing facilities by massive delays or suspending production, as well as interruptions, which can result in higher operating costs and damage settlements.
Water Stress	Long term (>10 years)	Changes in water availability can have an impact on ThaiBev's production line, supply chain, and revenue, especially if some of the company's plants are in high-water-stress locations.
Sea Water Intrusion	Short term (1-3 years)	ThaiBev's operation relies heavily on fresh water sources. Saltwater intrusion into aquifers can affect ThaiBev's operations, resulting in higher operating costs for purchasing fresh water.
Increasing Temperature	Long term (>10 years)	Changes in air temperature will reduce crop yields across ThaiBev's supply chain, increasing material procurement costs.

(Continued)

Table 4.4 (Continued): Climate Risks and Opportunities of ThaiBev

Climate Risks & Opportunities	Timeframe	Description
<b>2. Transition Climate Risks</b>		
<b>2.1 Policy and Legal Compliance</b>		
Water Tariff	Short term (0-3 years)	Increased water tariffs in Thailand may result in higher production costs for beverage businesses.
Carbon Pricing (Supply Chain)	Medium term (3-10 years)	Carbon pricing policies may raise the cost of raw materials upstream, putting ThaiBev at a disadvantage.
<b>2.2 Market Changes</b>	Medium term (3-10 years)	Consumer preferences for low-carbon products and demand for renewable carbon-neutral energy that reduces the use of fossil fuels in company operations are changing. If ThaiBev's fossil fuel use remains high, these developments may pose a threat to the company's product line. ThaiBev's revenue streams could be affected by changes in consumer demand
<b>2.3 Technology</b>	Medium term (3-10 years)	The introduction of new refrigerants with lower global warming potential to replace existing HFC refrigerants may result in increased operational expenses due to higher refrigerant pricing.

(Continued)

Table 4.4 (Continued): Climate Risks and Opportunities of ThaiBev

Climate Risks & Opportunities	Timeframe	Description
<b>3.Climate Transition Opportunities</b>		
<b>3.1 Transition to Circular Economy</b>	Short term (1-3 years)	ThaiBev's products require a substantial amount of resources to manufacture. The circular economy model will enable a bigger proportion of those resources to be produced in the future. This might be a profitable business opportunity.
<b>3.2 Energy Sources</b>		
Resource Efficiency	Medium term (3-10 years)	ThaiBev has conducted a number of projects in-house, including energy efficiency audits for all business units and the identification of appropriate technology solutions. Biogas plants and solar rooftop systems have been installed in the manufacture of alcoholic and non-alcoholic beverages, and will be expanded across the whole ThaiBev value chain in the near future.
Renewable Energy	Medium term (3-10 years)	Because of changes in demand and supply, renewable electricity will most likely become less expensive. When demand rises, production economies of scale will support an increase in supply.

(Continued)

Table 4.4 (Continued): Climate Risks and Opportunities of ThaiBev

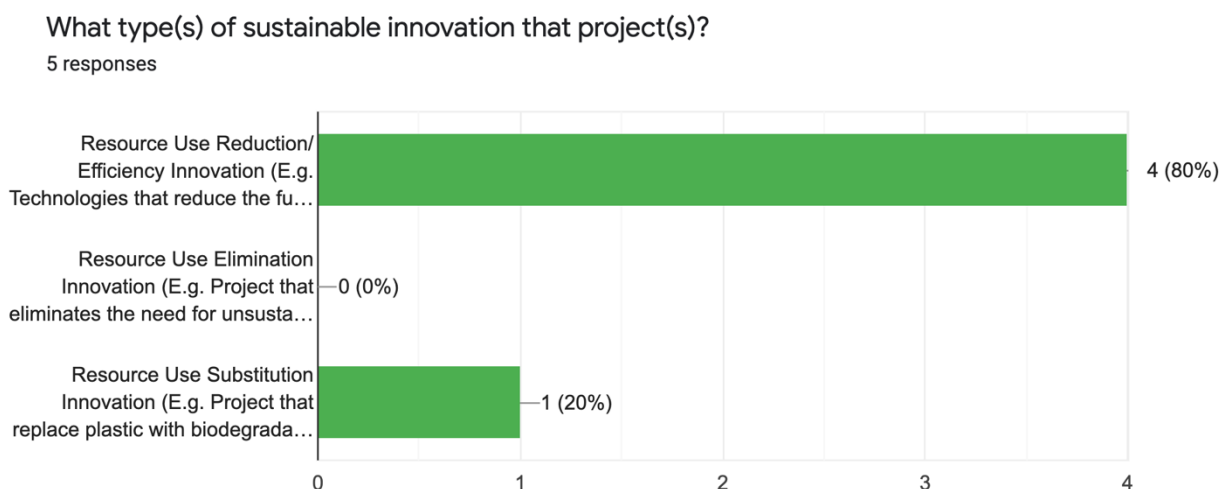
Climate Risks & Opportunities	Timeframe	Description
		ThaiBev intends to expand solar rooftop systems at its manufacturing facilities. By investing in low-carbon energy sources, the corporation is projected to reduce GHG emissions and reduce its reliance on fossil fuels, which may become more expensive in the future. ThaiBev will witness increased cost savings as well as a shift to renewable energy operations.
<b>3.3 Reputation</b>	Long term (>10 years)	Stakeholders' demands for eco-efficiency, environmentally friendly products, and transparency on material climate change risks are rising (investors, customers, lenders, host countries). ThaiBev can embrace this chance to win more trust from its stakeholders by properly disclosing and engaging with them.

On the one hand, ThaiBev's professionals and specialists say the company is deeply aware of the environmental impacts that could seriously affect business operations, and on the other, the corporation is continuously trying to understand potential changes. ThaiBev, on the other hand, sees future climate potential in shifting to a circular economy, resource efficiency, and renewable energy. Sustainable innovation initiatives that consider environmental consequences as a driver are more likely to be adopted by top management since they can help ThaiBev minimize unnecessary costs and

unlock the gate to new business segments. ThaiBev continues to invest in sustainable innovation efforts because of this.

#### 4.3.3 Types of Sustainable Innovation Projects

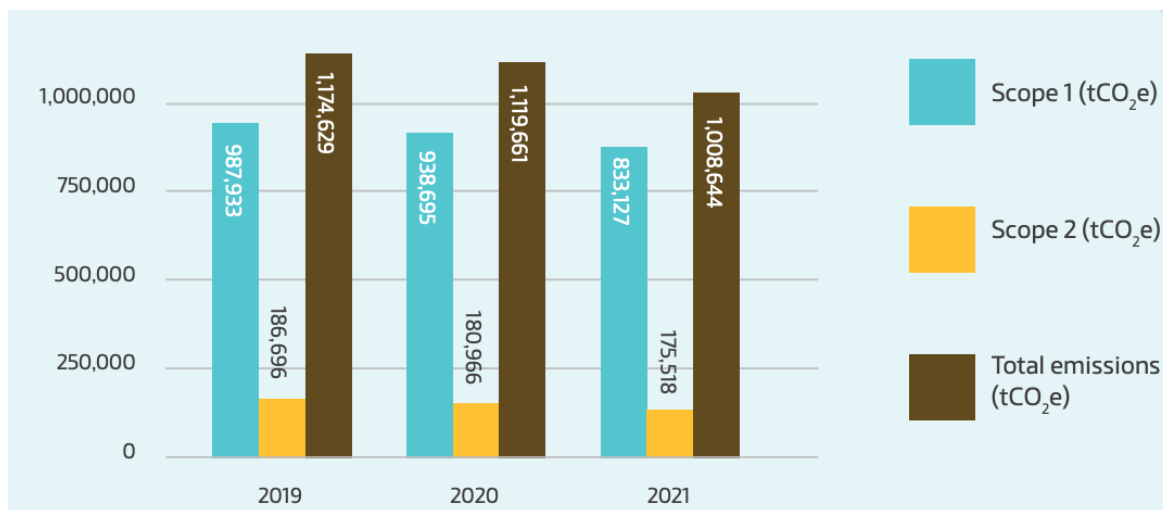
Figure 4.7: Responses of ThaiBev's Professionals and Specialists to Types of Sustainable Innovation Projects in ThaiBev's Value Chain



Resource use reduction or efficiency innovation, according to ThaiBev's professionals and specialists, is currently very appealing to the company. This preferences is influenced by a number of factors. To begin, ThaiBev is shifting from a linear to a circular economy, which necessitates the company's use of as many resources as possible to meet the objective. Second, ThaiBev's project managers can easily adopt and measure this type of innovation. ThaiBev's managers can view financial statistics, previous successful case studies, prospective benefits or cost reductions when these sustainable innovation projects are proposed. Finally, for sustainable innovation initiatives can be modified to ThaiBev's businesses and characteristics. ThaiBev's executives, on the other hand, are conservative, therefore they are more inclined to support sustainable innovation initiatives if they have been proven to be effective, and resource efficiency innovation projects tend to satisfy this criteria.

#### 4.3.4 Outcomes of Sustainable Innovation Projects

Figure 4.8: ThaiBev's GHG Emissions from 2019 to 2021



ThaiBev's scope 1, scope 2, and total emission have dropped significantly in the last three years, according to ThaiBev's sustainability report 2021. The amount of emissions in scope 1 decreased from 1,174,629 tCO<sub>2</sub>e in 2019 to 1,008,644 tCO<sub>2</sub>e in 2021, equaling about 166,000 tCO<sub>2</sub>e. In this scope 1 category, the biogas project accounts for 22% of the reduction. Following that, scope 2 emissions declined from 186,696 tCO<sub>2</sub>e in 2019 to 175,518 tCO<sub>2</sub>e in 2021, or 11,178 tCO<sub>2</sub>e. With the implementation of the solar rooftop project, ThaiBev will be able to cut GHG emissions by roughly 800 tCO<sub>2</sub>e per year per 1 MW installed capacity.

Table 4.5: ThaiBev's Scenario Analysis of Carbon Pricing in 2025

2025		CARBON PRICE (SGD)		
		2	5	10
SCENARIO		Cost to ThaiBev (THB)		
ACHIEVE TARGETS		43,475,918	108,689,795	217,379,589
BUSINESS AS USUAL		51,860,004	129,650,011	259,300,022
WORST CASE		55,875,092	139,567,731	279,135,461

Table 4.6: ThaiBev's Scenario Analysis of Carbon Pricing in 2030

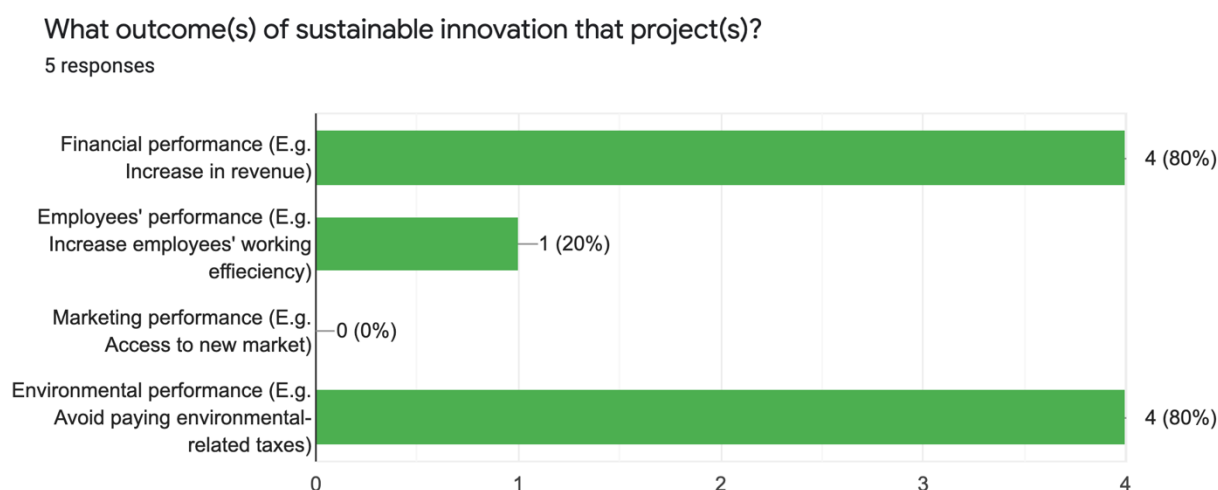
2030		CARBON PRICE (SGD)		
		2	5	10
SCENARIO		Cost to ThaiBev (THB)		
ACHIEVE TARGETS		38,306,444	95,766,110	191,532,220
BUSINESS AS USUAL		54,505,386	136,263,465	272,526,930
WORST CASE		63,163,231	157,909,077	315,816,153

Sensitivity analysis is carried out throughout the medium to long term to enable ThaiBev understand the possible cost of emissions under three scenarios as part of the Thailand Nationally Determined Contributions, so called NDCs scenario. ThaiBev's "achieve targets" relates to the company's SBTi, which calls for a 15% reduction annually in carbon emissions. The terms "BAU" and "Worst Case" refer to minor emission reductions and ongoing emissions rise, respectively. The carbon price in Singapore is utilized as the most relevant cost in the region. Assume that 1 SGD equals 24.3 THB. ThaiBev may have to pay THB38 million to THB315 million in carbon-related taxes,



according to the results of the sensitivity analysis. Sustainable innovation initiatives like biogas and solar rooftop are critical for ThaiBev's financial success as it prepares for the forthcoming transition changes. ThaiBev's profitability may suffer as a result of these sustainable developments, and shareholders' trust may be affected. Also, according to ThaiBev's estimates, the solar rooftop may save roughly 1,360 MWh per year and THB4.8 million per year on electricity purchased from external sources (PEA).

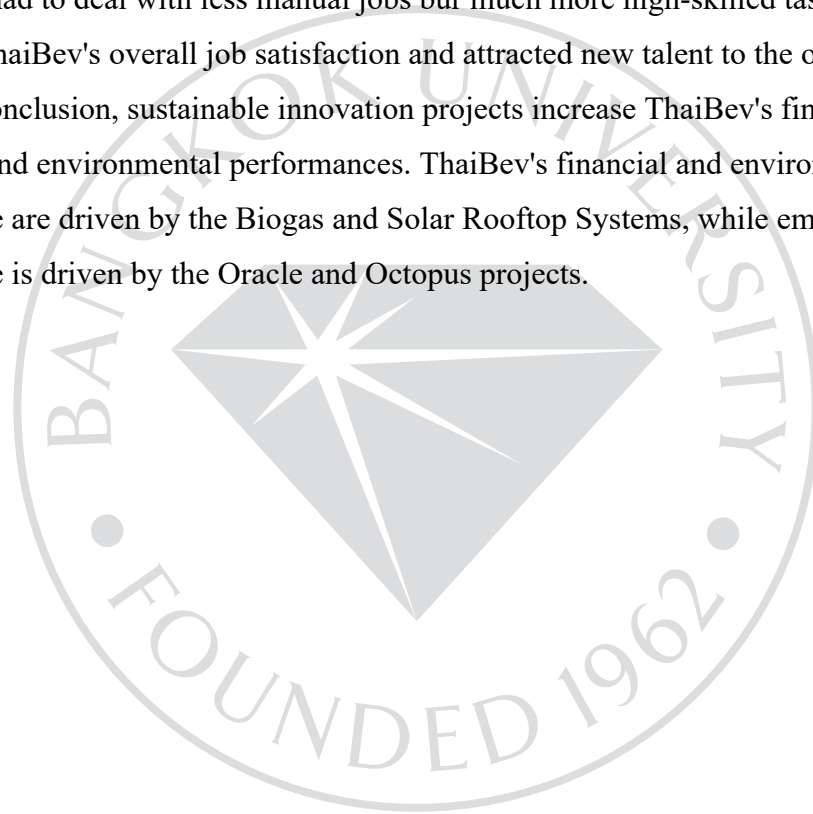
Figure 4.9: Responses of ThaiBev's Professionals and Specialists to Outcomes of Sustainable Innovation Projects in ThaiBev's Value Chain



According to ThaiBev's professionals, the company is now listed on the Singapore Stock Exchange ("SGX"), which is one of the most environmentally, socially, and governance-conscious ("ESG") stock exchanges in the world. To attract green investors or the world's capital funds to SGX, a company must publish its financial and environmental performance honestly. Furthermore, ThaiBev must demonstrate its level of resilience in the face of climate change. Those sustainable innovation initiatives, such as the Solar Rooftop System, might serve as a perfect reference for green investors when making investment decisions.

According to ThaiBev's experts, developing sustainable innovation projects like the Oracle project required collaboration with research institutes and other business partners. On this project, ThaiBev cooperated with Carnegie Mellon University, one of the most well-known universities in the field of artificial intelligence. It provided ThaiBev employees with an excellent opportunity to learn from and practice with some of the world's top computer science professors. On the other hand, this project is up-skilled workers from manual labor to computer scientists. As a result, ThaiBev employees had to deal with less manual jobs but much more high-skilled tasks. It also improved ThaiBev's overall job satisfaction and attracted new talent to the organization.

In conclusion, sustainable innovation projects increase ThaiBev's financial, employee, and environmental performances. ThaiBev's financial and environmental performance are driven by the Biogas and Solar Rooftop Systems, while employee performance is driven by the Oracle and Octopus projects.



## **CHAPTER 5**

### **CONCLUSION AND DISCUSSION**

This chapter summarizes everything learned through the interview, public and internal documents, and literature review. The answers to research questions are addressed in this conclusion. It also makes some useful recommendations for future practitioners and researchers.

#### **5.1 Research Findings Summary**

According to the research, many companies still believe the term "sustainable innovation" to be a new term. Although the United Nations World Commission on Environment and Development first discussed "sustainability" and "sustainable development" in 1987, it was unclear how to implement them in practice. The Triple Bottom Lines concept, which reveals the relationship between environmental, social, and economic values, is the best approach to interpret the term "sustainability."

Many firms are incorporating sustainability into their business agendas on the global level, looking for opportunities and innovations that contribute to corporate and investor success while also delivering societal value and producing innovative solutions. Being sustainable and innovative allows businesses not just to be more adaptable to change, particularly climate-related change, but also to establish trust among their stakeholders. Sustainable development makes businesses more appealing to green investors, provides a healthy working environment for employees, avoids unfavorable legislation from policymakers, and decreases damaging environmental and ecological damages.

The most accurate definition of sustainable innovation, according to scholars and professionals, is the intersection of sustainability, innovation, and economic growth. It might include a new method, a new product, new innovative ideas, and a management strategy that contributes to the sustainable, innovative, and successful growth of enterprises. Businesses can strengthen their resilience to change, prevent climate-related

risks, cut wasteful costs, increase stakeholder engagement, enter new markets, and get access to a new client base by putting sustainable innovation into practice.

Upstream supply chain, production, downstream supply chain, use or consumption, and post-use or post-consumption are the five basic stages of a company's value chain. Additionally, there are three types of sustainable innovation now being implemented by businesses around the world: resource use efficiency or reduction innovation, resource use elimination innovation, and resource use replacement innovation. Based on the traits, strategic decisions, and investment portfolios of top management, this type of innovation can occur at any stage of the company's value chain.

Due to increasing pressure from both internal and external factors such as environmental impacts, requirements from upstream suppliers and downstream customers, business expansion nationally and internationally, and slack, large companies must be sustainable and innovative, whether they want to or not, in order to maintain competitive advantages and ensure long-term profits. Companies that successfully apply sustainable innovation initiatives in their operations may increase not only financial performance but also environmental, employee, and marketing performance, regardless of those reasons.

ThaiBev, one of Southeast Asia's most successful food and beverage corporations, has been putting sustainable innovation initiatives into action since 2017. Although ThaiBev used to be a traditional manufacturing company with a take-make-dispose orientation, they are now adopting the Triple Bottom Lines concept into their business strategies and transforming their businesses to be more sustainable and innovative. Sustainable innovation projects have enabled them not only win the Dow Jones Sustainability Index Global Leader (“DJSI”) in the beverage industry for the past four years, but also expand their business beyond Thailand's borders. ThaiBev will also invest in more sustainable innovation initiatives on an ongoing basis.

Four sustainable innovation projects were assessed through the Sustainable Innovation Framework after completing interview sections with five ThaiBev professionals and specialists, including the Biogas Plant, the Solar Rooftop System, the

Oracle project, and the Octopus project. The need to reduce environmental impacts in the manufacturing and post-consumption stages drives most of these sustainable innovation projects. ThaiBev's specialists believe that if the project falls under resource use efficiency or reduction innovation, ThaiBev's top executives will most likely approve it. Because that project has a clear estimated financial number, has been demonstrated elsewhere, and can be changed to fit ThaiBev's company requirements. In addition, if a sustainable innovation initiative focuses on the production and post-consumption stages, the likelihood of it being executed doubles. Because ThaiBev has absolute control over the production and post-consumption stages, and there is plenty of opportunity for development in those stages.

Sustainable innovation projects need a massive investment budget, however, the long-term gains far exceed the costs. On the one hand, the Biogas Plant and Solar Rooftop Systems minimize ThaiBev's reliance on nonrenewable energy, which is expected to skyrocket in price in the near future, while simultaneously providing sustainable energy alternatives. These two projects will assist ThaiBev in reducing operational costs, reducing its carbon footprint, and avoiding carbon taxes, all of which would otherwise have a negative impact on the company's profitability in the coming years. The Oracle and Octopus projects, on the other hand, directly increase the working efficiency of ThaiBev employees while also indirectly increasing overall job satisfaction. ThaiBev employees can now go from manual labor to high-skilled technicians and cooperate on artificial intelligence development with some of the world's leading research institutes, such as Carnegie Mellon University. Sustainable innovation projects can be claimed to benefit ThaiBev in terms of environmental, financial, and employee performances.

## **5.2 Discussions and Recommendations**

### **5.2.1 Discussions and Recommendations for Practitioners**

Companies integrating sustainable innovation all over their whole value chain have been widespread. ThaiBev, a traditional manufacturing company in Thailand, was

one of the first to adopt the Triple Bottom Lines concept to their business objectives. This decision not only allows ThaiBev to keep its competitive advantages in Thailand, but also to expand its overseas operations. Following are recommendations based on the findings of the literature review, interviews, and documents that the author believes would benefit future research and ThaiBev executives in the long run.

1. To properly manage and review their future projects, companies should develop a sustainable innovation framework that is best suited for their business characteristics and industries. It would assist businesses in making better use of their resources, diversifying their sustainable innovation solutions, and avoiding duplicating efforts while overlooking other opportunities.
2. Aside from resource efficiency and resource utilization, traditional manufacturing firms should invest in a variety of types of sustainable innovation. Other types of sustainable innovation may not have clear financial implications, but they could be a game-changing endeavor for traditional businesses, resulting in new competitive advantages.
3. To fully develop sustainably throughout the supply chain, big enterprises should engage with their upstream suppliers and downstream customers to drive more sustainable innovation.

#### 5.2.2 Discussions and Recommendations for Future Research

Researchers from all over the world are increasingly interested in the topic of sustainable innovation. There are, however, significant research gaps that have yet to be filled. The author has made recommendations for future researchers based on the findings and literature reviews that he believes will be useful to them.

1. Sustainable development or sustainability used to be seen as a heavy burden for large companies all over the world since it required more work and a certain amount of capital, both of which have a negative impact on profitability. Furthermore, companies registered on the Singapore Stock Exchange ("SGX") are required to publish annual financial and sustainability reports. Companies that are not listed on a stock exchange like the Stock Exchange, on the other hand, may

not have any obvious reasons to become sustainable. As a result, demonstrating the measurable consequences or advantages of sustainable innovation is essential. It would be a perfect example for companies to follow, whether they are listed on the Stock Exchange or not.

2. Many top leading companies around the world, such as ThaiBev, Google, and Exxon, have been involved in sustainability innovation. However, there might not be a lot of study on how small and medium-sized enterprises ("SMEs") or new businesses are doing with sustainable innovation right now. This is due to the fact that large corporations have more products, processes, and services to transform them to be more sustainable and innovative. SMEs and startup businesses, on the other hand, tend to operate on a smaller scale with fewer products, processes, and services. However, the author believes that more research into incorporating the sustainable innovation concept at the start of SMEs' and newborn firms' lives is needed. As a result, SMEs and startups will have needed information to consider in order to manage their businesses in a sustainable and innovative way.
3. Traditional manufacturing companies only focus on implementing sustainable innovation projects in stages of their value chains where they have complete control, such as production and post-consumption. The stages, which include upstream supply chain and use/consumption, require collaboration among business partners. However, limited previous research has been done on how large corporations can influence and involve their business partners and customers in the field of sustainable innovation. It might be a fascinating research topic, as well as compelling proof for firms to collaborate in the journey of sustainability and innovation.

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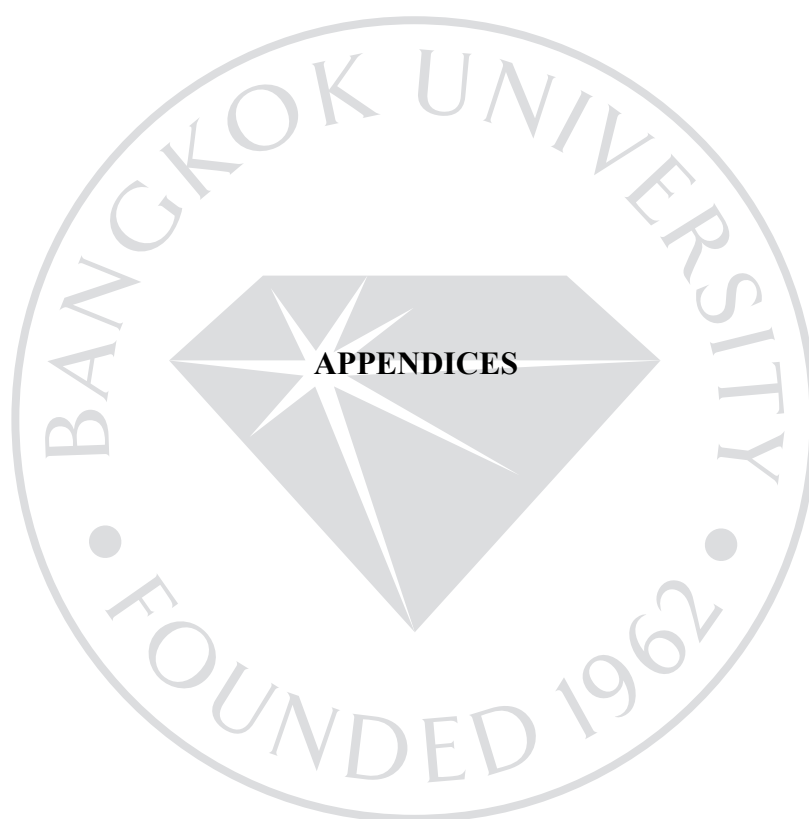


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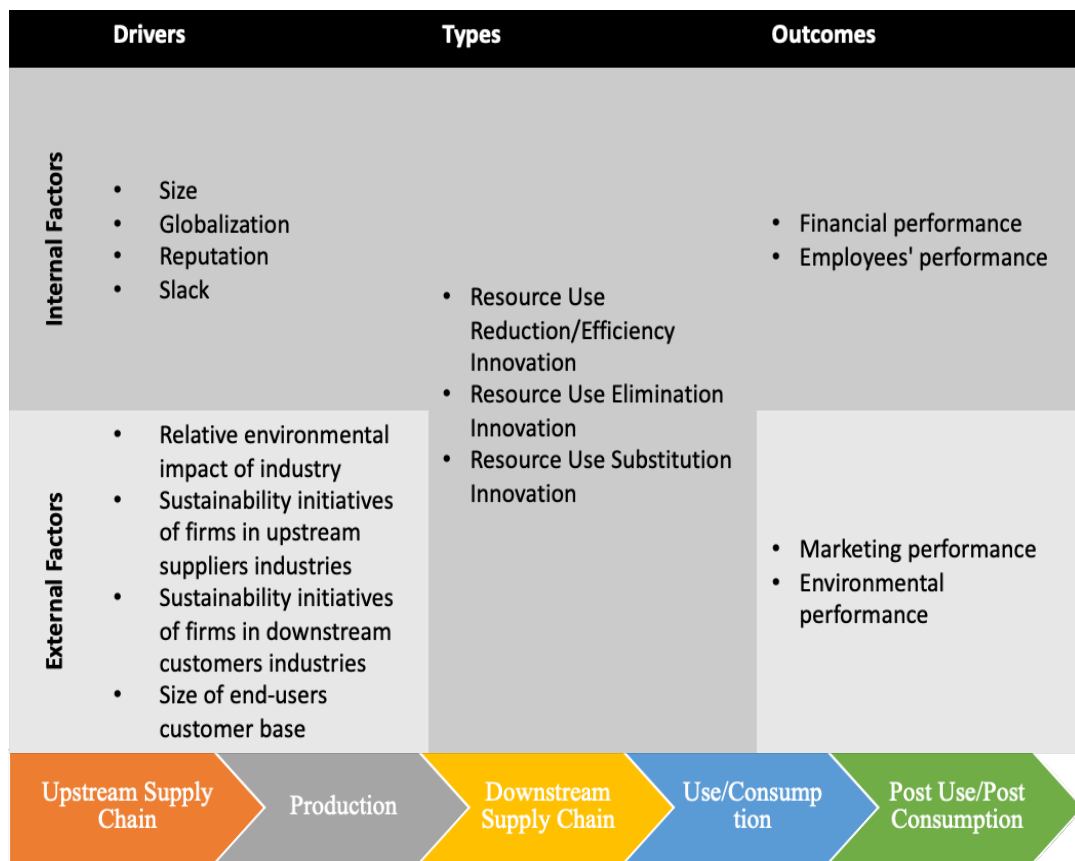
## Appendix A

### Interview Questions for Independent Study Thesis

#### Part 1: Demographic information

1. Can you please introduce yourself?
2. What is your current or the most recent position in ThaiBev?
3. How many years of service that you have in ThaiBev?

#### Part 2: Sustainable Innovation projects in ThaiBev



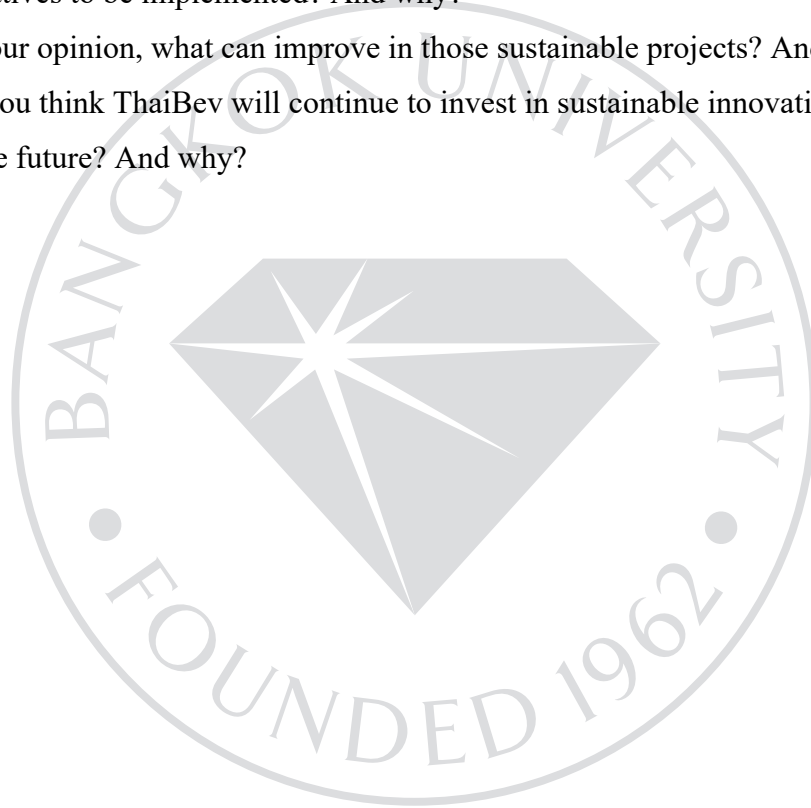
(This is the Sustainable Innovation Framework, which aims to identify and analyze sustainable innovation projects in the target firm throughout its supply chain)

1. What projects in ThaiBev that you consider "sustainable" and/or "innovative"?
2. Can you describe the project that suits this category most (sustainable and/or innovative)? And why?
3. What role you were in that project(s)?
4. What stages of the value chain the project(s) were located?

5. What driver(s) of that project(s)?
6. What type(s) of sustainable innovation that project(s)?
7. What outcome(s) of sustainable innovation that project(s)?

**Part 3: Discussion on sustainable innovation projects in ThaiBev**

1. Did or did not that sustainable and/or innovative project(s) meet your expectation? And why?
2. In your opinion, what constraints/limitations might stop sustainable innovation initiatives to be implemented? And why?
3. In your opinion, what can improve in those sustainable projects? And why?
4. Do you think ThaiBev will continue to invest in sustainable innovation initiatives in the future? And why?



## Appendix B

### Abbreviations

DJSI: Dow Jones Sustainability Indices

ESG: Environmental, social, and corporate governance

GHG: Greenhouse gases

S&P: Standard & Poor's

SGX: Singapore Exchange

SMEs: Small and medium-sized enterprises

TBR: Thai Beverage Recycle Co.,Ltd

ThaiBev: Thai Beverage Public Company Limited





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