Strategies for Integrating ESG into a Large Organization

- Case Study of a Large-scale Chinese High-Tech Manufacturing Enterprise

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Abstract

Today there is a crucial need to explore, understand and apply sustainable business models and strategies in manufacturing industries due to the global rise in environmental crises such as climate change and pollution. This has led to a push for more sustainability awareness among businesses. Environmental, Social and Governance (ESG), as a measure of a company's impact on society and the environment, is now being used by many businesses to analyse and improve their sustainability performance. However, as ESG strategy is a relatively new term, many companies, particularly in developing countries like China, are yet to undertake adequate measures to facilitate their understanding and applications of ESG strategies. In China, large scale manufacturing enterprises make an important contribution to the country's economy, and many are now taking initiatives to become more sustainable with their business practices. The Chinese government is introducing more policies to encourage and support enterprises to undertake sustainable transformation. This report will explore a case study of a large Chinese high-tech manufacturing enterprise – Sunny Group with ideal ESG ratings and performance. This company manufactures optical lens products and associated accessories. And over the years, it has taken several initiatives such as controlled energy consumption, staff training on sustainability measures, using a three-tiered management system to improve communication about sustainability, and marketing their social responsibilities among customers and stakeholders. All these strategies helped this organization to facilitate sustainability. This report will analyse some of the challenges and obstacles that enterprises like this encounter in the early stages of implementing ESG related strategies and how these can be addressed. This research makes an important contribution to the literature on sustainability and large enterprises in China and how to integrate ESG.

Keywords: *ESG strategy, Sustainability, Organizational Structure, Sustainability Challenges, Large enterprises, Chinese Enterprise*

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Author's Declaration

I declare that this thesis entitled "**Strategies for Integrating ESG into a Large Organization - Case Study of a Large-scale Chinese High-Tech Manufacturing Enterprise**" is an original work and I am the sole author. This study has been completed by myself and has not been submitted to any other university other than the University of York for MSc by Research degree. All sources have been clearly specified and acknowledged by explicit references.

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CHAPTER 1
INTRODUCTION

Over the years, different organizations have contributed a lot in terms of innovation to improve people's quality of life. However, climate change and environmental crises have led to significant sustainability challenges for a lot of these organizations. Although there is an increasing understanding and awareness of sustainability issues, changing business practices can be a complex and lengthy process. This needs to be driven by business leaders who have a strong sense of social responsibility and vision for sustainability and would like to address the challenges with market uncertainties. Today the concept of Environmental, Social and Governance (ESG) strategy has provided a reliable template for stakeholders including business leaders to engage in the sustainable transformation of an organization. The ESG strategies can be used by organizations to understand their weaknesses and limitations and help in measuring their impact on society and the environment. This is one of the reasons why it is now being used by many businesses to analyse and improve their sustainability performance. However, as this is a relatively new term, many enterprises, especially in developing countries, are yet to undertake adequate measures to facilitate their understanding and applications of ESG strategies. The implementation of lean manufacturing and green management could help to improve the efficiency and sustainability of enterprises. Lean manufacturing aims to help enterprises optimize production processes and eliminate unnecessary waste (Dhingra, Kress and Upreti, 2014). With the improvement of the production efficiency of enterprises, the waste of resources generated in the production process can be further controlled. The core concept of green management is to control resource consumption and pollution emission by developing sustainable products and introducing environment friendly materials (Hallam and Contreras, 2016). By introducing both approaches at the same time, Lean-green management (LGM) can help companies focus more effectively on improving their product lifecycle and establishing green supply chain (Hallam and Contreras, 2016). This comprehensive approach can help enterprises reduce waste and optimize resource structure. The operational performance and sustainability of the enterprise can be further improved. Six Sigma which is a set of techniques for process improvement (aimed at improving the overall quality of output by identifying and removing the causes of defects and minimizing variability in manufacturing and business processes) can also be combined with LGM. According to Kaswan and Rathi (2020), using this combination, defective

products and production waste can be controlled better. At the same time, a company's product delivery time, manufacturing and management costs can be further optimized using this initiative.In China, large scale manufacturing enterprises make an important contribution to the country's economy, and many are now taking initiatives to become more sustainable with their business practices. China is the world's largest energy consumer and carbon emitter (ChinaPower, 2022) and the World Bank (2022) notes that this country's resource-intensive and labour-intensive production models have exacerbated the emergence of structural imbalances in the economy, perpetuating its total greenhouse gas emissions as one of the world's highest. The Chinese government is introducing more policies to encourage and support enterprises to undertake sustainable transformation so as to address the various environmental issues, ensure sustainable economic growth, and achieve carbon-neutral milestones (He, Wen and Zheng, 2020). This includes a number of sustainability-related policies, such as mandatory disclosure of Environmental, Social and Governance (ESG) reports. For companies, using an ESG strategy as a framework to move towards a sustainable business model could help them build their competitive advantage and address some of the business and environmental risks (Cho and Patten, 2007). Moreover, as society's understanding of the concept of sustainability increases, companies that adhere to ESG principles will have more visibility and recognition in the marketplace by environment conscious consumers. However, there are risks and challenges associated with the process of ESG implementation.

The European Banking Authority (2021) discusses some of the negative impacts that the ESG reporting, and disclosure process may have on organisations, such as uncertainty, data security, and multi-point impact. Some studies also point out that ESG strategies will force companies to undergo additional financial pressure while introducing or replacing their infrastructure, equipment/resources so as to achieve sustainability (Telle, 2006). The business activities and output of large organizations in the context of environmental impact and social footprint tend to be higher than most SMEs. The strategies applied by business leaders from large organizations will have a more significant impact on the entire supply chain and industrial ecosystem. With their commitment towards sustainability, large organizations could have a more significant impact on society. While most of the existing literature are based on analysis of various financial database from different organizations, limited research uses case studies particularly large organizations to focus on the operational adjustments and cognitive improvements that companies need to make to implement ESG strategies successfully.

Also, there are very limited studies on Chinese large-scale organizations in this context. For companies who are considering sustainable transformation strategies, successful experiences from other organisations can act as a positive stimulus for them to undertake the next steps. In particular, companies will need to be cautious with the identification of potential risks and challenges while moving forward with their ESG strategies to avoid potential challenges by retaining stability with their operation. Therefore, it is crucial to understand how large organisations are transitioning to a sustainability-driven business model and identify the risks and challenges they face in this process.

1.1 Research Objectives

Through the formulation and implementation of sustainability-related strategies, enterprises can build their competitive advantage and harness their ability to manage risks. Large enterprises need to continuously maintain their brand recognition so as to ensure the growth and survival of their market presence (Nair and Menon, 2008). Large companies need to consider how to effectively drive the implementation of ESG strategies into their business models.

Existing studies have shown how sustainable businesses can have a positive impact on the development of society and enterprises. However, there is a lack of empirical research on how enterprises build strategies and allocate resources to facilitate the integration of sustainability into their businesses. There seems to be an ambiguity on how large firms construct and adapt their organizational structure and culture to support the drive of relevant sustainability related strategies. So far, there seems to be limited research on the influence and the degree of participation of various stakeholders in the process of promoting ESG-related strategies in large organizations. Therefore, this study aims to explore the approaches and strategies used by large organizations to integrate ESG as part of their drive to become sustainable. This study mainly addresses the following research question:

- **How do large enterprises implement ESG-related strategies to facilitate the sustainable development of their business operation?**

This study will explore some of the factors that motivate business leaders to pursue sustainability. This study will help in addressing some of the research gaps related to

large enterprises and how they implement sustainable strategies. The following are the main research objectives for this study:

- Discuss the terminologies and concepts related to sustainability.
- Explore some of the tools and methodologies that can help organisations to drive sustainable strategies.
- Study some of the key organisational strategies used by large organizations to facilitate sustainability.
- Identify some of the challenges encountered by large organizations in the process of incorporating sustainable policies in their business model.

1.2 Structure of the Report

The report begins with a literature review that discusses some of the key sustainability-related terminologies. It also looks at some of the tools for implementing sustainable strategies and explores some of the challenges encountered by large organizations in their sustainable practices. It covers some of the aspects of lean manufacturing and ESG principles.

The third chapter covers the research methodologies and the research design that was followed in this study. This includes the justification for the use of case study approach and semi-structured interviewing for data collection. This chapter also covers the ethical protocols followed in this study.

Chapter four provides an overall analysis of the case study used in this research including the key findings of their sustainable strategies and challenges. It also looks at the influence of stakeholders on strategy formulation, the influence of organizational management and structure on the implementation of ESG related strategies, and the identification and avoidance of risks. The report concludes with a summary on some of the limitations of this research study followed by some recommendations for further research.

CHAPTER 2
LITERATURE REVIEW

Today, the concept of sustainability has become a strong focus in many industrial sectors including core areas of manufacturing and production in several businesses. There is also a growing awareness on sustainability among consumers due to the rapidly increasing environmental issues such as global warming. As a result, more organisations are considering the implementation of sustainable models for business operation. Through literature review, this chapter will look at the characteristics of large-scale enterprises and the need for them to engage in sustainable transformation. It will discuss existing research on some of the approaches and challenges that need to be addressed in the process of sustainable operations of large enterprises. It will also explore some of the underlying contexts of ESG principles and strategies and their guiding implications for corporate sustainability.

2.1 Size of an Enterprise

In recent times, Small Medium Enterprises (SMEs) seem to be receiving a lot of attention due to their strong innovation capabilities and flexibility with market identification and development (Pavlak and Písař, 2020). In China, large-scale enterprises still account for 31.8 per cent of national revenues and 20.6 per cent of jobs (National Bureau of Statistics, 2019). Long-term capital accumulation of large enterprises and their operation system can create many job opportunities and provide attractive salaries and personal development plans for employees (Quain, 2018). The capabilities of smaller businesses are limited by the resources available and often need to spend most of their resources on activities necessary to keep their projects running smoothly. In comparison, large-scale enterprises tend to have sufficient budgets to provide schemes for various professional skills development for employees to ensure the advancement of their knowledge and skills. Besides, the considerable tax payment capacity of large-scale enterprises can provide strong financial support to the local government. This enables large enterprises to establish a strong relationship with the government, which sometimes helps them to enjoy relevant policy benefits and access to resource support more easily (Xie, Zhu and Wang, 2019). Similarly, with government support, the efficiency of their sustainable transformation process is expected to be further improved.

Focusing on economic or environmental sustainability, some researchers have argued

that large companies lack agility. Healy, O'Dwyer and Ledwith (2017) pointed out that the uncertainty of resources makes SMEs more willing to introduce radical innovation strategies and customize customers' needs. Govindarajan et al. (2019) noted that SMEs despite their strong capabilities and resilience, cannot replace large enterprises. That is because large companies have more capital and talent pool to invest in identifiable opportunities, which can help them continue to consolidate their market dominance. When large companies have the ability to continuously invest in their tangible and intangible assets, the agility and innovation of small companies will be difficult to effectively translate into their market competitiveness (Govindarajan et al., 2019). In the face of increasingly strict market regulations, large enterprises are able to afford the relevant certification fees of products or optimize the production process, especially some sustainable policies and standards temporarily issued by the government (Gutterman, 2018). However, small enterprises are limited by the pressure of capital chain and limited information channels, and it is relatively difficult to adjust their production mode flexibly in a limited time. With the implementation of a series of strict policies related to environmental sustainability, a large number of small enterprises that have been in extensive production mode for a long time had to bear huge fines and production shutdown risks because they could not update their production processes within a limited time (Li, 2020). Although this action was too strict in the implementation process and damages the basic rights of enterprises, it also reflects the strong handling ability of large enterprises in the face of emergencies. In addition, based on the country's political environment, local governments may give some extra support to local large enterprises to some extent in the implementation of such policies to ensure the stable growth of tax revenue and economy (Seth, 2021a).

Carrier (1994) noted that the simple and flexible internal structure of SMEs can enable employees' intrapreneurial ideas to be fully considered by managers. However, due to the personality of the leader and the limited resources, the plans of these potential intrapreneurs are easily frustrated or misunderstood in the implementation stage (Lobel, 2017). Moreover, without proper processes and methods to manage those employees with entrepreneurial ideas, some may consider starting their own businesses, which might affect the original market share of their former employers. For large-scale companies, intrapreneurship plans are generally influenced by the company's strategic orientation (Carrier, 1994). Projects that have passed the organization's internal review process can usually be successfully implemented by relying on the company's own powerful resources, which includes project guidance, material support and market basis.

Also, Organisation for Economic Co-operation and Development (OCED, 2018) points out that the innovation capacity of SMEs in OECD countries is at a low level when large-scale enterprises occupy 65% of the share in R&D.

2.1.1 Definition of Large-Scale Enterprise

Based on the differences in community culture, industrial structure and economic status, different countries have adopted different standards in their definition of large-scale Enterprise. The formulation of relevant standards can help governments better supervise and review the operation of their private enterprises, and they can more conveniently implement differentiated tax policies and support plans for enterprises of different sizes (European Commission, n.d.c). Table 1 shows the definition criteria for large scale enterprises for different countries.

Country	Classification Standards (minimum)
China	1000 practitioners and CNY 400 million annual operating revenue (for industrial company)
United Kingdom	250 practitioners or GBP 50 million annual turnover
European Union	250 practitioners / EUR 50 million turnover or EUR 43 million balance sheet total
Japan	300 practitioners or JPY 300 million
India	fixed asset investment INR 500 million and annual turnover INR 2.5 million

Table 2.1 Definition criteria for large scale enterprises in different countries (Sources: CCGP, 2018; Indeed Editorial Team, 2023; European Commission, n.d.c; Statista, 2024; Cyrill, 2023)

As shown in Table 2.1, mixed methods are adopted in the formulation of standards, which combines the number of employees, operation situation and enterprise assets. But in contrast, there are no clear standards in America that define the difference between large enterprises and SMEs. Instead of that, the United States Small Business Administration (SBA) has developed a detailed calculation mechanism for industrial structure and size standards, which can adjust the size standard with some market conditions including inflation (SBA, 2019). According to its published Size Standards methodology, companies that meet the standard calculation method for average annual

revenue size are classified as $5 million, $7 million, $10 million, $14 million, $19 million, $22.5 million, $30 million and $35.5 million in eight scale levels. And some industries that can accurately count the accurate number of employees are divided into six levels: 250, 500, 750, 1000, 1250 and 1500 (McMahon, 2019). Compared with this complex evaluation standard, China has adopted a clear and simple criterion. Also, this country has set different standards for the size of companies in different industries. Based on that classification standards, large scale manufacturing company in China needs to meet both the conditions of having more than 1000 employees and annual output of more than CNY 400 million.

2.1.2 High-Tech Manufacturing Industry in China

The manufacturing industry in general aims to process raw materials or semi-finished products into new products to meet market needs using various processing methods. This can be accomplished by manual manufacturing or machine assistance, which is a product transformation process that changes the original product's chemical, physical or mechanical properties (Levinson, 2018). Through these processes, products can be given more added value. Daily life and industrial production are inevitably dependent on manufacturing products, so the industry plays a crucial role in the economy. Meanwhile, manufacturing could create many employment opportunities for society, and they usually do not require new employees to possess high-level specific knowledge and skills. Thus, compared with other industries, it can provide considerable income support for local communities (Johnson, 2018). Shih (2012) proposed that a strong manufacturing industry base provides a practical guarantee for America's top innovation capability. Similarly, these sustainable innovation capabilities derived from manufacturing are considered to significantly impact a country's economic standing and international influence (Shih, 2012). Based on that, the comprehensive strength of a country is positively correlated with its manufacturing capacity. However, for the participants in the manufacturing industry, their different production modes and technological capabilities require further classification. The high-tech manufacturing industry has similar production processes to the ordinary manufacturing industry, but it seldom relies on cumbersome assembly processes and highly depends on technology research and development and use (Eagle, 2012). With the adoption of automation in high-tech manufacturing, Eagle (2012) forecasts that new production systems will require employees with higher skills when they do not need to rely on human resources

to complete labour-intensive activities. Based on that, some researchers are afraid that the development of the high-tech industry will greatly reduce the demand for low-skilled labour, and the employment structure will be unbalanced, which may negatively impact the social economy (Brynjolfsson and McAfee, 2014). On the contrary, others hold a positive attitude and believe that industrialized countries with traditional labour-intensive industries can obtain considerable development opportunities by relying on high-tech manufacturing (Krzywdzinski, 2017). Krzywdzinski (2017) found that the implementation of technology-led production mode is affected by various factors, including the national vocational education system, employees' attitude towards technological innovation and the perfection of external supporting facilities. Therefore, the realization of high degree of automation in the production process is closely related to these factors. In this context, in the process of high-tech transformation in traditional industrial countries, more high-skilled jobs will increase with the decrease of low-skilled jobs, and the gradually improved external support system can help low-skilled employees meet the needs of new vocational skills. Furthermore, this mutual relationship can avoid the emergence of social contradictions and the imbalance between the supply and demand of jobs in the process of transformation. Meanwhile, the situation of high value-added and high wages could contribute to the sustainable development of the country's overall economy.

This opinion is reflected in the policies and strategies issued by the Chinese government, which plays a global role as a manufacturing power. According to Richter's (2020) data, the country accounted for 28.7% of global manufacturing GDP in 2019. In the case of high proportion, most of this country's manufacturers focus on producing low-end products. For enhancing the country's overall competitiveness in international trade and avoid its passive position, the strategy called China 2025 (MIC2025) has been launched (Cyrill, 2018). By improving manufacturing capacity and technology, China may be able to reduce its technological dependence on other countries and enable its products to obtain higher added value in the international market. Specifically, the government hopes to increase the production capacity of core components and materials of high-tech enterprises through the program, which aims to increase their localization to 70% (Cyrill, 2018). The ultimate goal of the program is to help the country's enterprises gain stronger competitiveness in the international market and avoid the risk of market dominance in technology by other countries. Meanwhile, companies in other industries will have greater access to appropriate technologies and use them to support their own corporate sustainability strategies, benefiting from the program's strong support for

green industries, intelligent manufacturing and digitization (Nadicksbernd, 2020).

As defined by the National Bureau of Statistics (National Bureau of Statistics, 2021), high-tech industries need to have the characteristics of intelligence, innovation, strategy and consume fewer resources. High-tech enterprises in China need to be recognized by science and technology, finance and tax authorities. The criteria take into account the country's manufacturing participants' spending on R&D and the distribution of industry types. As shown in Figure 2.1, the National Bureau of Statistics has developed different high-tech industry classification standards for manufacturing and service industries according to the actual situation (National Bureau of Statistics, 2021).

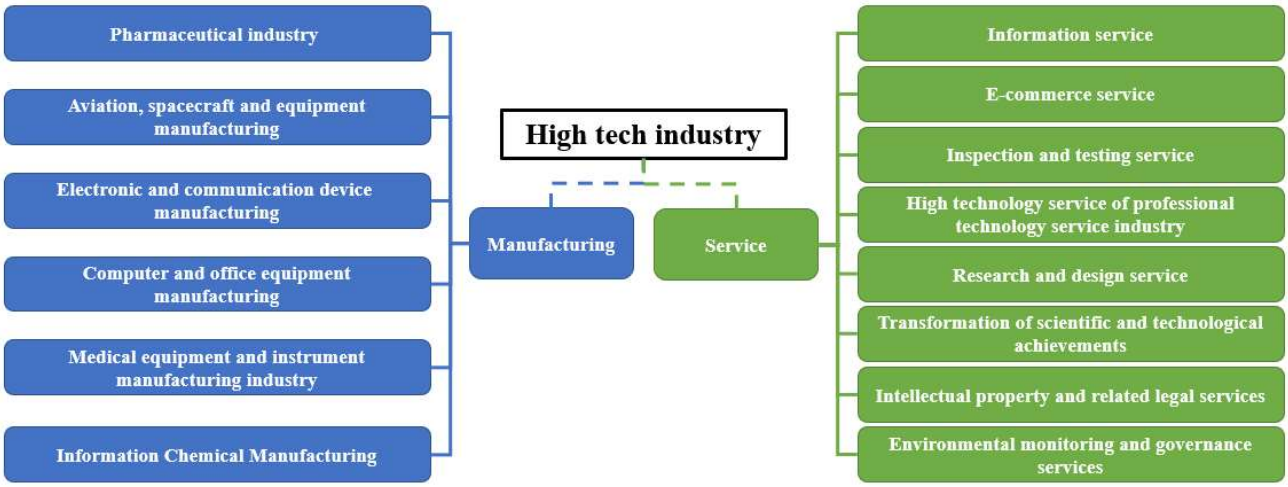

Figure 2.1 Classification standards in large scale high tech industries (Sources: National Bureau of Statistics, 2021)

For high-tech service industries, the services they provide mainly exist in the form of intangible assets. The way these businesses make money normally does not depend on physical products that actually exist. Instead of traditional products, the products provided by these enterprises could exist in digital form, which is also of great significance to economic development like physical products. Chinese Vice Commerce Minister indicates that China has great hopes for the development of the service industry and will focus on supporting the development of these industries in the next 20 years (Tan, 2021). Meanwhile, the birth of the high-tech service industry has changed China's economic structure and people's way of life. For instance, Alipay, a subsidiary of Alibaba Group, provides people with a convenient way of payment and financial management. The emergence of Taobao has changed people's shopping habits and provided entrepreneurs with a reliable transaction platform. Besides, “Ele. Me”,

which is a takeout food mobile application, has brought new development opportunities and created a large number of jobs for the catering industry, with more than 40 million users (Smith, 2021).

The development of high-tech manufacturing in China has played a crucial role in the country's economic growth, and hence, the government has provided a series of policies to support business development. In China, high-tech enterprises with relevant certifications can enjoy the government's preferential corporate income tax rate of 15%, R&D expense deduction and a series of indirect support policies (Eusme centre, 2016). Also, certified enterprises can have the opportunity to be invited by high-tech industrial parks, which can obtain hydropower resources at more favourable prices. To ensure that these policies are targeted to help the right companies, the country has developed a series of strict evaluation criteria (Ministry of Science and Technology, 2020):

- A business must be established for at least a year
- Companies buy and legally own core intellectual property rights involved in the production and use of their products
- Core intellectual property rights belong to the high-tech fields supported by the state
- The proportion of employees in technological innovation-related positions in the total number of employees of the company needs to be higher than 10%
- Large scale companies, who earned more than 200 million RMB in sales in the previous fiscal year, should spend more than 3% of their annual revenues on R&D
- Non-tech products can't contribute more than 40% of a company's total revenue during the same period
- The company must not have records of major safety accidents, quality accidents, and environmental violations within one year prior to the application

In addition, as shown in Table 2.2, the final score of the enterprise submitting the application in the enterprise ability assessment test needs to be higher than 70 points (Ministry of Science and Technology, 2020).

Intellectual property (30 marks)	**The ability to transform scientific and technological achievements (30 marks)**
• Technology advance 0-7 marks • Core technology support for main product(s) 0-8 marks • Intellectual property (patent) number 0-7 marks • Overall access to intellectual property (self-developed 1-6 marks / transfer only and other methods to obtain 1-3 marks)	*The ability of the enterprise to implement the research results in the form of products in the last three years* • More than 5 items 25-30 marks • 4 items 19-24 marks • 3 items 13-18 marks • 2 items 7-12 marks • 1 item 1-6 marks
Research and development organization management level (20 marks)	**Enterprise growth (20marks)**
• Owns an organizational management system for R&D activities and the corresponding capital accounting system 0-6 marks • Owns R&D organisations directly under the enterprise and able to carry out industry-teacher-research collaboration projects 0-6 marks with other organisations • Sets up specific implementation schemes and incentive system of scientific and technological achievement transformation, and has open innovation platforms 0-4 marks • Owns recruitment and training schemes for scientific and technical personnel and the associated performance award system 0-4 marks	Comprehensive evaluation based on the following indicators (the module score is zero if both items are negative): • Net asset growth rate (total assets and total liabilities) • sales revenue increases

Table 2.2 Enterprise capability evaluation table (Sources: Ministry of Science and Technology, 2020)

After the enterprise has passed the high-tech enterprise identification, it needs to report to the relevant government departments every year to ensure that it can still meet the corresponding certification standards and continue to enjoy the policy dividend. However, Liu et al. (2018) still believe that the certification process of high-tech enterprises has some shortcomings.

- Firstly, innovation capability and R&D capability can be similar but different at the same time. Innovation focuses on driving and creating new value, while R&D focuses more on improving on existing technologies (Moldyourown, 2019). Organizations often prefer continuous upgrades to existing technologies to maintain solid market share gains. Innovative products require the support of a large marketing campaign. And the company may face risks such as product quality instability in a long period of time.
- The national follow-up supervision process for high-tech enterprises needs to be further improved to avoid the continuous waste of limited market resources by non-compliant enterprises (Liu et al., 2018). Liu et al. (2018) recognized that some companies might selectively declare false innovation strategies in order to meet policy requirements, and they may falsify their R&D achievements and capital investment status.

In summary, despite of some of the shortcomings, the policy as a whole has provided a huge power source for the upgrading and transformation of China's economy.
Incorporating sustainability into these companies' innovation processes has the potential to help them become more competitive in the future as overall sustainability awareness increases via this strategy. The next section will look at sustainability as a concept.

2.2 Sustainability as a Concept

The United Nations Brundtland Commission defines the concept of sustainability as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs* " (United Nations, 2021). With the development of human production activities, environmental and social problems such as plastic pollution, water depletion and regional income disparities are emerging all over the world. The

proposal of the Millennium Development Goals (MDGs)[1] by United Nations reflects that people have started to pay more attention to social inequities and environmental degradation related issues thus leading to the increased motivation to improve performance (Sachs, 2012). Based on that, sustainable development requires an effective relationship between economic, social and environmental dimensions to achieve an effective balance, which means social equity and environmental sustainability can be well guaranteed while economic development continues.

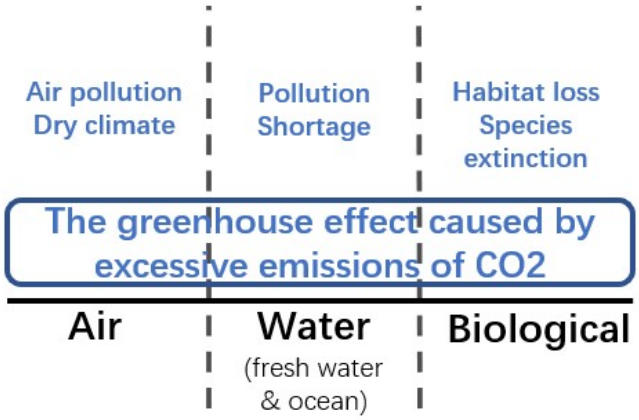

Figure 2.2 Environmental sustainability issues

As this research will be focused on environmental sustainability, it can be seen from Figure 2.2 that various environment-related issues can be identified from the air, water and biological resources (Nowodziński, 2021; IBERDROLA, n.d.). As a greenhouse gas (GHG) that can absorb and radiate heat, excessive emission of carbon dioxide will lead to energy imbalance of the earth and threaten the entire ecosystem (Lindsey, 2020). With the emergence of the greenhouse effect, meteorological disasters such as drought and forest fires, which seriously threaten the living environment of organisms, will appear more and more frequently (Nowodziński, 2021). Inadequate urban strategic planning, waste management, and resource transformation plans also contribute to the emergence of global environmental problems (IBERDROLA, n.d.).

Thus, the importance and priority of addressing sustainability issues are rapidly increasing. Still, it is important to note that their solution is not simply to abandon all the production activities with potentially negative impacts. Wahl (n.d.) suggested that as par the guidelines of sustainability, the existing extensive production modes, which

[1] MDGs aims to Eradicate extreme poverty and hunger, achieve universal primary education, promote gender equality and empower women, reduce child mortality, improve maternal health, combat HIV/AIDS, malaria, and other diseases and ensure environmental sustainability (Sachs, 2012).

would focus more on cost control and production speed, need to be redesigned to achieve the possibility of long-term existence, which needs to be renewable rather than destructive. The concept of sustainability is now recognized as having been applied to industrial design and manufacturing related production areas and linear consumer behaviour related life areas. The former also includes people's investment intention, technology development path, supply chain management and energy development (Youmatter, 2021).

2.2.1 Carbon Neutrality and its Importance

Carbon neutrality is a method that could strike a balance between carbon emissions and carbon absorption (OUPblog, 2006). Since there are currently no artificial solutions that can remove the carbon footprint from the atmosphere on a large scale with significant efficiency, the concept and practice of carbon neutrality can be recognized as the most efficient action to solve that as of now (Society, 2021).

In the fight against global warming, there are two potential approaches:

- The first is to avoid all carbon emissions in production as much as possible. This behaviour is better described by net-zero than carbon neutral (Bernoville, 2021). For example, a company can rely on its solar power system to meet the energy needs of its operations. This approach requires companies to focus on the type of energy they use in their production. In addition to using solar power to run equipment, businesses that rely on heat sources could opt for hydrogen as a clean alternative to traditional coal. Besides, some sustainable-oriented companies like Apple strictly regulate the carbon emissions used by suppliers in the production process when purchasing products, so as to ensure that their products can have sustainable characteristics to the maximum extent (Sunny Optical, 2021).

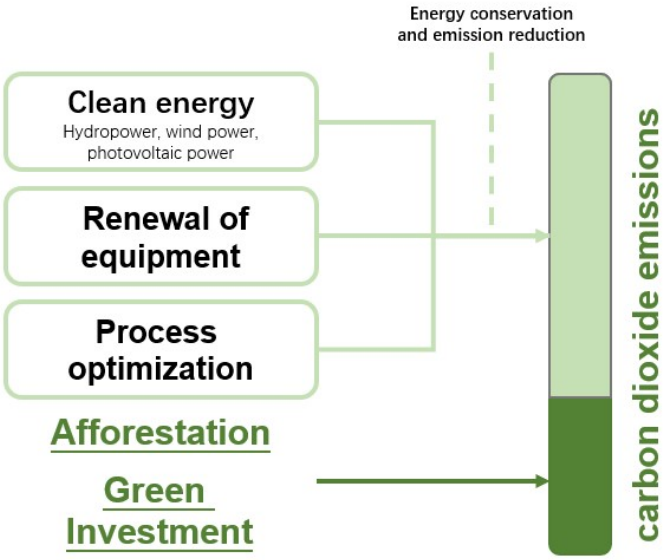

Figure 2.3 Methods of achieving carbon neutrality (Sources: Gao, 2021)

- The other approach as shown in Figure 2.3 is to minimize carbon emissions through a series of production adjustments and equipment upgrades (Gao, 2021). For the carbon footprint that cannot be further reduced, organizations need to purchase or invest in related environmental protection projects or carbon credits (Bernoville, 2021). For example, the Planetly Organization could provide its customers with a range of services related to carbon emissions, which includes a holistic assessment of carbon emissions and a variety of alternative climate investment projects (Buchmann, 2021). By choosing their climate projects, purchaser can achieve a balance between carbon emissions and offsets. Although the Planetly could provide evidence of sustainability related to the project, it does not lead to a corresponding improvement in the actual operation of the purchaser's company. This approach can only help these companies in external publicity and corporate image maintenance benefits. In addition, the trading of corporate carbon credits will be discussed in the following sections.

The process of achieving peak emissions and carbon neutrality will depend on regulations set by governments. Despite the relevant commitments and responsibilities made by governments in the Paris Agreement at COP21 (France Diplomacy, 2020), the actual strategic planning and actions made by them for carbon neutrality are different. The global statistical carbon emissions in 2019 reached 36.44 billion tons (Ritchie and Roser, n.d.). As shown in Figure 2.4, China's carbon emissions for the year 2022 was

the highest globally and accounted for 32.6% of the total emissions (Ritchie and Roser, n.d.).

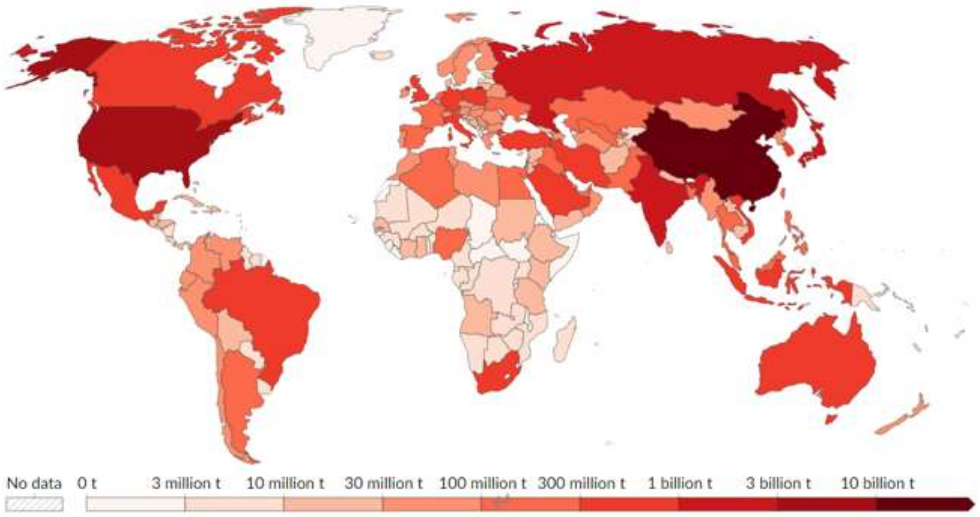

Figure 2.4 2022 global carbon dioxide emissions (Ritchie and Roser, n.d.)

In order to better understand the actions and contributions of countries to carbon neutrality, the following section will review countries with the highest overall emissions to analyse their comprehensive strategies and status quo, including China, the United States and countries in the European Union.

China

As the world's largest energy consumer and carbon emitter, China plays a crucial role in achieving carbon neutrality (Ritchie and Roser, n.d.). According to the Chinese government's plan, this country aims to peak its carbon emissions by 2030 and become fully carbon-neutral within the next three decades (Zhao, 2021). As a manufacturing power, the country's Carbon Emission Accounts & Datasets (CEADs) report shows that the industrial sector accounted for 70% of total carbon emissions in 2019 (Zhang and Chen, 2021). However, based on the extensive production mode in the middle and low end of China's manufacturing industry, its effective utilization rate of energy is only about 30%, which makes the regional environmental carrying capacity face huge challenges (Zhang and Chen, 2021).

To solve the sustainable development of China's economy and achieve the goal of carbon neutrality, the Chinese government emphasized the concept of carbon neutrality and put forward a series of strategic plans. Firstly, the world's largest national Emissions Trading Scheme (ETS) was established in July 2021 (UNESCO, 2021). That is an

economic incentive mechanism for carbon emission reduction (Nogrady, 2021). Based on it, high-energy industries in different regions need to carry out production activities according to the carbon emission quota they have obtained. The first to be included in the carbon market, the power generation sector has been piloted in the year 2021, and 4.1 million tons of carbon dioxide emission allowance were traded among related companies in the first stage (Reuters, 2021). Other industries will be added to the system in the future to establish a complete carbon emission control system. However, the effects of this series of behaviours need to be vertically verified. Many insiders believe that the plan needs to be implemented for a long time before it can achieve significant results (Buckley, 2021; Chen and Lin, 2021).

Take Ningbo city as an example, the municipal government has released specific strategic plans in the path to carbon neutrality. As shown in Table 2.3, they plan to start with seven key areas of industrial low-carbon transformation, low-carbon energy technology development and carbon sink capacity improvement (Ningbo Daily, 2021).

Fields	**Actions**
Energy	Establishing distributed photovoltaic power generation pilot areas in each district and county.
Industry	Building a number of green and low-carbon industrial parks, implement industrial energy-saving strategies and optimize industrial structure in the manufacturing industry, and encourage the landing and development of efficient and low-carbon emerging industries.
Construction	Promoting the spread of prefabricated buildings in industrial buildings to minimize resource and environmental waste during construction.
Transport	Promoting the new energy of public transport vehicles and increase low-carbon road service areas providing charging services.
Agriculture	Building a batch of provincial low-carbon farms.
Areas of living	Low-carbon in hospitals and schools, and incentives to expand the impact of low-carbon behaviour in the home.
Carbon sequestration	Expanding forestry coverage by establishing forestry pilot areas in more counties.

Table 2.3 Realization path of carbon neutralization strategy in Ningbo (Sources: Ningbo Daily, 2021)

United States

United States government set a goal of reducing the level of GHG pollution in the US, which aims to reduce 50% to 52% by 2030 compared with 2005 (Statements and Releases, 2021). According to a report released by the White House (Statements and Releases, 2021), their efforts to address climate change have focused on ways to create jobs in this context, which include expanding power transmission lines, developing new energy vehicles, supporting basic charging facilities and expanding the use of sustainable technologies in buildings. In addition, it is committed to deploying carbon capture technology and nuclear retrofitting to obtain electricity without carbon pollution in terms of power resource manufacturing (Statements and Releases, 2021).

In the industrial sector, compared with the overall carbon emissions of 70% in China, the industrial sector of the United States accounts for 29.6% (C2ES, 2021). Its department of energy announced in July 2021 that it was providing funding opportunities worth $42.3 million to new industry partners, which aims to create more efficient and energy-efficient production environments (Department of Energy, 2021). Meanwhile, it puts forward strategic plans in the manufacturing process, new materials and energy, which respectively include (Department of Energy, 2021):

- Improve energy efficiency and reduce carbon footprint by improving processes and technologies.
- Develop new materials to support the industry's demand for sustainable raw materials and ensure the energy efficiency of products circulating in the market.
- Optimize and improve energy storage and use processes, such as lithium-ion battery manufacturing, which is directly relevant to the electric vehicle industry.

European Union

The 27 member states of the European Union (EU) have reached a consensus on achieving carbon neutrality by 2050 and initiated internal discussions on the implementation plan in July 2021 (Amaro, 2021). The core content of the plan is to enhance the Europe's Emissions Trading Scheme, which is similar to the ETS that China tries to establish (Amaro, 2021). The plan will encourage companies to take the initiative to reduce their total GHG emissions, and through energy conservation measures they can obtain additional profits from excess quotas.

Finland, as one of the EU members states, started the collection of carbon taxes in 1990

(Asen, 2021). After that, other European countries followed suit and formulated different levels of taxation policies for different types of GHG, including carbon dioxide, methane, and nitrous oxide (Asen, 2021). In addition, members of the European Commission proposed the introduction of a carbon border adjustment mechanism to prevent the import of products that do not meet the EU's internal standards (Amaro, 2021).

In the industrial field, the European Union launched the Sustainable Industry Low Carbon (SILC) program from 2011 to 2020 to promote the development of sustainable concepts at the technical level (European Commission, n.d.a). The program was divided into two stages:

- In the first phase, it developed plans that could be implemented in the short term and financed transformation plans for a series of intensive industries, including steel, cement and glass.
- The second phase was known as Horizon 2020, which aims to provide financial support to influential pioneers in energy-intensive industries. And with the support of this program, the public sector is expected to engage in deeper cooperation with companies that have breakthrough technologies related to GHG reduction (European Commission, n.d.a; European Commission, n.d.b). Furthermore, the 9th Framework Programme continued the previous two plans and reserves 100 billion euros of budget (Pavlovic, 2020).

Moreover, due to the heavy financial pressure, Khan (2021) believes that these seemingly positive carbon emission control and sustainability plans may encounter opposition from relatively weak EU countries. For example, some of their members cannot guarantee their public spending on sustainability who may still rely on traditional high-emission enterprises to keep their economies functioning. And Asen (2021) proposed that the government's intervention in the market may trigger trade conflicts with other countries outside the EU, like their plan to impose additional taxes on imported steel, cement and other items (Khan, 2021).

2.3 Sustainable Entrepreneurship

Today, the increasing emergence of different types of businesses is helping to cope with the changing needs of the society. Entrepreneurship no doubt has the potential to influence the sustainable growth of the social economy by guiding people to carry out diversified entrepreneurial activities (Meyer and Jongh, 2018). However, the increase

in entrepreneurial activities is also inevitably harming the environment. Gillpatrick, Blunck and Boğa (2019) for instance, listed a range of possible hazards from commercial activities, including increased depletion of natural resources, human hazards from noise pollution and habitat destruction. Although many entrepreneurs are motivated by profit-oriented objectives, Montabon, Pagell and Wu (2016) noted that an increasing number of them today are trying to reduce or eliminate negative impact on society by adopting sustainable policies and compensation measures which leads to the concept of Sustainable Entrepreneurship.

Sustainable Entrepreneurship is the practice and expression of a kind of entrepreneurial behaviour focused on sustainable development (Dhahri and Omri, 2018; Hummels and Argrou, 2021). Human development is based on natural resources (Diesendorf, 2000), and sustainable development is one of the forms of social development *"that meets the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987). For Diesendorf (2000), sustainable development should be considered from the viewpoint of a responsible economy by taking the political dimension as its core element. Policy formulation needs to combine the opinions of multiple stakeholders, including the government, enterprises, industry experts and trade unions, and their feedback and perspectives can guide the process of change. Without effective policies, people's complex and inconsistent behavioural patterns will bring unpredictable uncertainties to the sustainable development of the society. Venkataraman (1997, p. 120) states *"Entrepreneurship as a scholarly field seeks to understand how opportunities to bring into existence "future" goods and services are discovered, created, and exploited, by whom, and with what consequences".* Over the years, researchers have come up with several definitions of Sustainable Entrepreneurship that explore how this spirit is reflected in the ways companies operate and the ways it can have a positive impact. Table 2.4 shows a chronological list of some of the key definitions on Sustainable Entrepreneurship over the years:

Researcher(s)	**Year**	**Definition**
Crals and Vereeck	2004	"*the continuing commitment by business to behave ethically and contribute to economic development while improving the quality of life of the workforce, their families, local communities, the society and the world at large as well as future generations*" (p.1)
Dean and McMullen	2007	*"the process of discovering, evaluating, and exploiting*

		economic opportunities that are present in market failures" (p.58)
Cohen and Winn	2007	"*how opportunities to bring into existence 'future' goods and services are discovered, created, and exploited, by whom, and with what economic, psychological, social, and environmental consequences*" (p.35)
Hockerts and Wüstenhagen	2009	"*economic opportunities through the generation of market disequilibria that initiate the transformation of a sector towards an environmentally and socially more sustainable state"* (p.482)
Tilley and Young	2009	"*holistically integrates the goals of economic, social and environmental entrepreneurship into an organization that is sustainable in its goal and sustainable in its form of wealth generation*" (p. 88)
Patzelt and Shepherd	2011	"*the discovery, creation, and exploitation of opportunities to create future goods and services that sustain the natural and/or communal environment and provide development gain for others"* (p.142)
Hummels and Argrou	2021	*"the process of discovering, evaluating, and exploiting opportunities, which are economically, environmentally, planetarily, and socially relevant and present themselves in market failures which detract from sustainability in general and the planetary boundaries in particular*" (p.8)

Table 2.4 Different definitions of sustainable entrepreneurship

The above table shows how the definitions of Sustainable Entrepreneurship have evolved over the years. As a derivative concept of entrepreneurship, Shepherd and Patzelt (2011) observed how business projects with sustainable objectives have some emphasis on profit. However, the focus is different from that of pure economic benefit, here it also involves nature conservation, life support and social fields. In some of the earlier definitions, researchers such as Crals and Vereeck (2004) had mainly focused on the benefits Sustainable Entrepreneurship could bring to the society and to individuals while defining the concept. Dean and McMullen (2007) in their definition emphasized how sustainable entrepreneurs need to be able to identify and exploit economic opportunities from market failures. Hockerts and Wüstenhagen, (2009) talked about the

process of evaluating and exploiting opportunities facilitated by a rapid transition of people's lifestyle. This rapid transformation of a society could lead to a potential market imbalance. This includes imbalance between market share and demand and unhealthy consumption patterns, or environment pollution. But potential entrepreneurs will have the ability to identify opportunities from these market failures and imbalances. In this context, Cohen and Winn (2007) noted how Sustainable Entrepreneurship can have a considerable impact on the economic, psychological, social and environmental levels. Sustainable entrepreneurs should therefore design and provide innovative sustainable products and services to the market by evaluating their potential impact on society, environment and people's health. In this context, sustainable innovations are "*aimed at the mass market and providing benefit to the larger part of society…address the unmet demand of a larger group of stakeholders*" (Schaltegger and Wagner, 2011, p.225).

In a recent study, Hummels and Argrou (2021) proposed that the concept of planetary boundaries should be added to the definition of Sustainable Entrepreneurship. These boundaries include the climate change, novel entities, stratospheric ozone depletion, atmospheric aerosol loading, ocean acidification, biochemical flows, freshwater use, land-system change, biosphere integrity, genetic diversity. Instead of simply judging the concept of Sustainable Entrepreneurship from the perspective of products or services provided by a company, these authors emphasized that every link in the process of business activities needs to be comprehensively evaluated so as to confirm whether there is any substantial impact on the planetary boundaries. And business actions promoted by Sustainable Entrepreneurship could facilitate the sustainable transformation of the environment and society reducing the negative economic, psychological, social and environmental impacts caused by certain human activities. But Buetzow (2021) observes that although many organizations might undertake objectives to adopt sustainable values and policies, many might fail to take substantial actions to achieve these. Hence, sustainable entrepreneurs not only have the responsibility to create sustainable goals and objectives, but they also need to take adequate actions to successfully implement these while working towards the sustainable development of their company and the society.

The advent of the digital age has changed people's living habits and social engagement making market demands and trends much more complex than before. For example, with the increasing popularity of social media and social influencers through platforms such as Instagram, the core messages of sustainability have reached out to many consumers thus creating a good level of awareness of this concept (Barua, 2021). With the increase

in the number of green-sensitive consumers and potential consumer demands, the operating strategies of businesses need to be aligned with the objectives of Sustainable Entrepreneurship (Ghosh, Shah and Swami, 2020). By identifying and assessing market failures in nature protection, life support and socio-economic aspects, enterprises can seize the opportunity to provide the market with products and services of truly sustainable value to increase personal economic and non-economic income. Sustainable Entrepreneurship has the potential to address some of the critical issues pertaining to the economic structure of the society, the negative status quo of our environment and mental health and wellbeing of general public.

2.3.1 The Context of Triple Bottom Line (TBL) and Corporate Social Responsibility (CSR)

By identifying and fulfilling environmental and resource gaps in existing markets, Sustainable Entrepreneurship involves businesses that could deliver future products, processes, and services to the society with corresponding personal, environmental, social, and non-economic value (Shepherd and Patzelt, 2011; Pinkse and Groot, 2015). Similar to a traditional business, York and Venkataraman (2010) believe that Sustainable Entrepreneurship needs to comprehensively consider the uncertain risks of market demand, the innovation of products and services, and the allocation of resources for the profit of the enterprise in question. Highlighting the concept of TBL, Terán-Yépez et al., (2020) pointed out that Sustainable Entrepreneurship needs to be considered as an important part of a company's core business. This can help the company to balance environmental, social and economic issues. In addition, although CSR is considered to be able to guide enterprises to focus on social and environmental issues, there is still some debate about the extent to which CSR can influence enterprises' operational strategies. The following sections will discuss the concepts of TBL and CSR in the context of Sustainable Entrepreneurship using the views of different researchers.

Sustainable Entrepreneurship and Triple Bottom Line

TBL is a theoretical model that evaluates the contribution and impact of an action or organization on sustainability through social, economic and environmental accounting (Elkington, 1999; Dalibozhko and Krakovetskaya, 2018). As Figure 2.5 shows, TBL

has three elements that could connect with each other and lead to sustainability.

Figure 2.5 Three elements of TBL (Dalibozhko and Krakovetskaya, 2018)

For economic value, entrepreneurs need to obtain considerable remuneration through business activities to meet their material needs and the enterprise's day-to-day operation. For environmental value, they need to avoid environmental degradation and waste of resources. For social value, the products they provide need to meet the development needs of the society and the construction of psychological civilization (Aghelie, Sorooshian and Azizan, 2016; Terán-Yépez et al., 2020). Based on that, enterprises need to pay attention to their performance of social responsibility and contribution towards environmental protection while evaluating their earning ability (Kenton, 2021b). They need to achieve a stable balance among the three elements (Klapper, Upham and Blundel, 2021). In past studies, many scholars believe that TBL can be identified as an assessment tool to explain the positive impact of Sustainable Entrepreneurship on society (Majid and Koe, 2012). Enterprises can ensure that they meet the requirements of Sustainable Entrepreneurship and identify their shortcomings by properly evaluating the three elements of TBL.

Elkington (2018), who first proposed the TBL concept, argued that this concept requires deeper thinking and should not be viewed just as an accounting tool. However, authors like Buetzow (2021) and Elkington (2018) noted that some who claim to be guided by Sustainable Entrepreneurship tend to use this concept as a marketing tool to promote their values. As a result, companies that aim to bring sustainable products or services with disruptive innovation to society can be classified under Sustainable Entrepreneurship (Hockerts and Wüstenhagen, 2009; Elkington, 2018), but 'bioneers' or 'social bricoleurs' is being used to call those who engage in incremental innovation (Piwowar-Sulej, Krzywonos and Kwil, 2021). But for some existing traditional enterprises with complex operating structures, gradual changes are indispensable when these kinds of processes involve many stakeholders and complex supply chains (Parida et al., 2019).

Furthermore, with the development and concretization of Sustainable Entrepreneurship theory, TBL may have some limitations in the process of interpreting Sustainable Entrepreneurship. Austin, Stevenson and Wei-Skillem (2006) mention the potential influence and importance of political and socio-cultural factors in their analysis of Social Entrepreneurship. Since sustainable entrepreneurs aim to create value by searching for and filling market gaps, it is also necessary for them to consider the preservation of community culture while focusing on the natural environment and life support (Majid and Koe, 2012). Based on that, several researchers have proposed the necessity to add cultural domains as a fourth component to the study of sustainable development (Nurse, 2006; Majid and Koe, 2012).

Sustainable Entrepreneurship and Corporate Social Responsibility

Corporate social responsibility refers to enterprises that can take various forms of feedback behaviours which will have positive impacts on the society in addition to profit maximization (Fernando, 2021). Rey (2011) believes that sustainable behaviours of companies that have been in operation for a long time are more oriented towards rewarding local communities or satisfying stakeholders which goes beyond the traditional profit goals. He believes these behaviours should be identified by CSR rather than Sustainable Entrepreneurship. The positive impact of CSR on the construction of new Environmental, Social and Governance (ESG) frameworks has increased the attention of sustainable projects in society (Rae and Roger, 2020). When analysing topics related to Sustainable Entrepreneurship, many scholars (Terán-Yépez et al., 2020;

Elkington, 2018; Schmidpeter, 2013) discussed how it is connected to CSR. For instance, Fernando (2021) believes that the implementation of CSR can help enterprises to better identify their responsibility and relationship with stakeholders, and its vision is to guide enterprises to correctly recognize the public welfare goals other than profit maximization. Thus, from its definition, it can be seen that it is also a kind of benefit towards the concept of sustainable development for a society. When the main goals of the two concepts are similar, the difference between CSR and Sustainable Entrepreneurship could be easily confused (Terán-Yépez, 2020). Schmidpeter (2013) puts forward the view that Sustainable Entrepreneurship can be seen as a concrete manifestation of CSR under certain circumstances, demonstrating the relevant contribution of corporate behaviour to social issues (Schmidpeter, 2013). Based on that, Sustainable Entrepreneurship focuses on the solution of social and environmental problems and the creation of value, whereas CSR is more suitable when considered as a company's propaganda behaviour of 'reparations' or 'corrections' (Hansen and Schaltegger, 2013; Greco and de Jong, 2017). Meanwhile, CSR is a behaviour mainly proposed by large-scale companies to protect market reputation, and it pays more attention to the realization of compliance and political performance (Last, 2012; Piwowar-Sulej, Krzywonos and Kwil, 2021). Moreover, CSR lacks some basic features of Sustainable Entrepreneurship, which includes providing truly environment friendly products and services for the market and infiltrating the concept of sustainability into the company's internal operation process (Rey, 2011). Therefore, CSR can be regarded as one of the concepts guiding the practice of Sustainable Entrepreneurship (Terán-Yépez et al., 2020).

2.4 Can Lean Manufacturing Methods help Facilitate Sustainability in Large Enterprises?

Due to the complexity of organisational structure, large-scale enterprises need to rely on a variety of management tools to effectively manage their resources and operation modes (Bunney and Dale, 1997). To effectively implement sustainability strategies, organisations with a sustainable vision need to consider incorporating management tools into their operations processes. These tools include corporate social responsibility and environmental management tools, which can be used to analyse the environmental impact of a company's operations, eco-efficiency and product life cycle assessment (Johnson and Schaltegger, 2016). By using these tools correctly, leaders of

organisations or people in different positions can effectively measure and fix sustainability deficiencies (Robèrt et al., 2002). In addition, sustainability-related assessment reports can effectively show the sustainable performance of enterprises within a certain period. Through these evaluation results, the enterprise's brand value, market recognition and financing ability are expected to be further increased. Besides, as a concept that can help enterprises control resource consumption in the process of design, production and delivery, lean theory and related production tools have been considered.

Furthermore, studies related to the practice of management methods in enterprises are mainly concentrated in Japan and western countries. China has a complex and powerful manufacturing system, but its emphasis on environmental sustainability is still in its infancy. There are a few articles analysing the sustainability practices and processes adopted by the country's largest companies. Therefore, the purpose of the following section is to provide theoretical support for the subsequent research on sustainable production and management methods of Chinese enterprises.

The concept of lean aims to continuously reduce waste in the production process and improve productivity with conservation as the core orientation (Dhingra, Kress and Upreti, 2014). Therefore, the application of lean concepts in the manufacturing process can help enterprises reduce unnecessary waste in the product life cycle and eliminate toxic substances that have a potential impact on the health of employees. Martínez-Jurado and Moyano-Fuentes (2014) believe that lean can complement the concept of green by following the principles of waste elimination and source control. Combined with the importance of employee skills and well-being to lean management proposed (Rothenberg, Pil and Maxwell, 2009), it can be identified as closely related to sustainable operation, which could improve the companies' sustainable performance.

Based on some early concepts, including Just-In-Time (JIT), Zero Inventories and Toyota Production System (TPS), Lean Manufacturing (LM) was proposed by MIT researchers and gradually applied to the promotion of industrial efficiency and production performance (Bhamu and Singh Sangwan, 2014). LM can be considered as a way to reduce waste by considering the aspects of quality, cost, delivery, and customer satisfaction, that enterprises need to avoid all meaningless added value in the product itself and production process on the premise of meeting market demand (Hartini and Ciptomulyono, 2015; Hallam and Contreras, 2016). Toyota Motor Corporation's lean manufacturing deployment used the Toyota Production System (TPS) to eliminate unnecessary waste of resources and reduce lead times. Through the introduction of

automated production processes and the development of key performance indicators, they have successfully minimized material waste and controlled emissions of volatile organic compounds (VOCs) (Toyota, n.d.).

However, not all efforts under the guidance of this concept are positively related to environmental performance and pollution reduction. As shown in Figure 2.6, LM mainly focuses on the production efficiency and raw material conversion rate of the enterprise. Thus, its role in promoting the sustainable development of an enterprise is limited.

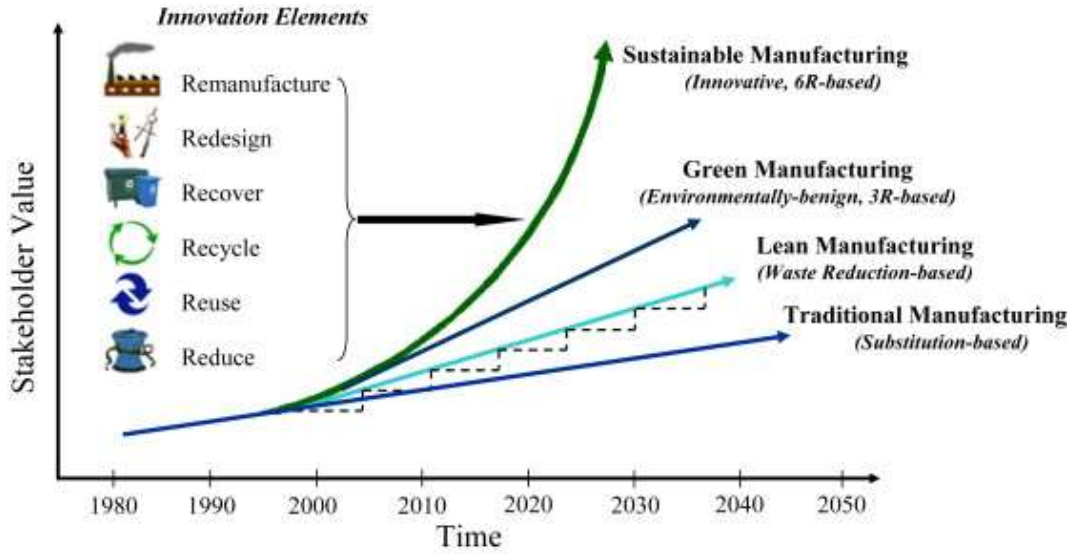

Figure 2.6 Evolution of manufacturing strategies (Faulkner and Badurdeen, 2014)

Hartini and Ciptomulyono (2015) discussed the correlation between lean manufacturing system and sustainable manufacturing. They suggest that combining the two concepts could lead to more efficient use of resources and a sustainable reduction in pollution. In addition, under the background that enterprises pay increasing attention to CSR, green management system, which focuses on pollution control, pollution prevention and product management at the same time, has received great attention (Hallam and Contreras, 2016). However, this management system depends on the investment of environmental protection equipment and the purchase of environmental protection raw materials, and almost all activities depend on capital input. Although some researchers believe that LM will not significantly increase the environmental pressure of enterprises (Yang, Hong and Modi, 2011), Hallam and Contreras (2016) hold the opposite idea that it could increase the pollution emissions in the process of product delivery. Thus, Hallam and Contreras (2016) proposed that sharing

management attributes between LM and green can help in achieving a complementary relationship and form lean-green manufacturing (LGM). By applying this combination of management methods, enterprises can better meet environmental sustainability requirements while controlling the costs associated with it (Inman and Green, 2018). Furthermore, in order to ensure the availability of this management method, Carvalho, Azevedo and Cruz-Machado (2010) proposed a measurement system based on TBL, that enterprises need to comprehensively evaluate the subprojects contained in each area from three aspects. These three aspects include:

- **Economic aspect:** operating costs, environmental costs and inventory costs
- **Environment aspect:** commercial waste, greenhouse gas emissions, brand image
- **Social aspect:** corruption and supplier selection (fairness and sustainability)

However, this measurement system exists as an auxiliary tool when lean and green management theory itself does not contain statistical methods that can identify changes in the process (Sharma, Chandna and Bhardwaj, 2021). Six Sigma Concept as a management approach based on data statistical processes helps enterprises identify and improve business processes (Hayes, 2021). By combining LM, green and 6 Sigma DMAIC, as shown in Figure 2.7, Kaswan and Rathi (2020) proposed a more feasible theoretical framework based on LGM, which is Green Lean Six Sigma (GLS). It is supposed to help companies reduce their carbon footprint and improve the quality of their products in a more environmentally friendly way. Moreover, this theory seems to address the issues associated with lean and green theory, which lacks statistical tools and cannot help improving product performance (Garza-Reyes, 2021; Sharma, Chandna and Bhardwaj, 2021).

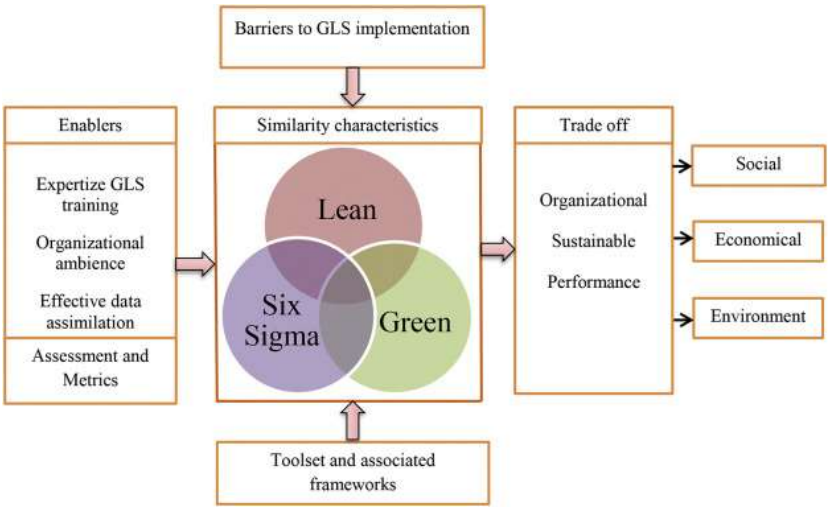

Figure 2.7 Integration model of GLS (Kaswan and Rathi, 2020)

Although Kaswan and Rathi (2020) believe that the model complies with the 3Rs principles, the 6Rs theory seems to be more suitable for this model composed of three management concepts. 3Rs contains reduce, reuse and recycle, which can be used to evaluate and promote the life-cycle of a sustainable product. And based on that, 6Rs was proposed by Jawahir et al. (2006), and the other three elements are recovery, redesign and remanufacture. These three factors focus on the product's market performance after entering the market and the scrap process after use, which can contribute to the formation of a sustainable closed-loop system.

Furthermore, Ball and Lunt (2020) proposed associating lean production system with eco-efficiency to promote the effective flow of resources and realize the maximization of value. Lean production system dominates the supply chain operation, and eco-efficiency can improve the company's financial performance by improving the working environment and product quality. They believe that both theories aim to seek effective flow of resources, and enterprises can maximize value by combining them (Ball and Lunt, 2020). And the study highlights the importance of lean maintenance, which makes maintenance behaviour more proactive. For applying that, the enterprise needs to fully consider its strategy for equipment maintenance and upgrading in its manufacturing process (Aucasime-Gonzales et al., 2020). Meanwhile, the improvement of employees' abilities and the guarantee of their welfare also need to be planned accordingly (Vinodh, Arvind and Somanaathan, 2011). In addition, for equipment maintenance, compared with purchasing new equipment to achieve the sustainable development goals of the enterprise, the successful improvement of existing processes and equipment can simultaneously avoid the waste of capital and resources (Ball and Lunt, 2020).

The Institution of Engineering and Technology (IET, n.d.) proposed that the practice of lean concepts in enterprises requires a process of change. These series of changes include vision creation, early success through pilots, passion for leading and building momentum. And creative destruction is considered by some researchers as an essential attribute of Sustainable Entrepreneurship (Sarpong, 2021), which is similar to disruptive innovation. But through partial adjustments to business processes, organizational structure and operating philosophy, which is a maintenance-driven sustainable behaviour, can also contribute to the development of the social economy.

Although large-scale enterprises have the ability to improve their production processes in a planned way, small and medium-sized enterprises have some difficulties in lean maintenance due to capital and technology limitations (Achanga et al., 2006). For dealing with that, Matsui (2021) proposed a solution that uses digital tools to transform legacy machines to help traditional enterprises realize intelligent production, which is expected to meet the potential demands of the market. And they also could provide consulting services to help optimize the supply chain and production process of related companies by improving the productivity of resources and the added value of products.

In order to implement lean thinking into the operation of enterprises, entrepreneurial lean thinking (ELT) may be helpful to enterprises to break the deadlock of thinking (Schwarz et al., 2021). This method aims to guide enterprises to pay attention to the waste caused by time cost, skills and enthusiasm of personnel in the operation process (Schwarz et al., 2021). Following the principle of customer pull, ELT encourages enterprises to reduce unnecessary services, products or business practices. The realization process mainly includes four aspects: opportunity identification, evaluation, development and utilization. As shown in Figure 2.8, each link includes a closed-loop process, including creating, testing and improving.

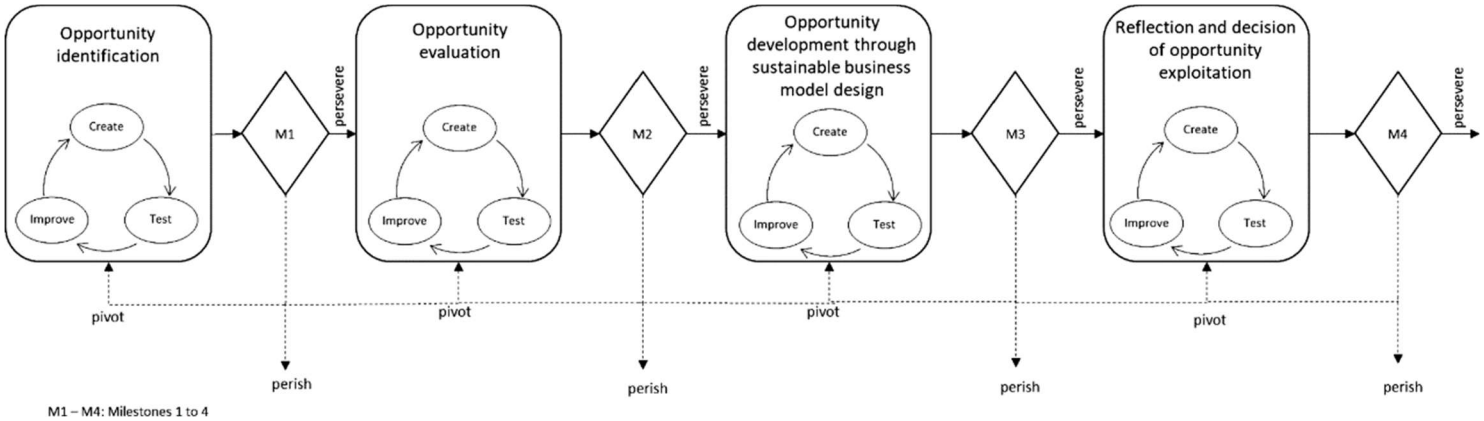

Figure 2.8 Workshop procedure for sustainable business model innovation based on entrepreneurial lean thinking (Schwarz et al., 2021)

Each node will enter the following link when the optimal solution is obtained. The opportunity assessment link needs to use PESTEL[2] (political, economic, social, technological, environmental, legal and ethical) to analyse and evaluate the macro-environmental factors suffered by the enterprise (Hart, 2021). At this stage, the qualitative assessment results can enable potential stakeholders to be more comprehensively identified (Yüksel, 2012). Thus, enterprises can make better use of macro-environmental resources. The third stage is to evaluate the company's existing operations or strategies, and it can be considered to be able to produce relevant guiding significance for LGM. After that, the process of reflection allows participants to review their previous ideas and consolidate the experience gained in this process (Pittaway and Thorpe, 2012). And the final strategic decision needs to be formulated and implemented in the relevant departments.

In order to discuss the sustainable performance of Lean in the actual operation process more intuitively, the next section of this report will discuss and analyse the management tools related to lean. And it will highlight how these tools should be used effectively.

Lean Oriented Sustainability

As shown in Figure 2.9, from the perspective of eliminating waste to achieve sustainability, Vinodh, Arvind and Somanaathan (2011) puts forward a sustainable operation mode with value stream mapping as the core.

[2] PESTEL is a tool that could help marketers analyse the external marketing environment. Compared with SWOT, it pays more attention to uncontrollable external factors. In addition, it can help companies fully understand potential challenges and make correct decisions (Hart, 2021).

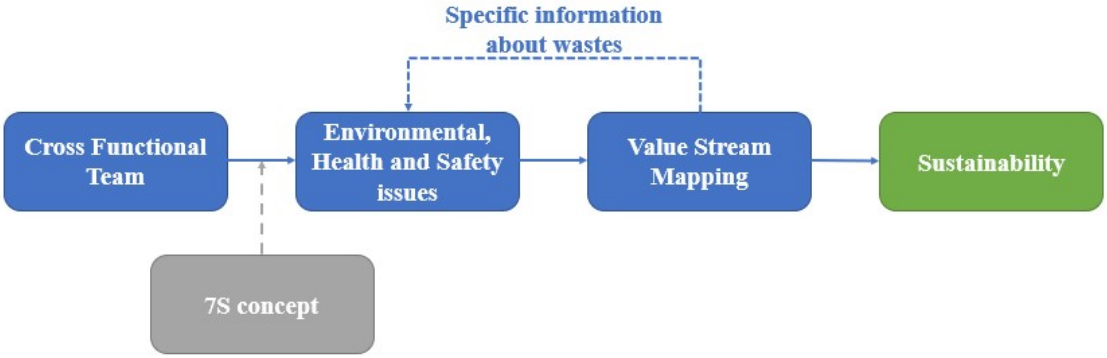

Figure 2.9 Lean and sustainable production process (Sources: Vinodh, Arvind and Somanaathan, 2011)

The implementation of this production process requires a team of professionals with a high degree of sustainability orientation, which can ensure the implementation of executive sustainability strategies (Vinodh, Arvind and Somanaathan, 2011). In order to introduce high-quality production models and achieve business excellence in manufacturing, the management system based on the 5S tool is highly favored by enterprises (Fernández Carrera et al., 2021).

5S[3] concept includes organization, neatness, cleaning, Standardization and discipline (Gapp, Fisher and Kobayashi, 2008). With the increasing importance of the concept of sustainability, the additional concept of 7S, which includes safety and sustainability, has been put forward by researchers. The former is proposed to improve the safety of workers' working environment and provide a higher level of health protection (Jiménez et al., 2019). And the latter is proposed to enhance corporate thinking on social and environmental issues by providing a sustainable perspective (Fernández Carrera et al., 2021). As a result, teams supported by the 7S concept are able to identify unreasonable events during production more effectively. After that, VSM can help people visually identify complex technological processes, and production methods that do not conform to the principle of sustainability can be identified (Seth, Seth and Dhariwal, 2017). Meanwhile, Environmental, Health, and Safety (EHS) problems need to be paid attention to and solved by professionals. These problems pose potential risks to the safety and health of workers, and the potential impact of defects in production processes involving metal processing and chemical reactions on the natural environment needs to be taken seriously (Vinodh, Arvind and Somanaathan, 2011). Therefore, VSM can identify environmental opportunities more comprehensively and deeply through the

[3] The 5S concept is derived from the Japanese words *seiri, seiton, seisō, seiketsu* and *Shitsuke*, which have been replaced in English with the same meaning in this paper.

participation of relevant personnel in EHS problem solving actions. Meanwhile, these identified related challenges can be fed back and added to the EHS problem list for further resolution (Vinodh, Arvind and Somanaathan, 2011). Ultimately, this process can generate significant momentum and performance for a sustainable transformation of the company.

The results of Ball and Lunt's (2020) study validate the positive impact of the way Total Productive Maintenance (TPM) tools are combined with lean production systems on the sustainable performance of actual industrial production. The application of TPM in business aims to maximize production efficiency through the participation of employees and managers in the company's production and maintenance process (Adesta, Prabowo and Agusman, 2018). And Adesta, Prabowo and Agusman (2018) state that this process needs to occur in a maintenance manner to maximize the enterprise's production process continuity. Ireland and Dale (2001, p.183) proposed seven important pillars to ensure the success of TPM implementation, which contains "*Focussed improvements, Autonomous maintenance, planned maintenance, quality maintenance, Education and training, early equipment maintenance, and Safety and the Environment*". However, in the specific implementation process, enterprises need to weigh the important differences of these pillars according to their own situation (Ireland and Dale, 2001). Based on that, some enterprises add another TPM in the Office pillar to let administrative and technical staff participate in the implementation of maintenance principles, which can support the management to realize the potential benefits of these improvements (Ireland and Dale, 2001; Adesta, Prabowo and Agusman, 2018). Lean maintenance is mainly manifested in the process of the overall effectiveness and to promote the efficiency of production equipment, and components in the process of replaceability may be able to update to the old equipment to control the maintenance cost of the late (Aucasime-Gonzales et al., 2020). Ramos et al. (2020) think this way can help organizations to establish a standardized maintenance procedure, improve the product percent of pass and reduce the redundant steps that won't produce additional value. Furthermore, Ball and Lunt (2020) propose that both eco-efficiency and lean are innovative processes, and they are compatible with maintenance operations. By introducing sustainability training in lean organizations and redefining the importance of maintenance in production processes, their business practices can be more consistent with sustainability (Ball and Lunt, 2020).

2.5 Challenges for Large Enterprises aiming for Sustainable Operation and

Practice

Entrepreneurship is a complex process of resource integration (Shane and Venkataraman, 2000). Given that the concept of sustainability is relatively new, many sustainable entrepreneurs might have to explore and promote new business models without any reference point such as relevant business experiences or examples of successful cases. This development process will require individual capabilities, and sustainable entrepreneurs need to fully consider the challenges sustainability poses to their team structure and external stakeholder relationships. The following section will discuss some of the skills that enterprise leaders may need while pursuing their business and sustainability driven objectives.

2.5.1 Personal Skills

An ideal sustainable project and its ultimate success could be affected by different factors. First of all, for entrepreneurs themselves, in order to successfully implement a business plan, they need to have a systematic way of thinking, interdisciplinary learning, interpersonal skill, strategic management and an ability to work under pressure and handle stress (Raudeliūnienė, Tvaronavičienė and Dzemyda, 2014). For sustainable entrepreneurs, Vecchio et al. (2021) proposed that they need to integrate the concept of sustainability into their basic principles. From the literature review, the following three abilities can be summarized as being vital in this context:

- **Thinking skills:** People need to be able to critically analyse potential sustainability challenges in existing markets from a global and long-term perspective based on an interdisciplinary framework (Foucrier and Wiek, 2019; Ploum et al., 2019). One can systematically evaluate market gaps and identify business opportunities which then can be strategically analysed, planned and implemented by those with critical thinking skills (Wiek, Withycombe and Redman, 2011).

- **Execution skills:** Sustainable entrepreneurs need to actively and responsibly identify, execute and implement opportunities in the market that promote social or environmental sustainability (Ploum et al., 2019). And they need to handle the relationship between internal and external

stakeholders in an effective manner, which aims to form a regulatory capacity that can help achieve a balance between sustainable values and business principles (Wiek, Withycombe and Redman, 2011; Ploum et al., 2019).

- **Strategic competencies:** This ability refers to competencies that can be used to solve practical problems at a technical level and involves interpersonal skills of entrepreneurs (Vecchio et al., 2021). Firstly, entrepreneurs need to add the concept of sustainability into the production and sales process of products, and they need to make assessments to predict the possible negative consequences of these business activities (Sumter et al., 2020). Secondly, entrepreneurs need to have a comprehensive ability to propose alternatives to unsustainable business processes (Ploum et al., 2019). Finally, interpersonal skills require entrepreneurs to be able to listen to the opinions of different people before making decisions, and to make rational use of interpersonal networks to analyse future trends in sustainability (Wiek, Withycombe and Redman, 2011; Foucrier and Wiek, 2019).

According to a recent study carried outby the Institution of Engineering and Technology (IET, 2021), that almost half of engineering employers they interviewed had already made sustainability strategies, but nine in ten tend to lack specific skills required in this context. Due to the complexity of large-scale enterprise structures, sustainability-related leadership skills need to be mastered by different levels of management to ensure effective implementation of sustainability concepts across the company.

As a leadership style that can cope with the sustainable transformation of enterprises, sustainable leadership can provide and maintain the direction and commitment of development for enterprises (McCauley, 2011). Through effective leadership, cultural change based on the environmental vision can be reflected in the daily operational processes of the enterprise. And the sustainable relationship between internal and external stakeholders can be further strengthened (Iqbal, Ahmad and Halim, 2020). At the individual level, sustainable leadership consists of three core processes including self-improvement and discipline (Burawat, 2019). Firstly, leaders can focus on and reflect on the effectiveness of other companies' sustainable behaviours and their own decisions in real time. Secondly, leaders have a clear understanding of their

organization's sustainability goals. Thirdly, leaders clearly understand the causes of their own motivation and can effectively implement self-behaviour management. On the other hand, in terms of the management of business activities, Resick et al. (2006) emphasizes the important connection between sustainable leadership and business ethics standards, that this kind of leadership should be able to guide organizations to meet the requirements of sustainable entrepreneurship and achieve sustainability.

Moreover, Burawat (2019) believes that transformational leadership is as important as sustainable leadership for the sustainable development of an organization. Compared with the driving effect of sustainable leadership on enterprise key performance, transformational leader can maintain the common vision of other members in the organization in terms of sustainable development and create supportive division (Burawat, 2019). Meanwhile, these leaders who focus on flexible solutions to sustainability problems and employee creativity (McLaughlin and Kunk-Czaplicki, 2020). As shown in Figure 2.10, both transformational leadership and sustainable entrepreneurship can effectively achieve the performance of sustainability in business. The former can be understood as focusing on the optimization of enterprise processes, which is a progressive innovation process. It tends to make long-term but small-scale improvements in production processes and product performance (Kantabutra and Avery, 2011). For radical innovation under the guidance of sustainable leadership, they prefer to give products and production lines new functions and discard the original production ideas in the process of achieving sustainable goals (Hancké, 2009; Burawat, 2019).

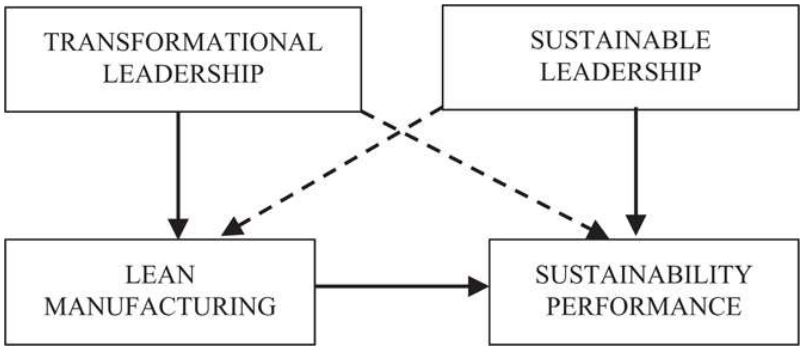

Figure 2.10 The impact of transformational and sustainable leadership on organizational sustainability (Burawat, 2019, p. 1027)

Furthermore, although large-scale companies usually have specialized departments and leaders to manage business activities related to sustainability, the data from Burawat's (2019) survey shows that the lack of skills and engagement of grassroots employees in

sustainability will make it difficult to effectively carry out inter-departmental cooperation within enterprises. The sustainable production plan within the enterprise requires the participation of all employees, which relies on the combination of technology and operation coordination between different departments. However, IET (2021) points out that it is difficult for employers to hire enough employees who have mastered cutting-edge knowledge related to sustainability and have the ability to adapt quickly at present (Found and Harvey, 2007). The lack of these skills and cognitions is believed to be closely related to Higher Education (Kuckertz and Wagner, 2010). However, according to Vecchio et al. (2021), although at present there is a lack of courses related to Sustainable Entrepreneurship in Europe, the initiative of Higher Education Institutions to incorporate the concept of sustainable development into their curricula is expected to improve the situation in the near future. Meanwhile, the Higher Education Funding Council for England (HEFCE) also has proposed a number of strategic plans to encourage Higher Education Institutions to incorporate sustainable development education into their daily curricula (HEFCE, 2009; Lourenço, Jones and Jayawarna, 2013). In China, higher education institutions have been gradually increasing their focus on sustainability education in recent years. However, a study by Wang, Yang and Maresova (2020) found that Chinese universities do not currently have a complete system in place to promote awareness and skills on sustainability. This is not due to a lack of sustainability awareness on the part of university management. In order to change this situation, higher education administrators need to raise student awareness of sustainability courses and provide a wide range of quality education programmes. Also, Wang, Yang and Maresova (2020) argued that education regulators need to introduce policy guidelines to guide higher education organisations to establish a standardised education model. In addition to direct training in sustainability by higher education institutions, collaborative training between companies and these institutions can help alleviate the problem of job vacancies related to sustainability. Fichter and Tiemann (2018) identify external factors, including commercial organisations and research institutions as key factors influencing higher education's contribution to sustainable transformation support systems. Those industry partners can provide relevant technical support, the latest industry trends and financial support to universities. In turn, colleges and universities can more efficiently produce the sustainable talent that companies need.

In addition, compared with school-enterprise cooperation, internal employee education can more directly meet the needs of enterprises for employees' sustainable ability

(Kantabutra and Avery, 2011). As an important part of human resource management, the formulation of employees' personal development plans and the implementation of training plans can strengthen the connection between them and the company (Kantabutra and Avery, 2011). Although the company needs to bear part of the additional resource consumption, these behaviours could further reduce the loss caused by employee demission and improve the company's production efficiency (Avery and Bergsteiner, 2010). And for the company's sustainable strategic planning, adding relevant concepts and skills into staff training modules can effectively improve the implementation efficiency of the company's sustainable strategy (Fichter and Tiemann, 2018). Training can improve the personal ability of employees and help enterprises build a responsible social image with a sustainable employee team.

2.5.2 Sustainable Vision

The sustainable development strategy of enterprises aims to guide enterprises to avoid negative impacts on the ecological environment or society to the greatest extent while meeting the purpose of profit (Dyllick and Hockerts, 2002). But according to Fowler and Hope's (2007) understanding of economic sustainability, it needs to maximise the growth of shareholder wealth through product innovation, cost control and differentiation in the strategic dimension. There are two viewpoints on the sustainable behaviour of enterprises:

- First is that the performance of sustainability in enterprises is based on practical innovation of products and manufacturing processes;
- Second is that the ultimate purpose of sustainability is to improve the competitiveness of enterprises in the market and enhance the market value of enterprises (Fichter and Tiemann, 2018).

The difference between these two opinions lies in the different orientations of the enterprise. Although both can claim to establish a sustainable development vision to stakeholders, the latter pays more attention to the improvement of corporate earnings in practice. Environmental sustainability depends on the financial support of enterprises to achieve the goal, which includes research and development investment, the cost burden of sustainable raw materials and the increase of equipment.

As shown in Figure 2.11, when confronted with the conflict between economic sustainability and environmental sustainability, the management philosophy of senior management will directly affect the company's vision and decision-making (DeChurch

et al., 2010). After the efforts of different organisation members, the company's sustainable performance and image could eventually be reflected (Salvioni and Gennari, 2017). Therefore, if leaders do not fully understand and make the effective commitment to the principle of sustainable development, the improvement of sustainable performance of enterprises may face huge limitations and challenges (Zucchella, 2007).

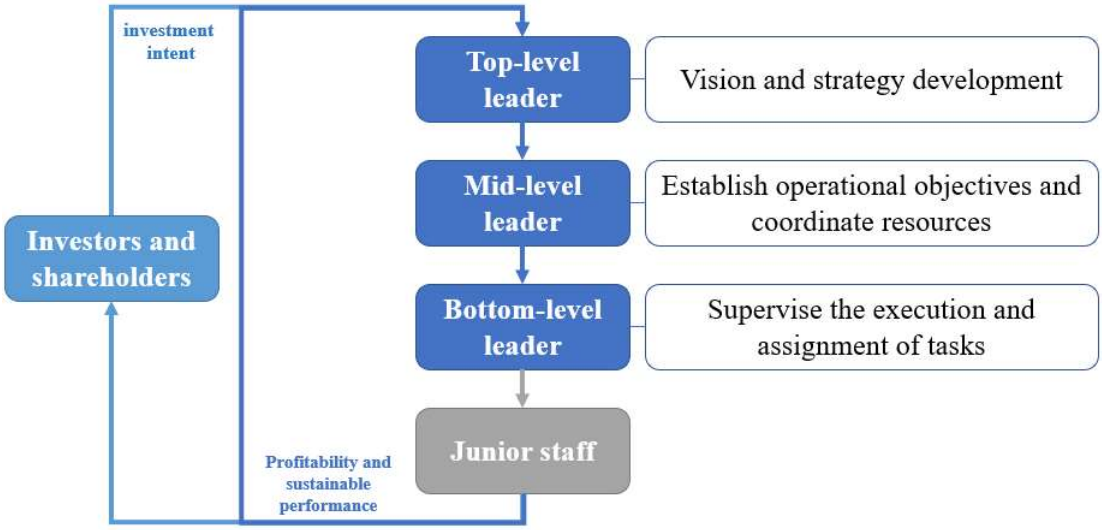

Figure 2.11 Correlation between enterprise structure and sustainable performance

Based on the importance of long-term competitive advantage for enterprises, Salvioni and Gennari (2017) proposed that companies should establish an effective balance between economic interests and social, environmental responsibilities. This balance can help enterprises further establish stable cooperative relations with investors and maintain the loyalty of their shareholders. As the sustainable strategy requires funds and resources, the company's short-term profitability is usually at a disadvantage (Fowler and Hope, 2007). Although investors are generally optimistic about sustainable markets, they still have doubts about the governance, economic performance and market risks of companies adopting sustainable strategies (Tseng et al., 2019). Therefore, enterprises should attach importance to the disclosure of their vision and strategic planning to a certain extent (Salvioni and Gennari, 2017). In this process, relevant organizations need to accurately identify the short-term and long-term financial risks that sustainability may generate and combine non-financial factors such as market opportunities and social value creation. In addition, investors could impact the formulation of business strategy to a certain extent. For example, HSBC Holdings PLC has drawn up and published a series of sustainability commitments under pressure

from investors and non-profit group ShareAction, which include reductions in financial support to the coal industry and net-zero emissions (Marsh, 2021). Based on that, enterprise operators also need to pay sufficient attention to external challenges to avoid declining brand image and losing market share.

In addition, from the company's internal analysis, it is meaningful for top managers to incorporate the concept of sustainability into the construction of organizational culture for the practice of sustainable strategy. Organizational culture can provide effective support for internal employees to construct values and beliefs (Kantabutra and Avery, 2011). And based on the formation of a common vision and values in the organization, employees can show strong loyalty and make extra efforts in the process of sustainable transformation of the enterprise. The construction of a high-quality team of employees can meet the needs of the sustainable skills of the enterprise by ensuring the compliance of business ethics to a higher degree (Weber, 2007). Salvioni and Gennari (2017) believe that employees need to be empowered by the management to formulate and supervise the enterprise's sustainable strategy. In turn, their focus on corporate social responsibility and sustainability will increase. Based on the improvement of the cognition and quality of grass-roots employees, the sustainable leadership ability of leaders can be continuously improved (Ladyshewsky, 2007). Therefore, an organization's investment in its employee community and inclusive management philosophy can help reduce the risk of sustainable business implementation. And the sustainable performance and brand image of an enterprise can be positively influenced by the improvement of employee quality (Fichter and Tiemann, 2018).

2.5.3 External Cooperation and Supplier Selection

In this era of resource integration, the limitations of individual abilities will affect the sustainable development, transformation and upgrading of enterprises. Regardless of whether one is a start-up or a traditional entrepreneur, they need to bear economic pressure and uncertain risks when carrying out Sustainable Entrepreneurship. Uncertain industry norms, inadequate support infrastructure and non-standard pricing mechanisms may pose a non-negligible headwind to the development of its sustainable business (Pacheco, Dean and Payne, 2010; Pinkse and Groot, 2015).

Hofstra (2007) proposes that entrepreneurs may get potential benefits from seeking reliable cooperation opportunities in the supply chain and sharing future business ideas with potential co-operators. This could be useful in facilitating the purpose of

decentralized research and development. The new business model will inevitably bring a certain degree of impact to the old consumption and production models, so taking actions in a cooperative manner to avoid these conflicts to the greatest extent is expected to be the best choice to create a new business environment. At the same time, it also proves the necessity of close communication between entrepreneurs and stakeholders, and more interaction can bring richer social capital to their sustainable businesses which includes higher public acceptance, corporate vision recognition and concerns of the government, and trust among stakeholders (Hoogendoorn, Van der Zwan and Thurik, 2019; Kenton, 2021a).

Through in-depth research and practice on the concept of industrial symbiosis, the resource utilization rate is expected to be further improved (Neves et al., 2019). Under the guidance of this concept, different enterprises can establish better business cooperation with others to achieve the zero-waste target. Meanwhile, this cooperation model among diverse stakeholders to build a circular economy can facilitate the identification of more sustainable entrepreneurial opportunities. However, there are a series of obstacles in the specific development of enterprise symbiosis, which includes the lack of innovation ability, market pressure and demand, and the entrepreneurial orientation of short-term profit rather than long-term sustainable operation (Zhang et al., 2019). Furthermore, Zhang et al. (2019) put forward that the issues of technology platform compatibility among supply chain participants, the commitment of leaders and cluster effect also pose challenges to the business development of sustainable entrepreneurs.

The implementation of sustainable strategy for manufacturing enterprises requires effective cooperation with different stakeholders. As shown in Figure 2.12, enterprises need to make references to the circular business model in the process of realizing sustainable transformation. According to the study of Lahti, Wincent and Parida (2018), this process requires enterprises to consider the four aspects of research and development, production, sales and recycling and identify potential challenges.

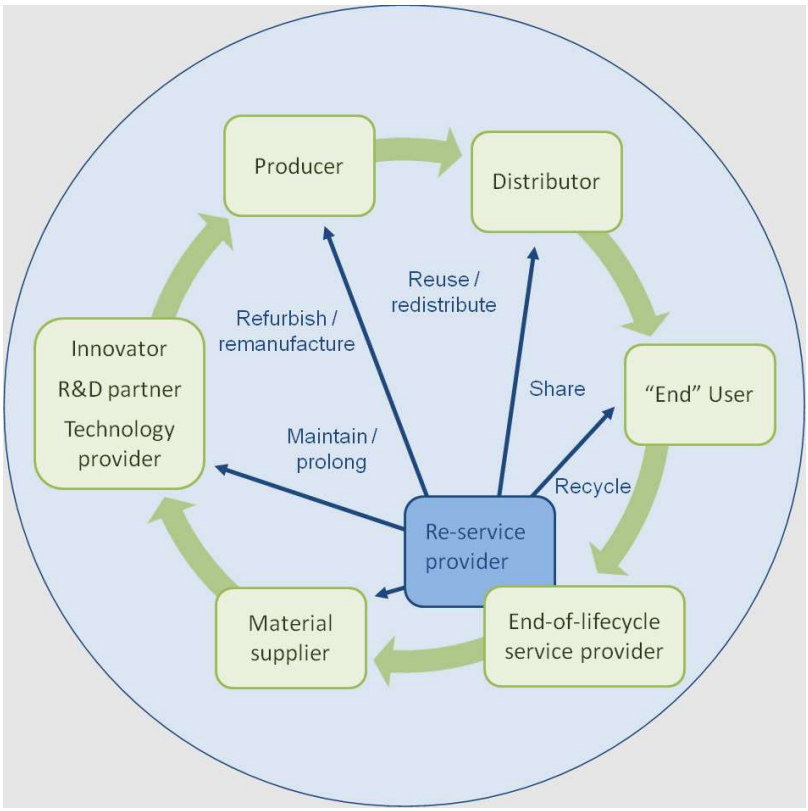

Figure 2.12 Establishment of cycle business model
(Antikainen and Valkokari, 2016, p.7)

First of all, in terms of R&D, manufacturing enterprises need to make the whole life cycle of products more sustainable while maintaining the original functions. It can be reflected in the use of sustainable recyclable materials and modular design, which enables products to have a longer service life (Mitra and Datta, 2014). The limitations of enterprise expertise further enhance the importance of cross-industry cooperation in the process of sustainable transformation (Antikainen and Valkokari, 2016). In terms of complementary innovation, H&M has reached a cooperative consensus with a number of cross-industry enterprises and obtained the technology of using plant products for clothing production. Secondly, sustainable business models require companies to adjust their production processes. Although large-scale enterprises have an advantage in terms of capital requirements for physical investment, manufacturers who can provide stable new production equipment that meets specific requirements are hard to find in the context of immature sustainable markets (Lahti, Wincent and Parida, 2018). Meanwhile, the supply of raw materials is also a challenge for normal production. The particularity of sustainable materials enables suppliers to take the initiative in the negotiation process, that they can frequently adjust the price of raw materials with the change of market

supply and demand (Burawat, 2019). Therefore, it is difficult for enterprises to reach a high degree of cooperation consensus with these kinds of suppliers. Besides, they need to face potential production costs and production shutdown pressure. After that, the sustainable manufacturing industry needs to ensure the service life of its products to the maximum extent, which means that the after-sales service system needs to be further improved (Murthy, Solem and Roren, 2004). In order to avoid the unreasonable allocation of their resources, many manufacturing enterprises should seek external partners in the reverse supply chain to provide after-sale support services for them (Murthy, Solem and Roren, 2004). New products produced by enterprises using sustainable manufacturing logic require third-party partners to invest in updating their maintenance technology simultaneously (Lahti, Wincent and Parida, 2018). Based on the fact that the latter's investment in business capability improvement cannot be reliably guaranteed, Lahti, Wincent and Parida (2018) believe that this could bring challenges to the maintenance of the cooperative relationship between the two. And sustainability-oriented large-scale enterprises have strict evaluation criteria for their suppliers and partners (Basf, n.d.). The cost of certification including sustainability certification is unaffordable for part of SMEs, which will limit the diversified development of sustainable markets (Gutterman, 2018). This situation could also adversely affect large-scale enterprises' own sustainable business development.

Finally, a reverse logistics system needs to dispose of discarded products or parts replaced during maintenance (Du and Evans, 2008). For example, UPS can provide customized supply chain solutions to businesses that need them. It includes the formulation of product transportation plans, transportation cost control and product recovery services. The formation of a sustainable supply chain requires many professional and extensive stakeholders to jointly maintain, which puts the risk tolerance of this system in a low state (Lahti, Wincent and Parida, 2018).

The problems of short-term and profit-oriented operation philosophy are more obvious in the process of sustainable transformation of large enterprises with complex internal structure.

Firstly, Sustainable Entrepreneurship requires enterprises to pay attention to social or environmental issues while making profits (Shepherd and Patzelt, 2011). However, due to the pursuit of profit maximization and concerns about transformation (Pinkse and Groot, 2015; Young and Kim, 2015), shareholders may bring large pressure to the expansion plan of the enterprise. Secondly, senior managers may not necessarily have the full picture of all the details of the company's operations while making key decisions

for the company (Deeb, 2016; Aina and Solikin, 2020). Therefore, relying on the power of employees to achieve Sustainable Entrepreneurship in enterprises could be an effective solution. Some companies like Unilever and Marks & Spencer are trying to encourage and improve the personal engagement of their employees on sustainability issues using such strategies (Polman and Bhattacharya, 2016). By introducing and emphasizing intrapreneurship, potential innovators in the company have the opportunity to combine their creativity with the company's resources. With internal entrepreneurs realizing their value and the advantages of working under the umbrella of an organization, the company can therefore enhance their competitive advantage and facilitate business growth and expansion (Baruah and Ward, 2015). However, Burawat's (2019) findings show that the turnover rate of employees in the process of implementing sustainable strategies is higher than that of traditional models. Due to the low level of education of employees in some regions, the management of the organization may be reluctant to establish effective communication with grassroots employees. Combined with the reality of the high turnover rate of labour-intensive enterprises in concentrated areas (Gómez, Riveros and Sachs, 2021), employees have less risk of re-employment after the resignation and can choose traditional enterprises where they think the salary and benefits are appropriate and do not need to pay attention to sustainability (Burawat, 2019).

2.5.4 Affordability

Regarding consumers' potential consumption intentions for sustainable products or services, some entrepreneurs have found that many consumers prefer traditional products with attractive appearance and stable performance to sustainable and low power consumption products (Bell and Stellingwerf, 2012). As higher costs may be needed to allocate a sustainable production line and operation methods, these costs will be reflected in the final product pricing. Therefore, Oskam (2020) proposes that sustainable entrepreneurs need to rely on reframing value to increase the attractiveness of products or services. This activity includes the launch of themed road show, which can raise participants' awareness of sustainability and encourage them to understand and accept the higher prices for the sustainability of the product. But this series of behaviours need to be based on support from new lateral ties like certifying bodies or consultancy firms (Oskam, 2020), which are social resources that most individual start-ups find it hard to invoke (Bell and Stellingwerf, 2012; Hoogendoorn, Van der Zwan

and Thurik, 2019).

The sustainable production certification of relevant institutions is another challenge and opportunity for obtaining market recognition (Pearson, 2021). In order to prove their effort towards sustainable development and meeting the requirement of environmental performance improvement and compliance obligations, companies need to rely on basic external certifications like ISCC, ISO14001 or EMAS (Crals and Vereeck, 2005; ISO, 2021; BM certification, n.d.). But only 312,580 organizations and 487,950 sites worldwide have obtained the ISO14001 certificate by the end of 2019 (Andrewtmarlow, 2020), with the number of private companies in the UK exceeding 5.9 million (GOV.UK, 2020b). For Crals and Vereeck (2005), most SMEs do not have enough capital and capacity to bear the cost of obtaining these certifications. Therefore, the higher threshold may bring negative factors to the expansion of the concept of sustainable management system in the industry (Crals and Vereeck, 2005).

In addition, the new management system has a significant positive correlation with the operation and development of Sustainable Entrepreneurship (Ramos-González, Rubio-Andrés and Sastre-Castillo, 2017). The effects of classical resource management systems are limited, like ERP (Enterprise Resource Planning) system could only provide efficient resource integration logic and intuitive financial status, company structure and customer relationship (Pohludka, Stverkova and Ślusarczyk, 2018). Environmental protection and employee well-being for the company's sustainable entrepreneurial strategic plan also should be included in the category of management systems, such as moral image and quality management (Crals and Vereeck, 2005; Ramos-González, Rubio-Andrés and Sastre-Castillo, 2017). Compared with traditional industries, sustainable entrepreneurs need to bear higher material and spiritual costs for these complex management systems (Douglas and Fitzsimmons, 2013). Meanwhile, Crals and Vereeck (2005) questioned whether the complex management system in Sustainable Entrepreneurship would cause the unsustainability of overlapping resources.

All of the above business operations related to sustainability need to rely on financial support. After interviewing five sustainable entrepreneurs, Bell and Stellingwerf (2012) found that most of the interviewees suffered from financing risks. They point out that sustainable products are more difficult to value in the marketplace than traditional products. And the expected return on investment (ROIs) are not sufficiently attractive, which leads to the reluctance from investment institutions and banks to invest funds in their projects in operation (Bell and Stellingwerf, 2012). Although the emergence of

crowdfunding platform provides a new way of financing, this behaviour also has many disadvantages. For example, when the raised funds fail to reach the set target, the financiers usually may not be able to obtain any further investment, but they will still need to bear the time and cost of working on their concepts and building their projects in the early stages (Invest Northern Ireland, n.d.). Therefore, the pressure of working capital is something that investors need to evaluate and predict carefully before the project starts.

2.6 Strategies related to ESG Principles

The concept of ESG (Environmental, Social and Governance) has been around for 19 years now since its first proposal in 2004. With the deepening of people's understanding of the concept of sustainability, the importance of ESG principles in the public sector, private sector and related investment institutions is rapidly increasing. The three elements included in ESG are usually used by investors and institutions in the financial industry to assess the extent to which a certain company's business behaviour can meet the requirements of sustainable concepts (Halbritter and Dorfleitner, 2015). The results of these assessments can help them conduct corresponding investment analyses and decision-making. The pressure from the capital side has simultaneously promoted the degree of attention given by related companies in these aspects. At the same time, some public sectors have shown a positive attitude towards the idea of integrating ESG-related information and disclosure measures into related policies. Especially since the principle was put forward, it has been highly valued by the governments and relevant institutions of developed countries in Europe and America, and a series of practices have been carried out. These practices include the establishment of an ESG evaluation system and the formulation of ESG disclosure data standards. Therefore, the role of ESG is also expanding from a financial tool to help investors pursue sustainable capital growth to an important method for companies to assess their own sustainability and achieve sustainable transformation (Le et al., 2021).

2.6.1 What are ESG principles?

The ESG strategy includes the three elements of Environmental, Social and Governance and can be seen as an important benchmark for responsible business practices. And ESG factors are determined as *"environmental, social or governance matters that may*

have a positive or negative impact on the financial performance or solvency of an entity, sovereign or individual" (European Banking Authority, 2021, p.6). As shown in Figure 2.13, the three elements contained in the ESG principles identify a range of issues that need to be considered when a company conducts sustainable operations.

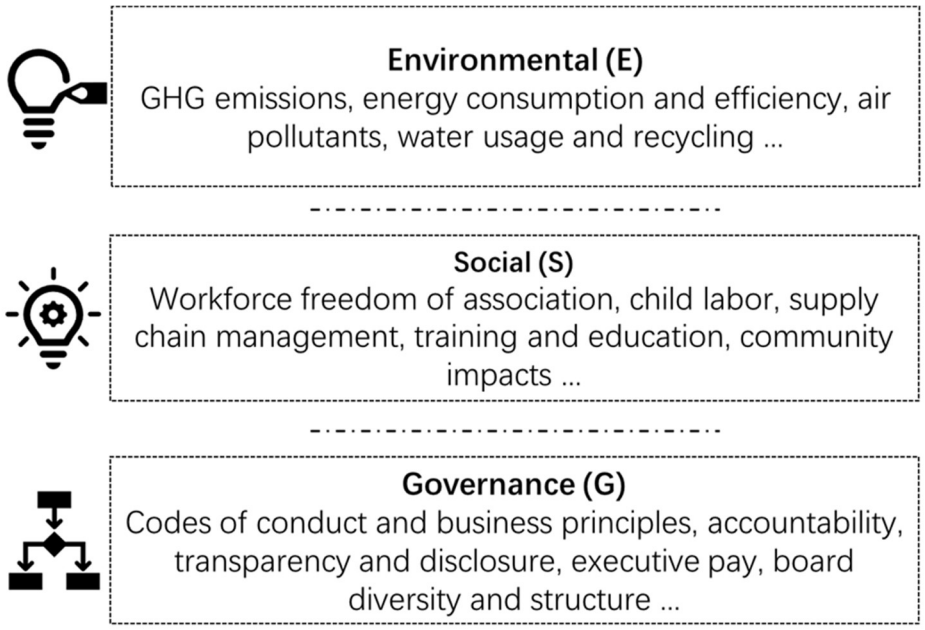

Figure 2.13 ESG principles (Resource from Li et al. (2021))

Guided by the principles of ESG, companies need to devote more energy to thinking about the impact of their business practices on environmental and social sustainability. Nevertheless, this principle is different from Corporate Social Responsibility (CSR), most notably in that ESG emphasises the internal governance aspects of a company (Gillan, Koch and Starks, 2021). In contrast to ESG, the term CSR focuses more on the positive or negative impact that companies bring to society. However, the term ESG has a broader scope and the strategies associated with it will directly impact the company's production and operational activities. Furthermore, developing an ESG strategy efficiently is a complex process, and companies and investors need to consider the interconnectedness of all three elements.

Environment (E) and Governance (G)

There is a strong correlation between the environmental element and the sustainable performance of a business. As a result, academic and business organisations have focused more on the environmental dimension. Li et al., (2021) in his study found existing research that focuses on both environmental and governance dimensions has

used five keywords, include management, governance, green, environment, and environmental performance. The correlation between these two dimensions has also been identified as a key topic of interest in ESG-related research. Companies need to consider their internal governance strategies in depth in order to achieve the desired environmental performance. Increased attention to environmental social responsibility can lead top management to consider their relationships with stakeholders more. When executives' awareness is raised, more governance strategies are expected to be developed to achieve positive environmental performance of the company (Flammer, Hong and Minor, 2019). Flammer, Hong and Minor (2019) also emphasises that organisations should consider incorporating environmental performance indicators into their management pay criteria. This is because the correlation between environmental performance and economic outcomes is not entirely positive. Environmental performance can be dependent on the capital investment of the business organisation, and it can affect the conduct of normal production activities. Therefore, the inclusion of an environmental component in the pay assessment may help company management to be more proactive in promoting environmental governance activities. In addition, the personal characteristics of top management, including the CEO, can also influence the strength of a company's environmental governance, and the Davidson, Dey and Smith's (2019) study found that companies led by non-materialistic CEOs have better environmental governance performance and that this has a positive correlation with their market capitalisation.

Social (S) and Governance (G)

Similar to environmental factors, top-level awareness also needs to sustain the correlation between social responsibility and corporate governance. Companies that focus on social responsibility would like to adopt a relatively conservative financial strategy in order to provide more transparent and high-quality financial information to the outside world (Kim, Park and Wier, 2012). This can also avoid internal self-interest by relevant staff to some extent, including insider trading and corruption.

The strategic decisions of senior management would directly impact the company's future social responsibility performance. The CEO plays an important role in this process. The CEO's personal characteristics and behavioural traits can directly influence the strength of corporate action in terms of social responsibility (Li et al., 2021). Several studies have discussed the psychological relevance of the CEO's personal image on the extent of their perception of social responsibility. Narcissistic

and arrogant personal qualities have different effects on CSR performance. Studies have shown that CEOs with narcissistic traits tend to organise more resources into socially responsible activities and improve their performance accordingly (Petrenko et al., 2014). Conversely, arrogant CEOs focus more on actual business performance and control excessive financial investment in these areas (Tang, Mack and Chen, 2018). In addition, there is a study which focused on the involvement of top managers in social responsibility in Chinese companies and their findings show that managers who have studied abroad are more willing to take on more social responsibility and increase the overall sense of corporate social responsibility (Luo, Chen and Chen, 2020). Such Managers will incorporate relatively advanced social responsibility and corporate governance concepts from abroad into their companies. Legitimacy is also one of the factors that motivate executives to take on more social responsibility. Companies need to take appropriate governance measures to meet the relevant demands of the government and thus build up sufficient credibility to respond to potential external pressures (Li and Lu, 2020). In addition, board satisfaction with executives is influenced by both financial and social performance (Hubbard, Christensen and Graffin, 2017). Furthermore, Hubbard, Christensen and Graffin (2017) also found that when top managers insist on investing more in CSR activities despite the organisation's poor financial performance, they are at serious risk of being removed from their positions.

2.6.2 Impact of ESG on Business

By effectively implementing an ESG strategy, companies that seek to transform themselves sustainably can understand the key performance indicators they have achieved regarding social responsibility. They can then undertake relevant corrective work on potential shortcomings (Fatemi, Glaum and Kaiser, 2018). Meanwhile, great ESG performance is seen by some scholars as having the potential to help companies enhance their values from the financial and non-financial aspects (Fatemi, Glaum and Kaiser, 2018; Zhou, Liu and Luo, 2022). In terms of non-financial performance, the implementation of ESG strategies requires companies to identify and streamline redundant processes in their operation processes, which in turn can lead to a simultaneous reduction in energy demand (Aras and Crowther, 2022). At the same time, implementing these actions could support the generation of innovations in the company, which include both quantity and quality (Tang, 2022). The implementation of ESG strategies can also positively impact the welfare and working conditions of employees

(European Banking Authority, 2021). A good working environment and incentives are positively correlated with employees' sense of belonging (Bhattacharya, Sen and Korschun, 2013). Therefore, this strategy can further ensure employees' productivity and attract more talent to the organisation (Bhattacharya, Sen and Korschun, 2013). As these aspects improve, the company's brand reputation, customer loyalty and overall satisfaction are ensured (Fatemi, Glaum and Kaiser, 2018).

As one of the important components of an ESG strategy, information disclosure can help companies showcase their efforts and achievements in social responsibility to the outside world. In addition to reinforcing investors' interest and confidence in investing (PRI, 2022), ESG disclosure efforts are believed to reduce or prevent adverse effects on a company's market value or reputation due to certain environmental contingencies (Cho and Patten, 2007). In terms of the impact of ESG performance on financial performance, most literature highlight these impacts as being positive. Regarding pollutant reduction, Telle (2006) puts forward that introducing environmental technologies can help companies reduce the capital investment required to deal with waste. On the other hand, companies' control over sustainable risks can help them better focus on and manage the cost of debt and further get benefits from tax incentives (Sharfman and Fernando, 2008). Conversely, one of the main arguments on the negative impact of ESG strategies on companies' financial performance is that companies need to incur additional management costs (Broadstock et al., 2020). Some scholars also argue that environmental or socially responsible activities that go beyond compliance can incur unnecessary costs and reduce company value (Friedman, n.d.; Kim and Lyon, 2015).

2.6.3 ESG Report

The main objective of a company's strategy related to ESG principles is to achieve good sustainable performance and to keep its commercially competitive. As a result, some companies publish regular ESG reports to disclose their non-financial aspects. Effective ESG disclosure can help stakeholders gain a comprehensive understanding of how a business organisation manages ESG-related risks and assesses opportunities (Peterdy, 2023). At the same time, the conduct of ESG disclosure is to some extent mandated by the government and financial institutions, including the stock exchange. As the market regulator, the Hong Kong Exchanges and Clearing Limited (HKEx) introduced ESG reporting guidelines in 2013 and has continued to refine and adjust the mandatory

disclosure obligations for listed companies (Hong Kong Exchanges and Clearing Limited, n.d.). The introduction of the mandatory measures is aimed at urging relevant companies to think about green and climate-related issues, and to help investors understand their investment objects more comprehensively. Furthermore, the main content of the ESG report needs to include its environmental and social responsibility performance. For example, its carbon emissions, energy usage data and the sustainability of its products. In addition, a high-quality ESG disclosure document according to Peterdy (2023) needs to contain the following three elements:

- **Risks** - Business organisations need to accurately identify and plan for challenges that could have a negative impact on their operations, finances or reputation.

- **Opportunities** - Business organisations need to have a comprehensive view of market dynamics in their sector and analyse potential opportunities, including measures to further reduce emissions and business model transitions.

- **Strategies** - Strategic planning by a business organisation's management to address challenges and opportunities, including schedule planning and financial budgeting.

Hong Kong Exchanges and Clearing Limited (n.d.) highlights the importance of relevant information on the board side of the ESG disclosure process. The regulator requires ESG reports to include the board's approach to monitoring ESG issues, its process for assessing and managing material challenges and the way it reviews ESG metrics for affiliated companies (Hong Kong Exchanges and Clearing Limited, n.d.). As a result, the organisation's management structure, including the board and senior management and their strategies also needs to be reflected in the ESG report.

2.7 Research Gaps from Literature Review

From the literature review, it was evident that many researchers have explored the benefits of ESG strategy for enterprises in terms of innovation and economy. However, there are very few in-depth case studies to analyse the attitude of enterprises towards ESG strategy and the series of risks/challenges that could potentially arise in the

implementation process. It is necessary to understand how enterprises can embody the principles of sustainability, sustainable practices within their operation and overall business model. Most of the literature related to sustainable transformation seems to have focused on small businesses with relatively simple business structure and resources. From the literature review, it is clear that ESG strategies can help investors make more reliable investment decisions while guiding companies to assess their sustainability performance and comprehensively make relevant changes. At the same time, governments and regulators are gradually promoting and encouraging companies to make regular ESG reporting disclosures. The identification of risks in the sustainable transformation process will help in building more understanding of sustainability and its benefits among other businesses, entrepreneurs and policy makers.

In China, large enterprises make a very strong contribution to the economy and society by offering a significant number of job opportunities and tax revenue. Chinese manufacturing industry at this stage needs to respond to the government's Made in China 2025 plan and carbon neutrality plan by thinking more deeply about sustainable and efficient operating models. Furthermore, China, with its large trading and production status, is still in the early stages of facilitating ESG strategies and sustainable transformation. Therefore, there is a need to understand the experiences of organizations undergoing such transformation.

Existing studies on the performance of sustainability-related methods and tools in enterprises mostly focus on their types, purposes and performance (Fernandez Carrera et al., 2021). However, only a few studies have analysed how sustainability-related factors affect their organisations from a business perspective. And there are not many research studies that looked at the production and management structures of large organizations to achieve their sustainability goals Therefore, this study aims to address some of these research gaps. The main research question for this study is:

- How do large enterprises implement ESG-related strategies to facilitate the sustainable development of their business operation?

CHAPTER 3
RESEARCH METHODOLOGY

This chapter presents the research objectives for this study and discusses the research design and methodology which was followed. This chapter clarifies the research philosophy adopted in this project and discusses the reasons for selecting a qualitative research approach and the use of a single case study method.

3.1 Research Philosophy

Research philosophy is an important influencing factor in the process of research method design. It shapes how researchers understand the world and approach their investigations and how they formulate their research questions, design their studies, collect, analyze and interpret data, and derive conclusions in their research. It can guide the construction of a framework based on research objectives to help researchers determine how to conduct effective research from the perspectives of reality and the nature of knowledge (Collis and Hussey, 2013).

There are different types of research philosophies: positivism, interpretivism, critical theory, pragmatism, realism, and constructivism. These philosophies guide researchers in conducting studies from various perspectives.

- Positivism focuses on measuring and analyzing objective data, emphasizing principles such as observability, verifiability, and objectivity (Alharahsheh and Pius, 2020). However, it does not delve into the intrinsic motivations and subjective feelings of individuals and organizations.
- Interpretivism advocates for knowledge and explanation through subjective understandings of social problems and phenomena (Alharahsheh and Pius, 2020). This paradigm is more applicable to exploring the connection between the real world and human subjective feelings rather than the implementation of strategic methods within organizations.
- Critical theory focuses on social change and power relations, aiming to understand how power operates within organizations and causes social change (Cruickshank, 2015). This approach requires summarizing and analyzing participants' views and experiences at different levels, which may not align with the research focus of critical theory.
- Pragmatism allows flexibility in using multiple research methods to determine

the practical applications and effects of research results (Rorty, Putnam, Conant, and Helfrich, 2009). It can analyze what actions an organization can take to achieve the best outcomes, though it may overlook the correlation between participants' subjective experiences and the course of action implementation.

- Realism is concerned with the connection between theory and reality. Research guided by this paradigm can use qualitative methods to explain the root causes and mechanisms behind certain phenomena. However, this study aims to explore the diverse experiences of different participants in the process of strategy implementation, without needing to delve into theoretical assumptions or universal laws.
- Constructivism emphasizes the understanding that knowledge is constructed through social processes and interactions, making it useful for exploring how participants interpret and make sense of their experiences. This philosophy focuses on understanding how individuals and groups create, interpret, and give meaning to their experiences and the world around them.

Thus, constructivism is more suitable for this study than other philosophical paradigms. This study includes a summary and analysis of the perspectives and experiences of an organization at multiple levels, including organizational management, strategy implementation and challenge avoidance and the perspectives of some of the employees working in this organization. Using qualitative research helps in exploring a research phenomenon more comprehensively. Constructivism's approach allows us to gain insight as to why phenomena occur and what factors influence them. The organizational structure, personnel allocation mode, cognition of organizational participants, corporate culture and the formulation of corporate strategy all have a certain degree of abstraction, which will directly impact the performance of enterprises in relevant aspects. These are things that researchers can't directly perceive and record. This study aims to understand and explain firms' participation in sustainable strategies by examining existing or implemented mechanisms and phenomena. Using a constructivist philosophy, this study focuses on those actions that could produce practical value and the experience to get achievement effectively. This study focuses on the organisational-level actions and management paradigm changes that a company undergoes in the pursuit of sustainability. The results from this study can help shed more light on how to drive and promote the sustainable performance of a business organisation.

3.2 Research Design

Research design is the process of structuring research in a way that helps to ensure the validity of research results. McCombes (2021) points out that well-planned research design can ensure that the research method corresponds to the research objectives, and the collected data can produce the desired results after correct analysis. Depending on the researcher's research objectives, an effective research design can help relate research questions to real-world situations. As the overall framework of the research plan, researchers need to consider and determine the following aspects in the research design: research objectives, research types, sample selection, ethical considerations, data collection, and data analysis (Yin, 2018).

3.2.1 Selection of Qualitative Approach

In order to answer the main research question which is “how do large enterprises implement ESG-related strategies to facilitate the sustainable development of their business operation”, the study design needs to select the appropriate data collection and analysis method from a number of different ways.

A qualitative method can guide a research project in understanding the subjective experiences and beliefs of the interviewees. It can be used to gain insight into the differences between how different individuals experience the world, feelings and perspectives (Bhandari, 2023).

Qualitative research is designed to be flexible and inductive. As the study progresses, research using this methodology enables opportunities to discuss and validate emerging ideas and issues as they arise in the process. Large organisations have complex organisational structures and resource frameworks within them, and these kins of information are not clear before the research begins. The research questions will need to be adapted and deepened as the researcher gained a better understanding of the target situation. Interviewees have different job responsibilities and individual competence differences, and their understanding of the research questions may vary. In contrast to quantitative methods, qualitative methods allow the researcher the flexibility to adjust the research strategy. The questioning style and question structure can be adjusted, taking into account the actual feedback and attitudes of the interviewees during the participation process (Bell, Bryman and Harley, 2019). Furthermore, the semi-structured interview format allows for the interview to be conducted in an informal

manner, with participants being given greater freedom to express their insights and attitudes towards the issues. Research needs to retain and analyse the meaning inherent in this rich data. This method of data collection requires the researcher to establish a thematic framework prior to conducting the data collection and a series of questions need to be developed in a logical manner (George, 2022). It helps the interviewer to collect reliable responses, and these open-ended questions can introduce richer data into the study. It is also difficult for the researcher to understand how the company really operates and the working patterns of the staff before conducting the case study. Therefore, the researcher may not be able to fully anticipate the ideas or opinions that the interviewees may bring up before the interview. During the interviews, the researcher can expect to uncover new viewpoints by exploring some of the points raised by the participants and prompting further discussion. At the same time, this method can improve the communication efficiency of the interview and encourage participants to give more subjective responses (George, 2022).

3.2.2 Selection of Single Case Study

Case studies are a method that can be applied in business research and provide a comprehensive analysis of behaviour and its consequences (Bell, Bryman and Harley, 2019). Yin (2018) suggests that case studies can describe the process of a phenomenon in a descriptive manner and evaluate it. Although ESG principles are not a new concept, the extent to which they have been incorporated into business practices is limited for now. Particularly in China and other developing countries, few companies have applied ESG principles to their organisational operations. Also, the market for this has not yet matured, which creates a great deal of uncertainty and challenges for organisations to move forward with sustainability initiatives. As a result, with the exception of a few start-ups promoting sustainable products and services, it is still predominantly large companies that have the capacity and willingness to embrace sustainability strategies fully. Some sustainability-conscious SMEs are more likely to consider implementing sustainability strategies at some key points in their operations due to risk-taking considerations. Therefore, in order to gain insight into the approach of business organisations in promoting ESG strategies, this study has selected a large-scale company that has achieved significant performance in the early stages of ESG strategy rollout. The experiences of the company and the employees working for it could provide a rich and comprehensive research for this study. In addition, given the complexity of

the structure of large enterprises and the varying degrees of ESG strategy implementation, this study is a single case study of a large enterprise rather than a multiple case study.

A single case study allows for an in-depth investigation of a specific instance, providing a detailed understanding of the subject matter. When dealing with unique or complex issues, such as corporate strategy implementation, a single case study can capture the intricacies and nuances specific to that case (Willis, 2014). This is particularly useful when the case involves distinctive elements like ESG strategy implementation, corporate culture and operational processes. Using a single case study will give the researcher an opportunity to explore how local policies, market demands, and other contextual factors influence the implementation of corporate ESG strategies. By focusing on one case, the researcher can gather detailed examples and insights that can serve as valuable references for other organizations. These detailed findings could potentially offer practical guidelines and strategies that others can adapt to their specific contexts. While multi-case studies aim for broader applicability, they can sometimes miss the unique aspects of each case. A single case study maintains the focus on the unique characteristics of the subject. The degree of ESG strategy implementation in Chinese companies varies widely, and sustainability standards and requirements differ across industries. To study multiple cases will require longer time-period. Hence, for a master's level project with limited time scope, a single case study was deemed more feasible.

Using a single case study can help collect comprehensive and detailed data and form an in-depth understanding of the enterprise. These aspects can cover a variety of factors and experiences that may have an impact on the research objectives, including internal decision-making, external influences and organizational culture.

Validating and confirming the quality of the findings is one of the important aspects of case study research. Yin (2018) suggests that the construct validity of the research needs to be adequately validated to ensure the reliability of the findings of a single case study. Researchers need to ensure that they have collected enough data, conducted in-depth analyses and achieved the desired research objectives. Rigorous research needs to be able to allow the reader to clearly understand how the authors formulated their research questions and reached their final conclusions (Yin, 2018). This case study draws on evidence from a variety of sources in selecting cases and conducting the analysis. In confirming that the target company has a desirable ESG performance, the study incorporates reports from a number of rating agencies and regulators, including MSCI,

to confirm that they can meet the requirements of this study. In addition, the data collected during the research was also evaluated for effectiveness in combination with relevant reports of the company and replies from other participants.

In addition, construct validity can be addressed more effectively through peer and expert review of case studies (Yin, 2018). This process allows for effective feedback and helps authors to better improve the accuracy of their case studies. For this research project, the researcher published parts of this case study in two conferences related to sustainability. The research paper "Sustainable Transformation of a Large Scale Chinese High-tech Manufacturing Enterprise" was presented at the 2nd International Istanbul Economics Research Conference in Turkey (25th November 2022). The second paper "The challenges in the process of Sustainable Transformation of a Large-Scale High-tech Manufacturing Enterprise was presented at the International Conference on Sustainability, Environment, and Social Transition in Economics and Finance (SESTEF)" in France (13-15 December 2022). These two papers were peer-reviewed and the researcher received constructive feedback from conference delegates which helped improve the overall structure of the study and the findings. The feedback from the experts on sustainability from these conferences helped in further addressing the construct validity of this case study.

3.2.3 Unit of Analysis and Observations

Units of analysis and units of observation are important concepts that need to be recognised for both quantitative and qualitative research. The setting of the research questions and objectives will to some extent influence the setting of the unit of analysis. Sheppard (2020) suggests that the unit of analysis is an entity that can be used to talk about and analyse at the end of the project. On the other hand, it can also be considered as the main focus of the research project. Generally common units of analysis contain individuals, groups and organisational structures (Yin, 2018). Abstract concepts that do not have a physical form are also able to be set as units of analysis, such as social phenomena, policies and principles. As a single case study, the aim of this research is to analyse the process of decision making and implementation of relevant strategies in a large company. So, at the end of the study, the results need to show the efforts they have made and the results they have obtained at the organisational level. Therefore, the unit of analysis for this study can be identified as the organisational level.

An observational unit is an item or items that can be observed or measured in order to collect actual data (Sheppard, 2020). The unit of observation needs to depend on the data collection process used to meet the objectives of the study. The study needs to obtain enough information from people within the organisation to confirm the efforts made by the organisation in certain areas. Their attitudes towards certain specific strategies need to be understood. At the same time, as participants and implementers of decisions, individual differences among different participants have different relevance to the phenomenon in question. The objectives of the survey could include identifying the extent to which the motivations, approaches and challenges of strategy implementation have an impact on the implementation of ESG-related sustainability strategies in companies. Therefore, this study needs to investigate and analyse the perspectives of managers at different levels from different departments within the firm. Data obtained through interviews will inevitably be influenced by subjective factors, and objectively available data and information need to be used as an additional unit of observation to complement the credibility of the results. Annual reports published by companies and third-party evaluation reports can be used as additional evidence to supplement and compare interview data. Researchers can also rely on these data to develop better interview strategies. Therefore, the units of observation for this study are identified as managers and reporting documents. To triangulate the research data, the researcher utilized a combination of primary and secondary data to build a comprehensive case study. This is discussed later in this chapter.

3.3 Case Selection

According to the research objectives, this case study focuses on China's large-scale manufacturing company's sustainability strategy and related performance. For this project, the researcher wanted to focus on a company that met the following criteria:

- a manufacturing company registered in mainland China with more than 1,000 employees or CNY 400 million annual operating revenue[4]
- a company that has a specific department responsible for the promotion and implementation of its ESG strategy and has published annual ESG reports for at least two consecutive years

[4] According to the criteria mentioned in Table 2.1, this selected company meets the requirements for the designation of a large enterprise in China.

- there are documents or reports that demonstrate that the company's sustainable performance has improved to some extent after the deployment of ESG strategies

Based on these selection criteria, one of the companies that met these requirements was Sunny Optical Technology (Group) Company Limited based in Yuyao city in China. This company established in the year 1948 primarily deals with optical lens products and associated accessories, such as mobile phone lenses and car cameras. The organisation has a large production and management system and their ESG coverage and associated corporate governance philosophy reflects their pursuit of sustainable transformation. Therefore, the data from this case can be expected to explain the methods and processes of implementing a sustainable strategy in a large organisation. The ways in which cross-functional cooperation between different people unfolds can be analysed. Although the company has not yet reached its ultimate strategic goals, they have been working on these aspects for some time. These efforts are reflected in their reports. The managers of the organisation in this context had better experience of engagement and more opportunities for engagement than other large organisations that already had mature systems and excellent performance. They were able to provide direct and authentic subjective insights.

According to the company's annual report in 2020, it has 23,961 employees in mainland China, and the annual revenue of primary products is CNY 38001.8 million (GBP 4418 million) (Sunny Optical, 2021). At the same time, the company's ESG report shows that it has a perfect ESG management structure to promote and implement the company's sustainable strategy, which is selected as a constituent of the Hang Seng ESG 50 Index. The company's ESG rating has steadily improved each year since it officially joined the MSCI ratings four years ago. These year-on-year improvements reflect the effective improvement in the company's ESG disclosure and organisational management. Although they are still in the early stages of applying ESG strategy, their experience and business transformation model is worth exploring. Also, they have rich experience in international cooperation, that many companies from European and American countries have put forward strict requirements on their production standards in terms of sustainability. Therefore, this complex Chinese enterprise will be studied as a single case in this research. Given its successful record of sustainability in its operation and complex internal structure, this organization will make a suitable case study for in-depth investigation and research.

3.4 Ethical Consideration

The researcher followed the ethical protocols recommended by the University. The following are the key elements in the ethical considerations for this research:

- **Ethics approval:** After determining the specific research framework and methodology with the project supervisor, an ethics approval application with the interview details was submitted to the University Ethics committee. The committee reviewed and approved the ethics application within two weeks.
- **Consent form and data protection:** A senior manager from Sunny Group reviewed the general framework of the study and the interview process. Following several informal exchanges with this manager, the study was adapted to address some of these issues highlighted by the management team from Sunny Group without compromising the study's overall research objectives. Those interviewers who formally participated in this study were asked to read and sign an interview consent form. Based on this interview consent form, the participants will be anonymised in the data reporting. Also, in order to avoid any potential issues or conflicts for these working managers, the specific job titles of all participants will also remain anonymous in this study. Furthermore, at any time during the interview process, the interviewees had the right to terminate the interview and ask to withdraw. They were also given the right to request the deletion of the interview transcripts after the interview, if necessary.
- **Data protection:** Moreover, the disclosure of raw interview data may pose a number of risks to the company and to this study. All data for this study is therefore stored as encrypted files on the researcher's laptop device and hard drive. These devices are also subscribed to McAfee's professional protection service. Access to the data by anyone other than the researcher and his supervisors is subject to approval.

3.5 Data Collection

On-site observation in research studies is usually a useful step for data collection and to understand the operational processes and modus operandi of a company. However, due to several restrictions including the confidential nature of some of the business elements and COVID-19, this was not the case for this research study. In order to obtain

the most direct and accurate data, semi-structured interviews and documentation were used for data collection in this study.

Interview Design

A semi-structured interview approach was adopted for this research. Doyle (2022) proposed that the semi-structured interview is a way of not strictly using the list of questions for interviewing, during which the researchers can extend discussions with the interviewees according to the actual situation.

This approach can help the researcher explore the diversity of issues companies may encounter in implementing ESG strategies. Structured interviews allow for the collection of comparable data, but their lack of flexibility is a drawback (Orvaschel, 2006). This method does not permit the researcher to adapt to new information and issues that arise during the interview process.

The research participants in this study include employees from different levels and functions, necessitating the collection of varied perspectives and experiences. While quantitative research using structured questionnaires can collect a large amount of standardized, comparable data (Cleave, 2023), this method is not suited for obtaining nuanced data such as individual motivations, experiences, and perspectives. Structured questionnaires are valuable for gathering evidence and drawing conclusions but fall short in capturing the variability required for this study.

Focus groups can collect qualitative data and diverse viewpoints, but they may not always reveal deeper individual perspectives. Additionally, hierarchical relationships among participants might influence the views expressed, limiting the method's effectiveness.

The observational method allows researchers to observe and analyze firm behaviour over an extended period. This method provides more informative data, free from subjective cognitive biases, and is suitable for understanding the link between corporate strategies and outcomes. However, it does not provide insights into the motivations and purposes behind the strategies and requires more time than other methods.

Therefore, semi-structured interviews are more suitable for this study as they allow for the collection of rich qualitative data and a comprehensive understanding of why organizations make specific decisions in particular contexts. This method is also compatible with the constructivist research paradigm.

In conjunction with the literature review, several questions that needed to be analyzed were identified. Li et al. (2021) provided a theoretical perspective on the three elements

encompassed by ESG principles. Researchers have studied ESG in terms of how it can enhance organizational value in both financial and non-financial terms (Fatemi, Glaum, and Kaiser, 2018; Zhou, Liu, and Luo, 2022). Conversely, some studies argue that corporate activities beyond compliance result in unnecessary costs (Friedman, n.d.; Kim and Lyon, 2015).

Existing research discusses the positive and negative impacts of ESG strategies or other sustainability concepts on businesses, but few studies focus on the considerations and methods used by businesses in developing an ESG strategy. Therefore, this study aims to fill gaps in existing theoretical research by understanding the experiences of different levels within the case organization during strategy development and implementation.

Some of the questions in the interview guide focused on the following:

- Why do companies pursue ESG strategies?
- Based on the ESG strategy, how does a company's interdepartmental alignment work?
- What are the key challenges in the process of sustainable transformation of a large enterprise?
- How can companies implement ESG strategies effectively?

The researcher's logic in designing the interview questions was to first understand the content of the participants' daily work and their associated knowledge and skills in ESG-related areas. Some of the questions as part of the interviews explored the company's initiatives for sustainable transformation in the early stages and the progress they have made so far. Some of the interview questions had to be adapted based on the circumstances and perspectives provided by the participants. The full list of all the interview questions is in Appendix 1.

Identifying research participants in large organizations is more challenging than in smaller ones due to the complexity of departments and the different levels of employees. This study conducted a comparative analysis of random sampling, stratified sampling, and snowball sampling to determine the most suitable method.

Random sampling enhances data authenticity. However, in large enterprises, obtaining a complete list of employees is difficult, and there's no guarantee that those selected will voluntarily cooperate in the research study. Moreover, not all employees are involved in the ESG strategy, so random sampling might not ensure that participants have relevant work experience.

Stratified sampling requires researchers to have detailed information about the company's organizational structure and employee distribution, which involves significant design and implementation costs.

Therefore, snowball sampling is more suitable for guiding sample selection in this study. This method involves initially selecting and interviewing a few participants. Based on their responses, researchers then ask these participants to recommend others who can provide relevant data (Simkus, 2023).

In the early stages of this project, the researcher presented the research intention and purpose of the study to a senior executive working in Sunny Group. Using a snowballing technique, more contacts were established with other participants in this company. The participants identified using this method are employees who play significant roles or have extensive experience in implementing ESG strategies. This ensures better quality and relevance of the data. Additionally, as the research progresses, this method can help researchers identify new research questions and potential interviewees. Based on some of the information provided by the participants, the main departments responsible for the promotion of the ESG strategy are the Investor Relations Department, the Administration Office and the Supply Chain Management Department. They also have a close working relationship with the HR department. Therefore, as shown in Table 3.1, five managers from these departments were interviewed for this study:

Code of Participant	**Department**	**Responsibilities (ESG related)**
Participant 1	Investor Relations Management Department	ESG report disclosures; Assessment of annual ESG results; Development of ESG strategy.
Participant 2	Administration Office	Implementation and monitoring of the deployment of the company's sustainability strategy - Occupational safety and Environmental Protection
Participant 3	Administration Office	Responsible for energy saving and emission reduction; Providing professional guidance and advice to the work of other departments.

Participant 4	Human Resource Department	Responsible for interfacing with the hiring department for personnel needs and recruitment
Participant 5	Supply chain management department (Subsidiary)	Responsible for the audit of supply chain participants

Table 3.1 Overview of the interview participants

Qualitative studies typically involve small sample sizes (Creswell, 2013). The in-depth and detailed interviews with these five participants provide valuable rich qualitative data for this analysis. This data helps the study understand the specific implementation of the ESG strategy in the company and the influencing factors.

The five participants were from four different departments, each responsible for a distinct aspect of the ESG strategy in the selected organization. Their work collectively covers all stages of the ESG strategy: identification, formulation, implementation, and feedback. By interviewing representatives from key departments involved in implementing ESG strategies, the study gains a comprehensive understanding of the practical approaches and collaboration models between different departments during the ESG strategy promotion process.

The first interviewee was the company's chief disclosure officer for ESG reporting. Using the snowball sampling method, the other four interviewees were recommended by the first interviewee, ensuring that all participants were relevant to the company's ESG strategy. This approach helps prevent the researcher from engaging individuals who are not pertinent to the enterprise's ESG strategy.The participants' names and job titles have not been disclosed here for maintaining their anonymity. Along with emails, some of the communications were also conducted via WeChat, the dominant social networking software in China. The interviews were conducted in Chinese, the first language of the interviewees. After completing the interviews, the researcher transcribed and translated the audio recordings. To ensure the quality of translation and avoid any errors, the contents were proofread and reviewed by another scholar who was proficient in both Chinese and English.

Documentation

Yin (2018) suggested that data collected using interview methods in case studies can be affected by biases in the subjective interpretation of the interviewees. Therefore, the

content analysis method, which could provide more accurate data and evidence, was used in this study to ensure the reliability and validity of the case study findings. As the selected company is a listed company, it is required by the regulator to disclose a series of financial and sustainability reports on a regular basis. And in order to attract more investor attention and boost shareholder confidence, the company needs to update relevant data on its operations. As a result, this study has downloaded a range of documents and reports, which are useful for analysis, from its website. The most important of these are the three ESG reports it has released in the past three years (2019-2022). The data and other information presented in these reports are useful in helping this study to understand its ESG-related performance and trends in recent years. The study also downloaded and analysed the company's public document entitled Sustainability-Linked Financing Framework, which is available on its website. In addition, evaluation reports of the company by other agencies also provided important evidence for this study. In addition to the findings of some of the rating agencies on their websites for the selected companies, this study focuses on the 2021 GHG Emission Intensity Data Assurance Report published by Deloitte and the Second Party Opinion published by S&P Global Ratings. The content of these reports was used to validate some of the interview findings and to provide a more comprehensive understanding of their organisational actions in relation to ESG strategies.

3.6 Method of Data Analysis

As shown in Table 3.1, each participant was assigned a number for maintaining anonymity and also for use in the data analysis. The company's full name is Sunny Optical Technology (Group) Company Limited also known as Sunny Group, this short term will be used in this study for referencing this organization. All interview transcripts were transcribed and translated. These translations were also reviewed by an academic who is professional in both Chinese and English. After that, the transcribed data were reviewed and analysed in depth for this study. Using thematic analysis which is a widely used qualitative research method for analysing and interpreting patterns or themes within qualitative data, important themes were identified from the interview transcripts and secondary data related to this case study. For example, in the interview data, by combininganalyzing information about different interviewees' understanding of ESG strategy and their job contentroles, it was possible to identify some of the methods and depth of the implementation of ESG strategy in the company. Moreover, by asking the

heads of different departments about their views on the importance of ESG strategy, it was possible to visualiseexplore some of the reasons why companies have fully or partially implemented the relevant strategiesy. The next step was to analyze the identified themes to understand what they reveal about the research topics and interpreting the significance of each theme and its implications for the study. These themes form the basis of the case study analysis in the next chapter. The data was analysed mainly using Word and Excel software provided by Microsoft Office. For the thematic analysis, the researcher used excel to categorise different themes using information from the primary and secondary data. The themes are discussed in the next chapter.

The triangulation method was applied because the participants' subjective perceptions can influence qualitative research data. This method requires qualitative research to be able to combine multiple data sources to synthesise the data for gaining an accurate understanding of the phenomenon (Carter et al., 2014).

For this study, the researcher applied triangulation by cross-referencing of interview data with literature data to obtain multi-level comprehensive analysis. Some interviewees may be influenced by subjective consciousness when talking about their experiences and experiences and make comments that are not completely consistent with the facts. Combined with data from other sources, this method can effectively avoid the bias that may exist in a single data type and improve the objectivity and accuracy of the research results.

Therefore, in conducting the analysis, the study cross-referenced a range of data. The secondary data include the company's annual reports, ESG reports and data published on their official website. Some of the key information from the relevant documents were also correlated and compared with the interview results as part of the triangulation.

3.7 Limitations

During the course of this research, there were limitations and difficulties in various aspects:

- Firstly, travel restrictions due to COVID-19 pandemic prevented the researcher from travelling to and from China to conduct face-to-face data collection and fieldwork. The company also requested that the interviews be conducted using online interviews because of the strict COVID-19 policies. As a result, the researcher did not get the opportunity to do site visits or meet any of the

participants face-to-face.

- Most Chinese companies are still in their infancy stage with regards to sustainability-related actions. So, as expected, Sunny Group is in the early stages of implementing its ESG strategy. Hence, the knowledge, experiences and perspective from some of their employees in these areas are limited. Some of the participants did not comprehensively understand the operational processes and ESG strategies at a corporate level.
- Due to the nature and duration of MSc by Research, the researcher had limited time for data collection for this project which covered a complex research topic. Also, the project work coincided with the outbreak of COVID-19. Many businesses were prioritizing safety measures and were trying to find ways to survive such an unprecedented circumstance. During this process, the researcher encountered a lot of challenges in contacting people and organizing interviews with senior management due to their extremely busy time schedule.

CHAPTER 4
CASE STUDY ANALYSIS – SUNNY GROUP

Sunny Group, as a large high-tech manufacturing enterprise in China, has successfully promoted its own sustainable transformation strategy over the years. Its ESG performance has been recognized by its partners and professional rating agencies. According to its published sustainable strategy and management structure (Sunny Optical, 2022), the group regards *"*co-creation*"* as one of its core values. Based on that, it has clearly defined its responsibilities in social, environmental and economic aspects:

- ***Social Responsibility*** - Sunny Group promotes the harmonious development of society, and creates a civilized and progressive society with co-operators from all walks of life (Sunny Optical, 2022).

- ***Environmental Responsibility*** - Sunny Group fully considers environmental protection requirements in its business activities, complies with various international environmental laws and regulations, and pursues environmental protection and sustainable development through technological innovation and manufacturing reform (Sunny Optical, 2022).

- ***Economic Responsibility*** - As a corporate citizen, Sunny Group strives to promote its responsibility in economic development, social security, culture and education, and is committed to social progress and sustainable development (Sunny Optical, 2022).

Figure 4.1 Roadmap of Sunny Group's sustainable strategy

As shown in Figure 4.1, Sunny Group's actions in recent years demonstrate their

approach to sustainability. These actions have been influenced by various factors such as market demand, policy requirements, cost control and social responsibility. The advancement and implementation of sustainability strategy has continued to increase year by year. The organisation has been able to improve its sustainable performance under the current conditions by optimising its production processes. They have optimised their internal organisational structure in the face of increasing demands. Responsibilities related to the sustainability strategy were integrated into departments at different levels. Supervisory and coordination responsibilities were assigned to the organisation's core management. In order to overcome the constraints imposed by the production sites and the surrounding facilities, Sunny Group has launched a new production site in 2023. There are plans to recruit more human resources with a background in sustainability to fit its latest growth strategy.

Based on its own large and complex organisational structure, the effective implementation of ESG-related strategies requires multiple business adjustments and process updates within the organisation. In order to comprehensively summarise and organise their efforts in sustainability, as shown in Figure 4.2, this chapter will analyse the case along with the collected data from the three aspects:

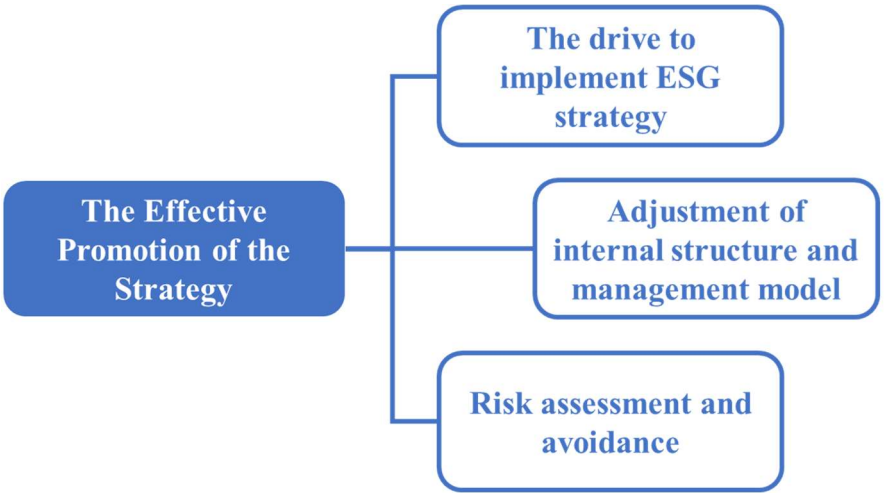

Figure 4.2 Implementation of strategies related to ESG principles

4.1 Motivation to Pursue Strategies Related to ESG Principles

Before focusing on how companies can achieve effective sustainable transformation internally, it is important to discuss the dynamics and reasons that drive them to carry out these activities since a lot of these activities may not necessarily bring direct commercial benefits to the enterprise. At the same time, organizations may have to bear

more pressure and face more uncertainty to carry out these activities. Petrenko et al. (2014) pointed out that there is a certain positive correlation between the governance concept of the top managers of the organization and the implementation degree of the enterprise's sustainability-related activities. In addition to personal cognition and governance concepts, factors related to government, customers, and internal governance could also promote the development of corporate-related actions.

4.1.1 Momentum Brought by Organizational Executives

Sustainable transformation supported by the ESG strategy requires companies to be able to identify their production status quo correctly and make the right changes. During the implementation of this process, different managers' understanding and attitude towards sustainable operation may affect the final result. In particular, the governance philosophy of the founder and executive director of the organization will be directly reflected in the company's actions and related performance.

The two core business strategies put forward by the founder of Sunny Group have played a key role in driving the motivation towards sustainability. Participant 2 mentioned: *"safe production and legal operation were proposed by our old chairman… from the very beginning of our company, we have seen these two conditions as high pressure lines that cannot be touched. If there is a problem with production safety and legal operation, the whole company may not be able to continue to operate"*. Based on these two conditions, prior to implementing ESG strategy, its early business strategy formulation was heavily influenced by the concept of Environment, Health & Safety (EHS). Prasad (2021) suggests that EHS can be considered as a subset of ESG, with the former's Health and Safety being combined with CSR to form 'Social' of the latter, while their environmental element contains similar guidance. However, according to participant 3, Sunny Group's early concerns about EHS were mainly focused on the production safety of its employees. As a result, it considered that the environmental element of EHS was to a greater extent focused only on the employee work environment and the control of hazardous substances. With the release of the ESG strategy, the company has added more relevant topics to its biannual EHS meetings, which are attended by senior management. Considering the strong positive correlation between the extent to which top management contributes to the development and implementation of a company's ESG strategy, the company assessed the diversity of its board members' backgrounds accordingly. According to the ESG Report 2021 (Sunny

Optical, 2022, p. 17), Sunny Group mentioned that *"we believe that board diversity can enhance corporate governance standard and decision-making capabilities, and it is an essential element in supporting the achievement of our strategic objectives and sustainable development"*. The company therefore takes full account of the complementarity of backgrounds and competencies between board members to ensure that the right strategy is developed. This diversity policy encompasses a number of factors, including skills, knowledge, gender, age, culture and educational background or professional experience. This organisational structure could effectively avoid any negative impact on the advancement of strategies related to ESG principles due to a lack of knowledge or skills. Participant 3 said that *"a range of issues encountered during the deployment of the ESG strategy can be fed back directly to top management at the meetings, and managers will be able to promote the work through their efforts"*. It is clear that senior manager support in these areas not only facilitates the development of effective strategies, but also enhances the motivation of employees in these areas. Participant 2 added that *"the most important prerequisite for us to be able to overcome resistance effectively is that the board of directors takes this aspect seriously in its own philosophy"* when he recalls the resistance he has encountered. Although there will inevitably be a series of conflicts between the advancement of the ESG strategy and the normal production activities of the company, these issues will not have much impact with the right governance philosophy guiding the senior management. Once their support is secured, lower-level departments and workers can eventually identify appropriate solutions to work together in an orderly manner and develop long-term and short- to medium-term plans. ESG is a relatively new terminology, and most of the middle and lower management and staff in Sunny Group do not master the specific skills and knowledge. For example, three of the five interviewees in this study do not have academic backgrounds in sustainability, and Participant 5 states that *"our job is to refine and implement the work based on the strategic direction given by senior management...we do not initiate a lot of ideas in this area ourselves"*. Thus, the governance philosophy of the organisation's top management can largely influence the promotion of the ESG strategy by Sunny Group. Participants' responses also provide further evidence that the current positive attitude of the management team towards ESG-related strategies brings sufficient impetus to the company's performance in terms of sustainability.

In addition, to ensure that managers are proactively providing the necessary support for ESG initiatives, Administration Office has taken on the role of monitoring and

evaluation. Participant 2 explained how they *"carry out daily monitoring and steering checks to determine the level of safety steering in each subsidiary or production department ... these results are directly linked to the financial income of the subsidiary's managing director and the group's president"*. As a result of these measures, the interviewees acknowledged the support they get from top management and how that drives their motivation.

4.1.2 External Pressures and Opportunities

Internal top-level management plays a crucial role in the promotion of ESG strategies. When further discussing what drives companies to apply these strategies, participants evaluated that the most significant drivers come from within the company, customers and government. Participant 2 considered that the customer and government factors should be considered as triggers, and he further stated that *"the key reason is that we have the awareness and the will to do this from the beginning"*. Therefore, Participant 2 believes that the primary motivation comes from within the company. For companies, they need to take action in relation to the control of energy consumption in production. Energy consumption exacerbates climate problems and could make it challenging to achieve the goals set for environmental sustainability. Sunny Group, with the understanding and support of the top management, would not be under additional pressure. The company has dedicated staff to follow up on the pressure of customer requests from different regions and countries. Due to geographical differences, different customers' supply chains and production processes are governed by different local policies. Therefore, it is not enough for Sunny Group to consider the sustainability requirements of the area in which its production sites are located to meet the needs of its customers. In addition, differences in operating philosophies between customers can also lead to differing supplier requirements. As Figure 4.3 shows, customers in different regions have different requirements for suppliers like Sunny Group in terms of sustainability-related aspects. These differences arise partly from differences in regional policies and partly from differences in the production requirements of the companies involved.

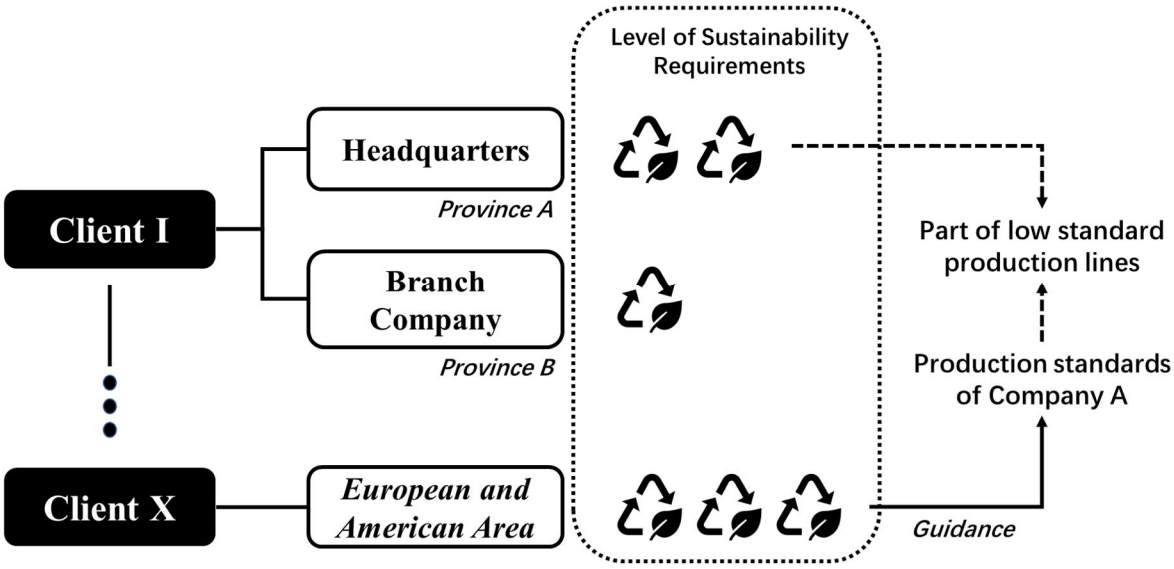

Figure 4.3 Differences in customer requirements

Therefore, Sunny Group would integrate different customer requirements regularly to adjust their production accordingly. Participant 1 further stated that *"some international customers would score their suppliers and the implementation of ESG strategies is highly valued as a plus point"*. In the case of Sunny Group itself, a series of assessment processes have been put in place to ensure that its supply chain participants meet the appropriate sustainability requirements. As part of the ESG strategy, Participant 5's department is responsible for *"identifying the environmental awareness of existing or potential suppliers in their production processes, the welfare of their employees and the sustainability of the products themselves"*. The main reason for these actions is that a company's ESG performance could be influenced by the sustainability performance of its suppliers. Downstream customers are also subject to a series of reviews of the supplier's partner performance when receiving products. Therefore, the implementation of an ESG strategy and the regular disclosure of reports will enable potential customers to understand the company's sustainability performance better and thus increase their interest in working together.

For domestic customers, Participant 2 highlighted the differences in policies between regions. For example, he said that *"if Huawei's production site in Guangdong needs to meet the requirements of the Guangzhou government, when the requirements in Zhejiang have not yet been synchronised, we need to take the initiative to achieve synchronisation at a relatively higher standard"*. In addition, the demand for clean energy from companies that are ahead of the curve in terms of sustainability, including Apple, is even more challenging. Participant 3 stated that *"those kinds of customers are*

more demanding of companies and there is a strict scrutiny system in terms of safety and environmental aspects". But the achievement of higher standards is positively correlated with higher costs. Sunny Group has to bear higher production costs for the new production methods and management model. So it is selectively phasing in the renewal of its production model. Although these challenges would put additional pressure on the company's operations, they also enable Sunny Group to remain a leader in the industry in terms of sustainability. At the same time, Participant 1 stated that in this context, having sustainable products and production conditions would attract more offers from customers.

Furthermore, the participants acknowledged the existence of governmental pressures. However, they did not see it as a strict challenge for companies. In the context of the early stage of Chinese government's regulation of sustainable business operations, Participant 2 said *"the sustainability-related requirements of their clients within the same period are always ahead of the standards of the mandatory government policies"*. For example, the immediate reason for Sunny Group's ESG strategy disclosure efforts were the Hong Kong Exchanges and Clearing's mandatory requirement for listed companies. Although there are reports that China is developing guidelines for corporate ESG disclosure, no mandatory policy has yet been issued for most manufacturing companies (Chan, 2022). As a result, Sunny Group overall is in a relatively advanced position in terms of compliance. In addition, companies with good tax capacity have relatively easy access to resources and services from local governments (Xie, Zhu & Wang, 2019). And Seth (2021b) found that some local governments are willing to give additional convenience to local large enterprises to avoid their own tax impact when implementing sustainable policies. This viewpoint is further supported by Participant 2, who argues that governments would apply lower standards for their regulatory requirements compared to other small and medium size enterprises. However, he added that *"we will still keep a close eye on these policy changes and translate their initial recommendations and requirements to our internal mandates"*. For example, Participant 3 led and participated in a six-month inspection of the facilities at its new production site to meet the government's environmental requirements for the separation of storm water and sewage. The government also offers a range of incentives for them. The purchase of environmentally friendly equipment is subsidised and companies with great sustainability performance could have chance to get the tax breaks. However, this positive situation is to a large extent only for large companies with plenty of capital. When it comes to the small-scale suppliers that Sunny Group works with, Participant 5

suggests that they often do not have complete sustainable operating systems and production capabilities. Their ability to adapt to meet government and partner requirements is very limited. Some companies have also faced the risk of being shut down during government-led environmental initiatives. This shows that government pressure and incentives can give companies some incentive to pursue business sustainability. And Participant 2 said that the company has already started work on a detailed internal review of China's plans to peak carbon emissions by 2030 and become carbon neutral by 2060, as proposed in 2020. In conjunction with requests for cooperation from some foreign companies, Sunny Group will accelerate the implementation of relevant measures and meet the targets ahead of schedule.

4.1.3 Stakeholder Relations Maintenance

As a listed company, Sunny Group is required to maintain relationships with its stakeholders while considering its business strategy. Their stakeholders have a significant influence on the sustainable operation of the business. Companies need to be timely and responsive to the expectations and demands of these stakeholders to ensure that corporate value is enhanced.

The governance aspect of an ESG strategy is critical to the long-term stability of a business. Participant 4 agreed that corporate governance is more important than environmental and social responsibility. And Participant 1 believes that ESG strategy can also be considered as a risk management approach. In the course of a company's operations, safeguarding employees' working environment and welfare can help reduce staff turnover. It is also possible to increase productivity to a certain extent. With these factors in mind, Participant 2's department has taken on the task of building a safe and harmonious workplace. Participant 2 mentions that *"the safety and health of our employees is always a priority for the Group and some of our businesses are already certified to ISO 45001 for occupational health and safety management systems"*. And Sunny Group's Report 2021 (ESG Report, 2022, p. 61) shows that *"we adhere to the development concept of Win-Win and Common Prosperity, emphasizing that employee benefits should be combined with enterprise development to form a harmonious labour relationship"*. As shown in Table 4.1, employee satisfaction with Sunny Group has shown a rapid increase over the last three years, and staff turnover has decreased.

Year			2019	2020	2021
Employee Satisfaction			78.8%	80.4%	82.6%
Separation Rate	Gender	Male	3.8%	3.0%	2.7%
		Female	3.9%	3.2%	2.5%
	Region	Chinese Mainland	3.8%	3.1%	2.6%
		Others	0.9%	4.7%	5.2%

Table 4.1 Overview of human resources since the advancement of the ESG strategy

It can be seen that the company's ESG strategy has been well received in terms of the actions it has taken to safeguard the welfare of its employees. In turn, the improved employee stability has helped it to increase productivity. Sunny Group was also able to achieve simultaneous savings in training costs and job handover costs. In addition, the increase in employee turnover outside mainland China was largely influenced by international travel restrictions during the outbreak.

For investors and shareholders, a good state of internal governance could enhance confidence in their investment. Participant 1, recognising the need for ESG strategies in companies, says, *"many investors assess the long-term sustainability of a company when evaluating whether it is a worthwhile investment ... financial data is often lagging, so investors are now more likely to combine ESG reports with market strategies to assess the future competitiveness of a company"*. In order to better attract the attention of investors, Sunny Group has invested a lot of strength in ESG strategy. And the disclosure of ESG strategy data is led annually by Participant 1's Investor Relations department. That department works to build a good relationship with investors by collating information on the company's actual sustainability performance and growth strategy. They also attend and present at a number of conferences each year with the aim of raising capital. The dynamics of the investors' investment philosophy is therefore one of the key indicators of the strategic changes made by Sunny Group.

4.2 Application of ESG Strategy

Pressures and opportunities from different aspects offer Sunny Group with sufficient incentive to drive its own sustainable operations initiatives. Different from traditional business expansion, this type of action requires companies to be able to assess the risks and rewards in a holistic manner. This is because the quality and performance of the

product normally will not be changed as a result of these improvements. Meanwhile, companies may face higher production costs and customer questions. And unlike the usual technological updates, many of Sunny Group's technical and administrative staff do not have sufficient knowledge and skills in sustainability. Moreover, these kinds of actions should be dependent on close cooperation between different departments. According to Sunny Group's newly published Sustainability Financing Framework (Sunny Optical Technology (Group) Company Limited, 2022), as shown in Figure 4.4, the sustainable performance they are pursuing encompasses a range of elements at the environmental and social levels respectively.

Environmental Aspect	Social Aspect
● Control of greenhouse gas emissions ● Reduction of hazardous waste emissions ● Paper conservation ● Electricity saving ● Water conservation	● No major safety-related accidents ● Continuously provide training and development opportunities for employees ● Provide an equal, healthy and safe working environment for employees

Figure 4.4 Sustainable goals for environmental and social dimensions

For a business organisation such as Sunny Group, which is in the early stages of exploring a sustainable operating model, organizing the internal resources and adapting the management model correctly is a necessary way to effectively drive the ESG strategy. As shown in Figure 4.5, Sunny Group now has a comprehensive management system in place to ensure that decisions related to the ESG strategy are effectively aligned and implemented at all levels.

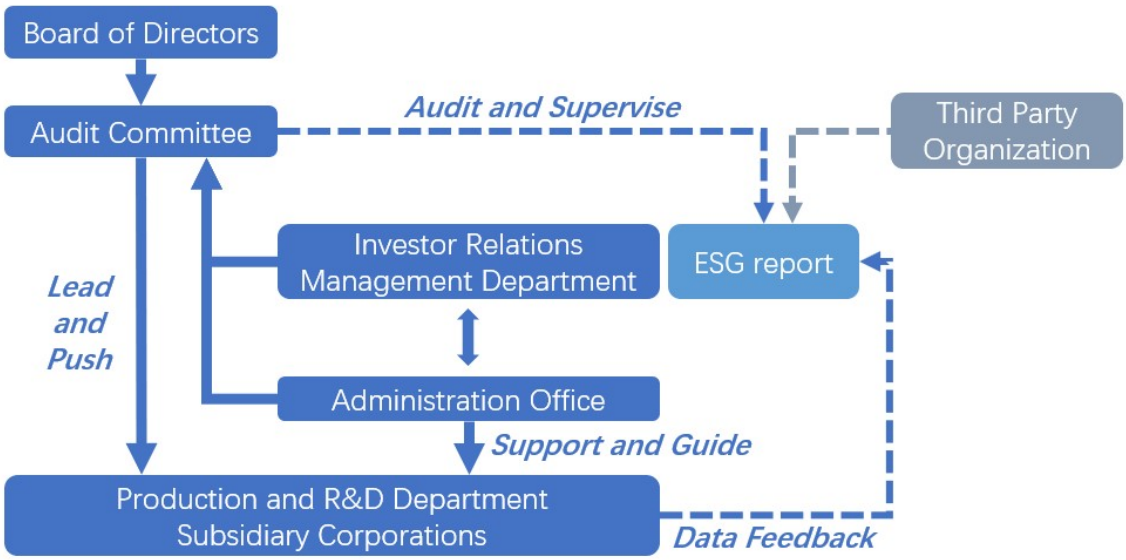

Figure 4.5 ESG strategy operation mechanism

In order to better explore the experience of Sunny Group in successfully improving its own sustainable performance, this subsection will first focus on the way in which the macro-strategic orientation of the company was established and the changes in the organisational structure following the implementation of strategies related to the ESG principles. The distribution of responsibilities between different departments and the development of cooperation will be focused on and analysed afterwards. Also, this study discusses what actions have been taken by Sunny Group and how they have led to results.

4.2.1 The Participation of High-level Enterprises in the Formulation of Macro-strategic Orientation

Based on Sunny Group's complex staffing and detailed job responsibilities, Participant 4 noted that *"employees are rarely able to initiate ideas related to sustainability, and their work is dependent on the macro-level ideas put forward by top management"*. And participant 3 added that *"when the attention at the top goes up to some aspects, it's natural for employees below to pay more attention to them"*. Thus, it follows from this that the level of implementation of ESG strategies by corporate functions is closely related to the level of perception of managers. Although the company has a relatively complete incentive mechanism to encourage all employees to participate in the process of formulating relevant strategies, most of their feedback is aimed at specific operations

processes. When asked whether it was necessary for staff to be involved in the development of macro-strategies, all participants responded in the affirmative. Participant 5 said that the subsidiary he works for *"is fully committed to the sustainability strategy deployed at Group level ... but the sustainability performance of this strategy is in some ways higher than what the market requires, so it is difficult to make a precise judgement to ... we are not in a position to make an accurate judgement on our own as to what strategic direction to take"*. As these actions involve a certain amount of financial pressure and market risk, such decisions need to be taken by senior management until the company's sustainable operating system is mature. When it comes to the board's perception of ESG strategy, participant 1, who is directly responsible for interfacing with the Chief Financial Officer (CFO), believes that *"they do not have a particularly deep understanding of that either"*. This is because the promotion of ESG strategy initiatives in China is still in its infancy. A person involved in a particular job for a long time would have difficulty receiving systematic training in this area. And their ability to accept new things will be limited. Moreover, given the time costs, it is not realistic for board members to spend a lot of time focusing on the details of ESG strategy promotion. They need a team of professionals who can help them take on leadership and review duties to some extent. In order to effectively address this issue, Sunny Group has added an audit committee in 2021, directly delegated by the Board of Directors, which is required to oversee and be accountable for the implementation of the ESG strategy on behalf of the Board. Its latest annual ESG report states that the committee is required to *"review and recommend the Group's ESG strategy and policies; review and annually review the implementation of the ESG strategy; review the Group's external communications policy and monitoring; and review and make recommendations to the Board on the Group's annual ESG report"*. The establishment of this committee enhances the soundness of the Board's decisions relating to the ESG strategy and reduce their work pressure. With the establishment of this Audit Committee, Sunny Group's three-tier management framework for its ESG strategy has been refined:

- ***Board of Directors -***

  It has overall responsibility for the ESG management system and disclosure, ensuring that the Group has an appropriate and effective system of ESG risk management and internal control and overseeing the management of ESG-related objectives and progress.

- ***The Audit Committee -***

It should be responsible for managing the ESG strategy and policy, managing ESG disclosure, and reviewing the effectiveness of the Audit Committee in discharging its responsibility for overseeing ESG matters and reporting to the Board on ESG matters.

- ***ESG Management and Promotion Team -***

This group consists of nine main departments, including Legal Affairs Department, Audit Department, Administration Office, Financial Department, Human Resource Department, The Party & the Masses Office, Information Technology Department, Strategic Development Centre, Investor Relations Management Department. Key departments of the subsidiaries will also be involved in the work of the group. They are responsible for communicating with stakeholders, identifying ESG risks faced by the Group, developing ESG management systems, objectives and work plans, promoting the establishment and optimisation of ESG management systems, as well as collecting ESG information, preparing annual ESG reports and disclosing ESG-related information through multiple channels.

The framework enables a top-down management model and ensures that ESG governance is integrated into the regular work of all departments. The emergence of audit committees fills the skills and knowledge gaps of board members and ensures performance indicators for ESG strategy-related actions. However, this does not mean that the involvement and importance of senior management in the ESG-related macro-strategy development process could be reduced. Participant 1 would organise regular meetings to report to the Board members on the progress of the ESG strategy. And the Board then should make a series of decisions based on this information and be accountable for these decisions. After that, relevant departments are responsible for the implementation of these strategies and objectives.

4.2.2 Key Sectors for ESG Strategy Implementation

Once the macro-strategic orientation has been established, cross-sectoral cooperation will take place to achieve these desired objectives. These objectives are specific environmental, social and governance. Firstly, with regard to the environment,

Participant 2 considers that this includes the sustainable performance of its products and the emissions and pollution performance of the company as a whole in its operations. As the company's main products and services are in the field of optics, therefore the importance of the latter is more evident, that Sunny Group needs to ensure its environmental sustainability performance by controlling its energy consumption and pollution emissions in its operations. In addition, Sunny Group is still in the early stages of exploring its ESG strategy and is dependent on specific sectors to assess its sustainability performance as a whole. By combining a range of reference information, including peers' performance and customer requirements, they will develop performance indicators that are appropriate for them. During the interviews, this study found that these actions are mainly carried out by the Investor Relations Management Department and Administration Office as a whole at the Group level. The development and implementation of strategies by individual departments or subsidiaries are currently limited. Participant 5, from one of the subsidiaries of Sunny Group, commented positively on this model of work, stating that *"the coordination at group level avoids redundancies and reduces the workload of the subsidiaries"*. In this case study, the promotion and evaluation of the target company's ESG strategy are carried out by two departments that are part of the group head office.

Investor Relations Management Department

The Investor Relations Management Department is responsible for the preparation and disclosure of ESG reports. Before the ESG strategy's implementation, this department's role was to provide external investors or stakeholders with real-time and accurate information on the company's operations and future strategic direction (Marston, & Straker, 2001). With this reorganization, the Investor Relation Officer (IRO) leads her team in the collection of data and information related to the sustainable transformation of the company. These data are then systematically collated and analysed with organizing to the newest ESG report. Besides, they are also responsible for gathering some external advice, such as the experiences of other companies which have effectively implemented ESG strategies. Thus, Participant 1 said that they have a two-way feedback mechanism for data collection and analysis, that *"when other departments give us feedback on the results of their work, we may also tell them what areas deserve further attention"*. In addition to drawing on the experiences of other companies, the necessary assistance provided by third-party consultants was also recognised by the participants. Participant 1 believes that the presence of a third-party

consultancy can hopefully address the gaps in their ESG expertise at this stage. On discussing the support from enquiry agencies, Participant 1 commented that *"they are professionals and have an in-depth knowledge of the industry and international requirements"*. For Sunny Group, which is in the early stages of implementing an ESG strategy, the involvement of external organisations can effectively control management costs and improve the quality of work. In addition, instead of keeping this working method for a long time, Participant 1 stated that *"we plan to carry out a project with the help of a consultancy to refine our unique strategy"*. Ultimately, they aim to implement ESG strategies by their internal teams effectively.

Administration Office

The Investor Relations department is mainly part of the financial management section of the company, so its function is to formulate ideas and requests at the data level. To implement these requirements, the Administration Office, which is part of the administration and general affairs department, is required to work closely with the investor relations department. In the early stages, this department focused on production safety issues and infrastructure-related issues, guided by the EHS concept. The environmental section was created to co-ordinate the implementation of sustainability projects better. Participant 3 said, *"our department was initially set up to explore the production status and sustainability deficiencies of each subsidiary based on compliance requirements"*. In contrast to other sections, the team in which Participant 3 works is made up of people who come from an environmental-related background. They are therefore requested to provide more specific guidance to other departments in Sunny Group and its subsidiaries. In conjunction with the review system adopted by the external client, this section also takes on responsibility for hazardous material substitution and waste disposal. They are also working on mining information for internal reference. For example, Participant 3 said that *"when we see that other peers are already using a more sustainable alternative material or process, we will feed it back to the relevant department for them to further evaluate the value and the feasibility of the alternative"*. For the resistance of their works. Participant 3 mentioned that *"the sustainability-related work can sometimes conflict with the production schedule ... sometimes they have a tight production schedule"*. Participant 3 and his colleagues need to pass the performance appraisal while other production departments need to ensure their production progress. This is a challenge that is still difficult for Sunny Group to address efficiently. But Participant 3 said that *"they have the right to shut down the*

production plans when some links do not match the basic principle... such as illegal emissions and serious safety hazards". For dealing with these sustainability issues, Sunny Group has provided great support in terms of financial budget. In addition, another section in this department has given responsibility for work related to energy efficiency and emissions reduction to the power section. This will need to plan and implement the carbon emission strategies to match the request for carbon peak plan proposed by China in 2020, which includes green energy and energy saving.

4.2.3 The Pursuit of Sustainability Performance Targets (SPTs)

As a high-tech company with a production process that rarely involves as much loss of raw materials and harmful emissions as traditional manufacturing, Participant 1 says that *"the company's main concern is to reduce its greenhouse gas emissions and achieve its carbon neutrality goal ahead of schedule"*. As a result, the company has developed three key environmental issues, including greenhouse gases, energy management and climate change. In order to properly assess its carbon footprint, the Group's main subsidiaries have adopted the Greenhouse Gas Protocol (GHG Protocol[5]). For the Group, the main focus is on Scope 1 and Scope 2 emissions. As Table 4.2 shows, the company has successfully controlled its non-renewable energy consumption and GHG emissions from its production processes over the last three years.

[5] The Greenhouse Gas Protocol (GHG Protocol) is a global standard framework for measuring and managing greenhouse gas emissions from production and operations in the private and public sectors. The Protocol classifies an organisation's GHG emissions into three categories, Scope 1, scope 2, and scope 3. Scope 1 includes direct emissions from a company's energy use, such as natural gas and fuel use and emissions from its own transport fleet vehicles. Scope 2 is the indirect emissions from the purchase of energy, such as the emissions from the production of electricity and steam energy purchased by the business organisation from external parties. Scope 3 is the carbon emissions generated in the company's value chain and includes the greenhouse gas emissions from products or services purchased externally and the greenhouse gas emissions from the products it sells at a later stage (ClimatePartner, 2022).

Category	Unit	2021	2020	2019
Total direct energy (Note 1)	MWh	582.8	5,675.0	7,016.0
Natural gas (Note 2)	MWh	/	4,348.4	3,151.8
Liquefied petroleum gas (Note 2)	MWh	/	726.0	2,041.7
Diesel oil	MWh	148.5	/	952.1
Gasoline	MWh	434.3	600.6	870.4
Total indirect energy	MWh	540,417.7	462,944.8	416,995.8
Electricity (Note 2)	MWh	540,417.7	462,944.8	416,995.8
Total energy consumption (Note 3)	MWh	541,000.5	468,619.8	424,011.8
Energy consumption intensity	MWh/ RMB million revenue	14.6	12.7	11.5
Greenhouse gas (Scope one) (Note 4)	tCO_2e	2,594.3	3,463.8	3,345.6
Natural gas	tCO_2e	/	869.4	630.2
Air conditioning coolant	tCO_2e	2,449.3	2,286.0	1,776.0
Liquefied petroleum gas	tCO_2e	/	161.5	480.2
Diesel oil	tCO_2e	38.8	/	248.5
Gasoline	tCO_2e	106.2	146.9	210.7
Greenhouse gas (Scope two) (Note 5)	tCO_2e	380,183.9	325,681.7	293,356.6
Electricity	tCO_2e	380,183.9	325,681.7	293,356.6
Total greenhouse gases	tCO_2e	382,778.2	329,145.5	296,702.2
Greenhouse gas emission intensity	tCO_2e / RMB million revenue	10.3	8.9	8.0

Table 4.2 GHG emissions performance of Sunny Group (Sunny Optical, 2022, p. 84)

Participant 3 states that the company has *"significantly reduced the use of diesel and petrol in recent years … the introduction of new energy-saving technologies has also further reduced the consumption of air-conditioning coolant"*. However, the data in Table 4.2 shows an upward trend in the intensity of greenhouse gas emissions at Sunny Group. Combining the interviews and the relevant reports released by it, it can be found that the occurrence of this situation is directly related to the iterative upgrade of the company's products, and the accuracy of their products is improving rapidly compared with the past. And as the market for electric vehicles expands, the logic of manufacturing optical components has changed in a number of relative ways. As a result, Sunny group's energy consumption is expected to grow continuously. However, the company's ESG Strategic Management Sub-Committee has stated that a 5% annual reduction in greenhouse gas emissions intensity is expected from 2022 onwards, and Participant 2 says that in the past few years, *"the ageing of the production facilities has limited the implementation of some sustainable actions … as new production sites come on stream, sustainability performance will improve again to a large extent"*. Further, the following actions have been undertaken by Sunny Group:

- **Proportion of renewable energy consumption** - Significant increase in investment in solar photovoltaic projects and the procurement of green electricity.
- **Renewal of existing production models** - Introduction of new energy-efficient equipment and optimization of power supply models. For example, the introduction of high-pressure energy-saving centrifuges, the retrofitting of high-powered air compressors, the use of automatic start/stop and fine-tuned control solutions for air conditioning fans in workshops, and the replacement of insulation materials in workshops.
- **Optimisation of design and manufacturing processes** - Streamlining of product manufacturing processes, such as the replacement of ultrasonic cleaning processes by blowing processes and the recycling of wastewater.

These actions have led to further control of the company's energy consumption. In terms of pollution discharge, the team led by Participant 3 has professionally planned and ranked the wastewater discharge and treatment systems for the new production site. In addition, Sunny Group has taken a number of measures to further improve its sustainable performance in the day-to-day office. In conjunction with the responses to Participant 1 and 4, Sunny Group is working on the implementation of a paperless office and the control logic of the office air conditioning control system has been updated. At the same time, solar hot water systems have been introduced in the staff accommodation areas.

Furthermore, although Sunny Group's greenhouse gas emissions intensity has been increasing in recent years, its sustainability performance is at a high level compared to the average of its major competitors in the industry, which is approximately 27.5 tCO2 / RMB million revenue. According to S&P Global's Second Party Opinion on Sunny Group (Wee, Lam and Labouley, 2023), the reason for the lack of efficient control of existing emissions could be attributed to the traditional power generation model in China's power sector, where 82.7% of electricity resources are still sourced from fossil fuels. For Sunny Group, the electricity resources it currently obtains through photovoltaic devices are far from sufficient to meet its normal production needs. Considering its own sustainable performance and the needs of its customers, Participant 1 states that *"the action that can be taken at this stage in terms of power procurement is to procure green power certificates from the power sector"*. This additional expenditure could help Sunny Group to demonstrate that some of the electricity it uses

is sustainable. However, given that they do not have an effective way to directly certify the sustainability of these sources, they are working to find reliable ways to address this issue. Some companies in western countries are working with organisations that offer carbon offsetting to solve these kinds of challenges and improve their negative sustainability performance. However, Sunny Group mentions that it has no strong interest in this type of business as it has not yet formed a mature market in China. Compared with that method, it prefers to work at its own organisational level to achieve its sustainability performance targets.

4.2.4 Internal Performance Appraisal

The improvement of sustainable performance at the organisational level relies on the concerted efforts of the employees. Therefore, a series of training sessions related to the ESG strategy was carried out in cooperation with the Human Resources Department and the Administration Office. These trainings include basic background on energy saving and waste reduction as well as awareness of waste separation in daily office and living processes.

Occupational safety and health-related guidelines are also mandatory for new employees. This training is designed to reduce resistance to the implementation of the strategy. However, when the ESG strategy reaches an advanced stage of deployment, the effective involvement of the entire workforce is indispensable. Therefore, the corresponding performance appraisal also needs to be formulated to ensure the motivation of the corresponding work. Participant 2 states that similar performance reviews are currently only being carried out for senior management, that *"routine monitoring and spot checks will be carried out to assess the overall sustainable performance of each subsidiary ... the results of these assessments are directly linked to the performance appraisals of the first responsible persons in each company, including the subsidiary's managing director and the Group's president"*. And there is a direct correlation between these performance evaluations and their financial income. The results are also would be fed back to the Board of Directors. As a result, these senior managers are actively involved in ESG-related work for reasons of career promotion and salary income. All participants report that they had received direct and efficient support from them in applying ESG-related actions. However, this type of performance appraisal has only been implemented to a limited extent so far. Participant 5 states that *"at the moment, we are mainly focused on meeting the requirements set by*

the Group ... most of the departments under our subsidiary will not be under the pressure of this indicator in their normal work". Participant 4 from the Human Resources Department puts forward the same sentiment, saying that the advancement of the ESG strategy has not yet had a fundamental impact on their working patterns. He adds: *"We just have to meet the requirements of each department ... although we have built a pool of people with sustainable backgrounds on our own initiative, this is not a mandatory task and does not have any impact on our performance appraisals."* From the interviews, it is clear that Sunny Group does not currently have specific assessment criteria for most of its lower and mid-level employees. Instead, incentives are in place to encourage employees to participate in the ESG strategy and this will not be mandatory for some time.

4.2.5 Supply Chain Management

ESG strategy-related performance is influenced both by internal organisational performance and by the external supply chain. According to the GHG Protocol adopted by Sunny Group, Scope 3 emissions performance is given a relatively high priority. The control of Scope 3 emissions is an important component of ESG strategy issues and is receiving increasing attention from the market and stakeholders. It requires the implementer of an ESG strategy to conduct a comprehensive assessment of the sustainable performance of its supply chain participants. Participant 5 indicates that the introduction of ESG strategies has led to the addition of more evaluation criteria in their supplier auditing process. These criteria include, but are not limited to, the supplier's use of green energy and control of carbon emissions. Previously, Sunny Group's management of suppliers relied heavily on CSR-related requirements. As shown in Figure 4.6, the company's supplier audit process now consists of the following processes.

Figure 4.6 Procedures for the management of suppliers (Sunny Optical, 2022, p.46)

It can be seen that Sunny Group's actions in placing the environmental risk assessment process at the first stage show the importance it places on the sustainable performance of its suppliers. In order to avoid potential risks to supply chain participants, Participant 5 states that it conducts an annual audit of its partner organisations. If serious problems and improvements cannot be made within a specified time frame, Sunny Group will consider terminating the partnership agreement. As Sunny Group's awareness of ESG principles increases and its strategy advances, its requirements for the quality of suppliers' products and production processes will be updated accordingly. And Participant 2 states that *"equipment or suppliers that cannot meet the company's latest production requirements will be replaced after a certain period of time"*. In addition, in order to reduce unnecessary work pressure, Sunny Group has adopted a hierarchical management system for different suppliers. Not all suppliers are subject to the same vetting criteria. For example, for start-ups with great products, Participant 5 says it would be unrealistic for such companies to fully meet sustainable operational standards in a short period of time. In addition, some downstream customers may have specific production requirements for their products. Participant 5 says that *"when a customer specifically specifies suppliers of relevant product components, we only use some basic evaluation criteria for them"*. As long as there are no problems or potential risks in principle with these suppliers, Sunny Group does not interfere unduly with the customer's choice.

Moreover, the company's work on the supply chain is expected to further improve its control over the quality of its customers' production and sustainable performance. As shown in Table 4.3, the number of compliant supply chain participants has effectively increased since the ESG strategy been launched.

Category	2020	2021
Number of new suppliers during the year	89	210
Accumulative number of suppliers signed the CSR-related undertakings	350	777
Number of suppliers conducted CSR audits during the year	83	276
Number of suppliers conducted on-site CSR audits during the year	29	52
Accumulative number of suppliers signed the certicates promising not to use hazardous substances	396	508
Number of suppliers conducted on-site audits on hazardous substances during the year	24	51
Number of suppliers recognized as having negative environmental and social effects during the year	1	0
Number of suppliers recognized as having negative environmental and social effects and agreed to environmental and social effects and agreed to improve after assessment	1	0
Accumulative number of suppliers using environmental products and services and achieving management on environmental procurement	653	559

Table 4.3 Key performance indicators for the supply chain

The table also shows that the company's supply chain review department has been conducting more on-site review activities in parallel. Although the identification of the sustainability-related performance of Sunny Group's supply chain participants is being carried out efficiently, fewer data or content related to Scope 3 emissions can be found in its existing ESG reports. Participant 5 explains that *"this is because we are still in the initial stages of identifying the ESG performance of our partners ... some of our small and medium-sized suppliers have not yet started to understand this in a standardised way ... for ourselves, the current model for doing this work is relatively rudimentary, that what we are engaging in is more about meeting group-level*

requirements and the need for ESG reporting disclosure". This situation is also related to the fact that Sunny Group is still in the early stages of its ESG strategy and needs more time to familiarise its staff with the implications and working model of this strategy.

4.2.6 Market and Customer Maintenance

As an upstream company itself, Sunny Group is also an important player in the supply chain of downstream companies. In turn, it needs to improve its performance in terms of ESG performance, production control and product quality to ensure stable market demand and customer relationships. In addition to implementing sustainability in its own production operations, Sunny Group can add some sustainable performance in terms of product attributes to improve the customer experience. According to the ESG report, Sunny Group mainly focused on four clean technology projects in 2021, as shown in Table 4.4.

Company name	Clean technology projects	Specific measures	Achievements
Sunny Automotive Optech	Heat dissipation lamp bead on projection display	By combining with clients' heat dissipation system, the cooling fan for lamp bead is removed, and only the finned radiator is retained, which can reduce the material consumption while not increases the energy consumption of the clients' heat dissipation	Based on the annual shipment volume of 10,000 units of a single product model, 16,000.0 kWh of electricity can be saved for our clients every year, so as to achieve the purpose of energy saving and emission reduction
	Laser heat sink	By applying environmental aluminum alloy materials for production and by reasonably setting the fins of heat sink and their spacing, the heat sink can meet the heat dissipation demand of the laser as well as reduce the material consumption	The materials of the heat sink meet the green material requirements. The temperature of the laser decreases from 80.0°C to about 60.0°C after the redesign of the heat sink structure, thereby reducing material waste and prolonging the life span of the laser
Sunny Opotech	Low voltage chip	By selecting chips with lower supply voltage while formulating camera module solutions in order to reduce the power consumption of the modules	Under the condition of constant power supply current, the power consumption of products using this chip can be reduced by about 20.0%, thus achieving the purpose of energy saving and emission reduction
	Graphene gimbal back cover	The graphene is pasted on the back of the module to increase the heat dissipation capability of the module and reduce the energy consumption required for heat dissipation	The maximum temperature during chip operation decreases from 63.3°C to 58.7°C, thereby achieving the purpose of energy saving and emission reduction

Table 4.4 Clean technology projects and outcomes for 2021 (Sunny Optical, 2022) p.34)

The development of these projects shows that Sunny Group has integrated the concept of sustainable development into its R&D strategy. Participant 1 believes that the sustainable performance of the company's products could maintain its market position and customer loyalty, for example *"the reduction in energy demand of the product will help customers to save further energy and market their products better as a highlight to sell their products to end customers"*. Thus, Sunny Group's strategy shows that it is investing more capital in improving the sustainability of its products to ensure that they are forward-looking and accepted by its customers.

In addition, establishing good communication with customers is the basis for the company to fulfil its social responsibility and lead the way towards sustainability. Participant 2 believes that *"the price advantage and the technological gap between products in the optical sector, to which the company belongs, are usually not very large ... so the speed with which customer complaints are dealt with and the efficiency with which after-sales problems are solved have a certain impact on the customer's interest in working together"*. In order to improve the customer experience in this area, Sunny Group has optimised its customer service system in line with the ESG requirements for corporate governance. Customers are free to express their opinions or complaints by mail, telephone or letter. A principle called *"2485"* was introduced. According to this principle, the corresponding customer service personnel are required to provide an initial response to a customer's request within two hours. In cases such as product changes that require urgent action, Sunny Group needs to take action within 24 hours. An in-depth analysis of the cause needs to be carried out within 48 hours, and a specific response strategy developed. Finally, all actions need to be carried out effectively and their effectiveness evaluated within five days. As a result of this process, Sunny Group handled a total of 1,029 customer complaints in 2021, and all issues were resolved within the expected time frame.

4.2.7 Staff Governance and Welfare Protection

Some elements of the social and governance elements of ESG strategies are closely related to employees. In terms of governance, enterprises are most concerned about employees' awareness of anti-fraud and anti-corruption. Participant 1 states that their company "*adheres to the principle of integrity and has zero tolerance for any form of bribery, corruption, extortion, fraud, embezzlement and money laundering in all business activities*". In 2020, Sunny Group established an audit department to ensure

the integrity of its operations and to investigate all types of fraud. In two years, the department has eliminated more than 1,000 hazards and assisted the relevant departments in rectifying ten high-risk incidents. All new employees are required to go through the anti-fraud system when they join the company. The company now provides training in this area to cover 100% of the total workforce.

In addition, Sunny Group values personal advancement opportunities for its employees after they join the company. It has a robust talent development strategy and training and development system. It has established three main promotion paths for managers, professionals and technical operators. People with different backgrounds can have a career path that suits them. In addition, all staff have the opportunity to receive professional training courses to improve their skills. As shown in Figure 4.7, Sunny Group's training and development system consist of a number of different programmes, each with a unique target group and training objective.

Figure 4.7 Development and training system (Sunny Optical, 2022, p.54)

After providing employees with the right opportunities for personal development, Sunny Group also needs to ensure that employees are satisfied with their work environment, which can directly affect their productivity and enthusiasm for work (Cohen, Smith and Mitchell, 2006). In addition to the statutory benefits, a number of additional living benefits and cash allowances are provided to employees. Participant 1 highlights the company's focus on gender diversity and equality, stating that in the past it had identified a disparity in the ratio of male to female employees. This situation has

improved through appropriate feedback to the HR department and support from the top management. From its latest report, it can be seen that the company has 61.1% of the total number of men, while women accounted for 38.9%. In the same period, female employees accounted for 30% of the manufacturing industry in the USA (Dowell, 2022). In addition, they provide breastfeeding women with easy access to private spaces within their production sites. They are provided with a range of additional leave and allowances while safeguarding their basic rights.

Furthermore, The Administration Office mainly took charge of the establishment of safe production environment and the prevention of occupational diseases. Participant 2 believes that *"safety and environmental protection are of equal importance to a company"*. *"Safety includes occupational health, the safe operation of special equipment, fire safety and the management of dangerous chemicals"*, he explains in the context of his department's responsibilities. To minimise these potential hazards and provide a safe working environment for employees, Sunny Group has developed a detailed safety management system within the company and has defined the rules of practice for some of its hazardous tasks. The company also provides training for some of its employees. In addition, Sunny Group has also provided some of its employees with training courses in emergency care. As a result of these efforts, the company met its safety targets for the year 2021 without any fatalities, occupational diseases or major safety incidents.

4.3 Challenge Identification and Avoidance

Sunny Group has taken a number of actions to achieve effective progress in its ESG strategy and to realise its sustainability performance. However, as business organisations are still in the early stages of their sustainability journey, and particularly as the Chinese government has only recently introduced a number of stringent regulations, Sunny Group will inevitably face a number of challenges in this process. In the following, this study will discuss the identification of the challenges and the approaches taken by Sunny Group to address them. Based on the interviews and research so far, this study categorizes these challenges into the following four themes:

- Operational Challenges at the Organization Level
- Resources and Facilities
- Recognition of employees' contribution

- Deficiency of Human Resource

4.3.1 Operational Challenges at the Organization Level

Although the ideal sustainable governance concept and promotion plan can be developed at the organizational level, the successful implementation of an ESG strategy in a complex organizational structure is complicated. This is because the implementation of all plans needs to be broken down into individual departments. Differences in sustainability awareness, experience, and ability to execute at different levels of management can affect the final outcome. Subsidiaries, in particular, are concerned about the negative impact these strategies may have on their profitability and operations. This is because the primary objective of the company is to maximize profitability. Although existing reports (Yoon, Lee and Byun, 2018) indicate that ESG performance is positively correlated with a company's overall enterprise and market value, Zhou, Liu and Luo (2022) find that ESG performance does not have a significant impact on firm's profitability. In turn, this strategy is dependent on significant financial and human resource requirements to proceed. According to the experiences of Participant 1, in this enterprise, "*there are some managers ... who may be more focused on short-term performance. And they may be less aggressive about some of the long-term reforms that depend on financial investment"*. This can potentially lead to some administrators preferring to invest in more significant benefits when developing financial budgets. And it can make it more difficult to advance the strategy, as executives may focus more on meeting corporate or external metrics rather than proactively doing more about it.

Furthermore, Participant 1 explained "*since all of our managers have different understanding of ESG, the practices of each subsidiary are different"*. If some subsidiaries do not care much about ESG or do not have ideal experience and ability about it, that will be difficult to work together with the functional departments of the headquarters. And if the people assigned by the subsidiary are not at a senior position, they may not be able to give enough information to the headquarter function and help them solve the problems efficiently. And Participant 5 believes that the performance of its subsidiaries in engaging in ESG-related strategies still needs to be further strengthened, that *"everyone's efforts in these areas are to a certain extent to meet the requirements of the annual report at the corporate level ... at this moment the proactive organisation of resources to promote related strategies by the subsidiaries is still*

limited". But he also believes that this is not because colleagues are resistant to such initiatives, but because they are *"still exploring models of action in these areas, which will be a longitude process"*. Thus, Participant 1 suggested that the development of the group's ESG strategic plan requires more thinking about the future of work and that these elements need to be broken down and made accessible to the relevant managers. If these actions can be realized, then Participant 2 explains *"when we want to push forward the rectification ... a lot of production work can't be stopped on the production side of the company"* and the situation is likely to improve. On the contrary, it may be difficult to achieve efficient integration and implementation of each subsidiary's own development plan with the sustainability concept proposed by the headquarters in a short period of time.

In addition, the support of top management plays a crucial role in the implementation of ESG strategies. All the interviewees currently report that the top management is supportive of their works, for example, employees in these two departments are able to *"give feedback directly to the top management in the regular meetings and managers would also promote related work through their own efforts"* when they encounter difficulties in the course of their work. However, Participant 1, who is directly responsible for working with the CFO, said *"they do not have a particularly deep understanding of that either"* when talking about the board's cognition of ESG strategy. And for now, most of their decisions are still made by their departments, with senior leaders playing more of a supervisory and decision-making role in this regard. While the engagement made by these functional departments could make the company currently meet compliance requirements, the long-term implementation of the company's ESG strategy is likely to be more challenging. The board members, who hold the lifeblood of the company, play a decisive role in the long-term development of the company. If they do not have a deep understanding of the content related to sustainability, their involvement in developing the strategy may not meet the long-term vision for sustainable operations. As Participant 3 said, *"when the attention at the top goes up, it's natural for employees below to pay more attention to it"*. So, if their perceptions do not reach the desired level, the motivation of other levels of management for the strategy may also be affected to some extent.

4.3.2 Resources and Facilities

For manufacturing companies, their production activities are dependent on various types of production equipment and large amounts of energy. Therefore, the sustainable transformation of this type of businesses need to take into account the sustainability of their products as well as the sustainability of the production process. Sustainability in the production process includes mainly the control of emissions and energy savings. Sunny Group was founded over 40 years ago and therefore some of the existing production sites are not well equipped with supporting facilities. Participant 2 separated this challenge into two key aspects:

- The first aspect is that, unlike modern industrial parks, the facilities around these production sites were not well equipped in the beginning. As a result, they had to face a series of problems such as poor sewage pipes and inadequate waste disposal systems. And part of these problems is due to the lack of municipal resources. Although Participant 2 believed that the government has been very supportive of Sunny Group in most aspects, the relatively slow pace of renewal of municipal facilities has hindered the transformation of the company to some extent.
- In the second aspect, Participant 2 raised his concern in terms of the aging problem of the equipment. As they belong to the manufacturing industry, they need to rely on a large amount of machinery and equipment to carry out their daily production activities. As time goes by, the aging of machinery and equipment makes it difficult to meet the needs of sustainable production. And in terms of capital costs, large-scale replacement of these old equipment is also unrealistic. As a result, both Participant 2 and Participant 3 said that their work can only be carried out in a step-by-step manner, without efficiently achieving the desired results.

In terms of technology, Participant 2 believed that the application of technology related to sustainability strategies is not yet at the ideal state. For large-scale companies, the budget is sufficient so that they do not think too much about cost. Participant 2 said, *"if there are any safety or environmental issues that's really serious, we would not care a lot from the financial side"*. Instead of capital concerns, they put more attention on areas such as the use of alternative technologies and how that will affect the quality of the process in the production of their products. Especially for new technologies that need to be introduced externally, Sunny Group usually takes a cautious approach to testing

them. Participant 2 said that regardless of the extent to which these technologies have already gained market acceptance, they would use a sophisticated approach to validate them extensively to demonstrate feasibility. Any potential risks identified during the validation process will be given high priority. And with the introduction of new technologies, Participant 1 added, *"we do not just have to think about ESG performance, we have to think about market delivery for other customers... and we are not sure if the customer will agree with us to replace them"*. For Sunny Group, therefore, the introduction of new technologies is a complex process that requires extensive validation and evaluation in many areas. On the other hand, Participant 2 noted some concerns about technological barriers. The company belongs to the high-tech industry, and its products involve a lot of high technology from design to production. Therefore, both in terms of international politics and business competitiveness, the supporting technologies for similar high-tech industries will not be released to the market for a long time. On the other hand, companies' excessive concerns about emerging technologies may hinder their exploration and practice of ESG strategies. An organisation called RSM (2022) who offers the global leading consulting service for enterprises, highlights the importance of innovation in ESG. They believe that it is critical for companies to apply innovative and emerging technologies to their ESG strategies, which can drive the creation of value from sustainable innovation.

In terms of resource consideration, Sunny Group, as a major consumer of electricity resources, has introduced various electricity saving measures and purchased Solar Power Generator System. But without the ability to generate enough clean energy on its own, the company has to spend more than the cost of ordinary electricity to procure clean energy from power companies. In China, this part of the power source comes with a renewable energy green power certificate. And Participant 1 raised her concerns to the risk of affording higher cost for this part of the power source, because they do not have any direct evidence except the paper certificate. Also, *"this renewable energy green power certificate is not recognized by many customers"* for this company. At the same time, it is not practical for companies to build their own generation facilities with sufficient capacity, either in terms of capital investment or policy constraints. At present, Sunny Group's response to this challenge is to facilitate as much photovoltaic power generation equipment as possible. However, more than these power sources are needed to meet its own production energy requirements. As a result, Sunny Group still faces a significant challenge in terms of power resources.

4.3.3 Recognition of employees' contribution

Earlier, this report discussed managers' awareness and how ESG-related sustainable strategies might be insignificant in helping to improve the company's profitability. Based on that, Participant 2 stated *"the benefits of this strategy are more from the implicit side and not as significant as the benefits of transforming production and business operations"*. As a result, there might be some challenges in fairly assessing the efforts made by employees in these areas to achieve sustainable development. While Participant 2 believed that "*these actions are certainly beneficial for the long-term development of the company*", he also raised the consideration that "*there are certainly some short-term effects on individuals*". Especially for the lower and middle-level employees, their motivation and initiative will be seriously affected if their workload and effort are not recognized and motivated. Moreover, Participant 5 says *"we need to take on more of the day-to-day workload for the ESG strategy... although some of the work like the environmental review has been done before, the company is now requiring more detailed work and specifications for the department ... but in turn, there is no corresponding increase in our income"*. It is clear from his response that many of these additional duties are a refinement of the original tasks. It is therefore difficult to determine whether they are really creating more value and deserve to be paid more. Similarly, some senior staff may potentially not pay much attention to this area of work due to the insignificant or uncertain benefits to their role.

In order to avoid the negative impact on the company's ESG strategy due to such issues, it is evident from the results of the interviews that Sunny Group is trying to improve the relevant performance appraisal system. For instance, Participant 2 mentioned that the company had established a correlation between sustainability-related assessment results and salary to some extent, including that of the group president. However, Participant 1 said that the ESG strategy as a whole had not been effectively incorporated into the performance appraisal of the person in charge. It was also confirmed by Participant 2 that the main reason for this difference is that the Administration Office is mainly involved in safety and environmental issues, so the indicators are more specific. However, the ESG strategy, for which the IRO is responsible, requires a combination of environmental, social and corporate governance factors. Although feedback from third-party organisations can provide some indication of the company's efforts during the year, it is not practical to use them for performance reviews. In order to engage employees at different levels throughout the organisation in the ESG strategy, a

systematic evaluation mechanism needs to be thought through at a deeper level and promoted by the company in their future projects.

4.3.4 Deficiency of Human Resource

Employees are indispensable part of any enterprise. In order to effectively implement sustainable strategies, organizations need to pay attention to the competence and responsibility allocated to their employees. Limited by traditional management experience and complex organizational structure, large enterprises may encounter certain challenges:

Professional Ability

The implementation of a company's strategy relies on the cooperation of multi departments and the joint efforts of all employees. This is especially true for ESG, which is a relatively new strategy for most Chinese companies. Therefore, the implementation of ESG strategies should rely on the expertise of employees. However, Sunny Group currently relies more on the help and support of third-party organisations in organising ESG disclosures. When it comes to the company's approach to evaluating its own sustainability achievements, the participants felt that their current monitoring and evaluation system is more likely to be conducted through a third party.

Participant 1 mentioned, in relation to the working model of its sector, *"because we are not professionals either, we would look to third-party consultants for guidance and help"*. She further stated that she is not a professional with an environmental background. With the addition of ESG strategy-related responsibilities to her portfolio, she had to undergo a series of training to ensure she has the appropriate competencies. Although Participant 1 made it clear during the interview that her skills in ESG reporting had been enhanced by reading books, attending courses offered by consultancies and communicating with investors, it was uncertain whether these skills would contribute to the implementation of an ESG strategy. Participant 3, who has a background in environmental protection, explained that *"external training may not provide much help, and there is a limit to how much of it can actually be applied to the work"*. When discussing the performance evaluation of their internal work, Participant 1 said that currently *it is mainly based on a third-party rating...and also on investors' feedback*. It is evident that the department has not yet established an effective way of subjectively assessing the company's ESG performance and introducing it into the

planning of future strategies. Therefore, as an important department with a key role in developing the company's future ESG strategy, IRO needs to find appropriate ways to improve the professional competence of its personnel.

As a key driver of sustainable transformation for the company's divisions and subsidiaries, the administration office has developed a program to regularly visit different divisions and provide professional information on their sustainability initiatives, such as informing them that *"other peers are already using something to replace what we are using...so why don't you also try to see if this substitution has a big impact on the final quality of the product"*. Based on this, it can be noted that the professional competence of the personnel in this department makes an important contribution to the promotion of the ESG strategy. However, this also reflects a lack of overall sustainability expertise among the company's employees.

Participant 2 noted that several colleagues in their administration office have a professional background in environmental engineering, but there is still a shortage of such staff in subsidiaries and other departments. Participant 3 found that sometimes when working in collaborative projects, colleagues from other departments may not be able to understand what they are talking about. For instance, when Participant 3 was carrying out an inspection of its new production site to separate rainwater and wastewater, he found that some workers mistakenly combined the two because they did not have the relevant expertise or knowledge. These mistakes increased the pressure on the company to rectify the situation later further impacting their budget.

There is also a limit to the professional support that Administration Office can provide to other departments. However, many departments have to rely on their guidance in order to carry out their work. For example, the subsidiary needs professional guidance in process innovation and target setting, and the Human Resource Department needs assistance in identifying sustainable talent for recruitment. In order to relieve their work pressure and improve the overall motivation of Sunny Group, Participant 3 says, *"we have launched e-publications and training for all employees on the topics of environmental sustainability, work safety and occupational health...the aim of these training is to enable colleagues in other departments to cooperate more effectively with us"*. However, participants from other departments felt that the current generic training content did not really help them to implement it in their work. Participant 4 mentions that *"the training courses we currently offer for our ESG strategy are mainly aimed at making employees aware of safe production processes and get to know what can be done to cause environmental pollution...but these courses might hard to help these staffs*

to acquire the expertise to implement sustainable behaviour in their work proactively". Therefore, these efforts do not effectively relieve the pressure on professional employees who are able to work sustainably.

Quantity of personnel allocation

The lack of personnel allocation has led to a certain impact on the progress of ESG strategy in Sunny Group. Participant 3 explained, "*due to the limited number of staff, I am currently concentrating on a limited number of more important tasks*". Thus, he can only focus on emission management for now, which include the sewage discharge, industrial waste and exhaust emission problems. Until completing the current phase of work as a whole, they could potentially organize energy to focus on the next step of carbon emissions regulation. This aspect is also reflected in its ESG report. Comparing Sunny Group's energy use and greenhouse gas emissions over the past two years, it can be observed that its direct energy consumption, including natural gas, LPG, diesel and gasoline, has dropped significantly through process adjustments, from 5,675 MWh to 582.8 MWh. But its CO2 emissions have not shown a downward trend. The increase in product demand and the operation of new production sites have had an impact on this situation. In this context, Participant 3 notes *"we will subsequently consider the energy efficiency aspect. Although some related work is already underway, the main point of our work is still on emission control"*. From a company's point of view, hiring too many employees does cause some stress in terms of payment. But they need to overcome this challenge and strike a balance between the number of employees and their responsibilities if they want to implement ESG strategies effectively.

Instability of human resource

Staff turnover and job restructuring made it challenging for the company to carry out ESG-related work. The company's real-time ESG strategy led to changes in some departments, including an increase and refinement of responsibilities. As the company's focus on this area has increased, new sections and departments have been added to the organization's structure. The section managed by Participant 3, for example, was just established at the beginning of this year, which means they need to explore and develop a new working model and assessment criteria.

Participant 1 believed that this turnover and job restructuring would create instability and affect the alignment of work in the implementation of sustainable strategies. For most employees, Participant 1 thought that "*they did not have a comprehensive*

understanding of the company". So, when these employees are asked to work with the relevant departments on ESG aspects they are not familiar with, the process will require IRO's staff to "*spend more time on interviews and engage information validation"*.

Recruitment of Personnel from Sustainable Backgrounds

Interviewees responded positively to whether they had plans to recruit more talents with specialist competencies. Participant 2 says, *"our main staff in the Administration Office have a professional background in sustainability or safety, so there is no urgent need for them at the moment...but for the subsidiaries, they are relatively understaffed in this area upfront"*. However, his colleague Participant 2 in the context of his work pressure noted that *"we have a shortage of staff at the moment, mainly because of the concentration of tasks that need to be rectified and promoted at this stage...with less staffing, we can only focus on the more important tasks at the moment"*. In conjunction with these circumstances, Participant 4 from the HR department said that they had built a special pool of candidates with sustainability backgrounds for the job market and applicants. Although many department heads have discussed the demand for people with sustainability backgrounds with their departments in informal meetings, he further mentioned that the number of formal recruitment requests they currently receive has not increased significantly relative to the period before the ESG strategy was formally implemented. This situation stems partly from their financial budgetary concerns and partly from their preference for a stable rather than a radical sustainable transformation strategy.

Participant 1 believes that *"disruptive implementation of an ESG strategy poses a significant risk to the company... we need to consider not only the performance of the ESG strategy implementation but also the delivery cycle and acceptance of the customer"*. Furthermore, although the ESG strategy is a strategy that needs to be updated and implemented over time, they do not need to invest a lot of energy and human resources to carry out related activities after the organisation has completed the basic deployment and alignment of its work. For this reason, many departments consider that hiring a large number of people with sustainable expertise at this stage poses a potential risk to their long-term operations. Once their working patterns have met the appropriate sustainability requirements, the need for such employees will be reduced, but the sector will still be liable for the corresponding payroll obligations. As a result, most departments do not consider recruiting specialist sustainability talent at this stage. This also supports Participant 2's response that they prefer to use specific

services provided by consulting firms at this stage. And instead of hiring the talents directly, based on the current state of affairs, Sunny Group has undertaken a series of internal motivational and awareness-raising initiatives to initially improve the situation and enhance the effectiveness of its ESG strategy.

In addition, some participants also raised their views on some of the challenges in this process. Participant 1 said that IRO needs people with *"a background in environmental science...or experience in ESG management"*. However, she said that this category is difficult to recruit, as people with these competencies are more likely to work for consulting organisations with more appropriate expertise than to enter production-based companies. And Participant 2 and 3 said that their departments require employees with an environmental background who are familiar with the working patterns of production companies. Thus, many graduates in the Environmental sector may not be able to apply their expertise to the actual production of the company and adopt their working models. Participant 3 adds that *"it is not difficult to recruit people with a relevant background for a department such as ours, which specialises in environmental and production safety...but for other departments that do not require a high level of expertise, it is harder to find people with the right mix of skills to meet their requirements"*. Based on these realities, the interviewees thought that the most efficient solution at present is to train the relevant personnel in-house. However, it would be difficult to train more qualified people with their current limited capacity. They would therefore also like to see more inter-disciplinary talent on the talent market to support the company's demands in the sustainable transformation process.

Limitations of full participation

When views on the need for grassroots employees to be involved in the company's sustainable strategy were discussed with the participants, most of them gave a favourable opinion.

Participant Code	Attitude to full participation
1	Yes, *"sustainable development is the goal of a company and should be related to every employee"*
2	Yes, *"I think it is important to involve all staff in this strategy, regardless of the current situation in the company...but our large workforce may make this model difficult to implement effectively"*

3	Yes, but not now, *"at the end of the day, the ESG strategy is definitely going to require full participation...but due to staff awareness and organisational structure at the moment, I do not think we have reached that point yet"*
4	Yes, "*If the time cost allows, I think it is possible to lead all staff to become aware of and participate in this strategy...but at the moment, I do not think it is particularly necessary to work on this...It is enough for employees who are not directly involved to have a simple understanding of the work carried out by the company as a whole".*
5	Yes, *"I think everyone should have the opportunity to be involved in sustainability-related decisions... sustainability-related actions and the launch of green products require all employees in the company to be able to participate and innovate".*

Table 4.5 Participants' attitude to full participation

Although Participant 3 stated that *"if ESG is implemented at an advanced stage, then definitely all employees should be involved"*. But he added *"we may not be at that stage yet"*. The reason for this situation stems mainly from the lack of understanding of ESG strategies and the lack of expertise of the grassroots staff. So why does not this company try to establish effective ways to communicate its ESG strategy fully? As shown in Figure 4.8, combined with the responses of the interviewees, it can be seen that there are a series of challenges for employees to participate fully in the ESG strategy.

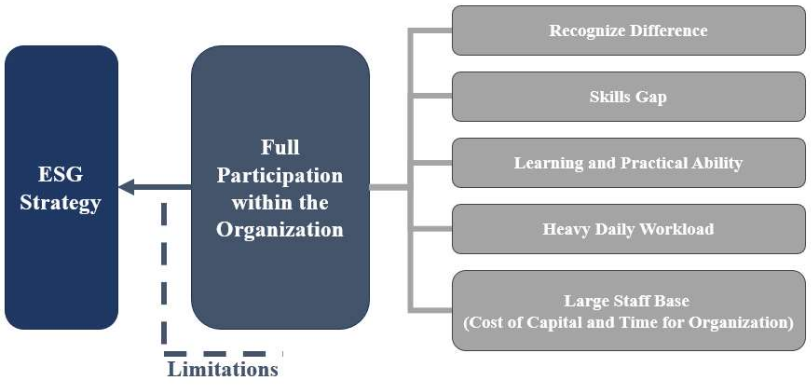

Figure 4.8 Potential challenges of full participation

Participant 2 felt that it was impractical to promote ESG strategy to raise awareness

among employees, because "*if the whole ESG strategy is given to employees in a straightforward manner...there are many elements in it that they have no way to understand and implement*". Even if the relevant advocacy actions were implemented, Participant 2 highlighted his concern by stating "*in the actual work, they may still be working to accomplish the leader's request, and will not really follow up these principles on their actions*". Based on this, he proposed the method of decomposing and simplifying the strategy. However, in combination with Participant 1's response, the company has not yet established a clear long-term plan for ESG strategy. Therefore, it is difficult to carry out this kind of behaviour to raise the awareness and participation of grassroots employees.

A series of activities and competitions are organised to solve these kinds of challenges and encourage more staff to put forward more innovations related to ESG strategy. For example, an event called *"golden ideas"* takes place in Sunny Group where any suggestion that simplifies the workflow or improves the product's performance will be reviewed and rewarded accordingly. But Participant 2 noted *"we do not seem to be taking these actions across the board. So, the effect of these actions is very limited for promoting ESG strategies*". At the same time, Sunny Gorup has a large employee base, which makes it difficult for them to provide specific training to employees in different positions. This series of training requires the company to bear the capital cost and the time cost of the employees' learning process. The results of this training may not be directly reflected in the company's short-term earnings. On the other hand, the company is currently operating at a saturation level and has a long-standing double-shift production model. So, employees rarely have a window during their working day to undertake systematic learning. Therefore, full participation in the ESG strategy is a challenge for the company to overcome in terms of resource allocation and time costs for employees.

Now with the completion of Sunny Group's new production base, the hardware problems might effectively be addressed. Overall, the company has put a lot of effort into ESG strategy in terms of management and organizational structure. However, due to the huge organizational structure and complex production process, there are still some problems that cannot be addressed properly for the time being. Participant 1 indicated that, according to the decision of the board of directors, they would invest more energy and resources in the next year to achieve higher degree of sustainable transformation of the enterprise. The company is taking initiatives and measures to be a pioneer in sustainability with their business.

CHAPTER 5
CONCLUSION

Today, companies are becoming more conscious about sustainability and the environment. Hence, many are actively incorporating actions or exploring ways to facilitate sustainability into their daily business operations. Although ESG principles have been around for over 19 years, only in recent years has there been a significant interest among researchers, businesses, and government bodies due to the rising environmental issues such as pollution and global warming. Many researchers have explored the overall benefits of ESG strategy for enterprises in terms of innovation and economy but very few have analysed the risks and challenges that could potentially arise in the implementation process of ESG particularly in large organizations. In China, large enterprises are significant to the economy and there is a need to understand the experiences of organizations undergoing sustainable transformation. Chinese manufacturing industry in particular will have to go through significant changes in the near future in terms of embodying sustainability into their business model due to the government's Made in China 2025 plan and carbon neutrality plan. One of the significant research gaps is the lack of understanding on how large enterprises in China can integrate the principles of sustainability and implement ESG-related strategies to facilitate the sustainable development of their business operation.

Therefore, the main empirical objectives of this research study focused on the following:

- Study some of the key organisational strategies used by large organizations to facilitate sustainability.
- Identify some of the challenges encountered by large organizations in the process of incorporating sustainable policies in their business model.

Using a case study approach, this research focused on the efforts made by a large-scale Chinese manufacturing company – Sunny Group to promote sustainability in its business practices and the application of ESG strategies. Over the years through a series of organisational and operational changes, this company has effectively integrated ESG strategies into its business development strategy and managed to improve its sustainable performance. One of the distinguishing factors about Sunny Group is that this company rather than taking short-term ad hoc measures, is taking initiatives to integrate the concept of sustainable management into its overall development strategy so as to address its environmental impact and performance.

Key organisational strategies used by Sunny Group to facilitate sustainability

The case study analysis of Sunny Group explored some of the key organisational strategies used to facilitate sustainability which include:

- The core foundations of ESG strategies complement the early business strategy formulation of Sunny Group which were heavily influenced by the concept of Environment, Health & Safety (EHS) emphasising safe production and legal operation.
- Strengthen the relationship with their investors by collating and providing key information about the company's sustainability performance and growth and thereby building more transparency.
- Create a safe and harmonious workplace environment to emphasise on staff welfare, reduce turnover and increase overall staff satisfaction.
- Use a three-tier management framework to enable a top-down management model to facilitate the integration of ESG governance into various departments and levels.
- Control energy consumption and pollution emissions in their business operation by adopting Greenhouse Gas Protocol (GHG Protocol) and this involves working with selective suppliers in the supply chain that matches their sustainability principles and values.
- Provide training sessions on ESG strategy to various employees and this involves building their awareness on some of the core aspects of energy saving and waste management. And set up incentive mechanisms to encourage employees to actively participate in the implementation of the strategy, such as proposing feasible suggestions and problems at the grassroots level.
- Establish good communication with their stakeholders and customers about the company’s products and sustainability initiatives. This helps to market their social responsibility and increase better customer and stakeholder experience with Sunny Group.
- By evaluating existing production conditions and public facilities, they have invested in new production sites to avoid the constraints of traditional production models on the transformation of sustainable production methods.

Challenges encountered by Sunny Group in the process of incorporating ESG Strategy

Sunny Group has faced several challenges in their path to integrating ESG strategy over

the years. This includes:

- There appears to be an inconsistent level of awareness on ESG among senior management and the board. This has led to certain problems in Sunny Group such as special fund investment being limited, corporate culture transformation facing difficulties, and challenges with adjusting and maintaining relations with stakeholders.
- Many staff can get overwhelmed with the sheer amount of work in the early stages of ESG strategy implementation as these changes can lead to a dramatic increase in their workload. Several employees struggled in this process which can pose a huge challenge to a company's productivity. Some departments in Sunny Group had to get help from external third-party consultants to cope with this.
- There are certain limitations with the top-down management approaches used in Sunny Group. Some participants felt that this needs to be replaced by an all-hands-on-deck model. But the current organizational structure of the business may not be at the right stage to drive such initiatives.
- There is a shortage of people with a combination of expertise and sustainability backgrounds in the talent market. Hence, recruiting employees with the relevant background on sustainability has been a challenge for Sunny Group. Companies in remote locations generally struggle to find the right talent. Moreover, as China started late in the aspect of sustainability, there seems to be limited people with extensive experiences in these areas. In addition, the company culture and the working philosophy will be a potential challenge.
- There is a lack of clarity about the challenges that large companies like Sunny Group can face in a complex market like China. Because the drive towards sustainability is relatively new in China and other developing countries, only a limited number of companies has had some experience in applying sustainable strategies. So, there are no clear templates to look for guidance and reference.

Guidelines for businesses wanting to incorporate ESG strategies

This study contributes to the existing literature on sustainability by shedding more insights on the changes in the organisational structure and operational models of large organization in the process of implementing ESG strategies Here are some of the key points that other companies can consider while implementing ESG strategies in their business:

- Companies in the early stages of an ESG strategy may need to undergo a range of changes and undertake a large number of tasks, including but not limited to human resource restructuring, management model renewal and a comprehensive assessment of the current production model. However, in some companies, the existing personnel may not be able to cope with such extensive changes and work in terms of their abilities, experiences and energies. In such circumstances, using the services of third-party consultancies may help them to fill the gaps in their expertise efficiently and relieve the pressure on some of the departments concerned.
- While the services of third-party consultancies can be used in the early stages to fill gaps in the competencies and experience of a company's employees, Companies should think about their long-term human resource needs, they will need to develop a unique strategy that relies on their own resources, which needs to be closely aligned with the company's realities and operational characteristics.
- Companies will need to implement talent development or recruitment programmes more effectively to ensure their strategy is in line with the latest industry requirements.
- Before a company decides to implement an ESG strategy, there is a crucial need for top management to have some consistency in their understanding and awareness of ESG and the importance to the company's sustainability goals. As large Chinese companies are relatively new to the areas of sustainability, companies may consider organising training for key personnel and executives in these areas. Through a series of trainings, they can clarify the benefits that ESG strategies can bring to their company and gain a more comprehensive understanding of industry and market trends.

This study found that when a company's strategy progresses, its employees' competencies and management patterns may change and evolve with the process. Therefore, there is a need to understand the range of factors that may influence the outcome of relevant decisions in the early stages of a company's ESG strategy implementation and what factors prompt these changes among employees. There is a need to understand the competency needs of companies for talent and to develop programmes to better match future needs for complex talent. This case study identifies two types of specialised talent that can meet the needs of companies to better deploy ESG strategies. One type of talent is those who have direct access to the ESG-related

knowledge base and who can help organisations build virtuous growth strategies. The role of this person is to monitor and guide the development of various strategies. By hiring such talent, companies may possibly address the skills gaps between themselves and industry leaders in terms of sustainable action. This can then help them to undertake solid plans to facilitate sustainability. The other type of talent is composite talent. This can also be welcomed by companies, and unlike other employees, they have sustainability awareness along with a specialised competency. They are able to understand and implement corporate strategies related to ESG principles. By integrating sustainability principles into their daily work, they can help companies to better achieve sustainable operations. Higher education in countries like China could therefore consider including ESG-related content in optional modules for science and engineering students, which could create more interest and awareness, better employment opportunities for students and provide strong talent support for companies.

CHAPTER 6
LIMITATION AND FUTURE WORK

There are some limitations to this research study. Firstly, this research is based on a single case study. It focuses on one organization's approach to ESG facilitation, and the analysis and reporting is specific to this case study and the sector. Future research could focus on multiple case studies across different industries to get a more comprehensive picture of the phenomena.

This project did not adopt a longitudinal approach for data collection and the number of interviews conducted was limited due to the time constraints of an MSc by research. The data collection was also affected due to restrictions from COVID related policies. The deployment of ESG strategies in the chosen company is still at an early stage, and many of the relevant management models and operational practices are not yet mature. Hence, there appears to be limited awareness and understanding of ESG strategies among many employees working for the chosen company. There may be some bias in the understanding and attitude of employees between different levels towards the ESG strategies implemented. Hence, further research could do more interviews across different departments and explore the attitudes of management and the involvement of all employees in the development and implementation of ESG strategies.

As the Chinese government adjusted COVID-19 policies recently, more changes aimed at stimulating economic growth are being introduced. They are also strengthening their sustainability policies to meet the carbon emission targets for the 2030 and 2050 plans. Against this background, it is expected that more companies will be involved in sustainability initiatives related to ESG strategies. Future research could focus on the impact of government public policy adjustments on corporate sustainability performance.

Furthermore, this study focuses on a large-scale private sector. Large-scale enterprises have sufficient capital and resources to undertake the relevant change activities. In the case of SMEs, their simple organisational structure gives them relative flexibility to operate. Future research could compare the differences in behaviour between large firms and SMEs during sustainable transformation. Researchers could explore whether the motivations and challenges of SMEs in promoting ESG strategies differ from those of larger enterprises. Moreover, future research could also focus on how some SMEs have overcome the corresponding barriers and built their own reliable and sustainable supply chains. Researchers can also explore whether top managers in large

companies and SMEs have different decision-making approaches when it comes to sustainability.

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Appendix 1 – Interview Guide

Senior Manager Demographic Information

- Job title:
- What is your age?

  Less than 25 years 25-35 years

  36-45 years 46-55 years

  56-65 years More than 65 years
- What is your highest level of education qualification?

  High School Associate degree

  Bachelor's degree Master's degree

  Doctorate Others or prefer not to say:_____
- When did you join this organization?
- What was your job title when you first joined this organization?

Preliminary Interview Guide for Senior Managers

1 - Background of the company's sustainable development strategy

- Please tell me about your role in the company.
- Do you enjoy working for this company? What do you like most about your job?
- As we can see, this company focuses a lot on sustainability. In that context, I want to ask you, what does the term 'sustainability' mean to you?
- From where do you draw your understanding/motivation towards this concept?
- Does your previous work experience influence your understanding and engagement with sustainability?

Next, I'd like to discuss with you about the topic of issues related to environmental sustainability. First of all, the embodiment of sustainability in the operation of enterprises includes economic sustainability and environmental sustainability. The former includes the sustainable expansion of the market, the continuous reduction of costs and the development of research and development activities. This project will focus on corporate strategies related to environmental sustainability. The concept of environmental sustainability requires companies to look at the immediate and long-term impacts of their business activities on the natural environment. Such as the use of renewable energy and the establishment of reverse logistics networks.

- In what ways is environment sustainability relevant to your current job role?
- I am very interested to understand your company's approach towards sustainability. Can you please give me an overview of your company's overall sustainable development regulatory system?
  - What aspects are involved in this model/system?
  - How did you company build this model/structure towards integrating environmental sustainability?
  - When did this company start to make this transition towards a sustainability driven model?
  - What inspired your company to focus on sustainability?
- Can you please explain how the process of formulating and implementing sustainable strategies work here? Who in your company are generally involved with this process?

2 - The importance of sustainability

- How important do you think it is for today's businesses to integrate sustainability into their organizational strategies? Why?

- As a senior manager, in what ways do you think environmental sustainability will help/has helped your business?
    - Corporate social responsibility? Compliance? Economic benefit?

- Do you think environmental sustainability strategies have had a direct impact on your company's performance?

- What is the role of senior managers like you in successfully implementing environmental sustainability strategies?

- To what extent do you think entry-level employees should be engaged with the company's sustainability strategy? Do you think their participation is important? Please explain.

- Are you aware of any supportive policies in place to encourage employees to innovate on sustainability?

- To what extent do you think the process of implementing sustainable strategy within an organization depends on the coordination between different departments? Please explain your views.
    - How exactly is this alignment achieved? Does your company follow this process?
    - or who does the unified deployment of strategy?

- Which department(s) do you think play a key role in achieving the environmental sustainability in this company?

- How do you measure the success of sustainability related goals/objectives?
    - Are you aware of any methods and criteria for evaluating sustainable performance in your company?

3 - Personal ability and sustainable strategy

- How do you engage with sustainability in your current role?
    - How do you come up with sustainable ideas/concepts?

- How do you build your knowledge and skills related to sustainable development? (Have you studied any Specialized courses or undergone any training on these areas?)

- How do you obtain relevant information to support your sustainability related decisions?

- Do you think one's personal perception related to sustainability will influence the decision-making process to some extent?

- Do you think the successful implementation of sustainability strategies depends on any specific individual capabilities?

- Can you share with me some sustainable decisions or actions that you have been directly involved with?
  - To what extent did you manage to achieve those goals?
  - How did you engage with other managers and employees during this process?
  - Did you encounter any obstacles or challenges in the process of making these decisions?

- Which do you prefer - disruptive or conservative sustainability strategies? Why?

- How do you keep your knowledge on environmental sustainability up-to-date?

4 - Challenges

- Can you list some of the challenges or surprises that you have experienced while implementing sustainability related strategies?

- Has your participation in the sustainable development of the company been restricted in any way by traditional management practices?

- How do you strike a balance between existing management methods and sustainable strategies?

- To what extent do you think the company's existing human resources can meet the company's business transformation or expansion needs in terms of sustainability?

- Do you think risks from external stakeholders, such as suppliers, need to be considered in the implementation of sustainability strategies? Please explain.

- Do you think the policy adjustment from the government's environmental protection department is likely or has brought pressure to the company to a certain extent?

- What are your upcoming goals/vision towards sustainable strategies?

Appendix 2 – Interview Consent

Interview Consent Form

Firstly, thank you for agreeing to take the time to assist in the research for my PhD project. The project title of my study is "**A study of the Participation and Performance of a Large-scale Chinese High-Tech Manufacturing Enterprise in Environmental Sustainability**". And the main research question for this study is "How does a Chinese large-scale company align its organizational processes to achieve successful environmental sustainability?". This study will focus on the efforts and challenges of your enterprise in the process of facilitating environmental sustainability.

The objective of this project is to build a comprehensive understanding of the sustainable development and transformation of an enterprise. This will help bring clarity on the future of the application of sustainable strategies.

This interview should take approximately **30 minutes**, although it is recommended that you allow for 1 hour. Due to current Chinese regulations and hard situation, this interview will be conducted via a Tencent online meeting or Wechat call. I will be recording the interview on an audio recorder to assist in my analysis of your responses. [1]

All your responses will be used exclusively for this project research purpose. The only identifiable information that will be linked to your responses will be your job title. All other personal information will be completely anonymised. Your responses will be stored securely during the research process and all content will be deleted 1 year after the project completion.

You retain the right to not answer any question that you are not comfortable with and you may end the interview at any point you wish.

Please read the following statements carefully:

I, the participant, confirm that:

I have been briefed about this research project and its purpose and I agree to participate.

I understand and agree to the level of anonymity that my responses will be granted.

I have been briefed about how the interview data will be stored during the study.

I agree to this interview being audio recorded.

If you agree to the above statements and are happy to continue with the interview, please reply to kc1238@york.ac.uk or chenkan321 (Wechat) with the following consent statement:

I, *insert name*, have read the interview consent form provided to me and I agree with all the statements outlined at the end of the form.

访谈知情书

首先，非常感谢您同意花时间协助我的博士项目的研究。我的研究项目名称是"**中国大型高科技制造企业在环境可持续性方面的参与和绩效研究**"。本研究的主要研究问题是"中国大型企业如何协调其组织过程以实现成功的环境可持续性的?"。本研究将重点关注您的企业在促进环境可持续性的过程中所做的努力和面临的挑战。

本项目的目的是建立一个对企业可持续发展和转型的全面认识。这将有助于使可持续战略的未来应用方式变得更加清晰。

访谈大约需要 30 分钟，但希望您能为此留出 1 个小时。由于往返中国的政策限制，本次采访将通过腾讯在线会议或微信电话进行。我将使用录音软件录下面试过程，以便分析你的回复。

您的所有回复将特定地被用于这个项目的研究目的。与您回复相链接的唯一可识别信息将是你的职位头衔。所有其他个人信息将被完全匿名。您的回答将会得到安全存储，所有内容将在项目完成后 1 年删除。

你有权力不回答任何让你感到不舒服的问题，并且你可以在任何时候结束访谈。

请仔细阅读以下声明:

我，与会者，确认:

我已经简要了解了这个研究项目及其目的，我同意参加。

我理解并同意在匿名的情况下给予研究人员相应的回复。

我已经简要介绍了在研究期间访问数据将如何存储。

我同意将这次采访录音。

如果您同意上述声明并愿意继续采访，烦请将以下同意声明回复至 kc1238@york.ac.uk 或个人微信 chenkan321:

我(*填上姓名*)已经阅读了提供给我的面试同意书，我同意表格最后列出的所有陈述。