# Information Systems-enabled Sustainability Transformation in Food Supply Chain Management: A Multi-Theory Perspective

Imairi Eitiveni

ORCID: 0000-0002-4039-2243

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The University of Melbourne, Australia

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# ABSTRACT

There have been growing expectations that the food industry should improve their economic, environmental, and social impacts simultaneously. Compared to other industries, the food industry faces pressing environmental and social issues including food waste due to shelf life constraint, disruptions caused by weather or pests, the use of toxic pesticides in farming, food contamination, child labour, and human rights violation. Consequently, organisations in food supply chains are pressured to integrate environmental and social objectives, or known as sustainability, into their supply chain management. However, transforming towards a sustainable supply chain is challenging. It is inter-organisational in nature, involving different and sometimes conflicting, objectives among various stakeholders. Moreover, successful sustainability transformation requires a set of specific resources and organisational capabilities that are often supported by technologies in general and information systems (IS) in specific. Nonetheless, the previous studies do not inform us adequately about how we can particularly use IS to develop the necessary capabilities to engage in sustainable practice.

This study addresses the current knowledge gaps by investigating the following research question: "*How do IS support the sustainability transformation in food supply chains?*" This study applies Stakeholder theory, Affordance Theory, and Dynamic Capability Theory to guide the research in planning, execution, and data analysis. The study adopts a multiple case study approach involving five Indonesian food manufacturers and their suppliers, resulting in the development of an IS-enabled sustainability transformation model that addresses the research question.

The IS-enabled sustainability transformation model presents key elements that contribute to the successful sustainability transformation in supply chains. The model describes the interactions between organisations and IS that result in the identification of nine possibilities for actions, which are referred to as *IS affordances*. The actualisation of these affordances, in turn, leads to the development of a set of sustainability capabilities. The exercise of these sustainability capabilities collectively contributes to the development of dynamic sustainability capabilities pertinent to a successful transformation process. In short, the study argues that by developing specific dynamic capabilities enabled by IS, organisations can enhance their change process towards becoming sustainable entities.

The thesis advances the current knowledge at the intersection of the SSCM and IS fields in the following ways:

1. It improves our understanding of IS and the potential affordances emerging from its material properties, sustainability goals, and socio-technical conditions.
2. It extends the current knowledge of how IS enable the development of essential sustainability capabilities by applying a novel combination of Stakeholder theory, Affordance Theory, and Dynamic Capability Theory
3. It provides rich empirical evidence demonstrating that firms require certain dynamic capabilities to respond to challenges posed by emerging environmental and social issues.
4. It extends the literature by presenting a holistic view of sustainability transformation.
5. It provides insights into how IS can support firms to anticipate and deal with challenging social issues in supply chains.
6. It enhances our understanding of how sustainability transformation occurs in a developing country.

# DECLARATION

This is to certify that:

   i.   the thesis comprises only my original work towards the PhD,

  ii.   due acknowledgement has been made in the text to all other material used,

 iii.   the thesis is less than 100,000 words in length, exclusive of tables, maps, bibliographies, and appendices.


Imairi Eitiveni

July 2020

# PREFACE

This thesis research has been carried out at the School of Computing and Information Systems, The University of Melbourne. The main contributions of the thesis are discussed in Chapters 2-7 and are based on the following publications:

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2017. "Sustainable Supply Chain Management: Taxonomy, Gaps and Future Directions", Proceedings of the 21$^{st}$ Pacific Asia Conference on Information Systems. Langkawi, Malaysia: Association of Information Systems.

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2018. "IT-Enabled Capabilities for Sustainable Supply Chain Management: An Affordance Theory Perspective", Proceedings of the 22$^{nd}$ Pacific Asia Conference on Information Systems, Yokohama, Japan: Association of Information Systems.

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2019. "A Traceability System for Sustainability Transformation in the Food Supply Chain: An Affordance Theory Perspective", Proceedings of the 27$^{th}$ European Conference on Information Systems, Stockholm, Sweden: Association of Information Systems.

- **Imairi, Eitiveni,** Sherah Kurnia, and Rajkumar Buyya, 2020. "IS-enabled Sustainability Capability Development in Sustainability Transformation: the Case of Indonesian Food Supply Chains", Journal of Strategic Information Systems (submitted)

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# GLOSSARY

- **Affordance** – The ability of an object to offer a possibility for action for the actors. Existence of an affordance is independent on the actors' ability to perceive it. The same object can afford different affordance to different actors.

- **Affordance actualisation** – The process of materialising the potential for actions offered by an object. An actor has to take concrete action to materialise the possible outcome offered by an object.

- **GHG** – Greenhouse gas

- **PROPER** – A ranking system created by the Ministry of Environment and Forestry of the Republic of Indonesia to evaluate the environmental performance of companies operating in its territory.

- **Sustainability capability** – "Firm's capacities to effectively coordinate bundles of complex human and non-human resources to achieve sustainability goals and delivering sustainable values to its stakeholders" (Dao, Langella, & Carbo, 2011, p. 65)

- **Dynamic sustainability capability** – Essential organisational ability that arises from exercising a combination of specific sustainability capabilities.

- **Sustainability goals** – Stakeholders' objectives in enacting sustainability transformation, which may include reducing environmental impacts of supply chain activities and benefiting various actors within supply chains.

- **Sustainability transformation** – Organisational and supply chain change process towards becoming a sustainable entity.

- **Sustainable practice** – The operationalisation of the sustainability principles in supply chain processes and activities.

- **Triple Bottom Line** – An accounting framework that measures environmental, social, and economic performance simultaneously.

# CHAPTER 1: INTRODUCTION

## 1.1   Research Context

Over the past few decades, there have been growing concerns regarding the negative impacts of supply chain activities on the environment. Supply chain activities are contributing to straining the earth's rare resources, producing massive air, water, and land waste as well as utilisation of hazardous materials, and threatening biological diversity. Business processes involved in producing and distributing products often require excessive consumption of water and land, and produce gas emissions and other waste that negatively impact the environment and threatening biological diversity. For instance, food supply chains face distinct environmental issues, including food waste due to shelf life constraint, disruptions because of weather or pests, the use of toxic pesticides in farming, and food contamination. In Indonesia, the economic growth has relied heavily on the extraction of natural resources at the expense of the environment and society. In 2015, Indonesia was one of the 15 largest emitters of greenhouse gases (Henstridge, Chiappe, & Crawfurd, 2013) which is accounted for 4.5% of global emissions, doubling in two years. The country also suffers from rapid deforestation with around 1.1 million of forests has been lost from 2000 to 2010 (Henstridge et al., 2013).

There is also an increasing apprehension regarding companies conducting socially irresponsible practices, such as providing unsafe working conditions, hiring child labours, violating workers' rights, and disregarding the health, safety, and privacy of the customers (Thornton, Autry, Gligor, & Brik, 2013). In Indonesia's supply chains, pertinent social issues include low wages, inadequate working health and safety, unfair dismissal, and discrimination. Majority of the labour force are not protected by formal social and healthcare insurance (Suharto, 2009) and paid below minimum wage (Allen, 2016; Nomaan & Nayantara, 2018). Despite the significant progress, companies operating in Indonesia are still struggling to eliminate child labour from their workforce (Organisation, 2015).

Various environmental advocacy groups, non-governmental organisations (NGOs), and governments have demanded companies to consider the impact of their activities on the environment and society. Customers are also becoming more informed about the

environmental and societal effects of the company's operations and putting pressure on the companies to address this issue (McPhee, 2014; Morali & Searcy, 2013). This pressure leads to an increasing number of companies that show efforts to integrate sustainability into their activities.

The consideration of environmental and social impacts of supply chain operation is known as sustainable supply chain management (SSCM). SSCM is the "management of material, information, and capital flows as well as cooperation among firms along a supply chain while taking into account economic, environmental, and social factors which are derived from customer and stakeholder requirements" (Seuring & Müller, 2008, p. 2). This definition suggests that businesses need to consider profit, people, and the planet (also known as the triple bottom line—TBL) in performing business activities (Elkington, 1999). Profit is related to the economic value creation by organisations. The people aspect relates to the consideration of the impacts of a firm's business operations to the well-being of its employees, customers, and the community. The planet aspect deals with managing the environmental impacts of business practices, so they, at least, do not degrade the natural environment. Thus, the goal of SSCM is to improve social and environmental performances, while remaining economically competitive (Gold, Seuring, & Beske, 2009).

However, across all industries, defining a strategy and implementing the plan related to sustainability are challenging for organisations. The aspiring organisations encounter internal and external barriers, including costs, lack of knowledge and expertise, and higher coordination complexity (Min & Galle, 2001; Helen Walker, Di Sisto, & McBain, 2008). Additionally, the lack of a clear understanding of the sustainability concept and technical expertise within organisations could limit SSCM initiatives (Carter & Dresner, 2001; Morali & Searcy, 2013). Moreover, achieving sustainability goals requires all members in the supply chain to collaborate extensively (Seuring & Müller, 2008) to ensure transparency and traceability of demand, sourcing, production, and delivery of product and services (Pagell & Wu, 2009). Organisations face unprecedented challenges to overcome these barriers since the sustainability transformation is inter-organisational in nature, involving various, and sometimes conflicting, objectives among diverse stakeholders (Kirchoff, Omar, & Fugate, 2016).

Therefore, there is a heightened need and interest in comprehensive studies in the SSCM area. This stream has experienced considerable growth, especially post the 2010s

onwards. In recent years, there has been an increasing interest in investigating various aspects of SSCM, such as barriers in starting sustainability initiatives (Foerstl, Azadegan, Leppelt, & Hartmann, 2015; Rauer & Kaufmann, 2015), drivers in adopting sustainability initiatives (Carter & Dresner, 2001; Rath, 2013; Vijayan, Kamarulzaman, Mohamed, & Mahir, 2014), critical success factors in sustainability implementation (Ageron, Gunasekaran, & Spalanzani, 2012; Gopal & Thakkar, 2016), and theoretical framework that guide specific sustainable practices (Azevedo, Carvalho, & Cruz Machado, 2011; Bommel, 2011; Carter & Carter, 1998; Kumar & Rahman, 2016).

## 1.2 Motivations

Despite the growing interests, the current knowledge about organisational and supply chain transformation process towards becoming a sustainable entity (referred to as **sustainability transformation**) resides at the level of understanding the phenomenon and building theoretical frameworks, while not informing practice adequately (Eitiveni, Kurnia, & Buyya, 2017). A large amount of literature is devoted to identifying sustainable practices in various contexts, but generally, only cover specific elements of SSCM (e.g.,(P. J.-H. Hu, Hu, Wei, & Hsu, 2017; Smith, 2008). The majority of SSCM studies only consider environmental dimension while excluding the social aspect (e.g., (Cantor, Morrow, & Montabon, 2012; Golicic & Smith, 2013; Hassan, Nordin, & Ashari, 2016). There has been limited discussion about comprehensive SSCM models that consider all aspects of TBL. Furthermore, the theoretical development in SSCM is mostly focused within individual organisations (Cantor et al., 2012; Matthews, Power, Touboulic, & Marques, 2013; Tate, Ellram, & Kirchoff, 2010). There is still a lack of understanding of how to create effective collaboration beyond an organisational boundary.

Moreover, the SSCM research to date has tended to focus on sustainable supply chain practices in developed countries (e.g., (Bansal & Mcknight, 2009; Carter, Ellram, & Ready, 1998; Pullman, Maloni, & Carter, 2009). Studies about sustainable supply chain practices in developing countries have only been carried out in a small number of countries such as China (S. A. R. Khan, Dong, & Yu, 2016; J. Liu, Yang, Lu, & Zhang, 2016), Taiwan (A. H. Hu & Hsu, 2006; Wu, 2013), India (Gopal & Thakkar, 2016; Sunil Luthra, Garg, & Haleem, 2016), Mexico (Huerta, Güereca, & Lozano, 2016), Ecuador (Rodriguez, Thomsen, Arenas, & Pagell, 2016), and Vietnam (Nayak, Akbari, & Maleki Far, 2019). Since many organisations have now extended their supply chains to

developing countries, global efforts are required to protect the planet and society. Therefore, it is essential to ensure that developing countries also adopt SSCM.

The goal of SSCM can only be achieved if the entire supply chain has relevant resources and capabilities for implementing SSCM (Bowen, Cousins, Lamming, & Faruk, 2001). Several studies (e.g., (Dangelico, Pontrandolfo, & Pujari, 2013; Gavronski, Klassen, Vachon, & Nascimento, 2011; Shang, Lu, & Li, 2010) examine the necessary capabilities for implementing SSCM. However, they primarily concentrate on the environmental aspect and exclude the social issue. Existing studies also classify capabilities based on phases in supply chains such as green manufacturing, green marketing, or green design (e.g., (S. Li, Jayaraman, Paulraj, & Shang, 2015; Y. Liu, Zhu, & Seuring, 2017; Shang et al., 2010). These capabilities cannot be generalised to all industries. For instance, green manufacturing is not relevant to the service industry. Furthermore, these capabilities cannot be applied to various roles in a supply chain. For example, green manufacturing does not apply to retailers. Studies that define and identify a broader set of capabilities that are applicable in various contexts and can successfully address economic, environmental, and social goals simultaneously are lacking. This study referred to this kind of capacities as **sustainability capabilities**.

At the same time, the recent development in the SSCM field has led to a renewed interest in the role of IS in helping companies to engage in sustainable practices. The role of IS as a crucial enabler in the traditional supply chain management has been widely acknowledged. IS can significantly reduce paperwork, lead time, and non-value-added activities, and enhance communication (Handfield & Nichols, 1999). On this premise, a growing number of studies have investigated various aspects in the intersection of IS and SSCM. For example, Luna-Reyes et al. (2014) developed a system to enable customers to choose sustainable products, while N. Melville and Ramirez (2008) provided research agenda on IS innovation for environmental sustainability, and Iveroth and Bengtsson (2014) investigated how IS can be used to change individual's behaviour towards sustainable practices.

While such studies are useful, these studies do not inform us about how we can use IS to develop the necessary capabilities to support SSCM. Most studies on IS and SSCM propose the role of IS in specific practices such as pollution reduction (Dao et al., 2011) or management of product return (Jayaraman, Ross, & Agarwal, 2008). Existing studies also tend to provide the general role of IS such as automation (Dao et al., 2011), to

improve information flow (Gunasekaran & Ngai, 2004) or to help decision making (Jayaraman et al., 2008). In fact, IS are expected to support the development of the required capabilities to successfully transform a supply chain to become a sustainable entity (Dao et al., 2011; Kurnia, Mahbubur, & Gloet, 2012). There are few studies investigated the IS capabilities in helping supply chain to engage in sustainable practices, such as (Dao et al., 2011; Kurnia, Rahim, Samson, & Prakash, 2014; Thöni & Tjoa, 2015). The previous studies argue that IS cannot enable transformation by itself. IS need to be complemented with other enablers to be effective (Dao et al., 2011). However, there is arguably no empirical study investigating the relationship between IS and capabilities development that enable sustainability transformation within and beyond an organisational boundary. An overarching examination of sustainability transformation that assesses stakeholder perspectives, capability development, and IS role, is instrumental in fulfilling the imminent need for sustainable supply chains.

## 1.3 The Focus of the Study

To address the current knowledge gaps in the literature, this study aims to:

1. Analyse organisations' IS-enabled transformation process towards becoming sustainable food supply chains from a multi-theory perspective.

2. Investigate the role of IS in building the required capabilities to enable sustainability transformation within and across organisations.

Specifically, the study addresses the following research question:

"***How do IS support the sustainability transformation in food supply chains***?"

Six sub-questions are listed below:

1. What are the primary stakeholders' goals and barriers in transforming food supply chains towards becoming sustainable entities?

2. What IS affordances are relevant for supporting the achievement of the sustainability goals of the primary stakeholders?

3. What resources are affecting the actualisation of the IS affordances?

4. What is the outcome of the IS affordance actualisation?

5. What dynamic capabilities are required in supporting sustainability transformation?

6. What is the process of IS-enabled sustainability transformation?

## 1.4 Overview of the Research Design

This study is qualitative research that employs an inductive approach. A qualitative study was chosen as it can preserve and capture the contextual richness of the real-world settings (Yin, 2016). It enables an in-depth study of sustainability transformation and capability building within the exemplary firms and supply chains. This study consists of three phases: contextual, empirical, and data validation. In the contextual stage, this study started with a systematic literature review to identify the current theories, findings, and debates within the SSCM literature. A careful analysis and synthesis of the previous studies were conducted to gain an understanding of IS-enabled changes towards sustainable supply chains, including current practices, capabilities, and IS roles. This phase resulted in the identification of existing gaps in the literature.

In the empirical phase, this study adopted multiple case studies involving five manufacturers and their suppliers in Indonesia, forming five case studies. The participants were selected based on several sustainability measurements, such as the availability of GRI reports and recognition for successful sustainability initiatives shown by sustainability-related awards and certifications. In the data validation phase, further interviews were held with officials from seven government agencies, four NGOs, and two organisational customers. These interviews aimed to validate the insights gained from the five case studies.

Data collection was conducted through semi-structured interviews, observations, and collecting relevant documents. The combination of all data collection methods provides a holistic interpretation of the phenomenon. Data collection and analysis happened simultaneously where results from the data collection phase informed data analysis in refining or reformulation of questions and findings. The data analysis involved transcribing and coding the collected data. It consisted of several passes through the data to identify the key themes and subthemes based on open, axial, and selective coding to answer the research question. The data analysis included within-case and cross-case analysis.

## 1.5 Key Findings

To answer the research question presented in Section 1.3, this study proposes an IS-enabled sustainability transformation model (shown in Figure 1.1). The IS-enabled
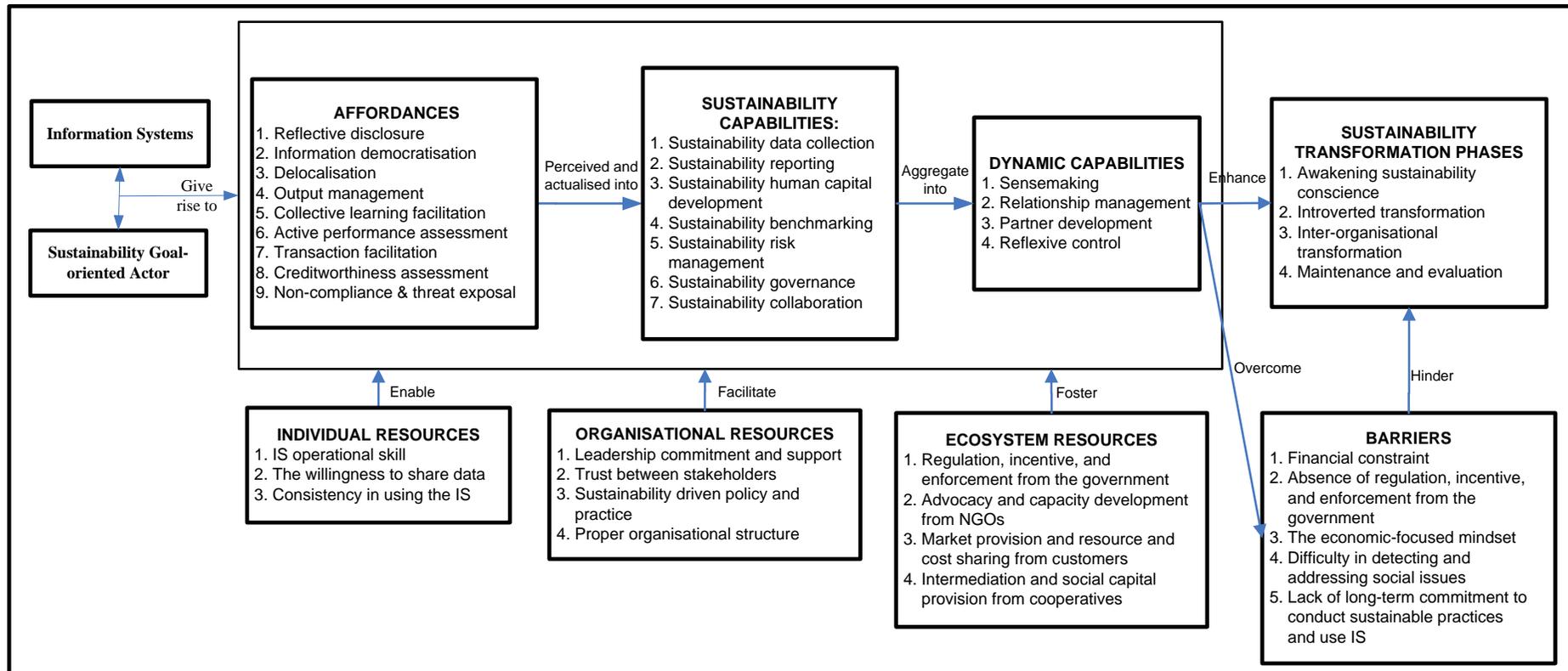
Figure 1.1 IS-enabled Sustainability Transformation Model

sustainability transformation model highlights key concepts that contribute to the successful sustainability transformation in food manufacturing organisations and their suppliers. The model describes that organisations use IS to achieve their goals of becoming sustainable entities (referred to as **sustainability goals**). The interaction between the actors and IS results in the emergence of possibilities for actions or known as IS **affordances**. This study identified nine key affordances. In particular, the model also indicates that certain set of **individual, organisational, and ecosystem resources** are required to enable the actualisation of the IS affordances. The actualisation of these affordances resulted in the development of **sustainability capabilities**. The exercise of these sustainability capabilities collectively contributes to the development of **dynamic sustainability capabilities** pertinent to the successful transformation process. The findings of this study also revealed several **barriers** that the stakeholders face in achieving sustainability goals. This study further shows how possessing specific dynamic sustainability capabilities support organisations to overcome these barriers. Finally, by developing specific dynamic capabilities, organisations can enhance their changes process towards becoming sustainable entities.

This study provides the following contributions to research. First, this study improves our understanding of IS and the potential affordances emerging from its material properties, stakeholders' sustainability goals, and socio-technical conditions that are specific and necessary for sustainability transformation. Second, this study extends the current knowledge of how IS enable the development of essential sustainability capabilities by applying a novel combination of Stakeholder theory, Affordance Theory, and Dynamic Capability Theory. Third, it provides rich empirical confirmation to illustrate that firms require certain dynamic capabilities to respond to challenges posed by emerging environmental and social issues. Fourth, it extends the literature by presenting a holistic view of sustainability transformation. Fifth, it provides insights into how IS can support firms to anticipate and deal with challenging social issues in supply chains, which so far been largely overlooked by IS scholars. Sixth, it enhances our understanding of how sustainability transformation occurs in a developing country which is still poorly understood.

From the practical perspective, the insights from this study offer useful guidance to supply chain practitioners, IS designers, and the stakeholders within supply chains. First, for supply chain practitioners, the results of this study can guide the recognition of relevant

resources, capabilities, and dynamic capabilities required for sustainability transformation. Second, this study also provides practitioners with practical insights into effective use of IS by guiding the actualisation process so that the desired outcome is more attainable. Third, for IS designer, operationalising the IS affordances and their source material properties can improve IS designs by raising the awareness of possible actions offered by IS in supporting organisational change towards SSCM. Fourth, the findings of this research provide valuable insights into the role of the government, customers, cooperatives, and NGOs in creating a supportive ecosystem for the enactment of sustainability transformation.

## 1.6 Thesis Outline

The structure of this thesis is as follows:

Chapter 2 reviews the SSCM literature to establish the context of this study. It explains the general concept of SCM and SSCM, and is followed by the explanation of the key themes that emerged from the literature review. Then, it highlights the gaps in the literature. This chapter forms the basis of this study's overarching research question. This chapter is derived from:

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2017. "Sustainable Supply Chain Management: Taxonomy, Gaps and Future Directions", Proceedings of the 21st Pacific Asia Conference on Information Systems. Langkawi, Malaysia: Association of Information Systems.

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2018. "IT-Enabled Capabilities for Sustainable Supply Chain Management: An Affordance Theory Perspective", Proceedings of the 22nd Pacific Asia Conference on Information Systems, Yokohama, Japan: Association of Information Systems.

Chapter 3 discusses three theoretical foundations of this study: Stakeholder Theory, Affordance Theory, and Dynamic Capability Theory. Stakeholder Theory provides a useful lens in identifying primary stakeholders and examine their roles in moving towards becoming a sustainable supply chain. Affordance Theory is used to analyse how the relationship between IS and actors can lead to successful sustainability transformation. Meanwhile, Dynamic Capability Theory contributes to explaining the required dynamic capabilities in sustainability transformation. The integration of various insights from these theories guides the plan, execution, and evaluation of the overall research.

Chapter 4 describes the research methodology of this study and justifies the multiple case study as the most appropriate approach to address the research question of this study. It begins with an overview of the nature of this research and continues with an elaboration of the research design, including the comprehensive review undertaken to develop the IS-enabled sustainability transformation model. Then, the data collection and analysis methods are explained. Finally, the chapter explains approaches for ensuring the rigour and validity of the study.

Chapter 5 presents the data and findings that emerged from data collection and analysis. The chapter starts by describing the findings from each case study and then triangulates them with insights from the government, NGOs, and business customers. This chapter is derived from:

- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2019. "A Traceability System for Sustainability Transformation in the Food Supply Chain: An Affordance Theory Perspective," Proceedings of the 27th European Conference on Information Systems, Stockholm, Sweden: Association of Information Systems.

- **Imairi, Eitiveni,** Sherah Kurnia, and Rajkumar Buyya, 2020. "IS-enabled Sustainability Capability Development in Sustainability Transformation: the Case of Indonesian Food Supply Chains", Journal of Strategy Information Systems (submitted)

Chapter 6 provides analysis across the five case studies to answer this study six sub-questions. The chapter begins with analysing various stakeholders' goals and barriers while engaging in sustainability transformation. Afterwards, based on the analysis and critical reflection of the case studies, this study extracts IS affordances, resources affecting and the outcome of IS affordances actualisation, dynamic sustainability capabilities, and sustainability transformation phases.

Chapter 7 presents the answers to the research question based on the interpretation of the case study findings. The findings from the previous chapter are then used to construct the IS-enabled sustainability transformation model as the key finding of this study. Where relevant, how this research relates to the broader debates in the existing SSCM and IS literature is explained. Then, the chapter outlines the theoretical and practical contributions of the study.

Finally, Chapter 8 concludes the thesis. It summarises the overall study, outlines several limitations of this study, and recommends future research and practice.

# CHAPTER 2: LITERATURE REVIEW

## 2.1    Introduction

This chapter systematically reviews previous studies at the intersection of the IS and SSCM literature. The chapter focuses on sustainability transformation. It provides a descriptive analysis of the previous studies in terms of research focus, geographical location, and theoretical lens. Then, the chapter introduces the concepts of supply chain management (SCM). Afterwards, various aspects in SSCM literature are examined including the triple bottom line, sustainable practices, sustainability transformation, barriers, resources, sustainability capability, and IS roles in enabling change. Gaps in the literature are also identified and summarised. Drawing from the overall discussion, the research question of this study is formulated into: *how do IS support the sustainability transformation in food supply chains?*

## 2.2    Literature Review Methodology

The emergence of sustainability consideration in supply chains leads to a growing number of SSCM studies. The SSCM literature intersects with various disciplines such as business, management, engineering, environmental science, SCM, decision science, social science, economics, and IS. To examine the scope and depth of existing SSCM research, a systematic literature review proposed by Webster and Watson (2002) was conducted as a part of this study.

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This chapter is derived from:
- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2017. "Sustainable Supply Chain Management: Taxonomy, Gaps and Future Directions," Proceedings of the 21st Pacific Asia Conference on Information Systems. Langkawi, Malaysia: Association of Information Systems.
- **Imairi Eitiveni**, Sherah Kurnia, and Rajkumar Buyya, 2018. "IT-Enabled Capabilities for Sustainable Supply Chain Management: An Affordance Theory Perspective," Proceedings of the 22nd Pacific Asia Conference on Information Systems, Yokohama, Japan: Association of Information Systems.

This methodology was chosen due to its generalisability, which can be applied to a systematic literature review in any field. It provides a systematic search of the relevant literature, which leads to a reliable assessment of the current status of a research field. The systematic literature in this study aims to provide the landscape of the SSCM literature and identify the significant gaps.

The systematic literature review adheres to the following steps. First, the relevant literature sources were identified, and a search strategy was implemented. Since SSCM is a cross-disciplinary field, the researcher investigated relevant sources across various journal articles in prominent literature databases such as ProQuest, AIS electronic library, and Science Direct. The keywords used were various combinations and synonyms of "sustainable supply chain management", "green supply chain", "social sustainability", "environmental management" or "triple bottom line". This search identified over 500 articles. The next step was setting the criteria for the inclusion of the papers. The criteria for inclusion were documents that were concerned with or relevant to investigate the use of IS to enable sustainability transformation, were written in English, and were published in the last ten years. The title and abstracts of the initial list were examined to decide its inclusion into the final set. This step yielded 130 articles. References of highly relevant articles were also examined and added to the existing database resulting in an additional 72 papers. Out of 202 articles considered for in-depth review and coding, 150 included variables of interests and are compiled in the analysis. Following Webster and Watson (2002), a concept matrix was created to categorise and synthesise the literature.

The following subsection presents the descriptive analysis of the reviewed papers. The descriptive analysis examined the research focus, geographic location, and theoretical lens of the papers. It contributes to revealing the trends and gaps in the literature. Then, based on the literature review, several key areas relevant to this study were identified. First, the traditional SCM realm is discussed to present the background of this study. Then, the SSCM realm is explored with a focus on enabling the sustainability transformation. Several factors were analysed and explained in the succeeding subsections, including fundamental concepts, resources, barriers, essential capabilities, and the role of IS in affecting sustainability transformation.

## 2.3 Descriptive Analysis of the Literature

As explained above, descriptive analysis was conducted to identify trends and gaps in the SSCM literature. Figure 2.1 shows the distribution of the articles by year. From the end of 1990 and early 2000, the awareness of SSCM is shown as very low since practitioners and researchers implemented the traditional SCM. Around 2009, the SSCM literature started to increase as more firms began to understand the importance of considering the environmental and social impacts of their business activities. Since then, the SSCM literature and practice have been growing gradually. SSCM implementation has been observed in, among others, manufacturing (Kumar & Rahman, 2016; Zhu & Sarkis, 2007), textile (Dangelico et al., 2013; Hiremath, Kattumuri, Kumar, Khatri, & Patil, 2012), and agri-food (Dania, Xing, & Amer, 2018; Fischer et al., 2010).
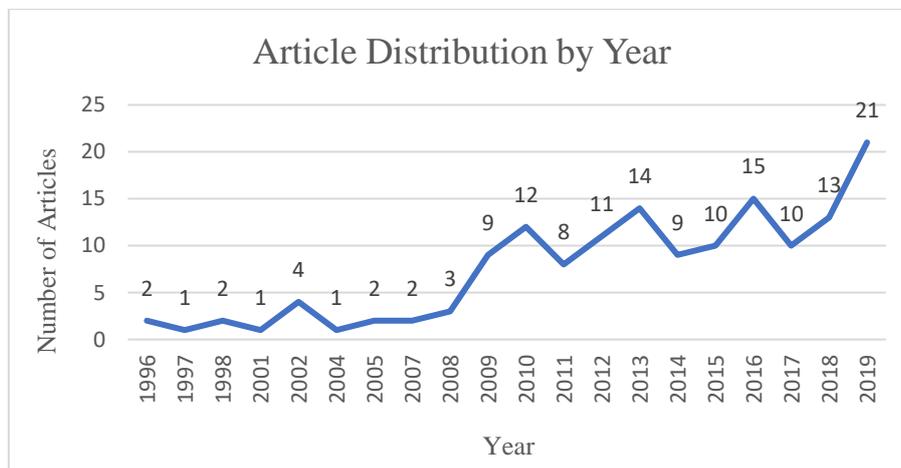


Figure 2.1. Article Distribution by Year

### 2.3.1 Research Focus

The classification of SSCM articles based on the focus of the study is shown in Figure 2.2. The analysis reveals that the economic dimension of sustainability is taken as intrinsic. 52.7% of studies use the word "sustainability" which indicate they treat the three dimensions equally, although some of them only address environmental aspects or discuss social issue insignificantly. Meanwhile, there is a strong association of the environmental dimension with the sustainability concept. 44.7% of the SSCM literature reviewed applied environmental approach (e.g., (Cantor et al., 2012; Golicic & Smith, 2013; Hassan et al., 2016; Nair et al., 2016; Wichmann, Carter, Kaufmann, & Wilson, 2016). Only 2.6% of papers that focus on examining social dimensions (e.g., (Mani et al., 2016; Rodriguez et al., 2016; Thornton et al., 2013).

**PAPER DISTRIBUTION BASED ON RESEARCH FOCUS**

Environment
44%

Sustainability
53%
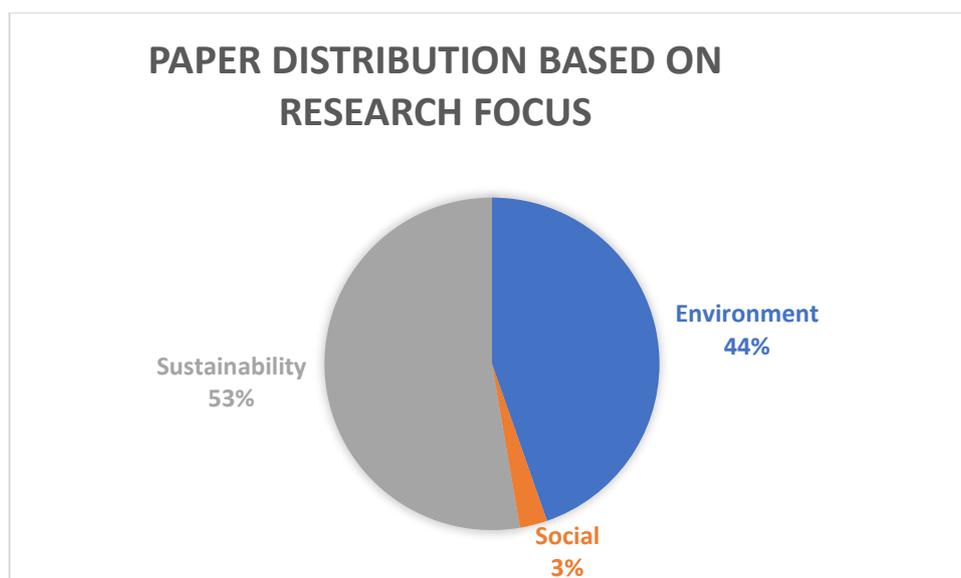
Social
3%

Figure 2.2. Paper Distribution based on Research Focus

Looking at Figure 2.2, it is apparent that compared to the environmental dimension, the studies investigating the social dimension of the sustainability are significantly limited. Numerous studies that aimed to investigate sustainability only considered the environmental aspect. Even when both dimensions were discussed, the emphasis was on the environmental rather than the social dimension. Studies focusing on the social dimension mostly focused on specific practices or areas without providing a comprehensive view. More work is required to explore how to support the social dimension in supply chains and integrate it with environmental and economic dimensions in supporting sustainability transformation.

## 2.3.2   Geographic Location

This study further characterises the literature based on country types (i.e., developed and developing country) according to the development status published by the United Nations (Development, 2019). This categorisation serves as the landscape of SSCM literature in terms of the location of studies. As can be seen from Figure 2.3, SSCM studies have been conducted in both developing and developed countries. The sustainability initiatives and research are dominantly undertaken in developed countries such as Canada (Bansal & Mcknight, 2009; Morali & Searcy, 2013), the United States (Pagell, Yang, Krumwiede, & Sheu, 2004; Pullman et al., 2009; Thornton et al., 2013; Wichmann et al., 2016), German (Carter et al., 1998); United Kingdom (K. Green, Morton, & New, 1996; Preuss, 2005), and Netherlands (Bommel, 2011). Studies about sustainability in developing

countries are considerably smaller in number. Several examples are China (Pagell et al., 2004; Thornton et al., 2013; Zhu & Sarkis, 2007), Ecuador (Rodriguez et al., 2016), and India (Gopal & Thakkar, 2016; Kumar & Rahman, 2016; Mani et al., 2016). Within the developing country group, there is a high concentration of studies conducted in China, India, and Taiwan, while most other developing countries have received marginal attention.
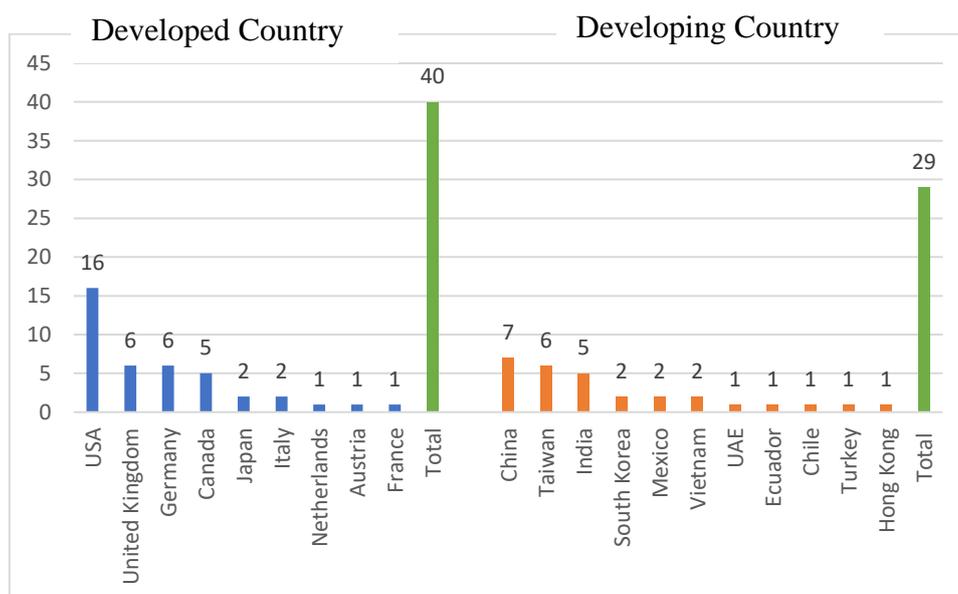


Figure 2.3. Article Distribution by Country

A considerable amount of literature has contextualised SSCM in developed countries. This results in a lack of understanding of SSCM implementation in the developing regions. While studies conducted in developed countries may produce some frameworks or best practices, it may be challenging to implement them in developing countries. Sustainability transformation is a complicated process, and there is uncertainty to whether insights from the developed countries can be applied to developing countries. Some proposed models and frameworks in developed countries require sophisticated infrastructure, effective regulation and governmental enforcement, high skilled labour, and market readiness. These factors may not be available in developing countries due to fundamental challenges such as lack of infrastructure, poverty, corruption, and income inequality (Esfahbodi, Zhang, & Watson, 2016; Galal & Moneim, 2016). Especially within the developing countries group, there is a high concentration of studies conducted in China, India, and Taiwan. The effective SSCM adoption and implementation in other developing countries have received little attention.

## 2.3.3   Theoretical Lens

The list of theories applied in the reviewed papers is shown in Table 2.1. Nine papers employ more than one theories. Across all the articles reviewed (N=150), only 44 papers utilise a theoretical lens to investigate a phenomenon in question. Within this category, Resource-based View (RBV) is mostly used (13 papers), followed by Dynamic Capabilities Theory (five papers) and Natural RBV (four papers).

Table 2.1 Theories Applied in the Reviewed Articles

| Theory | Number of Paper (N=150) |
|---|---|
| Resource-based View (RBV) | 13 |
| Dynamic Capabilities Theory | 5 |
| Natural RBV | 4 |
| Fuzzy Set Theory | 3 |
| Stakeholder Theory | 3 |
| Affordance Theory | 2 |
| Behavioural Theory of the Firm | 2 |
| Resource Advantage Theory | 2 |
| Resource Dependency Theory | 2 |
| Absorptive Capacity Theory | 1 |
| Activity Theory | 1 |
| Complexity Theory | 1 |
| Contingency Theory | 1 |
| Ecological Modernization Theory | 1 |
| Institutional Theory | 1 |
| Intra Organizational Influence Theory | 1 |
| Knowledge-based View | 1 |
| Modern Market Theory | 1 |
| Neo-institutional Theory | 1 |
| Network Theory | 1 |
| Organisational Theory | 1 |
| Organisational Support Theory | 1 |
| Paradoxical Theory | 1 |
| Practice Theory | 1 |
| Psychological Distance Theory | 1 |
| Rough Set and Grey System Theory | 1 |
| Stochastic Differential Game Theory | 1 |
| Technological Diffusion Theory | 1 |
| The Lead Market Theory | 1 |
| Theory of Persuasive Systems Design | 1 |
| **TOTAL THEORIES** | **57** |
| **TOTAL PAPERS USING THEORY(IES)** | **44** |

Various theoretical lenses have been employed in analysing sustainability in SCM. However, not many studies are theory-driven. Furthermore, the contextualisation of a combination of theories to tackle various components in SSCM is limited. Since SSCM is a multidisciplinary field consisting of many practices, stakeholders, enablers, and barriers, employing and combining theories from more diverse fields is a promising area of interest. Transferring and combining theories from other fields could address distinct aspects of supply chains and enrich the theoretical foundation of the SSCM field.

## 2.4 Supply Chain Management

A supply chain is a network of activities that delivers a finished product or service to the customer (Simchi-Levi, Kaminsky, & Simchi-Levi, 2009). It involves managing supply and demand, sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, distribution, and delivery to the customers. It includes a series of manufacturers, wholesalers, distributors, retailers as well as some firms that provide a wide range of services such as trucking and air freight shipping, IS, and warehousing (Wisner, Leong, & Tan, 2005). An illustration of a typical supply chain can be seen in Figure 2.4.
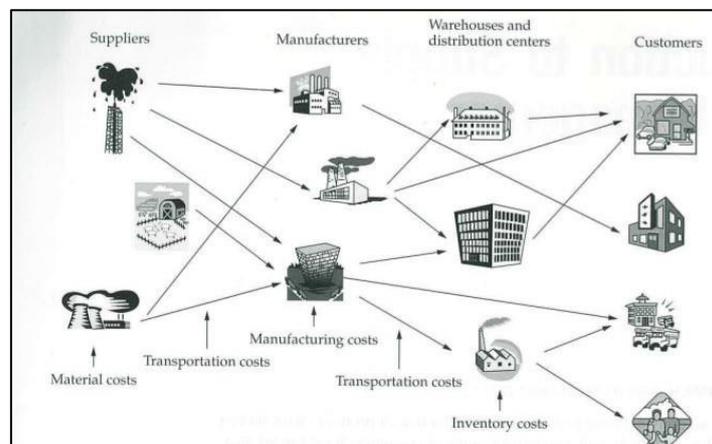


Figure 2.4. A Typical Supply Chain (Simchi-Levi et al., 2009, p. 2)

The idea behind the creation of supply chain is that an organisation may not be able to do all business functions in-house. Even when it has the necessary resources, it may not always be practical to do so. Other organisations may have better resources and competencies to perform the task. Therefore, a company may find it is more effective and cost-efficient to engage with other organisation to perform some tasks (Cetinkaya et al.,

2011). The coordination and integration of all these activities between members of the supply chain are called supply chain management (SCM).

SCM is defined as a

> set of approaches utilised to efficiently integrate suppliers, manufacturers, warehouses, and stores, so that merchandise is produced and distributed at the right quantities, to the right locations, and at the right time, to minimise system-wide costs while satisfying service level requirements (Simchi-Levi et al., 2009, p. 1).

The definition implies that the objective of supply chains is to reduce systemwide costs, including material, transportation, manufacturing, and inventory costs. These cost reductions can lead to increased profit and market share. For instance, in the grocery industry, an effective supply chain strategy can save about $30 billion or 10% of annual operating cost (Simchi-Levi et al., 2009). SCM is crucial to improve operational efficiency, quality, and customer service, which, in the long term, can provide sustainable competitive advantages for all firms involved in the supply chain (Gattorna, 2010).

## 2.5 Sustainable Supply Chain Management

The sourcing, production, and movement of products and services to where they are most valued are commonly driven by economic goals. However, there are also environmental and social implications of these activities. For example, transporting goods contributes to pollution and congestion. Food production requires the earth's rare resources: land and water. Transportation has a potential negative social effect such as accident and environmental impact through the creation of harmful gases and particles, including carbon-dioxides (Cetinkaya et al., 2011). Other supply chain activities produce massive air, water, and land waste and threaten biological diversity. Additionally, the economic objective to obtain profit as much as possible by reducing costs may potentially conflict with worker's right in the form of underpayment, inadequate working condition or child labour (Thornton et al., 2013).

Consequently, the environmental and social issues in supply chains are increasingly on the public agenda. There is increasing pressure from the governments, customers, shareholders, and other stakeholders to improve the environmental and social impacts of supply chain activities (Gopal & Thakkar, 2016; Morali & Searcy, 2013). As the stakeholders becoming more aware of sustainability issues, companies feel the need to have a positive image by engaging in environmentally and socially responsible behaviour

(McPhee, 2014; Morali & Searcy, 2013). The consideration environmental, social, and economic concerns lead to the emergence of SSCM.

## 2.5.1   Fundamental Concepts

- Definition

There are various definitions of SSCM. Most of them were derived from the sustainability development concept by World Commission on Environment and Development as 'development that meets the needs of the present without compromising the ability of future generations to meet their needs' (Linton, Klassen, & Jayaraman, 2007, p. 1076). Because of this broad definition of sustainability, organisations often find it challenging to integrate sustainability into supply chains. Various interrelated complex issues are involved, including how to identify future needs, how to balance present and future needs, and what resources needed to meet these needs. Therefore, the issues are revolving around environmental requirements such as conserving natural resources and minimising environmental degradation as the result of economic activity, while societal needs receive little attention (Yawar & Seuring, 2015).

There are numerous definitions of SSCM identified in previous studies (Badurdeen et al., 2009; Ciliberti, Pontrandolfo, & Scozzi, 2008; Pagell & Wu, 2009). Ahi and Searcy (2013) proposed a refined definition of SSCM after analysing SSCM definitions mentioned in 180 papers ranging from 2002-2012. They define SSCM as

> the creation of coordinated supply chains through the voluntary integration of **economic, environmental, and social** considerations with key **inter-organisational business systems** designed to efficiently and effectively manage the **material, information, and capital flows** associated with the procurement, production, and distribution of products or services **to meet stakeholder requirements** and improve the profitability, competitiveness, and resilience of the organisation over the short and long term (Ahi & Searcy, 2013, p. 339).

From this definition, SSCM's key characteristics can be derived as follows:

1. The inclusion of economic, environmental, and social considerations;
2. Involvement inter-organisational business systems;
3. Management of material, information, and capital flows;
4. Meeting stakeholder requirements.

- **Triple Bottom Line**

The inclusion of economic, environmental, and social objectives simultaneously in managing a supply chain is widely known as Triple Bottom Line (TBL). Firms who adopt TBL approach hold a balanced stance on pursuing economic prosperity, social justice, and environmental preservation (Elkington, 1999). This is the main difference between SSCM and traditional SCM whose sole purpose is to maximise the economic bottom line. To further operationalise SSCM, TBL dimensions can be broken down into subdimensions as summarised in Figure 2.5.
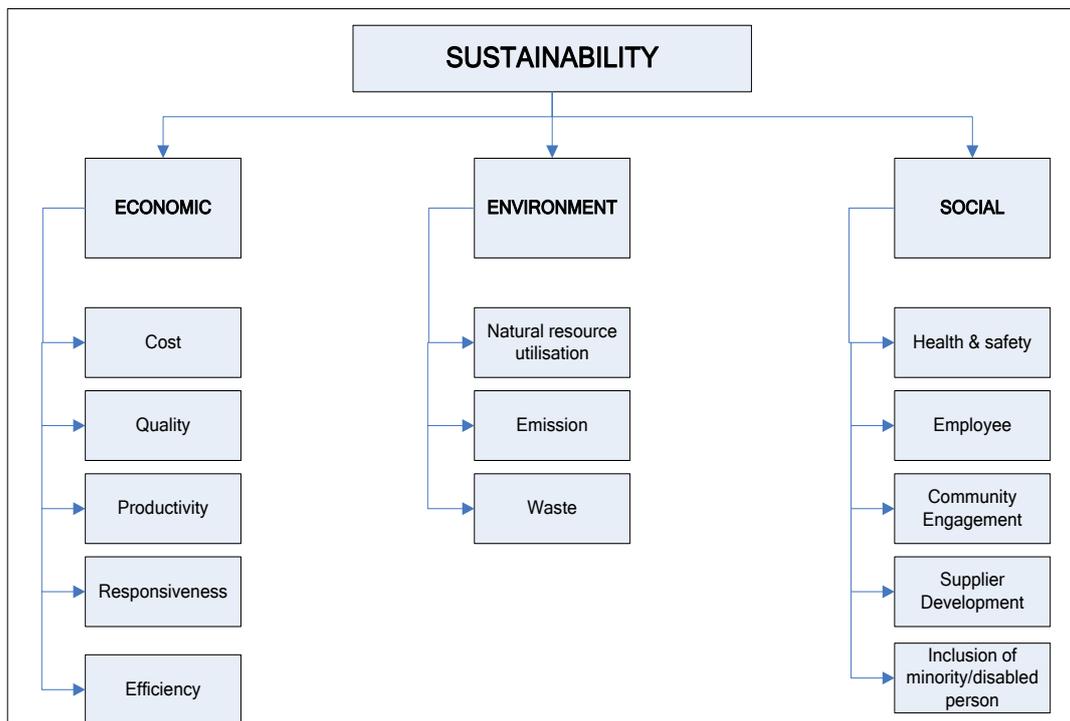


Figure 2.5. Metric Dimensions and Subdimensions (Cetinkaya et al., 2011; Mohanty, 2018; Subramanian & Gunasekaran, 2015)

1. **Economic Dimension**

Traditional SCM focuses solely on maximising profit and cost leadership. Profit deals with economic value created by the organisation. For any organisation, it is crucial to measure its profitability performance. It is measured through several metrics such as cost, quality, productivity, responsiveness, and efficiency. Cost occurred during supply chain activities should be monitored and kept to the minimum. These costs include costs of warehousing, transportation, human resources, and infrastructure.

## 2. Environmental Dimension

The environmental dimension of the TBL aims to benefit the planet as much as possible or at least to minimise the impact of supply chain activities on the environment. The metric in this dimension measures the consumption of natural resources and management of waste and emission. Various strategies exist to tackle environmental issues in supply chains such as waste reduction, ISO 14001 adherence, the inclusion of ecological consideration into supplier selection, product life cycle assessment, lean management, closed-loop logistics, and packaging material reduction (Ageron et al., 2012; Chung & Wee, 2010).

Engaging in environmentally responsible activities can lead to improved economic performance (Azevedo et al., 2011). Environmentally responsible practices (e.g., recycling) generate revenue and reduce costs through reducing materials consumption, reuse and reutilisation of waste and by-products. Food processing can recycle wastewater from fresh cut vegetables processing plant, which leads to financial savings (Jefferson, Jesus, Jones, & Ortiz, 2014). Another cost-saving opportunity also comes from the mitigation of potential legal problems and environment incidents (Yu, 2016). This cost reduction outcome contributes to increasing overall company savings and profits. Conducting environmentally responsible practice also leads to opportunities such as acquiring new customers (Ageron et al., 2012), especially those who favour sustainable practices.

## 3. Social Dimension

Social dimension comprises of health and safety, employee, community, and customer (Cetinkaya et al., 2011; Subramanian & Gunasekaran, 2015). There are various social issues that a company may encounter in its supply chain including labour conditions, child labour, human rights, health and safety, minority development, disabled/marginalised inclusion, and gender equality (Yawar & Seuring, 2015). These problems can bring numerous impacts to supply chains such as reputational threat, disruption to production, and defect products. Social issues can also impose operational risks, such as ignoring employee's rights may cause strikes that lead to production disruption. Lack of health and safety may cause food contamination which may lead to consumer backlash, fine, or loss of market share (Klassen & Vereecke, 2012). These issues may lead to loss of revenue and competitive advantage. The impacts are not only measured in one organisation

internally, but also within the supply chain partners where relevant (Cetinkaya et al., 2011). Therefore, it is crucial to managing social issues in supply chains.

Operationalising the TBL in every supply chain activity leads to sustainable practices in the supply chain. The following section explains sustainable practices.

- **Sustainable Practice**

The development of a sustainable supply chain requires the implementation of sustainable practices (Seidel, Recker, & Brocke, 2013). This study defines sustainable practices as the operationalisation of the three aspects of sustainability in supply chain processes and activities. Seven sustainable practices were synthesised from the previous studies, as outlined below.

1. **Sustainable design**

Sustainable design is a practice that considers the impact of product design on energy and material requirements for manufacturing, usage, and secondary usage (Tsoulfas & Pappis, 2006) as well as improvement in human well-being and livelihood (Margolin, 2002). Sustainable design aims to solve human problems, fulfil people's needs, and contribute to social well-being. It improves firms' sustainability performance by enhancing product functionality, while also reducing environmental and social impacts. It leads to a reduction in business waste and environmental cost, while increasing customer satisfaction (Zhu, Sarkis, & Lai, 2008). It also addresses the social aspect of design through the use of Social Life Cycle Assessment (Dreux-Gerphagnon & Haoues, 2011).

2. **Sustainable purchasing**

Sustainable purchasing considers the environmental and social aspects of purchasing activities. It consists of material selection, supplier selection, development, and evaluation. It provides several benefits such as lower disposal and liability costs, promoting resource conservation, and boosting the public image of the organisation (Min & Galle, 2001; Tsoulfas & Pappis, 2006). Particularly, supplier evaluation increases the visibility required to enhance collaboration in value-added activities (Wisner et al., 2005). Supplier development is also crucial for improving the quality of the goods produced, increasing customer satisfaction, and ensuring an uninterrupted flow of materials.

3. **Sustainable manufacturing and packaging**

Sustainable manufacturing is the integration of environmental and social issues into product development in manufacturing processes (Dangelico et al., 2013; Gavronski et al., 2011). Sustainable manufacturing and packaging can improve environmental performances via efficient use of energy in production processes, using renewable energy sources, and pollution and waste prevention (Dangelico et al., 2013). Several initiatives include conducting life cycle analysis, applying ISO 140001 and implementing environmental management systems (Gavronski et al., 2011). The social performance can also be improved via the provision of a safer and healthier working condition during manufacturing and packaging processes.

4. **Sustainable distribution**

Sustainable distribution is concerned with the delivery of products and services from the point of origin to the point of consumption efficiently by optimising the use of resources (Ninlawan, Seksan, Tossapol, & Pilada, 2010). This practice contributes to improving sustainability through efficient use of water, electricity, and storage spaces in distribution centres, optimal route in the distribution process, and eliminating redundancy in the distribution process (Ninlawan et al., 2010; Singhry, 2015). Social aspects are addressed by providing safe and healthy facilities while transporting products as well as supplying transportation facilities for employees with disability.

5. **Sustainable marketing**

Sustainable marketing is an act of promoting products, services, and activities which are not harmful to the environment, employees, and communities in which an organisation operate in (Rath, 2013; Shang et al., 2010). Sustainable marketing includes proactively communicating environmental and social issues on websites and publicising sustainability activities, products, and services to the customers and relevant stakeholders. Shang et al. (2010) revealed that companies that excel at green marketing demonstrate superior performance. This is due to promoting their sustainable practices to customers will likely to lead to a sustained competitive advantage.

6. **Sustainable consumption**

Sustainable consumption refers to the consumer's conscious act to choose and consume environmentally and socially responsible products and services (Sharma & Jha, 2017). This practice includes consumers' preference towards products and services that use

minimal natural resources and harmful materials, while producing minimal waste and pollutants. It also involves consumer's concern about social problems that happen over the life cycle of supply chains such as child and forced labour employed in the production and distribution activities. Sustainable consumption has substantial impacts on the environment, individual, public health, and the economy (Shaban & El-Bassiouny, 2017). Sustainable consumption can drives companies to produce sustainable products and services (Handfield, Walton, Seegers, & Melnyk, 1997). Companies may not produce sustainable products and services if there is no demand from the customer (Gopal & Thakkar, 2016).

7. **Reverse Logistics**

Reverse logistics is "the process of planning, implementing, and controlling the efficient, effective inbound flow, inspection and disposition of returned products and related information for the purpose of recovering value" (Srivastava, Sahay, & Srivastava, 2006, p. 7). Reverse logistics can improve sustainability performance via several processes such as acquisition that includes the collection, sorting, grading, disassembly, proper packaging and labelling, reuse/resale; product upgrade consisting of repairing, refurbishing and remanufacturing; material recovery including cannibalisation and recycling; and waste management that includes incineration and landfilling (Koppius, Özdemir-Akyıldırım, & Laan, 2014; Singhry, 2015).

So far, this chapter has discussed the TBL and sustainable practices to provide a reliable foundation for the overall discussion. The following section proceeds with describing in detail the sustainability transformation phases that shift the traditional SCM to SSCM.

## 2.5.2  *Sustainability Transformation Phases*

For the past two decades, the level of sophistication of sustainable practice has changed considerably. Firms in various sectors have undertaken an incremental revolution towards becoming sustainable entities. Based on the synthesis of the literature, sustainability transformation involves four phases: ***awakening sustainability conscience, introverted transformation, inter-organisational transformation,*** and ***maintenance and evaluation***. These phases represent the chronological development from a traditional supply chain to a sustainable supply chain. The summary of studies in each phase is shown in Table 2.2.

Table 2.2. Key Studies Addressing Sustainability Transformation Phases

| Phase\nStudy | Awakening Sustainability Conscience | Introverted Trans-formation | Inter-organisational Transformation | Maintenance and Evaluation |
|---|---|---|---|---|
| (Maignan & McAlister, 2003) | ✓ | | | |
| (Morali & Searcy, 2013) | ✓ | ✓ | | |
| (Seuring & Müller, 2008) | ✓ | | | |
| (Ahmad, Rezaei, Tavasszy, & de Brito, 2016) | ✓ | | | |
| (Cantor et al., 2012) | ✓ | | | |
| (Corbett, 2013) | ✓ | | | |
| (Wichmann et al., 2016) | ✓ | | | ✓ |
| (Iveroth & Bengtsson, 2014) | ✓ | | | |
| (N. P. Melville, 2010) | ✓ | | | |
| (He, Gallear, Ghobadian, & Ramanathan, 2019) | | ✓ | | |
| (Perez-Rodriguez, Nunes, & Azevedo, 2016) | | ✓ | | |
| (Thöni & Tjoa, 2015) | | | | |
| (P. J.-H. Hu et al., 2017) | | ✓ | | |
| (Smith, 2008) | | ✓ | | |
| (Kirchoff et al., 2016) | | ✓ | | |
| (Foerstl et al., 2015) | | | ✓ | ✓ |
| (Gimenez, Wilding, & Tachizawa, 2012) | | | ✓ | |
| (Gold et al., 2009) | | | ✓ | |
| (Grimm, Hofstetter, & Sarkis, 2014) | | | ✓ | |
| (Hajmohammad & Vachon, 2012) | | | ✓ | |
| (Kumar & Rahman, 2016) | | | ✓ | |
| (Theiben, Spinler, & Huchzermeier, 2014) | | | ✓ | |
| (Yawar & Seuring, 2015) | | | ✓ | |
| (Azevedo et al., 2011) | | | | ✓ |
| (Golicic & Smith, 2013) | | | | ✓ |
| (Marett, Otondo, & Taylor, 2013) | | | | ✓ |
| (Simpson & Power, 2005) | | | | ✓ |
| **Total** | **9** | **6** | **8** | **6** |

- Awakening Sustainability Conscience

Awakening sustainability conscience is the pre-manifested state of SSCM implementation where the main goal is to build favourable intent towards initiation of SSCM. The key activities of this phase are summarised in Table 2.3.

Table 2.3 Key Activities in Awakening Sustainability Conscience Phase

| Phase | Activity | Reference |
|---|---|---|
| Awakening Sustainability Conscience | Building awareness toward consideration of the environment and society in supply chains. | (Maignan & McAlister, 2003; Morali & Searcy, 2013; Seuring & Müller, 2008) |
| | Gaining employees' commitment. | (Ahmad et al., 2016; Cantor et al., 2012; Corbett, 2013; Wichmann et al., 2016) |
| | Identification of enablers. | (Iveroth & Bengtsson, 2014; N. P. Melville, 2010) |

Various external stakeholders request organisations or supply chains to consider the impact of their activities into the environment and society such as NGOs, shareholders, business associations, business customers, and governments (Maignan & McAlister, 2003; Morali & Searcy, 2013; Seuring & Müller, 2008). They use power and organisational norm to influence the implementation of responsible practices within an organisation or a supply chain. Two fundamental activities in this phase are gaining employees commitment to perform sustainable practices and identifying enablers to sustainability transformation.

Within an organisation, gaining employees' commitment to engage in sustainable practices employees is influenced by numerous factors. Cantor et al. (2012) and Wichmann et al. (2016) found that when employees perceive support for environmentally responsible behaviour by the organisation, they would likely commit to adopting a sustainable behaviour. Organisations can show supports toward sustainable behaviour through supervisory support, provision of environmental goals, policies, procedures, and relevant training. Conversely, Ahmad et al. (2016) argue that management preparedness may support the implementation of sustainability in supply chains more than commitment. They report the importance of operational risk management, supplier and logistics management, and organisational culture that encourages collaboration.

In addition, various studies have highlighted the importance of IS as the enabler of sustainability transformation by facilitating behaviour change. N. P. Melville (2010) states that sustainability transformation requires knowledge about how belief and

assumptions about sustainability appear (Belief), how individuals and organisations react to them (Action), and the result (Outcome) of these actions, or referred to as Belief-Action-Outcome Framework. This framework shows that individual belief and action are influenced by social and organisational structure. Collective individual psychic leads to combined individual actions which lead to improvement to organisational performance. The study further suggests theories that can be applied to each element. For instance, Stakeholder Theory, Technology Acceptance Model, and Dynamic Capability Theory are useful lenses to examine belief formation, action formation, and assessment of outcome, respectively. N. P. Melville (2010) concludes by providing 12 research questions, some of them are "how can different theories be applied to complex problems involving information systems, organisations, and the natural environment?" and "how do belief, actions, and outcome impact and be impacted by the use of IS?"

- **Introverted Transformation**

Following up the previous stage, the introverted transformation phase focuses on the materialisation of favourable intent and strategies into the implementation of sustainable practice within an organisation. Organisations examine their current state of practices, then devise strategies and approach towards the prospective SSCM uptake. The plan and approach highly depend on the identification, acquisition and deployment of enablers, practices, and challenges, as shown in Table 2.4.

Table 2.4 Key Activities in Introverted Transformation Phase

| Phase | Activity | Reference |
|---|---|---|
| Introverted Transformation | Identification of the role of IS as an enabler | (He et al., 2019; Perez-Rodriguez et al., 2016; Thöni & Tjoa, 2015) |
| | Identification of industry or sector-specific sustainable practices | (P. J.-H. Hu et al., 2017; Smith, 2008) |
| | Identification of the challenges | (Kirchoff et al., 2016; Morali & Searcy, 2013) |

The SSCM literature has highlighted Information Systems' role as an enabler of sustainability transformation. In SSCM, the main roles of IS are data capture (Parry, Kumar, Brax, Maull, & Ng, 2016), information exchange (Lehmann, R. Reiche, & Schiefer., 2012), monitoring implementation (Björk et al., 2011), and automation (Dao et al., 2011). These roles are explained further in Section 2.5.6.

Much of the literature in this phase pays particular attention to investigate industry or sector-specific sustainable practices. Smith (2008) describes several factors affecting the implementation of the sustainable food supply chain, for instances the availability of resources, long-term business vision, customer demand for sustainable products, and strategic partnership with suppliers. Major attention has been given to the manufacturing industry (e.g., (Hassan et al., 2016; P. Hong, Roh, & Rawski, 2012), followed by the textile industry (e.g., (Dangelico et al., 2013; Hiremath et al., 2012).

Additionally, the literature has investigated the challenges associated with implementing internal sustainable practices. Firms struggle to achieve sustainability due to various complexities including resources requirement, lack of understanding the sustainability concept among suppliers and customers, difficulties in conducting risk management and monitoring, especially in developing countries, conflicting demand from internal and external stakeholders, and information insufficiency (Kirchoff et al., 2016; Morali & Searcy, 2013). Therefore, the previous studies recommend improving collaboration among supply chain members, conducting customer and supplier education about sustainability implementation, and balancing stakeholders' objectives (Kirchoff et al., 2016; Morali & Searcy, 2013).

- Inter-organisational Transformation

Progressing from the focus on processes within a company, in the inter-organisational transformation phase, the previous studies assessed the sustainability transformation in a broader scope of a supply chain. Table 2.5 presents the key activities of this stage. Much of the previous research has studied how focal companies persuade their suppliers and customers to implement sustainability practices (Gimenez et al., 2012). A significant portion of the literature also aims to explore effective collaboration among supply chain members (Busse, 2010; Theiben et al., 2014). Other studies focused on challenges in expanding sustainability across supply chains.

Expanding sustainability implementation from an organisation to other members of its supply chain requires effective collaboration. Effective collaboration depends on various factors such as trust between the buying firm, direct supplier, and sub-supplier; buyer power over the respective upstream partner; buying firm's technical knowledge; direct supplier's willingness to reveal its sub-suppliers, perceived shared value for sub-supplier and direct supplier, a common vision of the future, senior management support and

Table 2.5 Key Activities in Inter-organisational Transformation Phase

| Phase | Activity | Reference |
|---|---|---|
| Inter-organisational Transformation | Building effective collaboration across members of supply chains | (Foerstl et al., 2015; Gimenez et al., 2012; Gold et al., 2009; Grimm et al., 2014). |
| | Identifying approaches to extend sustainability transformation | (Dao et al., 2011; Hajmohammad & Vachon, 2012; Kumar & Rahman, 2016; Theiben et al., 2014) |
| | Addressing social problems in supply chains | (Chiesa & Przychodzen, 2019; Yawar & Seuring, 2015) |

involvement, availability of resources, and the ability of sub-supplier to fulfil the sustainability standards requirements (Foerstl et al., 2015; Gimenez et al., 2012; Gold et al., 2009; Grimm et al., 2014).

Additionally, various approaches have been proposed to facilitate SSCM extension. Theiben et al. (2014) propose six stages of collaborative $CO_2$ reduction management. The first stage is "definition of goals and initial assessment of potential partners". The goals dictate the second stage that is "identification of potential supply chain partners". The third stage is "inter-organisational communication building". This stage requires intensive communication to begin the carbon reduction initiative. The next stage is "interfacing with partners" which deals with setting the $CO_2$ accounting standard. The fifth stage is "driving the relationship". A more mature partner monitors and drives the other partner's transformation towards adopting $CO_2$ reduction standards and practices. The final stage is "measuring success". This stage involves an evaluation of whether the goals have been attained.

One of the challenging tasks in inter-organisational sustainability transformation is addressing social issues in the supply chain, especially in the (sub-)suppliers' sites. There are several approaches to managing social issues in supply chains. First, firms can perform communication strategy to deliver its social responsibility and accountability to the internal and external stakeholders (Chiesa & Przychodzen, 2019). This approach increases transparency within and beyond the organisation. Second, firms can carry out a compliance strategy to ensure the implementation of socially responsible practices is conducted across supply chain partners (Yawar & Seuring, 2015). The compliance strategy involves auditing and monitoring activities. Third, firms can perform supplier

development to develop their suppliers' capabilities and resources to improve their social performance (Chiesa & Przychodzen, 2019; Yawar & Seuring, 2015).

- Maintenance and Evaluation

At this stage, organisations aim to ensure the continuity and enhancement of sustainable practices. Table 2.6 demonstrates the key activities relevant to the maintenance and evaluation stage. Consistent with the previous level, managing inter-firm dynamics is also a key towards sustained SSCM implementation because it supports the moving from compliance to commitment (Foerstl et al., 2015), facilitates knowledge sharing among firms (Cervellon, Choi, & Wernerfelt, 2012; M. Khan, Hussain, & Saber, 2016; Meacham, Toms, Green, & Bhadauria, 2013) and detects misconduct (Wolf, 2011).

Table 2.6 Key Activities in Maintenance and Evaluation Phase

| Phase | Activity | Reference |
|---|---|---|
| Maintenance and Evaluation | Performance evaluation | (Azevedo et al., 2011; Golicic & Smith, 2013) |
| | Ensuring continuity of sustainable practice implementation | (Foerstl et al., 2015; Marett et al., 2013; Simpson & Power, 2005; Wichmann et al., 2016) |

In this phase, organisations evaluate the performance of their company and their supply chain in integrating environmental and social objectives in their activities. The greater part of the literature has shown a positive link between SSCM adoption to company and supply chain performance. Azevedo et al. (2011) report that environmentally responsible practices have a positive effect on the environmental performance. Additionally, the practices contribute to improved economic performance through reduced environmental cost, improved quality, customer satisfaction and efficiency. Golicic and Smith (2013) reported that environmentally responsible practices are linked to positive market based, operational based, and accounting-based performance. They further argue that environmentally responsible practices are a source of competitive advantage.

Buyer and supplier relationship is crucial in ensuring sustained inter-organisational sustainability transformation (Foerstl et al., 2015; Simpson & Power, 2005; Wichmann et al., 2016). Foerstl et al. (2015) argue that the integration of procurement and marketing functions ease the transition from supplier compliance to commitment. The marketing function is responsible for channelling customers and stakeholders' demand to the internal firm and communicate the firm's response. Meanwhile, the purchasing function

is tasked to work with suppliers to address this demand. This study found that the stronger the influence of the customer is, the greater the commitment and resource allocation are towards sustainability initiatives on the supplier side.

Overall, there had been little attention in the SSCM literature that subscribes to a comprehensive and overarching investigation of the sustainability transformation process. Extant models, roadmaps, and frameworks have not provided comprehensive support for sustainability transformation. Goals and strategy are not effectively guided that lead to uncoordinated execution. Majority of SSCM research has been restricted to the intrinsic nature of the sustainability transformation within a specific context. A holistic view of sustainability transformation that substantiates the evolution of traditional supply chains toward sustainable entities from the conception to maintenance and evaluation stages remains unclear. There is also a lack of research in terms of tangible outputs such as a model or framework that construe how various factors support or hinder organisations or supply chains from moving forward in the sustainability transformation process.

## 2.5.3   Barriers to Sustainability Transformation

There are many challenges in integrating sustainability into SCM. Identifying these challenges is crucial in diffusing an appropriate strategy in implementing SSCM. Recognising these barriers have also set a direction about where future research might explore. This study has identified several internal and external obstacles to sustainability transformation, as summarised in Table 2.7. Each barrier is explained below.

Table 2.7 Barriers to Sustainability Transformation

| Category | Barrier | Reference |
|----------|---------|-----------|
| A. Internal | Financial constraint | (Min & Galle, 2001; Seuring & Müller, 2008; Taylor & Vachon, 2017; Helen Walker et al., 2008; Wycherley, 1999) (Ageron et al., 2012; Govindan, Kaliyan, Kannan, & Haq, 2014; Morali & Searcy, 2013; M. D. Porter & Linde, 1995; Tong, Shi, & Zhou, 2012) |
| | Lack of communication | (Ageron et al., 2012; Carter & Dresner, 2001; Govindan et al., 2014; Rauer & Kaufmann, 2015; Seuring & Müller, 2008) |

| Category | Barrier | Reference |
|---|---|---|
| | Lack of understanding of the concept of sustainability | (Carter & Dresner, 2001; de Jesus Pacheco, ten Caten, Jung, Sassanelli, & Terzi, 2019; Govindan et al., 2014; Kirchoff et al., 2016; Morali & Searcy, 2013; Taylor & Vachon, 2017; Vijayan et al., 2014; Helen Walker et al., 2008) |
| B. External | Lack of appropriate regulation | (Carter & Carter, 1998; Govindan et al., 2014; M. D. Porter & Linde, 1995; Rauer & Kaufmann, 2015; Taylor & Vachon, 2017; Tumpa et al., 2019; Vijayan et al., 2014) |
| | Restricted access to sub-suppliers | (Rauer & Kaufmann, 2015) |

- **Internal Barriers**

Internal barriers are obstacles that come from within an organisation. These barriers are elaborated below.

**1. Financial constraint**

A considerable amount of studies has found that the financial constraint to cover the costs to acquire resources is the main barrier in sustainability transformation. Starting and practising sustainability initiatives requires investment for training, development of new standards, and acquiring relevant facilities (Min & Galle, 2001; Morali & Searcy, 2013; Seuring & Müller, 2008). It also stems from the difficulty in distributing costs among supply chain members (Ageron et al., 2012).

**2. Lack of communication and coordination**

The previous studies state the lack of communication and coordination acts as a barrier to sustainable practice implementation (Ageron et al., 2012; Carter & Dresner, 2001). Sustainable practices rely heavily on effective communication and coordination among supply chain members (Govindan et al., 2014). For instance, the manufacturers must continuously monitor their suppliers to ensure they engage in sustainable behaviour. Therefore, the lack of coordination significantly hinders the attainment of sustainability goals.

**3. Lack of understanding of the sustainability concept**

Lack of clear understanding and knowledge of the sustainability concept amongst suppliers and customers hinders sustainability transformation (Morali & Searcy, 2013). This barrier includes a lack of clarity about the benefit of sustainable practices. Therefore,

they are not motivated to implement SSCM. There is also a lack of technical expertise or how-to knowledge in conducting sustainable practices (Carter & Dresner, 2001). Sustainability initiatives could not be implemented without all stakeholders' full understanding of what sustainability is and how to implement it. The absence or lack of knowledge and technical expertise might discourage companies from starting sustainability initiatives.

- **External barriers**

An external barrier is an obstacle that is caused by external parties (outside of the focal organisations). These barriers are explained below.

1. **Improper or the lack of appropriate regulations**

Incorrect regulations pose certain restrictions. Overly restrictive rules, inappropriate standards, and inefficient administration may inhibit innovative solutions (Tumpa et al., 2019). Regulations that require specific technologies, set exceptionally short compliance deadline, and focus on cleaning/fixing strategies rather than prevention may not be a rational approach in a given circumstance, thus prevent progress (Carter & Carter, 1998; M. E. Porter & Van der Linde, 1995).

At the same time, the absence of regulation to enforce the adoption of sustainable practices has also been found as a barrier (Rauer & Kaufmann, 2015). Since conducting activities such as waste disposal management, ensuring health and safety, and fair trade might be perceived as additional costs to the organisations, the lack of regulation to invoke these might discourage organisations from engaging in sustainable operations (Tumpa et al., 2019). Moreover, the absence of stimulus, such as tax exemption for SSCM adoption, is also cited as a barrier (Vijayan et al., 2014).

2. **Restricted access to sub-suppliers**

Nowadays, a supply chain mostly comprises a complex multi-tier network. The successful implementation of sustainability across a supply chain significantly relies on the cooperation between members, especially the upstream suppliers. Sustainable practices conducted at a manufacturer should be diffused to the whole supply chain. However, it is difficult for the company to reach beyond its tier-one suppliers due to lack of access to the sub-suppliers (Rauer & Kaufmann, 2015). There is also power imbalance in the supply chain where the sub-suppliers are in the more dominant position than the

buying company. Therefore, the buying company perceived itself as incapable of forcing the implementation of sustainable standards to its sub-suppliers.

Various barriers involved in sustainability transformation have been discussed. It is now necessary to examine the essential resources and capabilities that enable sustainability transformation.

## 2.5.4   Resources in Sustainability Transformation

The shift towards sustained sustainability transformation can only be achieved if the entire supply chain has relevant resources and capabilities for implementing sustainable practices (Bowen et al., 2001). They have to be effectively identified and managed for a supply chain to become sustainable (Jabbour, Mauricio, & Jabbour, 2017). Identification of resources is also useful to understand why some organisations are more sustainable than others. This understanding helps practitioners devise appropriate strategies to increase the likelihood of success in sustainability transformation. However, studies on resources that enable the successful implementation of sustainable practices in supply chains are still fragmented.   By synthesising previous related studies, this study has identified individual and organisational resources valuable in sustainability transformation. As can be seen in Table 2.8, resources identified in the previous studies are mostly intangible.

Table 2.8 Resources to Support Sustainability Transformation

| Resource | Study |
|---|---|
| *Individual resource* | |
| Commitment, knowledge, and skill of the employees | (Garvare & Johansson, 2010; Gopal & Thakkar, 2016; Gopal & Thakkar., 2015; Hajmohammad & Vachon, 2012; So & Xu, 2014; Subramanian & Gunasekaran, 2015; Wichmann et al., 2016) |
| *Organisational resource* | |
| Top management commitment and support for sustainability transformation | (Ageron et al., 2012; Alvarez, Pilbeam, & Wilding, 2010; Arnfalk, Ulf Pilerot, Per Schillander, & Gr€onvall, 2016; Beske & Seuring, 2014; Bowen et al., 2001; Faisal, 2010; K. Green et al., 1996; Jabbour et al., 2017; Lee & Klassen, 2008; Sunil Luthra et al., 2016; McPhee, 2014; Morali & Searcy, 2013; Pagell & Wu, 2009; Park, Eo, & Lee, 2012; Subramanian & Gunasekaran, 2015; Taylor & Vachon, 2017; Thomas-Francois, von Massow, & Joppe, 2017; Helen Walker et al., 2008; H. Walker & Jones, 2012; Wolf, 2011; Zhu et al., 2008) |

| Resource | Study |
|----------|-------|
| Appropriate organisational structure | (Gopalakrishnan, Yusuf, Musa, Abubakar, & Ambursa, 2012; Wolf, 2011) |
| IS adoption | (Koppius et al., 2014; S. Luthra, Garg, & Haleem, 2015; Seidel et al., 2013; Seidel, Recker, Pimmer, & Brocke, 2014; So & Xu, 2014; Thöni & Tjoa, 2015; H. Walker & Jones, 2012; Wittstruck & Teuteberg, 2012) |
| Trust between supply chain members | (Alvarez et al., 2010; Ciliberti et al., 2008; Grimm et al., 2014) |
| Relevant organisational capability | (Benitez-Amado & Walczuch, 2012; Beske, 2012; Beske, Land, & Seuring, 2014; Bowen et al., 2001; Eitiveni, Kurnia, & Rajkumar, 2018; Eltantawy, 2015; Gopal & Thakkar, 2016; Kurnia et al., 2014) |

- **Individual Resource**

### 1. Commitment, knowledge, and skill of the employees

Many studies reported that, at the individual level, it is crucial to gain commitment from the employees. This is due to sustainable programs usually require changes in business processes and reward systems, which potentially cause resistance (So & Xu, 2014). Therefore, it is vital to get buy-in from all stakeholders involved, especially employees, because they are the ones who carry out the programs.

Few studies have examined how to gain employees' commitment to conduct sustainable practice. So and Xu (2014) argue that the influence of project champions is positively associated with employee's commitment if the champions use tactics such as inspirational appeals, consultation, and rational persuasion. Later, (Wichmann et al., 2016) partially refuted this finding by revealing that persuasion was not related to gaining commitment. However, they both agreed on the importance of employees' commitment to implement SSCM.

Once employees' buy-in is acquired, they need to be equipped with appropriate knowledge and skills. Training, mentoring, and other capacity-building programs are cited by many studies to provide employees with the necessary skills and expertise (Garvare & Johansson, 2010; Gopal & Thakkar, 2016; Gopal & Thakkar., 2015). Then, they need to be incentivised with a reward system based on sustainability-related performance measurement (Hajmohammad & Vachon, 2012; Subramanian & Gunasekaran, 2015; Wichmann et al., 2016).

Meanwhile, previous studies cited several resources possessed by exemplar firms. These are classified as the following organisational resources.

- Organisational Resource

**1. Top management commitment and support for sustainability practices**

Many studies cite top management commitment and support as the most significant enablers to SSCM implementation (Pagell & Wu, 2009; Helen Walker et al., 2008; Zhu et al., 2008). Previous studies suggest that successful sustainability transformation requires complete integration of sustainability objectives and practices into daily operations and everyone's responsibility, beginning with the top management (McPhee, 2014). Senior management commitment towards sustainability steers the efforts to become more sustainable. It ensures that sustainability initiatives are interwoven in corporate strategy rather than treated as additional programs (Nair et al., 2016). Support from the top management ensures that sustainability goals, practices, and cognition are integrated into every decision. This means that for every decision, sustainability measure needs to be considered and evaluated. Top management is paramount because this integration may require policies or programs that contradict the existing practices (Park et al., 2012). Furthermore, the apparent commitment from top management provides ample power to extend the sustainability initiatives beyond the organisational boundary (Nair et al., 2016).

**2. Appropriate organisational structure**

Top management commitment needs to be realised into a more tangible form. (Gopalakrishnan et al., 2012; Wolf, 2011) suggest the creation of a dedicated committee or department that design, control, and oversee the implementation of rules and policies that address environmental and social issues across an organisation and its supply chain. This department is also tasked to coordinate sustainability-related roles and responsibilities in an organisation.

**3. IS adoption**

One prominent stream in sustainability is green IS. It examines Information Systems role and adoption in supporting environmentally responsible practice. Majority of studies in this stream describe Information Systems role as the essential enabler of sustainability

transformation (Koppius et al., 2014; Seidel et al., 2013; Seidel et al., 2014; Thöni & Tjoa, 2015). More about this resource is explained in Section 2.5.6.

**4.  Trust between supply chain members**

Trust has been cited by many studies as a resource as well as the outcome of sustainability implementation (Alvarez et al., 2010; Ciliberti et al., 2008; Grimm et al., 2014). It is a precondition for collaboration between supply chain members towards achieving shared goals (Smith, 2008). Trust grows over time, is difficult to imitate, and are not traded. Therefore, it is a source of competitive advantage. It is also an enabler for inter-organisational knowledge sharing.

Lack of mutual trust between supplier and buyer may decrease sustainability performance (Tachizawa & Wong, 2015). It inspires suppliers to hide issues during auditing. On the other end of supply chains, diminished trust provokes buyer to increase auditing and monitoring of its supplier, which eventually leads to lesser trust on both sides. Thereupon, trust-building is likely to become more beneficial than tight structures of external certification, contaminants analysis, and recurrent auditing (Smith, 2008).

This section has analysed the resources and has argued their importance in enabling sustainability transformation. The relevant capability is elaborated in a separate subsection, since it is highly relevant to this study.

## 2.5.5  Sustainability Capability

A capability is a firm's ability developed from a complex bundle of resources including skill, practice, relationship, accumulated knowledge, and organisational process that enable the possessing entity to conduct certain tasks or activities (Grant, 1991; Huq, Chowdhury, & Klassen, 2016). Capabilities are regarded as a source of competitive advantage, since they are harder to acquire or imitate than other resources such as capital equipment or finance (Collis & Montgomery, 1990). Sustainability capability is firm's capacity to effectively coordinate bundles of complex tangible and intangible resources to achieve sustainability goals and to deliver sustainable values to its stakeholders" (Dao et al., 2011, p. 65). Table 2.9 shows a synthesis of essential capabilities in sustainability transformation.

**1. Sustainability data collection**

Sustainability data collection is "the ability of an organisation to efficiently gather a range of data related to sustainability practices and the impacts within the organisation and across the supply chain" (Kurnia et al., 2014, p. 6). Sustainable practices require traceability and visibility along the supply chain to ensure each activity is conducted responsibly. Sustainability-related data that need to be collected include, among others, waste management, labour condition, suppliers' activities, and transportation routing.

Table 2.9 The Sustainability Capabilities derived from Kurnia et al. (2014)

| Capability | Definition | Reference |
|---|---|---|
| Sustainability data collection | "The ability of an organisation to efficiently gather a range of data related to sustainability practices and the impacts within the organisation and across the supply chain" (Kurnia et al., 2014, p. 6). | (Eltantawy, 2015; Kurnia et al., 2014; D. J. Teece, 2007) |
| Sustainability performance reporting | The ability to produce reports related to sustainability practices and impacts to inform internal and external stakeholders including government (Kurnia et al., 2014) | (Beske et al., 2014; Dao et al., 2011; Kurnia et al., 2014) |
| Sustainability benchmarking | "The ability of an organisation to compare the sustainability performance across various units (internal) and supply chain members (external)" (Kurnia et al., 2014, p. 6) | (Kurnia et al., 2014; D. Y. Li & Liu, 2014; Protogerou, Caloghirou, & Lioukas, 2011) |
| Sustainability training | The ability to create an awareness of the importance of sustainability practices among stakeholders (Kurnia et al., 2014) and empower them to carry out those practices | (Beske et al., 2014; Dangelico et al., 2013; Dao et al., 2011; Defee & Fugate, 2010) |
| Sustainability risk analysis | The ability to assess the "potential negative consequences" of conducting a sustainable practice affecting the implementation success of SSCM practices (Kurnia et al., 2014) | (Dao et al., 2011; Kurnia et al., 2014) |
| Sustainability governance | "The ability to manage and align the sustainability goals across organisational units and supply chain members" (Kurnia et al., 2014, p. 6). | (Eltantawy, 2015; Kurnia et al., 2014; Peters, Hofstetter, & Hoffmann, 2011) |

**2. Sustainability performance reporting capability**

It is defined as an organisation's ability to produce reports related to sustainability practices and impacts to inform internal and external stakeholders, including government (Kurnia et al., 2014, p. 6). Internally, reports that include both environmental and social

dimensions are delivered to all layers of management. Externally, public and relevant bodies are also informed. A firm that implements self-disclosure reporting of its sustainability practices through reporting program such as Global Reporting Initiative (GRI) is found to acquire and maintain a competitive advantage (Brown, de Jong, & Levy, 2009). Voluntary sustainability reporting is also found to improve the behaviour of stakeholders toward sustainable practices by internalising the sustainability principles into practices (Iveroth & Bengtsson, 2014).

**3. Sustainability benchmarking capability**

It is "the ability of an organisation to compare the sustainability performance across various units (internal) and supply chain members (external)" (Kurnia et al., 2014, p. 6). Furthermore, benchmarking can also be conducted against a competitor's sustainability performance (Nair et al., 2016) and existing standards such as Dow Jones Indexes, ISO14001, and SIGMA guidelines. Similarly, sustainability benchmarking can be performed using tools proposed in a number of previous studies (Bjorklund, Martinsen, & Abrahamsson, 2012; Colicchia, Melacini, & Perotti, 2011; Hemming, Pugh, Williams, & Blackburn, 2004; P. Hong et al., 2012; Presley & Meade, 2010).

**4. Sustainability training capability**

This is an organisation's capacity to create awareness about the importance of sustainability practices amongst stakeholders and empower them to carry out those practices (Kurnia et al., 2014, p. 6; Rodriguez et al., 2016). Training should be delivered to employees at all levels, supply chain partners, and consumers since it helps build the necessary capabilities in the companies and their supply chain partners (Gopal & Thakkar, 2016). It also plays crucial roles in internalising sustainability practices (McPhee, 2014). Investment in training could create psychological safety when facing uncertainty in dealing with sustainable practice adoption (Kirchoff et al., 2016).

**5. Sustainability risk analysis capability**

It is defined as an organisation's ability to assess the potential negative consequences of implementing a sustainable practice that may endanger the sustainability transformation (Kurnia et al., 2014, p. 6). The importance of risk analysis capability to SSCM implementation is paramount because supply chains may span across continents with numerous possible catastrophes. Firm and its partners should conduct cost and implementation risk assessments of sustainability initiatives that include the three aspects of sustainability (Faisal, Banwet, & Shankar, 2006; Mentzer et al., 2001).

**6. Sustainability governance capability**

Sustainability governance capability is "the ability to manage and align the sustainability goals across organisational units and supply chain members" (Kurnia et al., 2014, p. 6). Since a firm can only be as sustainable as its supply chain, sustainability across supply chains can only be actualised effectively if sustainability goals are internalised and enforced across the supply chain (Rauer & Kaufmann, 2015). Achieving this goal requires strong commitments and clear vision from top management (Kumar & Rahman, 2016). Then, they need to be supported by appropriate organisational culture and constant monitoring against sustainability goals and visions (Ahmad et al., 2016).

Clearly, sustainability goal can only be achieved if the entire supply chain has relevant resources and capabilities for implementing SSCM (Bowen et al., 2001). Several studies (e.g., (Dangelico et al., 2013; Gavronski et al., 2011; Shang et al., 2010) examine the necessary capabilities for implementing sustainable supply chain. However, they primarily concentrate on the environmental aspect and exclude the social issue. Therefore, it is essential to clearly define and identify a broader set of sustainability capabilities that are applicable in various contexts and address economic, environmental, and social goals simultaneously. Moreover, what has not been understood is how the resources or enablers can be employed to develop the essential capability in sustainability transformation. Additionally, there is a deficiency of research that investigates how individual preferences and behaviour, and organisational structure affect the essential capability development.

So far, this study has explained the barriers, resources, and capabilities affecting sustainability transformation. In the context of this study, it is necessary to analyse how IS enable organisational and supply chain change.

## 2.5.6   The Roles of IS in Sustainability Transformation

Information systems are "a set of capital and human resources that enables the collection, storage, and processing of data to produce and communicate relevant information to all levels of management to provide support in performing management related activities" (Sarngadharan & Minimol, 2010, p. 34). IS link the entire supply chain into a unified and coordinated system. Internally, they builds a seamless information exchange between various functional areas as well as externally between suppliers, carriers, retailers, customers, and other stakeholders (Simchi-Levi et al., 2009).  Little to no doubt remains

that information systems are critical for the survival and success of supply chains (Handfield and Nichols, 1999).

Various systems have been used in SSCM context such as intelligent transportation system (Marett et al., 2013), decision support system (Koh et al., 2013; Repoussis, Paraskevopoulos, Zobolas, Tarantilis, & Ioannou, 2009), geographical information system (Izadikhah & Saen, 2016), cloud computing (Schniederjans & Hales, 2016), and RFID (Björk et al., 2011; Dao et al., 2011). The literature has shown positive impacts of IS on sustainable practices and performances that include improved collaboration amongst supply chain partners (Schniederjans & Hales, 2016), enhanced sustainability capabilities (Dao et al., 2011), sustained economic growth and reduced greenhouse gas (GHG) emissions (Dedrick, 2010), and various operational benefits that ultimately lead to better economic and environment performances (Schniederjans & Hales, 2016).

The SSCM definition by Ahi and Searcy (2013) mentions of inter-organisational business systems to efficiently and effectively manage the resources and processes. This definition implies the need for IS to address the inter-organisational coordination needs. IS should be able to integrate the economic, environmental, and social considerations in managing material, information, and capital flows in supply chains. The system should also incorporate all the relevant stakeholders' requirements. The synthesis of Information Systems role to improve sustainability performance is presented in Table 2.10.

Table 2.10 IS Roles in Sustainability Transformation

| IS Role | Reference |
|---|---|
| Data capture | (Parry et al., 2016; Watson, Haraldson, & Lind, 2012) |
| Information exchange | (Lehmann et al., 2012; Schniederjans & Hales, 2016). |
| Monitoring implementation | (Björk et al., 2011; Chenga, 2011; K. W. Green, Zelbst, Bhadauria, & Meacham, 2012; Meacham et al., 2013) |
| Automation | (Chen, Tai, & Hung, 2012; Dao et al., 2011; Pamučar, Gigović, Ćirović, & Regodić, 2016; Ramos et al., 2015). |

## 1. Data capture

Data capture is an essential IS capability that can improve sustainable practices (Watson et al., 2012). In supply chains, IS capture data about products from production to a delivery or purchase point that eventually enhances visibility for all relevant parties

(Simchi-Levi et al., 2009). This IS role is specifically important in reverse logistics. Reverse logistics' main problem is acquiring sufficient products to enable economically feasible production (García-Rodríguez, Castilla-Gutiérrez, & Bustos-Flores, 2013). Reverse logistics require visibility about the patterns of consumption beyond the point of sale (García-Rodríguez et al., 2013). IS provide accurate and timely information that enables acquisition of the right product in the right quantities and price. IS can also acquire timing information that helps planning and capacity management (Parry et al., 2016).

## 2. Information exchange

IS enable real-time data exchange which is a precondition for sustainability (Meacham et al., 2013). IS can fulfil the information needs of various stakeholders in a supply chain (Lehmann et al., 2012). For example, the customers may need information about pesticides used in agricultural activities to make a purchasing decision. Supply chains can prove that their products meet the customers' requirement using IS, which may lead to revenue generation. Arguably, the most significant role of IS is to provide information sharing capability among supply chain partners to ensure traceability and transparency in either forward or reverse logistics (Schniederjans & Hales, 2016). In reverse logistics, close cooperation is required between manufacturing firms and customers, since customers act as both buyers and input suppliers. IS capability to enable constant contact can significantly lower uncertainty (García-Rodríguez et al., 2013).

## 3. Monitor sustainable practice implementation

IS have the capability to monitor activities to ensure lower environmental and social impacts of supply chain activities. Monitoring practice has led to an improved environmental and social performance (K. W. Green et al., 2012). For instance, the use of RFID systems has been well established to track and trace goods movement in a supply chain. RFID based technology was used in the wood industry to track individual logs from the tree felling to sawmills (Björk et al., 2011). The technology provides information which leads to increased raw materials yield and calculation of environmental impact along the supply chain (Björk et al., 2011). In the construction supply chain, a web service framework was used to monitor environmental performance along the supply chain (Chenga, 2011).

## 4. Automation

IS enables automation of work practice (Dao et al., 2011). IS have the ability to automatically calculate the impact of supply chain activities to the environment (Ramos et al., 2015), search for the most efficient route to minimise harmful gas emission from goods distribution (Pamučar et al., 2016), and ensure the compliance with sustainability standards (Chen et al., 2012).

Overall, IS role in affecting and enabling sustainability transformation remains under-explored. Table 2.10 presents an illustration of the existing studies that tend to provide the general purpose of IS. While these general roles are useful, these studies do not inform us about how we can use IS to develop relevant capabilities to support sustainability transformation. In fact, IS is expected to act as a crucial enabler in SSCM, especially in building the required capabilities to successfully implement SSCM (Dao et al., 2011; Kurnia et al., 2012). The existing studies also tend to treat IS as a standalone system that improves performance in solitude. The interaction between IS and the user is mostly ignored, although IS capability to deliver changes is significantly affected by the user's goal and capability to realise the expected changes (Strong et al., 2014). Finally, majority of IS roles focuses on environmental dimension of sustainability such as (Björk et al., 2011; Chenga, 2011). There is an absence in exploring how IS can support the social aspect of business practices.

So far, this chapter has explained the descriptive and content analysis of the literature to establish the context of this study. Preliminary investigations done by previous studies have been analysed to clarify areas of inquiry and identify gaps in the literature, which are summarised in the next section.

## 2.6 Summary of Research Gaps

Based on a systematic literature review, it is concluded that the accumulative SSCM literature is still maturing at micro-levels and is currently fragmented. The existing studies reside in the level of understanding the emerging phenomenon and building theories, while practical guidance is limited (Eitiveni et al., 2017). Various aspects of the supply chain have been analysed with theoretical lenses adapted from other disciplines. However, some gaps in the literature exist, as summarised in Table 2.11.

Table 2.11 Summary of the Main Findings and Gaps in the SSCM Literature

| Category | Main Findings | Gaps |
|---|---|---|
| Focus | Generic or environmentally driven approach | Compared to the environmental dimension, studies focusing on the social dimension is significantly limited. Even when both were discussed, the emphasis was on the ecological rather than social practices (see Section 2.3.1). |
| Geographic location | SSCM literature is primarily based in developed countries. | There is a lack of understanding of the effective adoption and implementation of sustainable practices in developing countries (see Section 2.3.2). |
| Theoretical Lens | A handful of theoretical lenses have been employed in analysing specific elements of SSCM. | Infrequent studies applied theory in examining the social dimension. The contextualisation of a combination of theories to tackle various components in SSCM is lacking (see Section 2.3.3). |
| Sustainability transformation phase | Previous studies have highlighted several important elements comprising each stage of sustainability transformation. | There has been little attention in the SSCM literature that provides a holistic view of sustainability transformation from the inception to maintenance and evaluation (see Section 2.5.2). |
| The necessary capability | Many studies have explored various industry-specific capabilities that support sustainability transformation. | There are relatively few studies exploring how the resources or enablers can be employed to develop the capability required to implement SSCM, how individual preferences and behaviour and organisational structure affect capability development, and how specific capabilities affect the sustainability transformation (see Section 2.5.5). |
| IS role | Existing studies provide general functions of IS in supporting sustainability transformation such as automation or data capture. | Few studies investigate how IS enhance the social aspect of sustainability and building the required capabilities (see Section 2.5.6). The interaction between IS and the user is mostly ignored. |

## 2.7 Reformulating Research Question

The research gaps identified above indicate the need to study the end-to-end process from raising sustainability conscience to maintenance and evaluation that pay considerable attention to social and environmental aspects. There is also a call for examining developing countries for its lack of representation in the SSCM literature and the use of

a combination of theories. This thesis particularly concerns with examining the role of IS in supporting the development of the critical capabilities required in enabling sustainability transformation. The research question then can be formulated as follows:

*"How do IS support the sustainability transformation in food supply chains?"*

The study context is Indonesia as an exemplification of a developing country. The justification is provided in Chapter 4.

## 2.8 Summary

This chapter presented the results of a systematic literature review of the SSCM literature following the methodology proposed by Webster and Watson (2002). The synthesis of the literature is organised using the concept matrix. The chapter covered: (a) a descriptive analysis of the SSCM literature, (b) SSCM definitions and concepts, (c) various key relevant concepts in the literature, and (d) the gaps identified from the review along with research question derived from the identified gaps. A description of the theories used in this study is presented in the next chapter.

# CHAPTER 3: THEORETICAL BACKGROUND

## 3.1 Introduction

This chapter explains the theories used in this study. It starts by highlighting the importance of theory in research. Then, the following sections describe the three theories that serve as the foundations of this study. The first one is Stakeholder Theory. This theory provides a useful lens in identifying relevant stakeholders and examine their roles in pushing firms and supply chains towards becoming sustainable entities. The next theoretical foundation is Affordance Theory. It is applied to explore how the relationship between IS and actors can lead to successful sustainability transformation through perception and actualisation of relevant IS affordances. The last one is Dynamic Capability Theory that guides the development of the required capabilities in sustainability transformation. Finally, the integration of various insights from these theories allows for a rich and novel investigation into how IS-enabled sustainability transformation occurs.

## 3.2 The Importance of Theory

There are several definitions of theory. Many researchers refer to the word "theory" as conjectures, models, frameworks, or body of knowledge (Gregor, 2002). Gregor (2002, p. 4) defines theory as the "abstraction and generalisation about a phenomenon, interactions and causation". Therefore, a set of facts and knowledge are not regarded as theory, although they may serve as a foundation of theoretical development. Most research includes an element of theory, especially in explanatory studies (Neuman, 2006). In general, theory can be used to:

1. Analyse and describe a specific phenomenon
2. Understand the mechanism or reason of an occurring phenomenon. In this sense, a theory is utilised as a "sensitising device" to observe the world in a specific way (Klein & Myers, 1999, p. 75)
3. Predict the outcomes of a set of factors.

4. Explain the mechanism and cause of a phenomenon as well as identifying regularities that enable prediction of future occurrence.

5. Design and implement research. In practice, theory can guide the selection of methodologies and tools used in a study including design of a research question, data selection, data interpretation, explanation of causes, and provide generalisation (Gregor, 2002, 2006).

Theories are constantly tested, modified, and developed into new ones. This systematic knowledge accumulation provides a foundation for future research. Research that applies theory effectively is generally stronger and better designed than studies that do not (Neuman, 2006).

## 3.2.1 Theories Applied in the Previous Studies

Based on the descriptive analysis in Chapter 2, six most frequently used theories in the SSCM and IS literature are shown in Table 3.1.

Table 3.1. Frequently Used Theories in the Previous Studies

| Theory | Description | Author |
|---|---|---|
| Resource-based View (RBV) | By possessing valuable, rare, imperfectly imitable, and non-substitutable resources, a firm can achieve and sustain competitive advantage | (J. B. Barney, 1991) |
| Dynamic Capability Theory | A firm needs to develop a dynamic capability to gain a competitive advantage in a turbulent environment. | (D. Teece, Pisano, & Sheun, 1997) |
| Natural RBV | The use of natural (biophysical) resources to support environmental strategies is the primary source of competitive advantage. | (Hart, 1995) |
| Fuzzy Set Theory | The theory of neural nets and evolutionary programming that deal with ambiguous, subjective, and imprecise judgment. | (Zadeh, 1965) |
| Stakeholder Theory | A firm's decision and performance are highly influenced by the values, belief, and demand of its stakeholders. Thus, the firm must manage its relationship with the key stakeholders effectively. | (R. Freeman, 1984) |
| Affordance Theory | Users do not perceive details of an object, but directly see what that object enables them to do (affordance). Existence of an affordance is independent on the ability of the actors to perceive it. The same object can afford different opportunities for different actors. | (Gibson, 1986) |

RBV, NRBV, and Fuzzy Set Theory are not sufficient to answer this study's research question. RBV postulates that to achieve and sustain competitive advantage, firms have to possess valuable, rare, imperfectly imitable, and non-substitutable resources (J. B. Barney, 1991). In a dynamic market such as the food industry, the value of a resource may increase or decrease over time, which may not guarantee sustained competitive advantage (Beske et al., 2014). Meanwhile, Natural Resource-based View focuses on the environmental aspect, while the social aspect is excluded. This study aims to address the social issues. Therefore, this theory does not serve the goal. Finally, Fuzzy Set Theory is positivist-oriented, which is suited for quantitative research. While this theory is useful to deal with ambiguous, subjective, and imprecise judgment, this research adopts interpretive worldview and qualitative approach (a detailed discussion is presented in Chapter 4). In short, these theories offer limited coverage in fulfilling the aim of this research.

This study adopts Stakeholder Theory, Affordance Theory, and Dynamic Capability Theory to provide an overarching examination of sustainability transformation in the food supply chain. Each theory focuses on a different aspect of the phenomenon. Stakeholder Theory is used to understand the mechanism and cause of belief reformation in the individual and organisational levels (N. P. Melville, 2010). Meanwhile, Affordance Theory provides a useful lens to examine how the belief reformation translates to action (Strong et al., 2014). Dynamic Capability Theory allows for the identification of regularities about how specific capabilities affect shifts in organisations and supply chains (Beske et al., 2014). The explanation of each theory and its suitability to this research is provided in the next sections.

## 3.3 Stakeholder Theory

### 3.3.1 Key Concepts

Stakeholder Theory, originated from business and management disciplines, accounts for various constituencies that affect and are affected by a business entity (R. E. E. Freeman & McVea, 2001). These constituencies are referred to as stakeholders. Typically, the stakeholders of a firm include employee, investors, supplier, customer, government, political group, trade association, and community in general (Donaldson & Preston, 1995). They can be classified into primary or secondary stakeholders depending on how

much they influence or are influenced by an organisation. Primary stakeholders directly influence or are influenced more by an organisation than the secondary ones (Mitchell, Agle, & Wood, 1997).

Stakeholder Theory posits that a firm's stakeholder profoundly influences its decision, norms, practices, and performance (R. E. E. Freeman & McVea, 2001). Consequently, values, belief, and demand of the stakeholders affect the management of a business. They also have multiple, sometimes conflicting objectives. Therefore, gaining understanding about how to effectively manage the relationship with a range of stakeholders highly determine a company's success (Donaldson & Preston, 1995; R. E. Freeman & Phillips, 2002).

Stakeholder Theory has three fundamental principles, i.e., descriptive, normative, and instrumental (Donaldson & Preston, 1995). Under normative thesis, Stakeholder Theory postulates that "managers ought to pay attention to key stakeholder relationships" (R. E. Freeman & Phillips, 2002, p. 8). This notion implies that a firm must identify the key stakeholders who have the most impact or are impacted the most by the firm's activities to succeed. Stakeholder Theory is also descriptive. It describes an organisation as a configuration of parties, and each possesses intrinsic value and interests. It provides recommendation on structures, practices, attitude, and approach that consider all legitimate stakeholders. Finally, it is also instrumental since it helps to explain the link between stakeholder management and firm performance. Its main tenet is that managing relationship with stakeholders effectively is likely lead to successful performance (R. E. E. Freeman & McVea, 2001).

## 3.3.2 The use of Stakeholder Theory in SSCM Research

The basic argument of Stakeholder Theory is that internal and external parties exert pressure on firms to change organisational practices (Freeman, 1984; Freeman et al., 2010). Donaldson and Preston (1995) placed the normative aspect of Stakeholder Theory at the 'core base' of Stakeholder Theory, which implies that stakeholders' interests with 'intrinsic' moral values could affect firm's performance significantly. From this perspective, Stakeholder Theory is particularly applicable to SSCM research because stakeholders' pressure may provoke firms to adopt sustainable practices that are initially economically unfavourable (Sarkis et al., 2011).

Stakeholder Theory argues that each stakeholder has property rights as well as responsibilities. Suppliers own the property rights to their supplies like employees to their labour. Consumers have property rights to their wealth as communities to public goods (R. E. Freeman & Phillips, 2002). A firm must concern itself with the ethics, morals, and values in running a business so that these rights are respected. Stakeholder Theory further exemplifies this notion by stating that to ensure sustained support and cooperation from the stakeholders, the relationship between a corporation and its stakeholders must exert some element of fairness (R. E. E. Freeman & McVea, 2001). This proposition means that (1) the relationship should be mutually beneficial for all of its stakeholders, (2) all stakeholders have the responsibility to act within reason, and (3) all stakeholders must accept responsibility for the effect of their actions, not only a single firm. For instance, suppliers have an obligation to supply materials and ensure smooth supply chain process. Consumers have a responsibility to use the products or service as intended. Shareholders are responsible for selecting executives to manage the business. Employees are expected to execute their work responsibly. If there is any party that violates the right of other parties, the harmed party must receive compensation or negotiate a new agreement that includes all the affected stakeholders (R. E. E. Freeman & McVea, 2001). Based on these principles, Stakeholder Theory offers a compelling lens to explore sustainability issues.

Stakeholder Theory has been used in SSCM research to identify relevant and crucial stakeholders in a sustainability initiative (Maignan & McAlister, 2003; Morali & Searcy, 2013). A considerable part of the SSCM literature that uses Stakeholder Theory has emphasised the profound role of the stakeholders in exerting pressures on business to reduce its adverse impacts on environment and society (e.g., (Govindan, 2018). Furthermore, studies also use the theory as a lens for the examination of motivations, objectives, barriers, and enablers of various stakeholders in SSCM adoption. It is a useful theory to assess conflict of interests among stakeholders which eventually yields in effective stakeholder engagement.

Previous studies have revealed several essential stakeholders in exercising pressures for a sustainability initiative. Table 3.2 shows the role of these stakeholders in integrating sustainability in a supply chain.

Table 3.2. Stakeholders' Roles in the Sustainability Initiative

| Stakeholder | Role | Reference |
|---|---|---|
| Customer | Demanding for sustainable product | (Baliga, Raut, & Kamble, 2019; Gopal & Thakkar, 2016; Govindan, 2018; Kirchoff et al., 2016; Seuring & Müller, 2008; Smith, 2008) |
| | Collecting the residual value in products through recycling and reuse | (McPhee, 2014) |
| | Providing feedback regarding customer's use of the product | (McPhee, 2014) |
| Employee | Exerting pressure for sustainability implementation | (McPhee, 2014) |
| | Developing sustainability-related commitment, skills and expertise | (Bowen et al., 2001; McPhee, 2014; Smith, 2008) |
| | Conducting the sustainable practices | (McPhee, 2014; Smith, 2008; Helen Walker et al., 2008) |
| Government | Exerting pressure for sustainability implementation | (Gopal & Thakkar, 2016; Govindan, 2018; Seuring & Müller, 2008; Smith, 2008; Zhu et al., 2008) |
| | Providing support in term of regulation and incentives. | (Smith, 2008) |
| NGO | Triggering and maintaining pressure for sustainability implementation | (Baliga et al., 2019; Govindan, 2018; McPhee, 2014) |
| | Providing expertise and insights | (Rodriguez et al., 2016; Smith, 2008) |
| Industry association | Sharing best practices | (Gavronski et al., 2011) |
| Community | Exerting pressure for sustainability implementation | (Baliga et al., 2019; McPhee, 2014; Smith, 2008) |

### 3.3.3 The Justification and Utilisation of Stakeholder Theory in This Study

Despite the attractiveness of Stakeholder Theory to examine the managerial motivation for sustainability implementation, recent studies have suggested that there is limited evidence showing that stakeholders' value has moved towards sustainability (Kirchoff et al., 2016). Thus, the claim that stakeholders' demand drives the sustainability implementation in a business or a supply chain needs to be reexamined. Furthermore, as shown in Chapter 2, the majority of SSCM studies had been conducted in developed

countries. The belief, norm, and practices of stakeholders in this region are likely to be different than those from developing countries.

This study adopts Stakeholder Theory as one of the driving theories in answering the research question. It was selected because previous studies highlighted the profound roles of multi-stakeholders in implementing sustainability along a supply chain. This theory provides a useful lens in identifying relevant stakeholders and examine their roles in moving towards becoming a sustainable supply chain. Specifically, this study applies Stakeholder Theory to:

- Identify the primary and secondary stakeholders in enabling sustainability transformation;
- Assess the current state of sustainability implementation in the Indonesian food supply chain based on the stakeholders' perspective;
- Identify appropriate sustainability goals and associated barriers;
- Recognise the roles they play in the sustainability transformation.

## 3.4 Affordance Theory

### 3.4.1 Key Concepts

The notion of 'affordances' was first used by Gibson (1986) to describe actor-environment mutuality as an inseparable relationship between animals or human beings with objects. Originally, it was used to explain his study about the animal perception of its surrounding. Animals do not perceive details of an object, but directly see what that object enable them to do. According to Gibson (1986), affordance is provided and offered to someone or something by an object. He argues that when animals or humans as the actors see an object, they instantly perceive its affordance. Then, when triggered, they recognise its physical properties, such as surface or colour, next. Having this perception helps animals and humans survive and prosper in their environment, since they are provided with alternatives for actions.

These possibilities for actions arises from "relations between the abilities of [the actor] and features of the environment" (Chemero, 2003). Thus, affordances are relational (Hutchby, 2001). It is further defined as "all action possibilities or capabilities latent in the environment, independent of the individual's ability to recognise them, but always in

relation to the actors and therefore dependent on their capabilities" (Stendal, Thapa, & Lanamaki, 2016, p. 1). The existence of affordances is implied to be independent on the abilities of the actors to perceive them. The same object can afford different opportunities by different actors depending on their needs and their capabilities (Gaver, 1991).

Strong et al. (2014) differentiate an affordance and its actualisation, as shown in Figure 3.1. This means that to produce an outcome, a goal-directed actor not only need to perceive an affordance, but also take specific actions to realise these potentials. They define actualisation as "the actions taken by actors as they take advantage of one or more affordances through their use of the technology to achieve immediate concrete outcomes in support of organisational goals" (Strong et al., 2014, p. 70). The actualisation of those actions depends on the abilities of the actor, features of the environment, and the relations between them (Chemero, 2003; Hutchby, 2001).
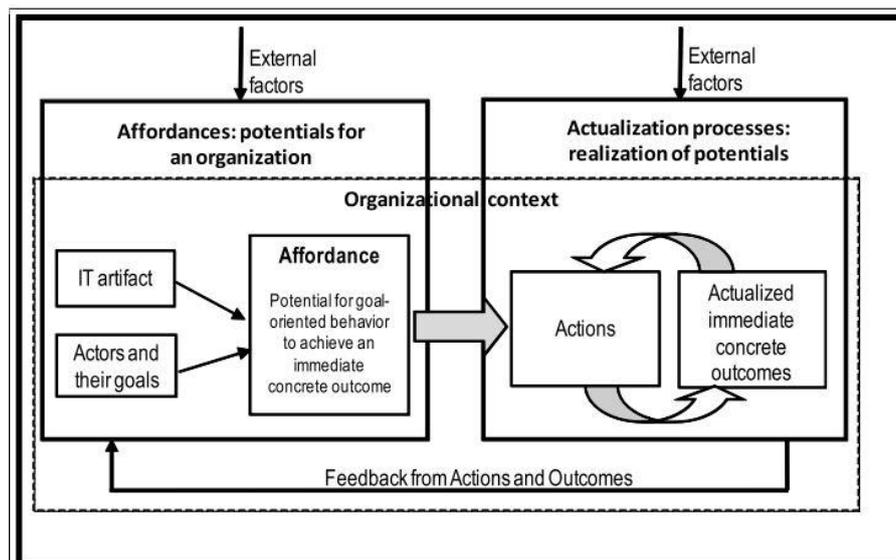


Figure 3.1. The Affordance Concept from the Organisational Context (Strong et al. 2014)

As a part of their actualisation definition, Strong et al. (2014) propose the idea of "immediate concrete outcome" as "specific expected outcome from actualisation… that is viewed as useful for realising overarching organisational goals". An immediate concrete outcome applies to all level (individual, group, or organisation). It poses as an intermediary between actions and organisational goals. For example, an immediate concrete outcome such as coordination or standardisation serves as a mediator to achieve a higher quality of work practice.

Affordance is also situated. This means that the perception and actualisation of an affordance are highly influenced by historical, social, and organisational settings (Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007; Zheng & Yu, 2016). The historical context means that the affordance at any given time is the result of the previous affordance. Moreover, the ability of an actor to perceive and actualise an affordance is influenced by the socially constructed meaning attributed to artefacts in a specific context (or known as social settings). Therefore, it is essential to examine beyond the interaction between an actor and object and consider the organisational structure and practices that shape and are shaped by these interactions (organisational settings) (Leonardi, 2011).

## 3.4.2   The Use of Affordance Theory in SSCM and IS Literature

Affordance Theory has been contextualised in various fields such as healthcare (Anderson & Robey, 2017; Burton-Jones & Volkoff, 2017; Hoon, Vasa, Mouzakis, Tan, & Fitzgerald, 2014; Savoli & Barki, 2016), e-commerce (Bang, Lee, & Han, 2014; Tan, Tan, Lu, & Land, 2017; Tan, Tan, & Pan, 2016), social development (Zheng & Yu, 2016), and learning (Canning, Payler, Horsley, & Gomez, 2017). Several researchers have conceptualised affordances arising from various artefacts such as social media (Argyris & Monu, 2015; Zheng & Yu, 2016), e-health IS (Strong et al., 2014), and business intelligence system (Glowalla, Rosenkranz, & Sunyaev, 2014).

In IS research, the term affordance is defined as  "…the possibilities for goal-oriented action afforded to specified user groups by technical objects" (Markus & Silver, 2008, p. 622). Another more straightforward definition is offered by (Majchrzak & Markus, 2012, p. 1) who conceptualised affordance as "what an individual or organisation with a particular purpose can do with a technology or information system". The use of Affordance Theory in Information System research examining various phenomena in various contexts is growing (e.g., (Canning et al., 2017; Strong et al., 2014; Zheng & Yu, 2016).

The relational view of affordance is further conceptualised in IS research by (Volkoff & Strong, 2018). They reiterate that affordance emerges from the relation between an actor and artefact, not only from the artefact, as the first principle in using Affordance Theory in IS research. They further suggest distinguishing an affordance from its actualisation (principle two) and to focus on the action to actualise the affordance, not the immediate concrete outcome (principle three). Closely related to principle three, an IS research

should "select an appropriate level of granularity for the affordances". The level of granularity should not be too high level as it might be regarded as an immediate concrete outcome. The correct level depends on the research question being asked (principle four). Principle five suggests the identification of interdependence of affordances, as more complex affordance might rely on the actualisation of more basic affordance. Finally, principle six recommends the identification of social context that affects the affordance actualisation.

Only a few studies have made a notable contribution about contextualisation of Affordance Theory in SSCM. Seidel et al. (2013) proposed four affordances of IT in enabling environmental sustainability transformation in organisations such as reflective disclosure, information democratisation, output management, and delocalisation. Reflective disclosure affordance affords for "a reconsideration of belief formation, action formation, and outcome assessment related to work practices" (Seidel et al., 2013, p. 1282). Information democratisation affordance facilitates information sharing about sustainability among internal and external parties. Output Management affordance provides a possibility to govern work processes and resource allocation that deals with calculating and reducing the harmful impact of work practices. Finally, delocalisation refers to the ability to eliminate the dependency of work practices to a specific location through digitisation of artefacts and work practices.

Another notable work is Hanelt, Busse, and Kolbe (2017) who added two IS affordances, i.e., technological flexibility and digital eco-innovation. In their study's context, IS act as a complementary of a physical eco-innovation solution (i.e., electric vehicles) and do not represent a complete IS product or service per se. The supporting IS provide two affordances: technological flexibility and digital eco-innovation. Technological flexibility affordance implies that supporting IS offer "infrastructural background in which the eco-innovation can be employed as efficiently as possible" (Hanelt et al., 2017, p. 31). Meanwhile, digital eco-innovation affordance is "the carrying out of new combinations of digital and physical components to produce novel, environmentally sustainable outcomes (products, services, business models)" (Hanelt et al., 2017, p. 31). Nonetheless, their studies were limited to discussion of the environmental dimension of sustainability, within an organisational boundary, and did not discuss the actualisation of those affordances in detail.

### 3.4.3 The Justification and Utilisation of Affordance Theory in This Study

Affordance Theory is a useful lens to understand the socio-technical mechanism in understanding how IS have been constraining or affording organisations to change their practices towards sustainability. Nonetheless, the use of this theory in SSCM field is scanty. By employing Affordance Theory, this study conducts a rich and novel investigation into how IS can enable sustainability transformation by:

1. Identifying IS affordances in enabling sustainability transformation and
2. Investigating factors affecting the actualisation of the IS affordances and the outcome.

## 3.5 Dynamic Capability Theory

### 3.5.1 Key Concepts

In the economic theory, resources are primarily financial capital, labour, and physical property, which are tangible, have prices, can be owned, and are traded in the market (Hall, 1992). Resource-based View (RBV) expands this boundary by adding capabilities and competencies as examples of resources. However, the difference between resources and capabilities needs to be acknowledged. Resources are the inputs to the production process such as capital equipment, skills of individual employees, finance, while capabilities are the capacity of a group of resources to perform some task or activity (Grant, 1991).

As opposed to the preceding example of resources, capabilities are intangible, less measurable, and could not be easily owned or traded. While tangible resources are mostly easy to be duplicated, intangible resources are the key to differentiation and competitive advantage. They are strategic resources that are not entirely transferable across firms due to them being valuable, rare, inimitable, and non-substitutable (J. B. Barney, 1991). The availability of, or access to, valuable, rare, inimitable, nonsubstitutable, and relatively immobile capabilities, along with other physical resources, are making it crucial resources in building differentiation that leads to competitive advantage (J. Barney & Clark, 2007; J. B. Barney, 1991).

Nevertheless, in a dynamic market, the value of a resource may increase or decrease over time. In this market, boundaries are blurred, changes happen frequently, and there is a high degree of uncertainty (Beske et al., 2014). The food industry is an example of this market. It is globalised wherein suppliers in a country provide food to customers on the other sides of the globe. The industry also places emphasis on food security and safety. The industry continually faces changing requirements from customers, NGOs, and governments who raise concern over the quality, safety, and health of the food products. RBV assumption provides less value if applied in this context. Thus, Dynamic Capability Theory is utilised to achieve a long-term competitive advantage.

Dynamic Capability Theory is originated from RBV and coined by (D. Teece et al., 1997). The theory postulates that to gain a competitive advantage in a turbulent environment, a firm needs to develop a dynamic capability. Dynamic capability is defined as "the firm's ability to integrate, build, and reconfigure internal and external dynamic capabilities to address rapidly changing environment" (D. Teece et al., 1997, p. 516). It marks the ability of a firm to renew, augment, and adapt competencies over time. Owning dynamic capability enables an organisation to respond promptly to a rapidly changing business environment and customer demand through flexible product and process innovation that contribute to gaining a competitive advantage (D. Teece et al., 1997).

Firms can develop capabilities based on their base of existing resources and capabilities. This process forms a path of capability development—the so-called path-dependence (Dierickx & Cool, 1989). Path dependencies depend on the current path of a firm and available path. The current path of a firm is the result of its past decision and actions. The future path is partly influenced by its existing repertoire of resources and competencies.

Dynamic capabilities are developed through three stages: sensing opportunities, seizing the opportunities and transforming (D. J. Teece, 2007). Sensing is the ability to create or recognise new opportunities that involve scanning and interpretation of the internal and external environments. Seizing is the ability to address opportunities that include maintaining and improving competencies and complementary assets such as enterprise structures, procedures, designs, and incentives. Transformation is the ability to recombine and to reconfigure assets and organisational structures as the enterprise grows, and as the external environment changes. It comprises the continuous alignment and realignment of specific tangible and intangible assets (D. J. Teece, 2007).

### 3.5.2  The Use of Dynamic Capability Theory in SSCM Literature

Organisations aspiring to achieve sustainability goals are more likely to face uncertainty than those without (J. Hong, Zhang, & Ding, 2018). Their performance and competitive advantage are determined not only by financial standing, but also social and environmental measures. They must address more diverse and changing requirements from a variety of stakeholders. There is a high possibility of penalty if these requirements are not met. Furthermore, a supply chain may spread over multiple countries with different regulations. Firms involved in multinationals trading should adapt and learn each of the countries conditions and regulations quickly and adapt to various, and sometimes simultaneous, change in each country. Misalignment in practice and governance of suppliers with stakeholders' requirement may lead to a severe penalty for the supply chain (Beske et al., 2014). Thus, Dynamic Capability Theory is an ideal lens to examine the SSCM phenomenon.

The use of Dynamic Capability Theory in SSCM research is growing. One fundamental study is presented by Beske (2012). Their study proposes five dynamic capabilities to improve sustainability performance, including supply chain (SC) reconceptualization, knowledge assessing, co-evolving, reflexive SC control, and SC partner development. J. Hong et al. (2018) examine the link between SC dynamic capabilities with economic, environmental, and social performance. Their study shows a positive relationship between SC dynamic capability and environmental performance, but not with economic and social performance. They argue that this is due to the more extended time required for the impact of the dynamic capability to be seen on economic and social performance.

Additionally, Mathivathanan, Govindan, and Haq (2017) demonstrate the importance of dynamic capability to achieve a competitive advantage, including in economic and social dimensions. Their study compiles a list of 40 dynamic capabilities and groups them under six performance measures, including profitability and social performance. Then, they rank these DC in each measure. The results show that "creative integration", "improving the overall efficiency of the supply chain", and "learning capability" rank among the top DCs to improve profitability. Meanwhile, the inclusion and management of NGOs, customers, policymakers appear as the most crucial DCs in improving social performance.

### 3.5.3 The Justification and Utilisation of Dynamic Capability Theory in This Study

Despite the growing interest in Dynamic Capability Theory in SSCM realm, various gaps still exist. The extant literature is dominated by conceptual study with limited empirical support. There is also a lack of studies exploring how IS contributes to capability acquisition and development. Majority of studies employing Dynamic Capability Theory assess the impact of a specific dynamic capability to firm performance. What is not yet clear is whether having a set dynamic capability alone is sufficient to enable sustainability transformation.

Accordingly, this study adopts Dynamic Capability Theory as the final theoretical lens in answering the research question. The theory is applied to unveil the capability building process that supports sustainability transformation. Specifically, this study applies Dynamic Capability Theory to:

- Identify dynamic capabilities required in sustainability transformation;
- Examine how IS can be utilised to acquire this set of essential capabilities;
- Examine whether the set of essential capabilities is sufficient to enable sustainability transformation.

## 3.6 Summary

This chapter justified the use of multiple theoretical lenses to strengthen and design this research. The theories that are selected as the basis of this study, including Stakeholder Theory, Affordance Theory, and Dynamic Capability Theory, were discussed. These theories provide complementary lenses that permit a rich interpretation of the findings presented in Chapter 6. Stakeholder Theory was applied to identify relevant stakeholders and examine their roles, sustainability goals, and barriers in enacting sustainability transformation. Affordance Theory was brought in to identify IS affordances and investigate the socio-technical mechanism in IS-enabled sustainability transformation. Finally, Dynamic Capability Theory was adopted to uncover the capability building process within sustainability transformation. The next chapter provides a detailed description of the research design and methodology used in this study.

# CHAPTER 4: RESEARCH METHODOLOGY

## 4.1 Introduction

This chapter describes the research methodology of this study. First, it begins with an explanation and justification of the research method used to answer this study's research question (*How do IS support the sustainability transformation in food supply chains?*). Due to the complexity and multilayered nature of the problem, this study employed an exploratory field study using a multiple case study design to answer the research question. Section 4.3 elaborates the research design of this study which consists of three phases: a contextual and empirical study, and data validation. Contextual study Section includes a comprehensive review undertaken to develop the research framework. Empirical study Section involves the justification of the context, the unit of analysis of this study, and the selection of case study participants followed by the background information about the case organisations. Then, data collection and data analysis methods are explained. In the data validation phase, further interviews were held with government agencies, NGOs, and organisational customers to validate the emerging insights from the five case studies. Finally, the chapter explains approaches to ensuring rigour and validity of the study, followed by a summary of the chapter.

## 4.2 Research Method

This study aims to explore how IS are used to support sustainability transformation in food supply chains. In doing so, a qualitative study using a multiple case study design is conducted. Given the highly dynamic sustainability requirements and implementation in the food supply chain with strong influence from the context, this study followed an exploratory inductive research method based on the interpretive paradigm. The justification is discussed in the following sections.

The interpretive research paradigm is deemed the most suitable for this study compared to other research paradigms: positivism and critical. This study examines the use of IS in

supporting sustainability transformation within the food supply chain in a developing country. It is a complex and multidimensional phenomenon that requires the consideration of behavioural and organisational aspects. This requirement adds complexity and the possibility of different interpretations of the same phenomenon. Therefore, it is difficult to employ an objective approach (Galliers & Land, 2002) such as positivism since positivist approach views reality as objectively given and stable. Meanwhile, critical research is not appropriate since this study sought to understand the sustainability transformation in food supply chains and how it unfolds over time, not to criticise the phenomenon. Adopting critical paradigm only partly addresses the aim of this study (i.e., factors affecting individual actors to use IS in enabling behavioural change). Therefore, interpretive research paradigm is chosen since it allows for the understanding of the phenomenon through relevant stakeholders' perspectives (Klein & Myers, 1999). Furthermore, this study treats context as an essential factor in understanding how IS enables and is altered by sustainability transformation, which is a trait of interpretive research (Walsham, 1993).

The researcher carried out a qualitative investigation to fully understand the context as needed by the interpretive paradigm. In this study, a qualitative approach was chosen as it can preserve and capture the contextual richness of the real-world settings (Yin, 2016). It can gather rich data using various data collection methods that helps the researcher to understand the relationship between actors, IS, and the context. This understanding is best captured through observations and understanding of being in the field. Therefore, a qualitative approach was used instead of quantitative since understanding the complexity of SSCM requires in-depth information and insights rather than the description of the phenomenon in numbers and measures.

Furthermore, this study followed an inductive exploratory method since SSCM in developing countries is under-explored, where limited research has been carried out (Eitiveni et al., 2017). There is no existing theories or studies that can adequately answer this study's research question. Therefore, this study did not propose specific hypotheses to be tested. The researcher began the investigation with an open mind without any preconceived ideas of what would be found and then generated new constructs based on data. The researcher conducted observations in the Indonesian food supply chains and identified patterns and regularities that informs the key finding of this study.

Moreover, the case study approach is particularly well suited to serve the purpose of this research. A case study focuses on contemporary events where the relevant behaviours cannot be manipulated and the phenomenon cannot be examined outside the context in which it occurs (Yin, 2017). Sustainability implementation in food supply chains is a broad and complex phenomenon. It requires in-depth investigation within its real-life settings without alteration of the variables to fully understand this phenomenon. Case study aligns well with this requirement. Understanding this current phenomenon involves important contextual conditions since they are highly related to the phenomenon in question (Yin, 2017). A case study is also suitable to investigate the 'how' questions (Yin, 2017), such as this study's research question. Thus, the aim of this study is best served via case study research.

For this study, a multiple case study is preferred to a single case study because a multiple case study design can maximise the ability to draw conclusions and external validity (K. Eisenhardt, 1989). The researcher was able to analyse the data within a case and across cases which yield understanding about similarities and differences between the cases. This allows for the identification of valuable findings that are supported by different empirical evidence. Therefore, the results from multiple cases are regarded as more reliable and convincing (Herriot & Firestone, 1983; Yin, 2017).

## 4.3   Research Design

This research consists of three phases: a contextual and empirical study, and data validation (see Figure 4.1). In the contextual study phase, the researcher reviewed the existing literature to gain familiarity with the phenomenon and identify the major issues in the area. The outcome of this phase is the development of a research design to guide the empirical study phase. In the empirical study phase, five manufacturers and their suppliers were examined, forming five case study. In each case study, the researcher interviewed relevant participants within each organisation, conduct observations, and gathering relevant documents. To validate the emerging insights from the case studies, additional interviews were held with government officials and NGOs in the data validation stage. Three theories were then applied to interpret findings arose from analysing the collected data that eventually informs the development of the key finding of this study: the IS-enabled sustainability transformation model.

## PHASE 1: CONTEXTUAL STUDY

TBL

Resource

Capability

Barrier

Role of IS

**Sustainability Transformation in Supply Chains**

Sustainable Practice

Stakeholder

Guides

## PHASE 2: EMPIRICAL STUDY

**Data Collection**
Semi-structure interviews with five manufacturers and their suppliers

**Data Analysis**

**Emerging Themes**

Informs

## PHASE 3: DATA VALIDATION

**Data Collection**
Semi-structure interviews with government officials and NGOs

**Data Analysis**

Barriers, Resources, Sustainability Capabilities identified previously are validated

Results in

## IS-ENABLED SUSTAINABILITY TRANSFORMATION MODEL

Figure 4.1. Research Design

### *4.3.1 Phase 1. Contextual Study*

In this stage, the researcher conducted a systematic literature review proposed by Webster and Watson (2002) to obtain background information from SSCM literature, examine the existing studies, and identify gaps in the literature. This phase was crucial to ensure this study is not looking for trivial problems, redoing past studies, or repeating other's mistakes. Areas explored included barriers of sustainability transformation, the TBL of sustainability dimensions, sustainable practices, relevant capabilities, IS role in enabling change, and relevant stakeholders. The results of this phase are presented in Chapter 2. Furthermore, this phase informed the appropriate research design and provided a foundation for the empirical phase through the identification of various issues affecting the implementation of sustainability in a supply chain and the IS adoption in this field.

### *4.3.2 Phase 2. Empirical Study*

- Context Selection and Justification

This research selected Indonesia as the research context due to its urgent environmental and social concerns over business activities and lack of existing literature in the region. The context of SSCM research tends to focus on developed countries, while marginal attention has been given to developing countries. Specifically, this research selected food supply chains as the focus due to its importance to this fourth most populous country in the world (Factbook, 2017).

As a developing country, Indonesia is considered as the largest economy in Southeast Asia (Factbook, 2017). It is the fifteenth largest economy in the world by nominal Gross Domestic Product and projected to be the top ten largest by 2025 (A. Indonesia, 2017). It has successfully maintained positive growth during the global financial crisis (Factbook, 2017). It is considered a rising power in the Association of Southeast Asian Nations (ASEAN) and the G20 (A. Indonesia, 2017).

However, economic development has brought environmental degradation in the country. The nation's economic growth has relied heavily on the extraction of natural resources at the expense of the environment. In 2015, it was one of the 15 largest emitters of greenhouse gases (Henstridge et al., 2013) which accounted for 4.5% of global emissions, doubling in two years. It also suffers from rapid deforestation with around 1.1 million

forests has been lost from 2000 to 2010. The primary reasons for deforestation are the expansion of oil palm plantations, illegal logging, forest fire, and agriculture (Henstridge et al., 2013). Indonesia has also been identified as one of the countries that most vulnerable to climate change hazards. These hazards include flood, drought, sea-level rise and landslide (Measey, 2010).

Besides environmental issues, Indonesia also experiences numerous social problems such as low wages, inadequate working health and safety, unfair dismissal, and discrimination (Thornton et al., 2013). The worker salary in Indonesia is relatively small compared to other countries in the region and the world (Allen, 2016; Nomaan & Nayantara, 2018). Majority of the labour force is not protected by formal social and healthcare insurance (Suharto, 2009). Firms operating in Indonesia are still struggling to eliminate child labour from their workforce (Organisation, 2015).

Research about environmental and social impacts of business has been dominantly addressed separately. Several previous studies include Hidayat, Glasbergen, and Offermans (2015) that examined the sustainability certification in palm oil companies, Schouten, Vellema, and Wijk (2016) that investigated the fitness of global sustainability standards in local organisations, and Purwanto and Afifah (2016) that assessed the impact of techno socioeconomic factors on the sustainability of two micro hydropower projects. No study that investigates IS role in supporting sustainability transformation in Indonesia has been identified.

In addition, the food industry was selected due to its relevance to all people and its significant sustainability implications. Compared to other industry, food industry faces pressing environmental and social issues including food waste due to shelf life constraint, disruptions due to weather or pests, the use of toxic pesticides in farming, food contamination, and variable yield due to biological variations (Grimm et al., 2014).

In response, there have been growing expectations that the food industry should engage in sustainable practices to improve their economic, environmental, and social impacts. Sustainability considerations in food production and delivery have become a factor affecting consumers' purchasing decision (Beske et al., 2014). Thus, organisations in food supply chains are pressured to conduct responsible practices and communicate them to the customers (Mol & Oosterveer, 2015).

- Unit of Analysis

The unit of analysis of this research is a *manufacturer* in the food industry and its interaction with the upstream trading partners (*suppliers*). Selecting a manufacturer and its interactions with its supplier as the unit of analysis is appropriate considering today's global market competition is shifting from between organisations towards between supply chains. Therefore, the responsibility of conducting sustainable practice should extend along the supply chain instead of one organisation (Ashby, Wilding, Leat, & Hudson-Smith, 2012). In contrast, the existing studies to date have tended to focus on analysing sustainability in the boundary of a focal company (e.g., (Golicic & Smith, 2013; Kirchoff et al., 2016; Pagell & Wu, 2009). This standpoint limits the ability to examine how sustainability can be extended to reach a broader scope of a supply chain.

- Selection of Case Organisations

The researcher performed the purposive sampling technique to select the organisation informants based on analysis of publicly available documents such as Global Reporting Initiative reports, mass media, and the organisations' websites. Purposeful sampling or criteria-based sampling is a strategy to deliberately select particular people or settings from which most can be discovered (Merriam & Tisdell, 2016). It is used to obtain information-rich data and to ensure a good fit with the research question. The analysis yielded the characteristics of organisations that are considered pioneers of sustainability transformation in the Indonesian food industry.

As a result, a list of ten manufacturers was developed as potential informants. The researcher sent them invitations for an interview. Appendix A shows a sample of an invitation letter to participate in an interview. Five manufacturers and their suppliers agreed to participate in this study. The illustration of the five case studies is shown in Figure 4.2. In each case study, a manufacturer is depicted by a rectangle and labelled with 'M', followed by sequence letter. A supplier is illustrated by a circle and named as 'S' followed by the letter of its interacting manufacturer and a sequence number. For example, case study 1 consists of Manufacturer A (MA) and its four suppliers (SA1, SA2, SA3, and SA4). One of the suppliers is labelled as SCDE because it interacts with Manufacturers C, D, E.
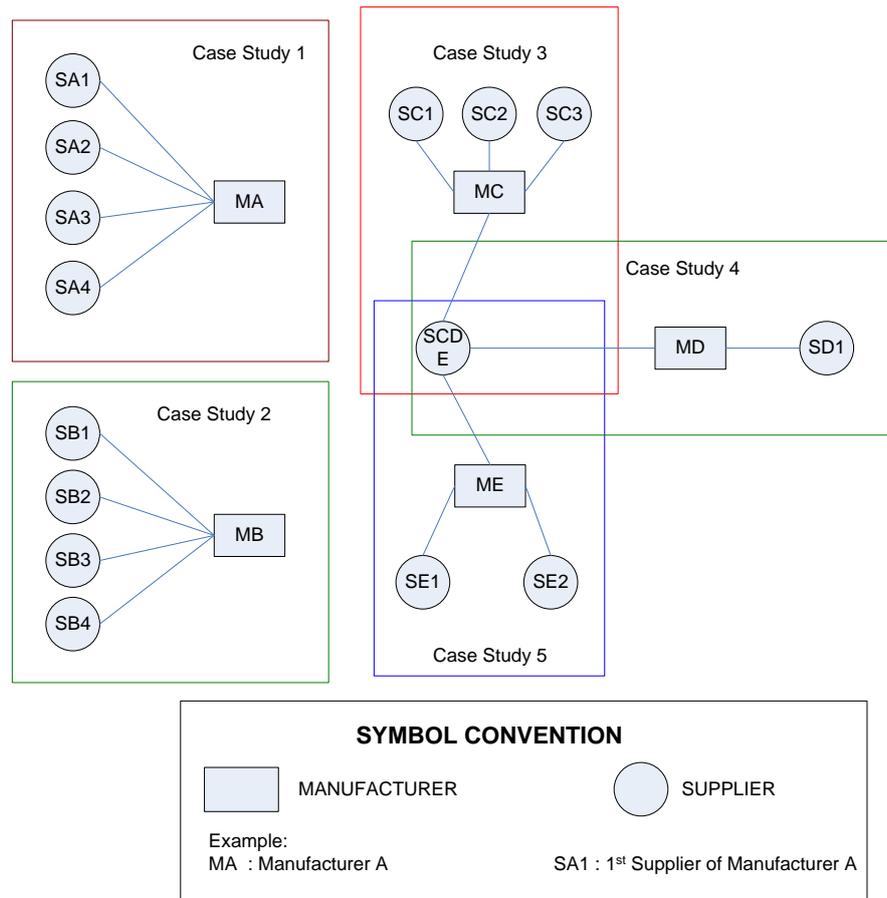
Figure 4.2. Overview of the Case Studies

## 1. Case Study 1 (Manufacturer A and Its Suppliers)

Manufacturer A is a multinational food and beverage company. Its products consist of coffee, cereal, beverages, milk, and baby foods. Its objectives are to improve nutrition, health, and wellness of its consumers. Currently, it is employing more than 3000 employees. The researcher interviewed four of its suppliers. The first and second participants (SA1, SA2) are coffee suppliers. They are located in Lampung Province. They have been supplying for Manufacturer A since 2012. The third participant (SA3) is a cocoa supplier. This supplier provides cocoa for Manufacturer A since 2016. Their farm is located in West Sulawesi Province. The fourth participant is milk supplier (SA4). This supplier sells milk to manufacturer A since 1992 and is located in East Java Province.

## 2. Case study 2 (Manufacturer B and its Suppliers)

Company B is a multinational food company. It sells mainly palm oil-based products. It has palm oil plants covering 138,000 hectares of land in total. It has 16 palm fruit processing plants and four refinement plants. It sells its products to Indonesian and

international markets. It is an active member of Roundtable Sustainable Palm Oil (RSPO), a certification organisation focusing on sustainable palm oil. It also received a certification from Indonesian sustainable palm oil (ISPO) as a recognition for its sustainability practices. In 2017, it won the Sustainable business awards Indonesia for land use, biodiversity, and environment category. Manufacturer B produces 40% of its materials from its owned plantations and sources the rest from its palm oil suppliers. The researcher interviewed four suppliers of Manufacturer B (SB1, SB2, SB3, SB4). They are all located in Riau province. Their plantations are 247 hectares, 30 hectares, 60 hectares, and 2.7 hectares respectively.

### 3. Case study 3 (Manufacturer C and its suppliers)

Manufacturer C is a multinational company. Its business activities consist of manufacturing, marketing, and distributing food and beverages. It has 14 food and beverage brands that are manufactured in its factories across Indonesia. Its distribution network comprises of more than 800 distributors who serve hundreds of thousands of stores across Indonesia. The researcher interviewed two soy suppliers and one palm oil supplier of Manufacturer C (SC1, SC2, and SC3). The researcher also interviewed one of Manufacturer C's plastic packaging (SCDE). The interview covered the supplier's interaction with Manufacturer C, D, and E.

### 4. Case study 4 (Manufacturer D and Its Suppliers)

Manufacturer D was established in 1973 and produced various beverages. Nationwide, it has 19 factories. Its objectives are to deliver healthy, clean, and pure drinking water to promote long term health to as many people as possible. Since it has licenses to harvest water from water springs across the nation, Manufacturer D's primary partners are packaging suppliers, mostly plastics vendors. The researcher interviewed two of its suppliers (SD1 and SCDE). SCDE is a plastic packaging company located in Jakarta Province. It produces various type and size of plastic packaging such as Polyethylene Terephthalate (PET) preforms, PET bottles, and HDPE closures. It serves Indonesian and international beverage markets. Meanwhile, SD1 is a logistics company providing delivery service to Manufacturer D. It is located in Banten Province.

### 5. Case study 5 (Manufacturer E and its Suppliers)

Manufacturer E is a food and beverages company in Indonesia. It was founded in 1990 and based in Jakarta. Its products are mainly peanut and milk-based snacks and drinking

water. It caters the Indonesian and international markets. It used to be a family business, but from 2018 it became a public company. The researcher interviewed three suppliers of Manufacturer E. Two of them are peanut suppliers (SE1, SE2, SE3). The third is its plastic packaging supplier (SCDE).

- Data Collection Methods

Since this study requires human participants, ethics approval must be obtained prior to data collection. The researcher submitted an ethics application (ID 1750224.1) to the Human Ethics Advisory Group (HEAG) within the School of Computing and Information System at the University of Melbourne. Once the approval was received, the field study was conducted in compliance with the ethics guidelines by HEAG.

Data collection commenced in December 2017 and concluded in September 2018. This research employs three data collection methods: semi-structured interview, observation through fieldwork, and internet archives and documents analysis, as explained below. All three data collection methods combined provide a holistic interpretation of the phenomenon being investigated.

### 1. Semi-structured Interview

This research employed semi-structured interviews to acquire specific information from informants as well as allowing the emergence of new ideas on the topic. The interviews aim to enter the other person's perspective to obtain a special kind of information that the researcher cannot directly observe. It is considered the most suitable for this research since structured interviews may restrict access to informants' perspectives and understanding while avoiding irrelevant viewpoints and pieces of information (Merriam & Tisdell, 2016). It is also useful to reconstruct past events that are difficult or impossible to reproduce.

Within a manufacturer, participants were drawn from the Sustainability or Information Technology (IT) divisions since they possess the relevant repertoire of knowledge and experiences in utilising IS to conduct sustainable practices within and beyond the organisation. This study performed snowball sampling by first identifying key persons (in strategic level) in sustainability implementation in an organisation. These individuals were interviewed and then were asked for referrals for the next suitable candidates. From the manufacturers, these participants include Directors of Sustainability Division, Team Leaders within Sustainability Division such as (Traceability and Supplier Engagement),

Directors of Supply Chain Division, Data Analysts, and Field Agent Coordinators. They are from various levels in an organisation to allow for generalisability of the findings, since the insights are triangulated from various sources at different level (K. Eisenhardt, 1989; Yin, 2017).

Then, the manufacturers provided access to their suppliers which, in most cases, also connected the researcher to other suppliers. From these suppliers, the researcher only interviewed the business managers since the suppliers are mostly SME in which the business managers have the knowledge of or were deeply involved in the daily operation.

Before interviews, the participants were asked to sign a plain language statement and a consent form.  The researcher followed a case study protocol developed based on concepts of sustainable practices, IS usage in enabling sustainable practices, factors affecting sustainability transformation, and required capabilities in sustainability transformation. The researcher also asked several open-ended questions to gather further insights and reflective thought from the participants. The semi-structured interview itself is not strictly scripted as the actual questions asked may differ according to context and setting of each interview as suggested by (Yin, 2016). Appendices B and C list the interview questions. Upon permission, all interviews were recorded, and notes were taken during the interviews. Most of the interviews lasted for around one hour.

In total, the researcher conducted 43 interviews with manufacturers and suppliers from five supply chains. The profiles of the informants are shown in Table 4.1. For meeting with a supplier for Manufacturers C, D, and E (labelled as SCDE), the researcher conducted one interview with the interviewee to talk about his organisation collaboration with the three manufacturers. Data collection and analysis were held until theoretical saturation was reached. It was when new information from further data was minimal since the insight was detected in the previous interviews or cases.

## 2.  Observation through Fieldwork

The researcher gained an opportunity to conduct observations in the manufacturers' offices and Manufacturer D's production facility. Aspects observed included physical settings of the sites, the participants, interactions, technologies used, and business practices. In addition, the researcher also observed how the suppliers used IS to conduct transactions. During observations, the researcher asked questions to the available officers and took notes to record the impressions during observation. The sample of an

observation note is shown in Appendix D. Through observations, the researcher was able to acquire data from a first-hand encounter with the participants rather than a second-hand

Table 4.1. The Profiles of the Interview Participants

| Case study | Manufacturer | Interviewee's role | Supplier | Interviewee's role |
|---|---|---|---|---|
| 1 | Manufacturer A (MA) | Supply Chain Division Director | SA1 | Business Manager |
| | | Sustainable Agriculture Development and Procurement Director | SA2 | Business Manager |
| | | Field Officer Coordinator | SA3 | Business Manager |
| | | Corporate Affairs Manager | SA4 | Business Manager |
| | | Data Analyst | | |
| 2 | Manufacturer B (MB) | Vice President of Commercial Sustainability | SC1 | Business Manager |
| | | Field Officer Coordinator | SC2 | Business Manager |
| | | Sustainability Lead Analyst | SC3 | Business Manager |
| | | Head of Supply Chain Engagement and Grievance Handling | SC4 | Business Manager |
| | | Supply Chain Traceability Head | | |
| 3 | Manufacturer C (MC) | Information Technology Director | SE1 | Business Manager |
| | | Supplier Development Manager | SE2 | Business Manager |
| | | Traceability Manager | SE3 | Business Manager |
| | | Sustainability Consultant | SCDE | Commercial director |
| | | Data Analyst | | |
| 2 | Manufacturer D (MD) | Director of Sourcing and Supplier Development | SB1 | Business Manager |
| | | Sustainable Development Director | SCDE | Commercial Director |
| | | Supply Chain Collaboration Director | | |
| | | Director of Supply Chain Division | | |
| | | Operations Manager | | |
| | | Production Manager | | |
| | | Logistics Manager | | |
| | | Data Analyst | | |

| Case study | Manufacturer | Interviewee's role | Supplier | Interviewee's role |
|---|---|---|---|---|
| 4 | Manufacturer E (ME) | Supply Chain Division Director | SD1 | Business Manager |
| | | Head of Supply Chain Subdivision | SD2 | Business Manager |
| | | Head of Farming | SCDE | Commercial Director |
| | | Supplier Development Manager | | |
| | | Data Analyst | | |

interpretation of informants (Merriam & Tisdell, 2016). The observations complemented and triangulated data gathered from interviews and document analyses. Despite all efforts, the researcher did not get access to other manufacturers' production facilities. They cited the security and confidentiality reasons for the rejection.

### 3. Internet Archive and documents analysis

Internet Archive and documents analysis is another useful data collection method as they are ready-made and easily accessible. It is also one method that does not intrude upon or alter the setting as in the interview or observation (Merriam & Tisdell, 2016). In this study, the researcher examined public records, personal documents, visual documents, and any relevant and available data such some companies' global reporting initiative reports, their profiles, their sustainability standards and policies. Other materials were also made available upon request. These documents allowed the triangulation of understanding of each organisation's practices, capabilities, IS usage, and transformation process.

### • Data Analysis

In this study, data collection and analysis occur simultaneously and iteratively to improve results and increase generalisability as suggested by Neuman (2006) and Yin (2017). Results from the data collection inform data analysis in refining or in the reformulation of questions and findings. The within-case analysis was conducted before the cross-case analysis. For each case, the data analysis included transcribing and coding process of the data collected. It involved several passes through the data to identify the key themes and subthemes based on open, axial, and selective coding to answer the research question. More specifically, the researcher followed the qualitative data analysis technique proposed by Neuman (2006) to ensure rigour and systematic transformation from raw

data to theoretical interpretations. The overview of the data analysis process is shown in Figure 4.3.
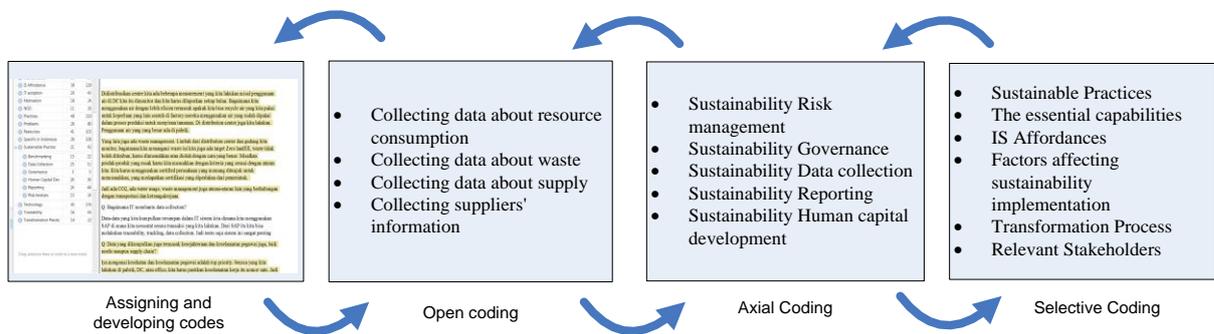


Figure 4.3. Overview of Data Analysis Process

1.  Open coding

All interview transcripts, background materials, and observation notes were reviewed and prepared carefully for data analysis, including ensuring the consistent format and fixing any typing errors. Then, all data were transcribed, coded, and analysed using NVivo 12. The researcher assigned preliminary codes to data chunks to identify repeating patterns. To further inform data analysis and avoid the overload of information, the data was initially coded based concepts resulting from the systematic literature review. Other codes emerged progressively during data analysis. The coding process captured codes such as "collecting data about resource consumption" or "collecting suppliers' information". As the data analysis continued, some codes were not empirically proven, hence they were not included in the findings. Meanwhile, some other codes were renamed to better represent the findings. Open coding was carried out until all data had been reviewed and no more possible new codes/patterns emerge from the data. An example of open coding is shown in Table 4.2 below.

2.  Axial coding

Axial coding was conducted to identify relationships between codes emerged from open coding. Data from across cases were sorted and compared to verify the resulting codes. As seen in Table 4.3, in this second pass, the codes were divided, clustered, or combined into meaningful subthemes. Some codes were dropped due to its irrelevance to answering the research question. From all case studies, some sequences of a process started to surface from these subthemes resulting in the identification of sustainability transformation process.

Table 4.2. Example of Open Coding

| Open Code | Examples of quotes |
|---|---|
| Collecting data about resource consumption | "*The use of water [RESOURCE CONSUMPTION]in our distribution centre is monitored, and we must be reported every month. We also record [COLLECT] whether we recycle that for other purposes, such as for watering the plants.*" (Supply Chain Division Director, Manufacturer A, Case Study 1) |
| Collecting data about waste produced | "*WASTE from our distribution centre and warehouse is monitored [COLLECT] to achieve our zero-landfill target.*" (Supply Chain Division Director, Manufacturer A, Case Study 1) |
| Collecting suppliers' information | "*We COLLECT DATA about our SUPPLIERS such as the supplier's name, the cooperative it belongs to, the map, the crops produced etc. So, we can estimate the yields.*" (Supply Chain Traceability Head, Manufacturer B, Case Study 2) |
| Reporting to internal stakeholders | "*We REPORT our activities compared to various aspects such as electricity consumption compared to the products produced. Reporting is done every month INTERNALLY.*" (Supply chain Director, Manufacturer D, Case Study 4) |
| Reporting to external stakeholders | "*On the website, we have a dashboard. We have a section that we publish [REPORT] our information about what we do. This is a tool we can report and communicate with our [EXTERNAL] stakeholders, especially the NGOs.*" (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2) |
| Training manufacturer's employees | "*We conduct TRAINING for our EMPLOYEES on how to do sustainable practices because we need to know whether what we are doing is correct or not*" (Supply Chain Director, Manufacturer D, Case Study 4) |
| Training the suppliers | "*We conduct SUPPLIERS' capacity building, such as TRAINING and guidance to conduct good agriculture practices.*" (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1) |

3. Selective coding

In this final pass, using NVivo, the researcher scanned all the data and codes to identify broad themes. The developed subthemes from the previous cycle were compared to the evidence from each case to see how well they fitted the data. The subthemes were analysed to look for interrelationships and overlap among the subthemes to develop higher-level analytic themes. Affordance Theory, Dynamic Capability Theory, and Stakeholder Theory were used to interpret the observed patterns emerging from data. This continuous comparison was conducted iteratively until theoretical saturation was reached (K. Eisenhardt, 1989). As a result, seven themes emerged from the subthemes that represented the overarching concept pertinent to understanding the role of IS in enabling

sustainability transformation in the food supply chain. The example of open, axial, and selective coding is shown in Table 4.3 and Appendix E.

Table 4.3. Example of Open, Axial, and Selective Coding from the Data

| Open Code | Axial Code | Selective Code |
|---|---|---|
| Collecting data about resource consumption | Sustainability data collection | Developing specific sustainability capability |
| Collecting data about waste produced | | |
| Collecting suppliers' info | | |
| Reporting to internal stakeholders | Sustainability reporting | |
| Reporting to external stakeholders | | |
| Training manufacturer's employees | Sustainability human capital development | |
| Training the suppliers | | |

Data analysis involved within-case and cross-case analysis. First, the within-case analysis was conducted during the open and axial coding to reveal the themes and the relationships among themes (Neuman, 2006). The objective of the within-case analysis was to identify unique patterns of each case. Then, all cases were analysed using the cross-case analysis where open, axial, and selective coding were carried out in all cases to analyse similarities and differences among cases as suggested by (Yin, 2017) and (Miles, Huberman, & Saldana, 2014). The cross-case analysis is useful to achieve comprehensive insights and generalisability of results in similar settings.

### 4.3.3   Phase 3. Data Validation

An important theme that emerged from the literature review was the prominent role of government and NGO in enabling sustainability transformation in food supply chains. Thus, further interviews were held with ten officers from seven government agencies, four informants from three NGOs, and four participants from two retailers to validate findings emerged from the empirical study phase. These interviews followed the protocol shown in Appendix C. The succeeding interviews provided alternative perspectives and a more complete picture on sustainability transformation in food supply chains, thus improves accuracy and confidence in the findings. The role of informants from each agency is shown in Table 4.4.

The government officers were selected from a set of agencies that manage and oversee sustainability-related implementation in the Indonesian food industry. These agencies include Trade Ministry, Ministry of Environment and Forestry, Ministry of Manpower,

Food and Medicine Monitoring Agency, Ministry of Industry, Agency of Technology Assessment and Application, and Ministry of Agriculture.

Table 4.4. Summary of Informants Roles from Government Agencies, NGOs, and Customers

| Agency's Name | Role of Participant |
|---|---|
| Ministry of Trade | Head of the Trade Assessment and Development Directorate |
| Ministry of Environment and Forestry | Head of Air Pollution Control Directorate |
| | Head of Industrial Waste Control Sub-Directorate |
| Ministry of Manpower | Head of Manpower Planning and Development Directorate |
| | Head of Manpower Social Guarantee Directorate |
| Food and Medicine Monitoring Agency | Head of Processed Food Directorate |
| Ministry of Industry | Head of Program Sub-Directorate |
| | Head of Green Industry Directorate |
| Agency of Technology Assessment and Application | Head of the Agroindustry Technology Centre |
| Ministry of Agriculture | Head of Research and Development Directorate |
| NGO A | Vice Executive Director |
| | General Manager |
| NGO B | Executive Director |
| NGO C | Chairman |
| Retailer A | General Manager |
| | Information Technology Director |
| Retailer B | Head of Supply Chain Division |
| | Corporate Responsibility Head |

Meanwhile, the selected NGOs are national and international organisations organised around environmental, SME development, and customer rights issues. They were selected to gather a complete and nuanced understanding of sustainability transformation, especially in the Indonesian food supply chains. NGO A is an international organisation focusing on SME capability development on sustainable farming practice. NGO B is the biggest national environmental and human rights advocacy organisation in Indonesia. NGO C is the largest national consumer organisation in Indonesia.

Finally, two retailers were chosen and interviewed to represent business customers of the manufacturers. The two retailers source products from all manufacturers in this study. Retailer A is a public company founded in France. It is a global retailer operating in more than 30 countries. Its franchise in Indonesia was built in 1998. Currently, it has more than 5000 stores in Indonesia. In addition, Retailer B was founded in South Korea. Its

business includes department stores, discount store chain (mart), and grocery store chain. In Indonesia, it has one department store and 36 marts.

The interviews were followed by the iterative process of data analysis and theorising, and complemented by simultaneous literature review. The findings were interpreted by applying the Stakeholder, Affordance, and Dynamic Capability Theories to capture a rich and novel understanding of sustainability transformation in food supply chains resulting in the development of the IS-enabled sustainability transformation model. The model is novel and empirically valid since it was closely built upon the data.

## 4.4  Ensuring the Rigor and Validity of Research

This study applied guidelines from (Yin, 2017) in ensuring the rigour and validity of the research. Yin (2017) recommends four criteria to maintain research rigours such as construct validity, external validity, reliability, and internal validity. Table 4.5 shows the application of Yin (2017) guideline in this study.

Table 4.5. Criteria to Ensure the Rigor and Validity of Research Design by Yin (2017)

| Criteria | Guidelines from the Literature | Approach to Achieving the Criteria |
|---|---|---|
| Construct validity | Multiple sources of evidence | This study used multiple sources of evidence such as interviews, observations, and internet archives and documents collection methods. |
| | Establishing a chain of evidence | All relevant data are kept, and procedures are documented. The findings from case study reports can be traced back to the case study questions. |
| Internal Validity | Pattern matching | Pattern matching logic was used in five cases to demonstrate that the empirically-based pattern matches the findings from previous relevant studies and theories. |
| External validity | Use replication logic | This study addressed the literal replications. The theoretical saturation point was achieved with the five cases. |
| Reliability | Use a case study protocol | An interview protocol was developed and used in all interviews. |
| | Develop a case study database | Case study notes and transcripts were entered into NVivo. |

1. Construct Validity

Construct validity means "identifying correct operational measures for the concept being studied" (Yin, 2017, p. 46). To satisfy the construct validity criteria, this study used multiple sources of evidence such as interviews, observations, and documents collection methods. This study also maintains a chain of evidence by including excerpts from the interviews accompanied by a citation to the relevant source in the case study database. All interviews followed the interview protocol, which is developed from the case study questions. This chain of evidence allows an external observer to follow the derivation of the conclusions to the questions.

2. Internal validity

Internal validity is the extent to which a study ensures valid cause and effect relationship within its context. In this study, the internal validity of the research findings is addressed by conducting critical review and analysis of relevant theories and previous studies to establish a good understanding of the key concepts explored in this research. This understanding helped the researcher ask the right questions to investigate the right concepts. In practice, the researcher compared the empirically based pattern with previous relevant studies and theories. When the theoretical and observed patterns coincide, it strengthened the internal validity of the study. This technique was used in all five cases to identify and rule out any plausible alternative explanations that account for the observed pattern.

3. External Validity

External validity concerns whether the findings of a study are generalizable beyond the studied cases. This study employs multiple case studies that follow replication logic. The replication logic states that if results from the first case can be replicated in the subsequent cases, then it would be considered robust (Yin, 2017). In this study, the literal replication logic was applied to all five cases. It indicates that the study findings are generalizable to other organisations in operating within the Indonesian food supply chain.

4. Reliability

Reliability test ensures that the operations of the study can be repeated with the same results to minimise errors and bias in a study (Yin, 2017). To pass this test, the researcher

documented every operation conducted in the research through the creation of a case study protocol and a database.

## 4.5    Summary

This chapter presented the research methods and design of this study. This is qualitative, exploratory, and interpretive research that contributes to theory around the use of IS to support the sustainability transformation. To achieve its objectives, this research adopted a multiple case study approach by examining five case studies in the food industry in Indonesia. It consisted of three phases: a contextual and empirical study and data validation. In the contextual study, further explained in Chapter 2, a systematic literature review was undertaken. Following that, the research problem, aims, and research questions were defined.  Then, an empirical study was performed by interviewing 43 informants in the food supply chain in Indonesia. Finally, data validation was performed by interviewing informants from seven government agencies and four NGOs. The overall process led to the development of the IS-enabled sustainability transformation model. This model aims to guide organisations to successfully enact sustainability transformation by using IS, which is further discussed in the following chapters.

# CHAPTER 5: MULTIPLE CASE STUDY AND VALIDATION STUDY

## 5.1    Introduction

The previous chapter explains and justifies the selected research methodology as the most appropriate approach to address the research question of this study: "***How do IS support the sustainability transformation in food supply chains?***" This chapter describes the findings from each case study and then triangulates them with insights from the government, NGOs, and business customers. Section 5.2 first describes the two main IS used in sustainability transformation in Indonesian food supply chains, i.e., Enterprise Resource Planning and Traceability system. Section 5.3 explains the sustainability transformation process, IS affordance perception, and actualisation in five manufacturers and their suppliers. The findings from these cases are then triangulated in Section 5.4 through supplementary interviews with the government, NGOs, and customers. Finally, Section 5.5 summarises the key arguments outlined in this chapter.

## 5.2    Key Information Systems Enabling Sustainability Transformation

Data analysis uncovered novel insights on how IS can enable sustainability transformation. This study examined two main IS utilised by manufacturers and suppliers in the Indonesian food supply chain to explore how IS align interests of various

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This chapter is partially derived from:

- **Eitiveni, I**., Kurnia, S., and Buyya, R. 2019. "A Traceability System for Sustainability Transformation in the Food Supply Chain: An Affordance Theory Perspective," European Conference on Information Systems, Stockholm, Sweden: Association of Information Systems.
- **Eitiveni, I**., Kurnia, S., and Buyya, R., 2020. "IS-enabled Sustainability Capability Development in Sustainability Transformation the Case of Indonesian Food Supply Chains", Journal of Strategy Information Systems (submitted)

stakeholders and addresses the barriers they face. The summary of the IS used and the evidence from relevant case studies is presented in Table 5.1.

Table 5.1. IS Used by Participants in This Study to Implement Sustainability

| Information Systems | Case Study | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Enterprise Resource Planning | ✓ | ✓ | ✓ | ✓ | ✓ |
| Traceability system | ✓ | ✓ | ✓ | - | - |

## 5.2.1 Enterprise Resource Planning (ERP)

ERP is "an integrated software solution, typically offered by a vendor as a package that supports the seamless integration of all the information flowing through a company" (Samara, 2015). Organisations use it to collect, store, manage, and analyse data of all aspect of business activities. It has been contributing significantly to increase organisational productivity (Ptak & Schragenheim, 2004).

All participating manufacturers use ERP systems from SAP, a European multinational software firm, as the primary source of data to support sustainability transformation. The manufacturers mostly utilise the business intelligence (BI) dashboard and SCM modules in ERP to support sustainable practices in their supply chains. ERP has been useful in providing visualisation of tracing and tracking products, and ensuring one version of truth for every user, as noted by Head of the Supply Chain Division from Manufacturer E when asked about IS used to support sustainability implementation in their organisation.

>   *"We extract data from ERP and then process the raw data into information so people can understand and read one version of data. Hence, we do not waste time processing and arguing over a problem that is based on incorrect data. We can work together to find the solution to any problem"* (Head of Supply Chain, Manufacturer E, Case Study 5).

However, ERP can only capture and store limited types of data which are mostly operational and could not be used to trace the materials beyond the first-tier suppliers. Further analysis must be performed beyond the system since it does not include all necessary features/metrics. Hence, the manufacturers extract data from ERP and processes them using other software.

>   *"We use ERP. We can track from the first-tier supplier to distributor until a (business) customer, but we don't have the system to capture the information from*

*before the first-tier suppliers."* (Director of Supply Chain Division, Manufacturer A, Case Study 1)

## 5.2.2   Traceability System

To address the limitation of ERP, Manufacturers A, B, and C also deploy a traceability system to identify and trace the economic, environmental, and social aspects of the production and distribution methods of raw materials used in food products. The system has built-in sustainability standards and compliance reporting to help businesses meet sustainability requirements. Currently, there are two traceability systems in use within the Indonesian food industries. Manufacturers A, B, and C use the same traceability system built by an Indonesian software vendor that offers integrated agri-business software solutions and services.

There are seven essential features of the traceability system used by the case organisations, which include:

 (1) Data collecting through structured data entry form to record transaction data

 (2) Monitoring via dashboard

 (3) Analysis via comparison tools

 (4) Presentation such as the map of the plantation areas

 (5) Interaction through file sharing and communication tools

 (6) Configuration and control via authentication and authorisation tools

 (7) Payment via invoices and receipt creation and money transfer tools

These features are available in mobile and desktop versions. The main menu of the system is shown in Figure 5.1.

The traceability system is mainly used to improve supplier sustainability performance. Therefore, the traceability system is only used by manufacturers with advanced supplier development program. In this study, only Manufacturers A, B, C, and their suppliers use the traceability system. Manufacturer D does not use IS to support its supplier development effort. Manufacturer E has a very limited supplier development program and is mostly not supported by IS.

The users of the traceability system include suppliers, traders, manufacturers, cooperatives, and business customers. The manufacturers employed field agents to collect
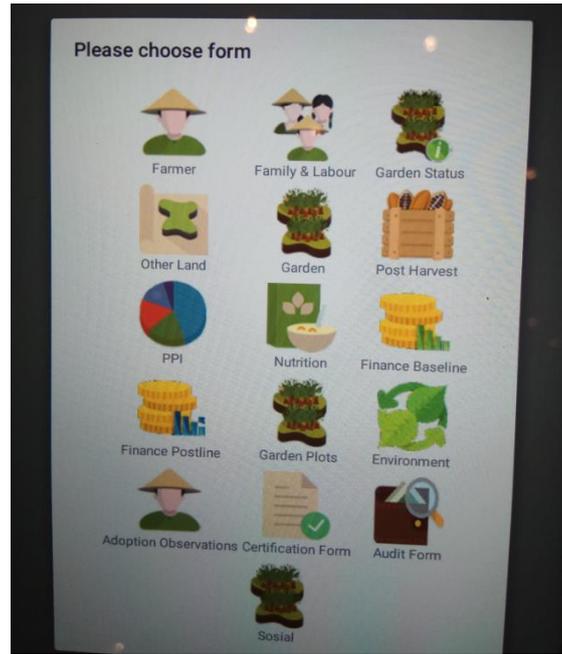
Figure 5.1. Traceability System Main Menu. 8th March, 2018.

data by visiting the suppliers at their plantations. They collected data including farmer profile, the labour involved, finance, sustainable practices, certification, training, and transaction details. They also recorded the size and the polygon form of the plantation, since the formal address of a farm may not be available. Whenever a supplier was selling their crops, a trader scanned the supplier's QR code equipped card to identify their identity. Then the trader inputted relevant data of the crops. As a result, the supplier could access their profile and their transaction details. Manufacturers could also track their purchases, and customers could trace the origin of a product up to plantation.

## 5.3    Description of Case Studies

Three categories of manufacturers and suppliers' interaction in terms of sustainability transformation level arose from the analysis: leading, advanced, and promising. Different dyads of manufacturer-supplier belong to each category as shown in Table 5.2.

Table 5.2. Case Study Categories in terms of Sustainability Transformation Level

| Category | Case Study |
|---|---|
| Leading | Case study 1 (Manufacturer A and its suppliers) |
|  | Case study 2 (Manufacturer B and its suppliers) |
|  | Case study 3 (Manufacturer C and its suppliers) |
| Advanced | Case study 4 (Manufacturer D and its suppliers) |
| Promising | Case study 5 (Manufacturer E and its suppliers) |

The first category is manufacturers who excel in expanding sustainability into their suppliers—termed as the '**leading**'. Manufacturers A, B, C, and their suppliers belong to this group. The manufacturers have a dedicated division focusing on aligning, implementing, and monitoring sustainability principles enactment across business units and their suppliers. They have won several sustainability-related awards and certifications. The second category is the '**advanced**' group that includes a manufacturer who has successfully transformed its internal process to be sustainable, but with minimum to no sustainability extension to its suppliers. Manufacturer D and its suppliers are classified into this group. The manufacturer has a dedicated division that manages the sustainability transformation by focusing on reducing waste and water conservation. It has also won various sustainability-related awards. The last category is the '**promising**' group. It consists of a manufacturer and its suppliers who has shown a moderate performance in conducting sustainability transformation within its organisational boundary, without any evidence of expanding the transformation to its suppliers. Manufacturer E and its suppliers belong to this group. This manufacturer is a smaller organisation in terms of revenue and scale compared to the other manufacturers in this study, which still places a higher priority on achieving the economic objectives. It has limited sustainability implementation. Therefore, it has promising opportunities to advance.

## 5.3.1   Case Study 1 (Manufacturer A and Its Suppliers)

This subsection describes the sustainability transformation within Manufacturer A and its suppliers. The following subsections provide a more detailed analysis on the sustainability capability and the outcome of its application, IS affordances, and resources affecting IS affordance actualisation.

- Sustainability Transformation Process

Table 5.3 shows that Manufacturer A interacts with various parties in its sustainability transformation, especially the government, NGOs, customers, cooperatives, and community. Interviews with respondents from Manufacturer A revealed that the company had undergone four phases in its sustainability transformation. Each phase has certain sustainability goals and barriers.

Table 5.3. Sustainability Transformation Process of Manufacturer A and Its Suppliers

| Sustainability Transformation Phase | Goal | Other Primary Stakeholder | Barrier |
|---|---|---|---|
| Awakening sustainability conscience | Raising awareness about sustainability issues | The government, NGOs, customers | Not identified |
| Introverted transformation | • Business continuity and cost-saving<br>• Reduced environmental impacts<br>• Employee safety, health, and welfare<br>• Improved communities<br>• Educating customer to prefer sustainable products | The government | Financial constraint |
| Inter-organisational transformation | • Reduced environmental impact<br>• Improved suppliers' sustainability performance<br>• Consumer health | NGOs and cooperatives | The economic-focused mindset |
| Maintenance and Evaluation | Sustained implementation of sustainable practices | The government | Lack of long-term commitment to conduct sustainable practices |

## 1. Awakening Sustainability Conscience

At this phase, the government, NGOs, and customers demanded Manufacturer A to implement sustainability in its business practice. Several prominent NGOs launched campaigns and requested Manufacturer A to obtain supplies from responsible suppliers. Participants from Manufacturer A remarked that the campaigns affected Manufacturer A's reputation as customers became aware of sustainability problems in its supply chains and then pressured the company to address the issues. Furthermore, Manufacturer A also wanted to ensure a continuous supply of materials. If Manufacturer A did not develop its suppliers, their productivity would be stagnant or even declining, which might lead to a supply shortage or disruption.

"*There are several factors that triggered our sustainability initiative; the first is our awareness that we must provide quality products that come from responsible sourcing. We must ensure we buy our raw materials from certified suppliers who can*

*explain where they got the materials and how they were processed. Second, some NGOs demand us to ensure our products are sourced responsibly. Their campaign influences our customers' awareness. Third, there is also a growing aspiration of our consumers to ensure we source from responsible suppliers.*" (Supply Chain Division Director, Manufacturer A, Case Study 1)

In this phase, Manufacturer A experienced minimal barrier. Most research participants from Manufacturer A emphasised on the importance of fulfilling customer demand to maintain market leadership. When customers urged for sustainability transformation, Manufacturer A was determined to materialise the aspiration by allocating the necessary resources to support the change.

**2. Introverted Transformation**

Driven by the aforementioned drivers, the CEO of Manufacturer A decided to transform the company's internal operation and its suppliers' practices to be more sustainable. The top management developed a set of broad sustainability goals including ensuring business continuity and costs saving, reducing the negative impacts of business activities to the environment, ensuring employee safety, health, and welfare, improving communities, and educating customers to prefer sustainable products.

Then, the goals were broken down into sub-goals and supporting practices to ensure compliance with the regulations and sustainability standards. The progress towards achievement of the goals was measured and treated as part of the performance indicators. There were regular audits and an Ombudsman body. Internal and external auditors checked the compliance to sustainability standards periodically. If there were any complaints or violation of rights and practices, anyone could report to the Ombudsman body. It was led by top-level management to ensure appropriate power was in place.

Most of the participants stated that the main barrier in this phase was related to financial constraint. The company had been allocating enormous funds for its sustainability initiative. Nevertheless, they needed high level funding to support sustainability transformation, but it was difficult to get the required funds because there were other competing priorities.

*"We must allocate a lot of money for our sustainability initiative. The problem is how much we can allocate. For example, if we have IDR 10 billion, we can finish an*

*initiative within six months, but since there are other priorities, we must delay its completion."* (Supply Chain Director, Manufacturer A, Case Study 1)

### 3. Inter-organisational Transformation

During this phase, Manufacturer A was assisted by several NGOs to ensure responsible sourcing of its raw materials. Specifically, the goals were to reduce the impact of supply chain activities to the environment, to improve suppliers' sustainability performance, and to ensure customers' health and safety. Manufacturer A expanded this goal into its suppliers via several approaches. First, Manufacturer A informed its sustainability policy to its suppliers to build awareness about responsible environmental and social practices. Formally, Manufacturer A specified the inclusion of sustainability principles in the contracts with suppliers. Then, Manufacturer A supported the capacity building of its suppliers in sustainable farming, financial literacy, and technology adoption through assistance by several specialist NGOs. Figure 5.2 shows one training session held by an NGO. Manufacturer A also supported the sustainability certification of its suppliers. Manufacturer A had established eight joint venture groups that trained and helped to certify the coffee and rice suppliers. As a result, 20,000 of Manufacturer A's coffee suppliers are certified.



Figure 5.2. Training for the Suppliers of Manufacturer A

In addition to NGOs, another key stakeholder in this phase was cooperatives. Cooperatives acted as an intermediary between the manufacturer and suppliers. Manufacturer A had thousands of suppliers, most of them were SMEs. It was neither effective nor efficient to interact with each of them, let alone to conduct training and further improvement efforts. Each cooperative could manage hundreds to thousands of

suppliers. Cooperatives aggregated supplies from the suppliers and sell them to Manufacturer A. Cooperatives also facilitated training for the suppliers.

*"We trade with Manufacturer A through a cooperative. The cooperative actively recruits members to join this sustainability program. It coordinates training and infrastructure for us so we can increase our productivity. As a result, the productivity and welfare of members of my cooperative have improved."* (Business Manager, Supplier of Manufacturer A (SA1), Case Study 1)

Participants from Manufacturer A repeatedly stated the main challenge during this phase was the economic-focused mindset of the suppliers. It was challenging to convince the suppliers to change their business models and practices to be more sustainable since they viewed it as an additional and unnecessary cost.

*"We carry out sustainability with our suppliers, our transporters, and customers. It needs their awareness. If they are not aware, they will not support us. Sometimes they do not see it as something beneficial but only adding to their costs."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

### 4. Maintenance and Evaluation

Manufacturer A and its suppliers are currently at the Maintenance and Evaluation phase. The firms employ processes and technologies to maintain and evaluate business processes for compliance or deviation from their intended objectives continuously. For instance, Manufacturer A evaluates its sustainability impact by using a third party specialised in impact assessment. The company also used IS in gathering and analysing data to measure its progress.

*"Continuous evaluation during and at the end of every program is critical. So, we can review what we had done and we know whether we are making progress or not. If the progress is slow, we can analyse how we can accelerate progress. So, data and evaluation are vital for us to know what we are doing is efficient and effective."* (Director of Sustainable Agriculture Development and Procurement, Manufacturer A, Case Study 1).

The key external stakeholder in this phase is the government. Since the compliance of organisations varied, the government needs to control the sustainability implementation across industries and organisations.

*"The government is the regulator and controller who ensures that businesses comply with the regulation since companies' maturity varies. Even if [Manufacturer A] is not monitored, we will continue to do so, but maybe other companies will not be compliant if they are not controlled. ... So, the government must ensure that companies do the right thing to ensure the safety and sustainability of foods sold in Indonesia."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Manufacturer A uses ERP and a traceability system to support its sustainability efforts. However, participants from Manufacturer A stated that lack of commitment in using IS to support sustainable practices has impeded the sustainability implementation.

All efforts have contributed to Manufacturer A's success in transforming itself and its supply chains. It has been rated compliant (Blue Rating) based on Indonesian environmental ranking system (i.e., PROPER—discussed in Section 5.4.1) and received various awards for its sustainability efforts.

Despite its success, Manufacturer A and its suppliers still aim to improve their organisational and supply chain sustainability performance. Hence, they continue their organisational and inter-organisational transformation.

## • IS Affordance

This study identified several IS affordances resulting from IS use by Manufacturer A and its suppliers. They include (1) transaction facilitation, (2) output management and reflective disclosure, (3) information democratisation, (4) collective learning, (5) active performance assessment, (6) creditworthiness assessment affordances, and (7) non-compliance and threat exposal.

First, Manufacturer A and its suppliers use ERP and a traceability system to facilitate transactions from suppliers to customers (**transaction facilitation** affordance). ERP records all operational data from the first-tier suppliers to customers, while the traceability system supports transactions and captures data of sourcing activities up to the (sub) suppliers' plantations. When a supplier brings their crops to a trader, their supplier ID card, depicted by Figure 5.3 below, is scanned. Then, the supplier gets paid based on the latest price.

Second, Manufacturer A and its suppliers also deploy IS to govern its resource consumption and waste production (**output management** affordance). The firms gather

data, including the distance taken to transport the products. Then, they count the CO2 emission produced from the transportation process using IS. IS has enabled the



Figure 5.3. A Supplier's ID Card. 8 March 2018.

organisation to reconsider its belief formation by assessing the impact of its operation on the environment (**reflective disclosure** affordance).

> "*We record all of our transactions using ERP. We can track and analyse our activities using that data, including benchmarking or risk assessment. IS play a vital role in evaluating sustainability implementation. For example, I can easily calculate the actual CO2 emission released by our shipping by using IS. We can get more accurate data, in real-time, and help decision making.*" (Supply Chain Division Director, Manufacturer A, Case Study 1)

Third, Manufacturer A and its suppliers rely on IS to disseminate information and discuss sustainability-related information with internal and external parties (**information democratisation** affordance). IS allow for knowledge generation and sharing among stakeholders, which eventually resulted in transparency. Transparency, in turn, is crucial in achieving sustainability goals, especially to communicate sustainability efforts to customers, as revealed below.

> "*The traceability system captures all relevant information about the suppliers such as name, family, land, how many trees, productivity etc. So, we can track the sustainability aspect of a product. The buyers need information about the materials that we buy, whether they are produced sustainably or violate rules such as deforestation, etc. We can see that information on the [traceability] system.*" (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1)

Fourth, IS allow for **collective learning facilitation.** Manufacturer A and its suppliers use IS to store and disseminate training materials, facilitate discussions, and record training history of all employees.

> *"All data about training done by employees are recorded in our IS. Internal training is automatically recorded by human resources into the system, but we must enter data about external training into our system."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Fifth, IS enable **active performance assessment**. Manufacturer A and its suppliers emphasise on the IS value in measuring the sustainability implementation. IS are playing an essential role in recognising whether the organisations are making progress towards achieving sustainability goals and suggesting future avenues for improvement.

> "*IS are crucial in performance assessment, so we can measure what we do, we know whether we make progress or not. If the progress is slow, we have the data to analyse how we can accelerate progress. So, data and measurement are fundamental for us to know whether what we are doing is efficient and effective.*" (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1)

Sixth, IS also contribute to supplier development by calculating the suppliers' creditworthiness (**creditworthiness assessment**). IS project profit and loss based on the supplier's asset and productivity. This projection affects decision making towards financing.

> "*In the traceability system, suppliers can see the projection of the result that they can get from doing something. For example, if the supplier does X to increase the quality of their production for Y year using the Z method, they can calculate the profits for the next 5-10 years. It helps them for better planning and providing a complete picture. They can take the projection to a bank. .... The suppliers can say "I need funding this much, if the Bank can invest in me, I will do X, Y, and Z, I can pay you back this much*"" (Corporate Affairs Manager, Manufacturer A, Case Study 1)

Seventh, IS allow for detection of violation to regulation and certification (**non-compliance and threat exposal affordance**). The traceability system includes metrics that measure the sustainability of products and work practices. The fulfilment of these

metrics smooths out the certification process, which guarantees the adherence to sustainability standards.

> *"When suppliers sell materials to traders, we can trace whether they are produced sustainably or violates rules, such as deforestation etc., via traceability system. They must comply with certification requirements. If a supplier has been certified as a sustainably certified entity, we can be sure that all coffee we buy from them is sustainable."* (Director of Sustainable Agriculture Development and Procurement, Manufacturer A, Case Study 1)

- **Resources Affecting IS Affordance Actualisation**

Several factors affecting IS affordance actualisation process are (1) IS operational skill, (2) the willingness to share data, (3) leadership commitment and support, (4) sustainability-driven policy and practices, and (5) appropriate organisational structure.

First, the interviews indicated that the **IS operational skill** enhances the actualisation of the affordances. Accordingly, when an actor lacks the capacity to operate the system, and they do not act upon it, they would be unwilling to process further. Therefore, it is recommended for a user to seek help when facing difficulty.

> "*We need competence and skill. If all of our [human] resources have the expected competence and skill, we can use the system to oversee the sustainability implementation efficiently*". (Business Manager, supplier of manufacturer A (SA4), Case Study 1)

Second, most respondents from Manufacturer A and its suppliers noted the **willingness to share data** as an important resource in enabling IS-enabled sustainability transformation. The companies gain data from suppliers and cooperatives. The willingness to share data from these upstream partners is crucial in enabling traceability. However, acquiring data from the downstream partner is complicated. Manufacturer A sells to retailers that have their own regulations for confidentiality. Hence, Manufacturer A has not collaborated with retailers to conduct sustainability.

> *"Large retailers have implemented sustainability to a certain extent, but they do not share the data because they have certain regulations."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Third, all participants from Manufacturer A and its suppliers agreed that **leadership commitment and support** is essential for IS adoption in supporting sustainability transformation. It drives the initiation, implementation, expansion, and maintenance of IS adoption in supporting sustainability implementation in Manufacturer A and its suppliers.

> *"In my opinion, the support from management is very important because if we expect our employees to engage more with sustainability-related activities and using IS to do so, we must get full support from the management"* (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1)

Fourth, **sustainability-driven policy and practices** was identified from interviews as a key resource in IS-enabled sustainability transformation. Policy launches and sustains IS adoption by defining the roles that IS play in sustainability transformation. Policy conveys what is expected of IS users and direct users' action so that users behave and operate in a collective, coordinated, and acceptable way. Sustainability-driven policy ensures the business practices comply with sustainability standards.

> *"We have purpose and value that are rooted in respect. We respect the community, the environment, and the people. This company is built with values where we must respect all existing rules, the government, and consumers. This value is realised in our sustainability policy and practices. Inevitably, we comply with regulations and sustainability mandated by the government in conducting our work practices."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Fifth, the findings indicate that **proper organisational structure** enables Manufacturer A and its suppliers in transitioning towards becoming a sustainable entity. Manufacturer A formed a Sustainability Division that oversees all sustainability-related activities and an Ombudsman body to investigate mal-administration or employees' rights violation. The Sustainability Division audits the compliance to sustainability standards periodically. Meanwhile, if there is any complaint or violation of practices, anyone can report it to the Ombudsman body. Both divisions are chaired by top-level management to ensure proper power is in place.

> *"We have an Ombudsman, if we know there is a non-compliant practice, we can report it to the Ombudsman. Our Corporate Affair and Legal Director heads this division. Any employee who observes any violation can report it to this body."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

- **Sustainability Capability and the Outcome of Its Application**

Interviews with all participants from Manufacturer A and its suppliers indicate that sustainability capabilities identified in the previous studies are relevant for their sustainability transformation process including (1) sustainability data collection, (2) sustainability reporting, (3) sustainability human capital development, (4) sustainability benchmarking and sustainability collaboration, (5) sustainability risk management, and (6) sustainability governance. Further data analysis shows that the application of a combination of these capabilities in Manufacturer A improves its (1) sensemaking, (2) relationship management, (3) partner development, and (4) reflexive control capacities.

First, **sustainability data collection** capability was identified as the foundational capabilities in Manufacturer A and its suppliers' sustainability effort. The firms collect data about water usage in their factories, waste produced in their operation activities, incident number etc. Applying sustainability data collection capability enables Manufacturer A and its suppliers to determine any cause of problem and measure the effectiveness of a strategy that leads to informed decision.

> *"IS are crucial in performance assessment, so we can measure what we do, we know whether we make progress or not. If the progress is slow, we have the data to analyse how we can accelerate progress. So, data and measurement are fundamental for us to know whether what we are doing is efficient and effective."* (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1)

Second, **sustainability reporting** was the next fundamental capability in supporting Manufacturer A and its suppliers' sustainability transformation identified from data analysis. Manufacturer A publishes its sustainability performance publicly using the GRI G4 guidelines and the UN Guiding Principles reporting framework. The application of this capability improves Manufacturer A and its suppliers' relationship with the stakeholders that demand for accountability and transparency. It helps them to measure, understand, and communicate their sustainability performance to the stakeholders that leads to trust building which directly affects bottom lines.

Third, another substantial capability identified from data analysis was **sustainability human capital development.** Manufacturer A conducts training and coaching with its suppliers to develop knowledge and skill to perform sustainable practice. Interviews with

Manufacturer A's suppliers showed that this approach has significantly improved their productivity, which leads to increased welfare.

> *"As a supplier, we need guidance. In 2000-2015, our production plummeted due to pest attack. After we received guidance from Manufacturer A, we know more about how to exterminate pests. Before, we lose 60-70% of our production."* (Business Manager, supplier of Manufacturer A (SA3), Case Study 1)

Fourth, **sustainability benchmarking** and **sustainability collaboration** are also crucial in supporting sustainability transformation within Manufacturer A and its suppliers. Manufacturer A conducts internal and external benchmarking. Manufacturer A compares its performance in Indonesia with its branch in other countries as well as among its factories in Indonesia. It also compares its performance with other competitors nationally and globally. Benchmarking assists Manufacturer A and its suppliers to identify the gap between their performance and industry's best and prioritise areas for improvement. Additionally, the companies collaborate with NGOs and research institutes to gain expertise in sustainable farming practices and addressing social conflicts. Collaboration also supports the improvement effort through costs and resource sharing.

Fifth, interviewees from Manufacturer A and its suppliers reported that **sustainability risk management** is crucial in supporting transition towards sustainability. This ability is operationalised in the creation of occupational safety and health procedure that focuses on preventing hazards or any risks related to human injury. It encompasses developing employees' capacity to stay safe and healthy, providing a conducive work environment, and developing the culture that supports health and safety at work. Sustainability risk management, through occupational safety and health, shows that the companies care about employees' safety. Therefore, this practice can help to gain the employees' loyalty and commitment to support sustainability transformation.

> *"We prioritise workplace safety. We have a behaviour-based safety process. If an employee finds a condition that may compromise the overall safety and health, they must report it into our IS. It will be followed up… employees see that the company work applies higher principles or rules. That will make them feel protected and trust in [Manufacturer A], which will ultimately motivate employees to do their jobs better.*" (Supply Chain Division Director, Manufacturer A, Case Study 1)

Finally, Manufacturer A deploys **sustainability governance** capability by performing inclusive sourcing with all participating suppliers. Inclusive sourcing is a non-discriminatory policy by sourcing products and services from previously under-utilised parties such as SMEs, women-owned business, ethnic minority, and social enterprise. Through inclusive sourcing, Manufacturer A has accelerated economic development along its supply chain, which has improved the competitiveness, welfare, and sustainability performance of the suppliers.

> "*Back in 1981, my business was failing. My production was extremely low. I was in the brink of bankruptcy. Then, [Manufacturer A] came, supported, and assisted me in improving my business. Knowing that [Manufacturer A] was willing to accept my product, I gained confidence and grew my business. It keeps growing since then.*" (Business Manager, supplier of Manufacturer A (SA4), Case Study 1).

The findings further indicated that the combined application of specific capabilities has resulted in the development of other higher-level abilities in Manufacturer A such as (1) sensemaking, (2) relationship management, (3) partner development, and (4) reflexive control, as can be seen in Figure 5.4. Initially, Manufacturer A possessed these abilities and then supported its suppliers to develop them.
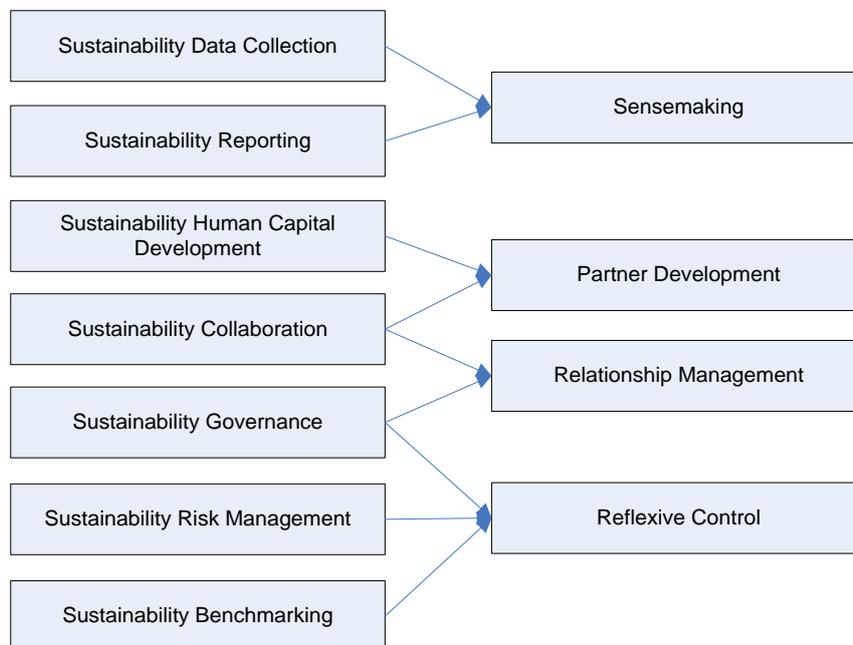


Figure 5.4 Combination of Sustainability Capabilities in Developing Dynamic Capabilities

First, sustainability data collection and reporting capabilities help Manufacturer A and its suppliers to make sense and justify the initial investment to gain long term benefits (**sensemaking** ability). Initial application of these capabilities helps Manufacturer A to get buy-in from its suppliers. Manufacturer A uses IS to gather data and develop profit projection to persuade the suppliers to adopt sustainable practices. This approach has been effective to help suppliers to develop sensemaking ability so that they can recognise the importance of the initial investments to gain a long-term benefit.

> *"Since IS have all the information [**sustainability data collection**], the suppliers use IS that can produce a profit projection [**sustainability reporting**]. For instance, if a supplier does specific practice needed to achieve the sustainability and quality of production for a year, they can see the profit for the next 5-10 years. The goal is to help them to plan better and comprehensively use IS".* (Corporate Affairs Manager, Manufacturer A, Case Study 1)

Second, Manufacturer A and its suppliers operationalise sustainability governance and sustainability collaboration capabilities to manage the relationship with stakeholders (**relationship management** ability). Manufacturer A and its suppliers collaborate with many stakeholders (e.g., cooperatives, NGOs, and the government) that have various objectives. Sustainability governance capability helps the companies align the various needs of the stakeholders toward realising sustainability goals.

> *"If we want to be sustainable, we must get buy-in from related parties such as suppliers, transporters, or customers [**sustainability collaboration**].... For example, if I require our transporters to use a new truck, ..., they must buy new trucks, then they charge us more. .... We need awareness from them. If they are not aware, they will not support us. Sometimes they do not see it as beneficial for them… or only as an addition to their costs. We have to address the problem [**sustainability governance**]."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Third, Manufacturer A applies sustainability human capital development and sustainability collaboration capabilities to develop its suppliers (**partner development** ability). The firm collaborates with NGOs, cooperatives, banks, a telecommunication company to train its suppliers about sustainable farming practices and technology adoption and provide access to banking.

"*We conduct training for our suppliers to increase their productivity [**sustainability human capital development**]. The training includes safe farming such as forest protection and soil conservation, and financial literacy. We also provide access to banking. We collaborate with banks so that suppliers can have bank accounts from branchless banks [**sustainability collaboration**]. The banks do not have to have a branch, but small stalls can become bank agents. The suppliers are paid by using a handphone and the phone number becomes the account number. It also allows them to make transactions at stalls without using cash.*" (Director of Sustainable Agriculture Development and Procurement, Manufacturer A, Case Study 1)

Fourth, Manufacturer A and its suppliers apply sustainability risk management, sustainability governance, and sustainability benchmarking capabilities collectively to ensure perpetual changes within the supply chains (**reflexive control** ability). Manufacturer A and its suppliers recognised the financial risks posed by NGOs campaign regarding irresponsible practices within the supply chains. Hence, the companies developed a more comprehensive and restricted policy governing their internal and external work practices. The employees must adhere to and are benchmarked against a set of rules and practices to ensure the enactment of sustainability transformation along the supply chains.

"*So, the motivation is ensuring a sustainable supply of material. If we do not improve coffee suppliers, eventually they lose interest in coffee farming and they change professions. Hence, there will be a lack of coffee supply, and the price will rise, there will be difficulty in obtaining raw materials that will threaten the sustainability of the company [**Sustainability risk management**]. ... We conduct traceability. When suppliers sell materials to traders, we can trace whether it is produced sustainably or violates rules such as deforestation etc. [**sustainability governance**]. It must comply with certification [**sustainability benchmarking**]. If a supplier has been certified as a sustainably certified entity, we can be sure that all the coffee we buy from them is sustainable [**sustainability risk management**].*" (Director of Sustainable Agriculture Development and Procurement, Manufacturer A, Case Study 1)

## 5.3.2   Case study 2 (Manufacturer B and its suppliers)

• Sustainability Transformation Process

Similar to Manufacturer A, Manufacturer B and its suppliers interact with the government, NGOs, customers, cooperatives, and community. Manufacturer B has undergone four phases. Each phase has its specific goals and barriers in its sustainability transformation. The manufacturer supported sustainability transformation within its suppliers in Phase three. Table 5.4 summarises the overall process.

Table 5.4. Sustainability Transformation within Manufacturer B and Its Suppliers

| Sustainability Transformation Phase | Goal | Other Primary Stakeholder | Barrier |
|---|---|---|---|
| Awakening sustainability conscience | Raising awareness about sustainability issues | The government, NGOs, customers | None. |
| Introverted transformation | <ul><li>Business continuity and costs saving</li><li>Reduced environmental impacts</li><li>employee safety, health, and welfare</li><li>improved communities</li><li>educating customers to prefer sustainable products</li></ul> | The government | Financial constraint |
| Inter-organisational transformation | <ul><li>Reduced environmental impact</li><li>Improved suppliers' sustainability performance</li><li>Consumer health</li></ul> | NGOs and cooperatives | • Financial constraint<br>• The economic-focused mindset<br>• Difficulty in detecting and measuring social issues<br>• Absence of appropriate regulation |
| Maintenance and Evaluation | Sustained implementation of sustainable practices. | The government | Lack of long-term commitment to conduct sustainable practices |

1. **Awakening sustainability conscience**

All participants from Manufacturer B pointed out that the initial motivation to implement sustainability was to address a claim from several NGOs regarding the environmental issues in the company's plantations and supply chains. In 2010, several environmental NGOs accused Manufacturer B of causing massive deforestation in Indonesian rainforests, the destruction of orangutan habitat, land grabs, and conflicts with local communities. The allegation had caused several business customers to stop procuring from Manufacturer B.

> "*The NGOs are actively campaigning against us. They are raising environmental, social, labour, and land conflict issues. Our customers care about from whom we buy [the raw materials] because the NGOs make them care. If we are buying from a company that is cutting down a forest, they will launch a public campaign. We have to address it, so we have to engage the suppliers and evaluate our policy.*" (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

2. **Introverted Transformation**

In response, Manufacturer B developed a comprehensive sustainability policy to address sustainability issues within the company and its supply chains. Previously, Manufacturer B had limited sustainability policy such as zero burning policy that prohibited burning to clear new land. In 2015, Manufacturer B launched a comprehensive social and environmental strategy that aimed to transform its supply chains. Specifically, the goals were ensuring business continuity, conserving the environment, improving employee safety, health, and welfare, and enhancing the livelihood of communities in which the company operates.

In the same year, Manufacturer B expanded its sustainability team into a division led by a senior manager. The Sustainability Division's main objective was to ensure the sustainability of raw materials that the company procures. Initially, Manufacturer B operationalised environmental and social considerations within its plantations through various sustainable practices including calculating GHG emission in the production, conservation of high carbon stock forests and peatlands, and traceability. Most participants reported no significant barrier at this point. As a result, Manufacturer B had successfully certified all its plantations.

*"We buy 60% of our material from other companies and 40% from our owned plantations. We have certified materials that come from our owned [plantations]."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

3. **Inter-Organisational Transformation**

Manufacturer B's main goals during this phase were reducing the impact of supply chain activities on the environment and improving suppliers' sustainability performance. The firm worked with NGOs and cooperatives to accomplish these goals. They faced several challenges such as financial constraint, the economic-focused mindset, the difficulty in detecting and measuring social issues, and the absence of appropriate regulation.

Manufacturer B worked with several NGOs to develop the capability of its suppliers to ensure their compliance with sustainability policy and standards. It was critical to do so since most of Manufacturer B's suppliers were SME who lack the capabilities and other resources to conduct sustainable practices. Initially, Manufacturer B and the NGOs conducted capability assessment to identify the gap between the current and the necessary capabilities. Whenever a gap existed, training was conducted to ensure suppliers have the relevant capabilities and knowledge to carry out sustainable sourcing. Additionally, Manufacturer B provided field agents to guide suppliers.

Manufacturer B used traceability system to track and monitor production activities in suppliers' plantations to ensure the raw materials produced by the suppliers met its social and environmental strategy. By using this system, suppliers could access their profile and their transaction details, Manufacturer B could track its purchases, and business customers could trace the origin of the product up to plantation.

Manufacturer B and its suppliers also included cooperatives in its supply chains. Cooperatives supported learning, assisted operational tasks, and provided a loan. They provided a permanent infrastructure for training. They also helped to gather seeds, process raw materials, and market the products so that the suppliers could focus on producing. Additionally, cooperatives could provide funding for its supplier member with a lower interest rate, so the suppliers did not need to get financing from loan sharks.

*"We provided the infrastructure and installed the traceability system in the cooperatives' offices. Our suppliers who joined as members of that cooperative can come to the office to access the IS to connect to us."* (Field Officer Coordinator, Manufacturer B, Case Study 2)

Manufacturer B and its suppliers faced financial constraint in transforming its supply chains due to its customers were not willing to share the responsibilities. Sustainability effort required significant investment. The findings show that the customers were demanding sustainable practices along a supply chain, but the customers were reluctant to share resources and costs.

> *"The business model is just making the big company pay for the whole effort, but the customers are not volunteering to pay."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Furthermore, Manufacturer B and its suppliers struggled to detect and mitigate social problems in its supply chains. There were numerous social problems in supply chains, including child and forced labours, and violation of labours' rights, safety, and welfare. Unlike environmental problems, which could be identified by using technologies such as satellite imaging, field agents should visit the locations to gather social-related data. Afterwards, Manufacturer B and its suppliers must develop tailored approach for each social issue.

> *"So far, we can mitigate environmental issues; they are relatively easy to detect and measure, unlike social issues. Social conflicts, such as forced and child labour, are challenging to detect and solve. We have to tailor an individual approach for each instance of social problems."* (Supply Chain Traceability Head, Manufacturer B, Case Study 2)

Additionally, interview participants from Manufacturer B and its suppliers criticised the lack of regulation from the government, especially about land ownership and sustainability reporting. The participants commented that resolving sustainability issues required data transparency, especially about land ownership and usage. There was also a relaxed requirement regarding sustainability report, which might discourage companies from conducting and reporting sustainable practices.

> *"Transparency is the key to address sustainability issues. We need information, especially land ownership or legality. The government needs to write laws to clarify this. Furthermore, the government should mandate [sustainability] reporting as a source of information for the industry. I do not see why not because there are so many benefits for the government, such as ensuring the companies pay the right taxes."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

**4. Maintenance and Evaluation**

Manufacturer B and its suppliers are currently in this phase. Some participants expressed that ensuring perpetual changes within Manufacturer B and its suppliers towards becoming sustainable organisations is complicated. The organisations try various approaches to maintain the consistency and commitment of their employees. For instance, upon detection of misconduct in upstream partners, Manufacturer B communicates with the alleged suppliers to rectify the situation. If they comply and commit to sustainable practice, Manufacturer B keeps sourcing from them. Otherwise, it stops procuring. However, Manufacturer B could not keep cutting ties with problematic suppliers. Otherwise, it could not fulfil its raw materials need.

> *"We have to engage the suppliers to evaluate whether they violate our policy. If they do, we should communicate with our suppliers and rectify the situation. Sometimes the supplier can accommodate our requests; sometimes they cannot, then we just stop buying. But if we keep doing this, soon we would not have anyone to buy from."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Manufacturer B and its suppliers keep looking for opportunities for improvement within their organisations and supply chain. Thus, after reaching Maintenance and Evaluation Phase, the firms cycle back to introverted and inter-organisational transformation phases.

- IS Affordance

IS use in Manufacturer B and its suppliers has resulted in the perception and actualisation of following affordances: (1) reflective disclosure, (2) non-compliance and threat exposal detection, (3) delocalisation, (4) information democratisation, (5) collective learning facilitation, (6) active performance assessment, (7) transaction facilitation, (8) output management, and (9) creditworthiness assessment.

First, participants from Manufacturer B and its suppliers reported that using IS has allowed risks identification and belief reformation (**reflective disclosure affordance**). The risks of losing its license to operate due to deforestation caused by its supply chains had inspired the conception of the company's sustainability policies. To do so, Manufacturer B uses IS to collect relevant data from its suppliers, including the suppliers' plantation profile, practices, and productivity. Then, the data is used to examine the current work practices and outcomes, and to form action to mitigate problems and achieve sustainability goals.

*"There are a lot of requests from the customer to measure GHG, water usage, things like that. All that data should be recorded. IS are useful to capture all of this information and act upon it."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Second, IS affords Manufacturer B and its suppliers to detect non-compliance (**non-compliance and threat exposal detection affordance**). The traceability system provides a map of each of plantation. This map could be overlaid with other types of data such as maps of mangrove areas or protected forests, as shown in Figure 5.5. A set of rules can also be programmed into the system to detect fraud. Whenever there is action or transaction that violates the standardised sustainability rules, the notification pops up in the system, such as when a farmer sells crops more than the maximum capacity of their plantation.

Moreover, the interviews revealed that some of the suppliers sold crops more than what their plantations could produce. The system was able to detect this misconduct. An investigation was held, and later it was revealed that the crop was bought from other plantation which was not registered in the system. This practice is considered fraud since each farm is monitored to ensure the fulfilment of sustainability standards.
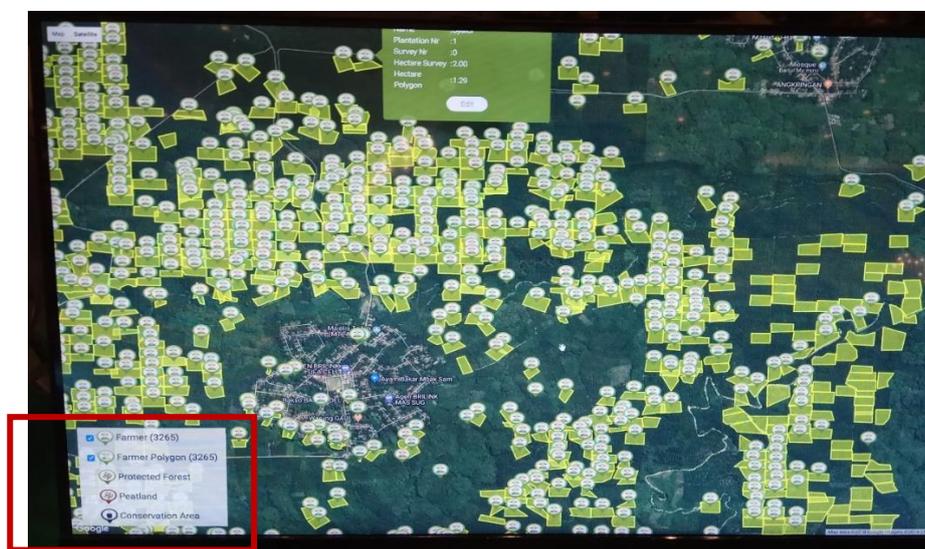


Figure 5.5. Map of Plantations with Overlaying Options with Protected Areas. 8 March 2018.

*"Our IS capture all of the interaction as it happens. We have information about this material that comes from which suppliers and weighs how many kilograms. We want to measure how productive they are. We analyse the data for anomalies whether any*

*of our suppliers are doing anything suspicious. For example, they register two hectares of plantation in the system, but how come they deliver crops equivalent to 10 hectares?*" (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Third, IS infrastructure has enabled Manufacturer B and its suppliers to perform business practices regardless of location (**delocalisation affordance**). Manufacturer B and its suppliers use IS to prove the sustainability processes in its production up to plantation. Palm trees are equipped with QR code to identify the source of each raw material. The sustainability-conscious customers could log in into IS and view information about the exact source of each batch of supplies, the suppliers, sustainable practices, and labours involved.

"*We can convince our buyers that our products are truly sustainable by using IS. Buyers can see information about the product and its supplier. We put QR code in our plantations so we can trace that these fruits come from this plantation and go to that factory.*" (Sustainability Lead Analyst, Manufacturer B, Case Study 2)

Fourth, IS enable the dissemination of sustainability-related information from both internal and external sources (**information democratisation affordance**). Manufacturer B and its suppliers have a dashboard that contains information about their sustainability implementation. Manufacturer B uses the system to communicate with NGOs and its suppliers regarding any alleged irresponsible practices conducted in suppliers' site.

"*We put all the relevant information on our sustainability dashboard. There is a lot of information about sustainability there. We use that to communicate with the stakeholders.*" (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2).

Fifth, Manufacturer B and its suppliers use IS to support learning (**collective learning facilitation affordance**). IS serve as a knowledge centre where training materials and sustainability-related knowledge are stored for the suppliers' development purpose.

"*We put all relevant information on our sustainability dashboard. There is a lot of information about sustainability there. We use that to communicate with the stakeholders. In that dashboard, there is also information for our suppliers to support their training*". (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2).

Sixth, IS provide the ability to assess the performance of the suppliers (**Active performance assessment affordance**). Interviews with all participants from Manufacturer B and its suppliers confirmed that the main problem in achieving sustainability in a food supply chain is the low productivity of SME suppliers. Manufacturer B and its suppliers address this problem by using the traceability system. It includes sustainability-related metrics and compares the performance of these suppliers against the metrics.

> *"Our IS has a dashboard or scoring system on which we can see the actual condition of our supplier. They are classified based on performance."* (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2).

Seventh, IS afford trading and tracing crops between suppliers and Manufacturer B (**transaction facilitation affordance**). The traceability system enables transaction as it happens. A supplier brings their crops to a trader who later scans the supplier's ID card. When a transaction is concluded, a receipt is printed, as depicted by Figure 5.6 below. Then, the supplier gets paid based on the latest price.



Figure 5.6. A Transaction Payment Facilitated by IS. 8 March 2018.

Eight, Manufacturer B and its suppliers utilise IS to govern their resource consumption and waste production (**output management affordance**). The companies use IS to record and calculate GHG produced from harvesting the trees to producing the refined products.

> *"There are a lot of requests from the customer to measure GHG, water usage, things like that. All that data should be recorded. Our IS record this information. We set up a portal that captures all of this information and relays that to our customer saying*

*"This is my supply chain. Everybody is compliant with the sustainability standard. Some problems here are being addressed", the customers are satisfied."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Ninth, suppliers of Manufacturer B use IS to assess their creditworthiness by appraising their asset and productivity (**creditworthiness assessment affordance**). The traceability system records the profile of the suppliers and their transaction. This data can be analysed for profit projection of conducting certain sustainable practices and evaluating the creditworthiness of a specific supplier. A supplier can bring the simulation provided by the system to a bank for loan application.

*"Our IS capture all of the interaction as it happens. We have information about this material comes from which suppliers and how many kilograms. We want to measure how productive they are"* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

- ## Resources affecting IS Affordance Actualisation

Observation and interviews with participants from Manufacturer B and its suppliers revealed several resources employed in IS affordance actualisation such as (1) willingness to share data, (2) leadership commitment and support, (3) trust between stakeholders, (4) relevant structure, and (5) sustainability-driven policy and practices.

First, most participants from Manufacturer B and its suppliers stated the **willingness to share data** as a significant intangible resource in supporting sustainability transformation. Sustainability starts with traceability because it provides the portrait of the real condition. However, traceability relies on data provision. Hence, traceability could not be achieved if people do not want to share their data.

Second, all respondents from Manufacturer B and its suppliers reported that it is their **top management's commitment** to transform the company and its supply chain to be sustainable entities as the primary resource of sustainability transformation and IS affordance actualisation. Majority of the participants observed that in Indonesian companies, most, if not all, policies are top-down. The top management's support and commitment do not only ensure the allocation of necessary resources, but also drive the creation of appropriate business process, and ensure the required actions to actualise the implementation of IS affordances.

*"We had a lot of communication and campaign to all of our employees, delivered by the CEO. Sometimes even the chairman explains the policy and information related to sustainability. They emphasised the importance of implementing sustainability and all the related actions, including IS adoption, to support it. In an Indonesian company, a lot of policy is top-down, so it's good that the top [management] shows their commitment, all the way to the bottom to our harvester in the field."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2).

Third, without **trust between stakeholders**, traceability is extremely difficult. The interviewees from Manufacturer B and its suppliers revealed that traceability is a prerequisite for sustainability. Initially, SME suppliers believed that sustainability was a scheme of large corporations to gain control over their operation. They were also afraid that if they revealed their data and practices, they would be cut off. A lot of trust-building through meetings and visitations were held to convince suppliers that traceability is not aiming to cut them, but to help them to be more sustainable.

*"There is a bit of hesitancy in stakeholders, especially third-party about transparency. It is a challenge to convince that it is useful for them to gather this information. Sometimes we must argue why this is good for them .... They do not want to disclose the information because they are afraid. In general, people are afraid whether they will be taxed or something like that.*" (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Fourth, a **specific organisational structure** affects sustainability transformation. Initially, Manufacturer B employed a small team to manage sustainability certification. Upon receiving harsh critic from prominent environmental NGOs, it expanded the team into a Sustainability Division that serves as an equal department as other operational divisions such as upstream and downstream operations, and human resource. The company also placed the division head in the top management position. According to most of the interviewees, this hierarchy ensures the necessary change in work practices is initiated and sustained. Proper power in place also allows for comprehensive and potent evaluation.

*"Before 2015, sustainability was only a small team. At that time, the palm oil industry only focused on certification, so if we had a certificate, we would already be called sustainable. However, sustainability increasingly becomes an important objective, so*

*it is expanded from a small team to a division."* (Sustainability Lead Analyst, Manufacturer B, Case Study 2)

Fifth, interviews with participants from Manufacturer B and its suppliers indicate that **sustainability-driven policy and practice** are essential resources in IS-enabled sustainability transformation. Manufacturer B developed a comprehensive and integrated sustainability policy covering environmental management, social and community engagement, and work environment and industrial relations. This policy provides the operational foundation of sustainable practices and IS adoption, constitutes acceptable behaviour by employees and suppliers, and ensures consistent completion of the policy.

> *"We have a sustainability policy since 2011. ... we improved it into a comprehensive and integrated policy. Then, we communicate the policy to the suppliers. If they violate our policy, it might affect our credibility. Sometimes the supplier can rectify the situation; sometimes they cannot, then we just stop buying."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

- ## Sustainability Capability and The Outcome of Its Application

From the interviews with all participants from Manufacturer B and its suppliers, six essential capabilities required to support sustainability transformation were identified, such as (1) sustainability data collection, (2) sustainability reporting, (3) sustainability benchmarking, (4) sustainability risk management, (5) sustainability governance, and (6) sustainability collaboration and sustainability human capital development. Furthermore, these findings show that the combined exercise of these capabilities has enabled Manufacturer B and its suppliers to develop the following abilities: (1) sensemaking, (2) relationship management, (3) partner development, and (4) reflexive control.

First, Manufacturer B and its suppliers apply **sustainability data collection** to provide a solid foundation for their sustainability transformation. They collect relevant data, such as plantation data, practices, and yield to enhance their sustainability transformation. The data serve as a basis for strategy formulation and implementation for sustainability transformation.

> *"We run ERP to capture information. .... It is very important to know and control what raw materials we are buying and measure if we are producing or processing them efficiently."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Second, all interviewees from Manufacturer B and its suppliers expressed that **reporting** its sustainability implementation to internal and external stakeholders is crucial in advancing the transition towards sustainability. Manufacturer B's sustainability reports include its approach and improvement to achieve sustainable palm oil. It follows the GRI guidelines to ensure comprehensive reporting covering all essential environmental, social, and economic concerns including those in its suppliers' sites. This ability enables Manufacturer B and its suppliers to showcase their sustainability commitment and claim to internal and external stakeholders.

Third, Manufacturer B and its suppliers conducts **sustainability benchmarking** to enable effective performance evaluation and comparison. Manufacturer B compares its sustainability performance and practices with national and global competitors and best practices in the industry. Manufacturer B also conducts benchmarking for its suppliers by utilising supplier scorecard. This capability enables Manufacturer B and its suppliers to identify areas where the gaps between current performance and standard and that of the best practices is the largest.

Fourth**, sustainability risk management** emerged as the initial capability that Manufacturer B and its suppliers performed at the beginning of the sustainability transition. Participants from Manufacturer B and its suppliers noted that the possibility of losing their license to operate due to deforestation caused by production activities had triggered their sustainability transformation. In response, the organisations hire external experts to identify and manage sustainability-related risks and compliance requirements. Sustainability risk management helps Manufacturer B and its suppliers to identify areas to improve work practices, environment, or training.

> "*We have a lot of experts. We need environmental and social issues experts. They are here to identify potential risks and manage conflicts on the ground. We work together to handle environmental and social conflicts.*" (Supply Chain Traceability lead, Manufacturer B, Case Study 2).

Fifth, Manufacturer B and its suppliers apply **sustainability governance** capability to ensure alignment of policy, actions, and outcome, to the sustainability goals within the company and its supply chains. Manufacturer B actively communicates its sustainability policy and evaluates its employees and suppliers' performance against it. This capability

is important to ensure convergent process towards successful sustainability transformation.

> *"We have had a sustainability policy since 2011. … We communicate the policy to the suppliers. If they violate our policy, it might affect our credibility. Sometimes the supplier can rectify the situation; sometimes they cannot, then we just stop buying."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

Sixth, Manufacturer B and its suppliers exercised **sustainability collaboration** and **sustainability human capital development** capabilities via supplier engagement. The application aims to ensure their compliance with sustainability policy and standards. At the beginning of Manufacturer B's collaboration with the suppliers, they were reluctant to share data due to lack of trust. Thus, Manufacturer B communicates its sustainability policy to its suppliers and convincing them to be involved in the sustainability efforts. Then, training and coaching are implemented to develop the suppliers' capability to perform sustainable practices. Sustainability collaboration and human capital development are critical to address significant environmental and social risks that may lie undetected further up the supply chains.

> *"My team starts a dialogue and communication with suppliers regarding sustainability issues. We also socialise our sustainability policies so that they understand about it and want to participate in our sustainability efforts. Many of our SME suppliers are willing to implement sustainable practices, but they do not have the required capabilities, labour, and fund. So, we work together. The most important thing is progress and their commitment to improving their practices."* (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2)

Furthermore, data analysis reveals that the combined application of sustainability collaboration and sustainability human capital development supports Manufacturer B and its suppliers in building **partner development** ability. They form partnership with relevant parties aiming to develop their capability to conduct sustainable practices. Especially, they collaborate with NGOs to provide training and with cooperatives to manage communication and infrastructures.

However, data analysis shows that prior to building partner development ability, the combined application of sustainability collaboration and sustainability governance enable Manufacturer B and its suppliers to develop **relationship management** ability. This

ability allows for the firms to recognise new stakeholders that would be beneficial in supporting its sustainability transformation. These stakeholders have various, sometimes conflicting, objectives. All participants stressed the negative impact of NGOs' campaign on their company's image and stated their dissatisfaction about how NGOs apply the first world standard in Indonesia. However, eventually, Manufacturer B and its suppliers collaborate with the NGOs to address the issues. Moreover, Manufacturer B and its suppliers also involve cooperatives in their supply chains. Cooperatives' primary purpose is to benefit its members by acquiring maximum profits that may expense the buyer, in this case, Manufacturer B. Nevertheless, relationship management ability allows for effective communication and alignment of common goals that benefit all parties. Partnership within and beyond the supply chain has allowed the company to gather, extend, and modify its collective resource base.

Moreover, this study found that the application of sustainability data collection and sustainability reporting capabilities yielded in the development of **sensemaking** capability. Manufacturer B and its suppliers collect data about internal and external environmental and social issues. The insights from data analysis are communicated to relevant stakeholders to raise awareness about previously unknown problems.

Data analysis shows that Manufacturer B and its suppliers developed **reflexive control** ability through the combined application of sustainability benchmarking, governance, and risk management capabilities. As a response to reputational and financial risks posed by NGOs' campaigns, Manufacturer B developed a comprehensive sustainability policy from several certifications standards and best practices and then socialised it to their suppliers. The company uses this policy to benchmark its suppliers to ensure alignment with sustainability goals.

> *The customers care about from whom we buy the raw materials because NGOs make them care. If we buy from an uncertified company that cut down forests, the NGOs campaigns against us in the public domain [**sustainability risk management**]. We must engage and evaluate the suppliers against our policy [**sustainability benchmarking**]. If they violate it, we must communicate with them and rectify the actions. Sometimes the suppliers can change their practices; sometimes they cannot, then we just stop buying [**sustainability governance**].* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

## 5.3.3   Case study 3 (Manufacturer C and Its Suppliers)

- Sustainability Transformation Process

Similar to the previous two cases, Manufacturer C and its suppliers interact with the government, NGOs, customers, and cooperatives in supporting their sustainability transformation phases. Manufacturer C undergone four phases of sustainability transformation and assisted the change in its suppliers in phase three onwards. Each phase has specific goals and barriers as summarised in Table 5.5 below.

Table 5.5. Sustainability Transformation within Manufacturer C and Its Suppliers

| Sustainability Transformation Phase | Goal | Other Primary Stakeholder | Barrier |
|---|---|---|---|
| Awakening sustainability conscience | Raising awareness about sustainability issues | NGOs, customers | None. |
| Introverted transformation | <ul><li>Business continuity and costs saving</li><li>Reduced environmental impacts</li><li>employee safety, health, and welfare</li><li>improved communities</li><li>educating customers to prefer sustainable products</li></ul> | The government | Absence of regulation, incentive, and enforcement from the government |
| Inter-organisational transformation | <ul><li>Reduced environmental impact</li><li>Improved suppliers' sustainability performance</li><li>Consumer health</li></ul> | NGOs and cooperatives | The economic-focused mindset |
| Maintenance and Evaluation | Sustained implementation of sustainable practices. | The government and NGOs | Inconsistency in using IS to support sustainable practice |

**1. Awakening sustainability Conscience**

Participants from Manufacturer C reported that the company has been driven by sustainability values since its inception. Its founders built the firm to provide nutritious food for the customers. In the 1990s, the company recognised the increase of organisational customer concerns regarding the environmental degradation in the

production of Manufacturer C's products and began promoting sustainable agriculture. Nonetheless, in 2010, the company was accused by an environmental NGO for deforestation and destruction of orangutan habitats. Several of its suppliers were also accused of clearing forest for plantations and profiting from child and forced labours. These allegations caused Manufacturer C to halt its procurement from the alleged suppliers.

### 2. Introverted Transformation

Since then, Manufacturer C has significantly improved its environmental and social performance. The company included environmental concern into its operation in 1996 through sustainable sourcing of fish. From one type of raw materials, by the end of 2018, 56% of its raw materials are sustainably sourced. In 2010, Manufacturer C developed a comprehensive sustainability policy that focuses on reducing the negative impact of supply chain activities to the environment, improving employee safety, health, and welfare, enhancing consumers' health, and improving communities. The company formed a sustainability division that oversees all efforts to integrate the policy into all layers of management and activities.

Internally, Manufacturer C aimed to reduce its environmental footprints by making its operations as efficient as possible. It reduced the use of resources and began to produce less waste from its offices and factories. The company designed products that use less plastic to reduce plastic consumption. It also designed and built green factories and green buildings that use less water and produce less carbon. Furthermore, Manufacturer C encouraged the development of healthy behaviour and nutrition improvements in the community through campaigns and donation of its products.

One key challenge during this phase was the absence of support from the government in term of regulation, incentive, and enforcement. It limited the proper implementation of sustainability within the firm and its supply chains. Business players need a strong incentive to implement sustainability principles since it requires considerable efforts and costs. Furthermore, there was also impeding regulation, such as the requirement for paper-based transactions instead of electronic-based. Although the government has shown a growing interest in creating regulation to promote sustainable practices, most interviewees from Manufacturer C remarked that the enforcement of these regulations is insubstantial.

*"In implementing sustainability, we are very dependent on government regulation. We can do [sustainable practice], but it will not be optimal if it is not supported by the government. For instance, we have started to conduct our transactions electronically, to reduce paper consumption, but still, there are some rules, for example, some audits still require paper documents with handwritten signatures and wet stamps."* (IT Director, Manufacturer C, Case Study 3)

## 3. Inter-organisational Transformation

Manufacturer C also aimed to expand sustainability transformation to its suppliers through inclusive sourcing, supplier engagement, traceability, and sustainable distribution. Manufacturer C included previously under-utilised suppliers such as SMEs, women-owned business, ethnic minority, and social enterprise in its supply chains. Manufacturer C engaged them to ensure their compliance with sustainability policy and standards. It developed suppliers' capacity to conduct sustainable farming practices, access to finance and technology by collaborating with several NGOs. Additionally, Manufacturer C utilised a traceability system to track various sustainability metrics in the production of raw materials.

The company involved cooperatives to manage interaction with suppliers. Since Manufacturer C traded with thousands of suppliers, it is not effective and efficient to interact with each of them, let alone conduct training and other improvement efforts. Hence, the company included cooperatives in its sustainability effort. Each cooperative could handle hundreds to thousand suppliers, which most of them were SMEs.

*"The involvement of cooperative has greatly cleared traceability effort. .... One cooperative manages 100-200 suppliers. ...It would be tough to trace all the suppliers manually without cooperatives. Cooperatives help to distribute information from us to the suppliers. They also help training the suppliers."* (Traceability Manager, Manufacturer C, Case Study 3)

One challenge at this phase was the economic-focused mindset. Participants from Manufacturer C reported that it was difficult to change stakeholders' economic-focused mindset and convince them to adopt sustainability and traceability. Some of the them suggested the solution to address the barrier by emphasising sustainability benefits to all parties in a supply chain.

*"If the added value [of sustainability and traceability] is only received by farmers,*

*while traders or cooperatives do not, it will not work. The concept of sustainability and traceability is if one member of the chain losses, there will be corruption there. So, we must ensure everyone gets the value of what we are doing… The initial adoption process was a nightmare. The first three years was the period in which we were struggling to make the stakeholders believe in the initiative and data."* (Traceability Manager, Manufacturer C, Case Study 3)

## 4. Maintenance and Evaluation

Manufacturer C and its suppliers are currently in this phase. They review business processes for compliance or deviations from their intended goals by using certifications and traceability. They use the guidelines from sustainability-related certifications and embeds the metrics into the traceability system. Manufacturer C and its customers can monitor the sustainability implementation along the supply chains. Manufacturer C uses the insights that emerged from such review for decision making about future improvement.

*"We follow certifications such as UTZ, RSPO, and ISPO since they can guarantee sustainability. We have to know the data about suppliers, including productivity, to inform decision making. Every year, we recertify and audit our supply chains to see the problems. Then, we can decide what we need to do to address them."* (Traceability Manager, Manufacturer C, Case Study 3)

Most participants from Manufacturer C and its suppliers reported that ensuring perpetual changes within the company and suppliers is challenging. Navigating various objectives among stakeholders and conducting change management is complicated.

*"I always say: the effort for software development is 30%, 70% for adoption. Anyone can develop software with enough money and skill, but for adoption and implementation, we face numerous parties such as labours, intermediaries, suppliers, cooperatives, etc. Everybody must walk the talk [implementing sustainability]. They need to be repeatedly reminded because they are used to the status quo."* (Traceability Manager, Manufacturer C, Case Study 3)

Nevertheless, all efforts have contributed to Manufacturer C and its suppliers' success in transforming themselves. They continue following the regulations from the government and collaborating with NGOs to address their concern. For its effort, Manufacturer C

received various sustainability-related awards and 75% of its factories gained Green rank on PROPER, while the rest received Blue rank.

Despite the success, Manufacturer C and its suppliers realise that they should undertake incremental improvements to their products, services, and processes to achieve sustainability goals. Thus, after reaching Maintenance and Evaluation Phase, Manufacturer C and its suppliers revisit the introverted and inter-organisational transformation phases and conduct further efforts.

- **IS Affordance**

Interviews with participants from Manufacturer C and its suppliers yielded IS affordances in supporting sustainability transformation including (1) reflective disclosure, (2) information democratisation, (3) delocalisation, (4) output management, (5) collective learning facilitation, (6) active performance assessment, (7) transaction facilitation, (8) creditworthiness assessment, and (9) detecting non-compliance.

First, IS allows Manufacturer C and its suppliers to reconsider their beliefs (**reflective disclosure affordance**). Manufacturer C uses IS to capture data about the resource consumption and waste of the IT infrastructure. The analysis revealed that there is an excellent potential to reduce electricity and paper consumption in the company. The use of IS has presented them with a list of alternatives to achieve sustainability goals. The company also Interviews with respondents from Manufacturer C and its suppliers yielded IS affordances in supporting sustainability transformation including (1) reflective disclosure, (2) information democratisation, (3) delocalisation, (4) output management, (5) collective learning facilitation, (6) active performance assessment, (7) transaction facilitation, (8) creditworthiness assessment, and (9) detecting non-compliance.

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> "*We have a dashboard for each division. One thing that we evaluate is paper consumption. The dashboard shows how much printing each user has done. Every*

*month we report it. We aim to encourage people to lower their paper consumption.*"
(IT Director, Manufacturer C, Case Study 3)

Second, IS affords Manufacturer C and its suppliers to smooth information sharing across stakeholders (**information democratisation**). The companies utilise IS to enable transparency and coordinate interaction among stakeholders. IS facilitate effortless information exchange across stakeholders such as cooperatives, NGOs, suppliers, and the manufacturer.

> "*This [traceability] system offers full service. It includes smallholder profile, supplier group administration that manage the administration of new suppliers, training administration with [Manufacturer C], NGOs, or the government. ... It also includes cooperative management feature that allows for the payroll of the suppliers. It is fully integrated from suppliers to the manufacturer enabling easy information sharing.*"
> (Traceability Manager, Manufacturer C, Case Study 3)

Third, another key affordance identified from interviews with participants from Manufacturer C and its suppliers is **delocalisation**. They use ERP and the traceability system to increase efficiency and visibility. The systems allow for automation, digitisation of artefacts and work practices so the amount of work and papers are reduced. The companies' use of IS has helped to collect and to standardise data and processes and offers full connectivity.

> "*We have been digitising our document and workflow by creating end-to-end online connectivity to reduce the need to travel.*" (IT Director, Manufacturer C, Case Study 3)

Fourth, Manufacturer C and its suppliers utilise IS to govern its resource consumption and waste production (**output management affordance**). They use IS to capture data about resource consumption and waste. The analysis revealed that there is an excellent potential to reduce electricity and paper consumption in the organisations. They found that their computers are left lit during the night when they are not used. Therefore, they conduct centralised auto shut down on their computers. Furthermore, they move toward digitisation of data and activities to reduce the use of paper for printing.

> "*We focus on digitisation to reduce the amount of printing. We have a dashboard that shows the amount of printing for each user and division. We report it every month to encourage our employees to read electronic documents, instead of printing them.*

*We also try to automate processes using EDI to reduce the number of transactions with paper*" (IT Director, Manufacturer C, Case Study 3)

Fifth, IS **facilitate collective learning** in Manufacturer C and its suppliers. IS are useful to facilitate joint learning among stakeholders, especially to seek value from waste. Some participants believe that the food industry should be an energy surplus industry. However, in Indonesia, plantations and manufacturing plants buy energy instead of selling the excess energy. IS can help the food industry to learn from others and seek alternatives or technologies to reduce and process waste.

"*IT can be used as a tool to make people aware of what we can do. For example, in the sugar industry, we use a huge amount of water and the waste is discharged. If we know the data about consumption and waste, we can think about how much water we can reduce and how we generate energy out of waste. In the food industry, waste is biodegradable, .... Any biodegradable waste can be converted into resource.... The role of IT is to make the industry aware of these opportunities and provide access to technology .... In India and Thailand, it already happened, how we can transfer this technology for users in Indonesia.*" (Sustainability Consultant, Manufacturer C, Case Study 3)

Sixth, IS allow for **active performance assessment**. IS play an essential role in recognising whether the organisation is making progress towards achieving sustainability goals and suggesting future avenues for improvement. Manufacturer C has a dashboard to show the sustainability performance of employees, divisions, suppliers. The results of sustainability performance evaluation affect the reward and punishment routines.

"*We have a dashboard for each division. One thing that we evaluate is paper consumption. The dashboard shows how much printing each user has done. Every month we report it. We aim to encourage people to lower their paper consumption.*" (IT Director, Manufacturer C, Case Study 3)

Seventh, IS **facilitate transaction** between stakeholders in supply chains. Suppliers can order materials from their sub-suppliers through the system. They can also sell their crops to traders using the same system. The system also processes the payment. Other relevant information such as the amount and quality of the crops are recorded in the system, as shown in Figure 5.7.

Figure 5.7. A Supplier' Profile and Sales Summary in the Traceability System. 8th March, 2018..

"*In the system, suppliers can order something like fertiliser to the supplier. They can see its price on the system. If the suppliers want to sell, they can contact traders. ... after the transaction, their payment is transferred into their accounts or via EDC as a credit. The suppliers can use that credit to shop in partner stalls. There is no need to go to a bank.*" (Traceability Manager, Manufacturer C, Case Study 3)

Eight, IS allow for Manufacturer C and its suppliers to conduct **creditworthiness assessment**. Since IS record all necessary information about the suppliers, they can evaluate their productivity and project potential profits. Then, suppliers can use the simulation provided by the systems to apply for a loan from banks. Otherwise, banks can also proactively assess suppliers and offer them a loan.

"*We provide access to the system to several banks. Banks have access to suppliers' profile. They can see that a supplier has a 2.5 hectare farm, produced 5 tons last year, and earned this much. They can see the cash flow, other income, the expense etc. The banks can assess the creditworthiness of that supplier*." (Traceability Manager, Manufacturer C, Case Study 3)

Ninth, IS enable Manufacturer C and its suppliers to conduct **noncompliance and threat exposal** analysis. They use the data provided by IS to uncover misconduct and possible issues. The data are then evaluated against a set of rules and targets programmed into the

system to detect misconduct and deception. IS could reveal rule violations, and then enable transparency within supply chains.

> "*By using IS, we can identify problems. For example, I am supplying from 10,000 suppliers, assuming the total is 8,000 tons per year. Now, it is already November, I have only received 3,000 tons. What is the problem? We look at the data. Before traceability [is deployed], one supplier can get certifications and claimed by different companies. Now, they cannot do that. There is transparency. The company knows where its supply from and is not deceived by cooperatives or agents anymore.*" (Traceability Manager, Manufacturer C, Case Study 3)

- Resources Affecting IS Affordance Actualisation

Observation and interviews with participants from Manufacturer C and its suppliers disclosed several resources employed in IS affordance actualisation such as (1) the willingness to share data, (2) leadership commitment and support, (3) trust between stakeholders, (4) sustainability-driven policy and practices, and (5) appropriate organisational structure.

First, all participants indicated that the **willingness to share (accurate) data** as a precondition for sustainability. Participants from Manufacturer C and its suppliers stated that traceability is a precondition of sustainability. Meanwhile, traceability requires a willingness not only to share data but the accurate ones.

> "*If we want sustainability, we need traceability, but the system depends on people. Even if the system is good with all the parameters, but if the input is not correct, it does not work. The industry and all involved parties must share data. They must open up and transform.*" (Traceability Manager, Manufacturer C, Case Study 3)

Second, the **commitment to implement sustainability needs to come from top management**. Sustainability vision must come from the top management, is internalised into all layers in the organisation and is extended into its supply chain members. Directives from the top management ensure the required actions to actualise the IS affordances are implemented.

Third, **trust between stakeholders** is found as a supporting resource in the IS actualisation process. If trust exists, parties are more willing to be involved in the

sustainability efforts and conduct the necessary actions to actualise IS affordances. They are also more likely to provide (accurate) data.

"*We cannot achieve sustainability along supply chains without trust if the manufacturers do not trust suppliers and vice versa. Sustainability starts with traceability. We cannot have traceability if we do not know information about the plantations such as productivity, location, supplier welfare etc. No sustainability without transparency. Suppliers must be willing to share accurate data and trust manufacturers and vice versa.*" (Traceability Manager, Manufacturer C, Case Study 3)

Fourth, all participants indicated that **sustainability-driven policy and practice** are necessary resources in sustainability transformation. Manufacturer C and its suppliers have a comprehensive sustainability policy that focuses on reducing the negative impact of supply chain activities to the environment, improving employee safety, health, and welfare, enhancing consumers' health, and improving communities. The policy serves as a solid foundation for the creation and implementation of sustainable practices.

"*Our management made it very clear that sustainability is our priority. Our CEO is the leader of the sustainability plan. He put the plan on top of the agenda, it starts from him, then it goes down to the department heads, and down to the employees. Each division is requested to contribute to achieving sustainability goals. In IT Division, we encourage less use of paper, auto shutdown, and digitisation of artefacts and business processes.*" (IT Director, Manufacturer C, Case Study 3)

Fifth, data analysis shows that a **proper organisational structure** contributes to the sustainability transformation and IS affordance actualisation in Manufacturer C and its suppliers. Manufacturer C formed a sustainability division that manage all efforts to integrate the policy into all layers of management and activities. The person in charge of sustainability is in also the top management. According to most of the interviewees, this structure is effective, since it ensures the necessary change in work practices is initiated and sustained.

"*There is a clear direction for the Sustainability Plan. We have one division called the [Manufacturer C] Care Foundation that is responsible and manages all sustainability-related implementation. Our CEO is the leader of our sustainability plan.*" (IT Director, Manufacturer C, Case Study 3)

- **Sustainability Capability and the Outcome of Its Application**

Interviews with all participants from Manufacturer C and its suppliers revealed six essential capabilities required to support sustainability transformation, such as (1) sustainability data collection, (2) sustainability reporting, (3) sustainability human capital development, (4) sustainability benchmarking, (5) sustainability risk management, (6) sustainability governance, and (7) sustainability collaboration. Further data analysis shows that the application of a combination of these capabilities in Manufacturer C and its suppliers improves their (1) sensemaking, (2) relationship management, (3) partner development, and (4) reflexive control abilities.

First, all interviewees from Manufacturer C and its suppliers confirmed the importance of **sustainability data collection capability** as they all require information on various variables on interest. Manufacturer C and its suppliers collect various data such as carbon dioxide (CO2) and sulphur oxides (SOx) produced in operation activities, energy usage, hazardous and toxic waste, water usage, and total training hours held for each employee. The data served as the basis for strategy formulation, implementation, and monitoring.

> *"Our field staff use a tablet and meet with suppliers to collect data. We also get feedback from them about their needs that can be accommodated by the traceability system."* (Data Analyst, Manufacturer C, Case Study 3)

Second, Manufacturer C displays an advanced **sustainability reporting capability** on its website. The central theme of its website is the message of how Manufacturer C has aligned its overall operation with sustainability principles. The site provides a detailed report on Manufacturer C activities in implementing sustainability, such as sustainable design, recycling, and sustainable marketing. The application of this capability has increased stakeholders' trust towards Manufacturer C's sustainability commitment.

Third, the findings show that Manufacturer C's sustainability transformation involves the application of **sustainability human capital development capability.** Manufacturer C aims to secure its raw material supplies. To do so, Manufacturer C improves its suppliers' economic wellbeing by developing their capabilities through training, coaching, and infrastructure provision. Moreover, Manufacturer C and its suppliers use the traceability system to record and track production, product movement, and progress towards achieving sustainability. As a result, by the end of 2018, Manufacturer C has improved the livelihoods of 746.000 smallholder suppliers.

*"We hold coaching and follow-up training for our suppliers. Training is usually done by an NGO in classrooms or field school. Coaching is when field agents come directly to the farm to provide consultation, solve problems, or improve practice."* (Sustainability Consultant, Manufacturer C, Case Study 3)

Fourth, **sustainability benchmarking capability** was identified as an essential capability for sustainability transformation in Manufacturer C and its suppliers. Manufacturer C and its suppliers compare their sustainability performance to performance in previous years, its competitors, and best practices. Manufacturer C's sustainability policy also mandates the benchmark of supplier performance against external certifications standards. When the relevant certification is not available, the company develops its own standards. This standard is reviewed and improved regularly, which eventually resulted in the creation of the firm's responsible sourcing and responsible business partner policy.

Fifth, the application of **sustainability risk management capability** triggered sustainability transformation in Manufacturer C and its suppliers. In the first phase of sustainability transformation, Manufacturer C identified risks related to environmental degradation and unethical practices in its supply chains. The application of this capability has helped Manufacturer C and its suppliers to align risks to sustainability transformation strategy.

Sixth, Manufacturer C and its suppliers applied **sustainability governance capability** to ensure alignment of its sustainability policy across business units and supply chain members. Manufacturer C has a comprehensive sustainability policy that provides a clear direction for all layers of management to implement sustainability initiative relevant to each units' responsibilities. Furthermore, the company formed a sustainability division that oversees the operationalisation of this policy. Sustainability governance capability has helped Manufacturer C and its suppliers to increase accountability and build positive relationship with stakeholders whose supports are crucial for sustainability transformation.

*"There is a clear direction for the Sustainability Plan. We have one division called the [Manufacturer C] Care Foundation that is responsible and manages all sustainability-related implementation."* (IT Director, Manufacturer C, Case Study 3)

Seventh, **sustainability collaboration** was identified as a key sustainability capability from interviews with respondents from Manufacturer C and its suppliers. The firms work

with cooperatives, traders, NGOs, and customers to identify and address sustainability-related problems inherent in the supply chains. Sustainability collaboration capability has enabled Manufacturer C and its suppliers to acquire the necessary resources to support sustainability transformation.

> "*Supply chain traceability is a collaborative project. We work with suppliers, traders, cooperatives, customers, and NGOs. We hope that we can provide solutions for [sustainability] problems. We work together to identify problems and challenges.*" (Traceability Manager, Manufacturer C, Case Study 3)

Data analysis shows that the application of sustainability data collection and sustainability reporting in Manufacturer C and its suppliers resulted in the development of **sensemaking** ability. The operationalisation of sustainability data collection enables the companies to identify the problems in their current operation from the sustainability perspective. The emerging insights are then communicated with internal and external stakeholders to allow collaborative solution-seeking. IS enable the companies to realise the problems and opportunities from their activities.

> "*IT can be used as a tool to make people aware of what we can do. For example, in the sugar industry, we use a huge amount of water and the waste is discharged. If we know the data about consumption and waste, we can think about how much water we can reduce and how we generate energy out of waste [**sustainability data collection**]. In the food industry, waste is biodegradable, …. Any biodegradable waste can be converted into resource…. The role of IT is to make the industry aware of these opportunities and provide access to technology [**sustainability reporting**]…. In India and Thailand, it already happened, how we can transfer this technology for users in Indonesia.*" (Sustainability Consultant, Manufacturer C, Case Study 3)

Further data analysis indicates that the operationalisation of sustainability collaboration combined with sustainability governance supports the development of **relationship management** ability in Manufacturer C and its suppliers. The companies collaborate with various internal and external stakeholders that have diverse, sometimes conflicting objectives, to enact sustainability transformation along its supply chains. The combination of sustainability governance and sustainability collaboration capabilities can align these various goals to reach the sustainability goals.

Similarly, the joint application of sustainability human capital development and sustainability collaboration capabilities has enabled Manufacturer C and its suppliers to build **partner development** ability. This is a crucial ability that enables supply chain-wide sustainability transformation. The combined application of sustainability human capital development and sustainability collaboration capabilities support the growth and improvement of supply chain partners' sustainability performance through collaborative skill development, and resource and costs sharing.

> *"This is one of our suppliers. She has been trained by an NGO and supported by our field agents [**sustainability collaboration**]. We hold coaching and follow-up training for our suppliers [**sustainability human capital development**]. Training is usually done by an NGO in classrooms or field school. Coaching is when field agents come directly to the farm to provide consultation, solve problems, or improve practice."* (Traceability Manager, Manufacturer C, Case Study 3)

Finally, the enactment of sustainability benchmarking, governance, and risk management capabilities simultaneously fosters the **reflexive control** ability in Manufacturer C and its suppliers. The firms compare performance to identify and manage risks. Subsequently, they perform corrective or enforcement actions to align all deviation from the intended goals.

> *"We conduct supplier evaluation and help them to get certified. Certifications have their own standards. We extract the data to satisfy the certification requirements from the traceability system. We compare their productivity and practice against the certification standards [**sustainability benchmarking**] to make sure the suppliers comply with the requirements and are not involved in any violations [**sustainability governance, sustainability risk management**]."* (Traceability Manager, Manufacturer C, Case Study 3)

## 5.3.4 Case study 4 (Manufacturer D and Its Supplier)

Unlike the previous cases, Manufacturer D had only undergone three phases in its sustainability transformation. It has mainly transactional interaction with its suppliers, hence its suppliers are largely not involved in Manufacturer D's sustainability transformation. It also mainly interacts with the government and NGOs. However, the sustainability goals and barriers in each phase remain similar, as shown in Table 5.6.

- Sustainability Transformation Process

Table 5.6. Sustainability Transformation within Manufacturer D and Its Suppliers

| Sustainability Transformation Phase | Goal | Other Primary Stakeholder | Barrier |
|---|---|---|---|
| Awakening sustainability conscience | Raising awareness about sustainability issues | The government and NGOs | None |
| Introverted transformation | <ul><li>Business continuity</li><li>Reduced environmental impacts</li><li>employee safety, health, and welfare</li><li>improved communities</li><li>educating customers to prefer sustainable products</li></ul> | The government, communities | <ul><li>The absence of appropriate regulation</li><li>Difficulty in addressing social issues</li></ul> |
| Maintenance and Evaluation | Sustained implementation of sustainable practices. | The government | Lack of long-term commitment to conduct sustainable practices |

**1. Awakening sustainability conscience**

Sustainability transformation in Manufacturer D was triggered by requests from the government and NGOs to manage the company's used plastic packaging. Along with the increased sales, waste produced from the company's used plastic packaging was growing substantially. Consequently, several NGOs and the government urged the company to collect and process packaging waste.

> *"When the company grows, the first challenge was related to the waste of our used plastic bottles. Especially in Indonesia, waste infrastructure is still abysmal. There were requests from the government and NGOs to us to do something about plastic waste."* (Sustainable Development Director, Manufacturer D, Case Study 4)

**2. Introverted transformation**

Afterwards, the introverted transformation in Manufacturer D was initiated by its CEO's commitment. This commitment was communicated to all layers of the company to gain understanding and cooperation from the employees. At this phase, the sustainability goals were ensuring business continuity, reducing business impacts to the environment,

ensuring employee safety, health, and welfare, improving communities in which it operates, and educating customers to prefer recycling products.

One of Manufacturer D's main sustainability goals in this phase was business continuity. Manufacturer D had a license to source water from several water springs. It was obliged to conserve these water sources by the government. Preserving water springs also aimed to ensure the continuity of its business, since water is the primary raw materials for its products. The firm monitored its water usage and reduced water consumption in the manufacturing process.

Manufacturer D further reduced the impacts of its activities on the environment through recycling. The company built collection points where customers could return used plastic packaging for money. The collected used packaging was then exported overseas for recycling. Furthermore, due to the value of the plastic waste, people started collecting it that later became communities of waste pickers. Manufacturer D formalised these communities by building recycling units and employing the communities.

Moreover, Manufacturer D aimed to educate customers to collect and recycle used plastic packaging and prefer products that use recycled materials. Majority of participants from Manufacturer D reported that sustainability awareness among individual customers in Indonesia was growing, but not at the sufficient magnitude to affect change. The majority still preferred cheaper products even at the expense of their health, the environment, and society.

> "We need time to educate our employees, partners, and the public. Most consumers do not care about, for instances, non-genetically modified products, deforestation, or underpaid labour involved in the production of a product, as long as it is cheap. Although they know that consuming GMO products has long-term effects on their health." (Supply Chain Director, Manufacturer D, Case Study 4)

The lack of comprehensive waste management regulation impeded Manufacturer D's recycling objective. Despite the willingness to adopt recycling practice and technology, Manufacturer D's suppliers had not produced recycled PET. It was difficult to collect enough supply of plastic packaging because there was no proper regulation or nationwide mechanism to collect and separate recycled and non-recycled plastic packaging. As a result, Manufacturer D only ordered virgin PET materials from its suppliers and their interaction was mainly transactional with limited supplier development

*"In Indonesia,… there is no regulation or mechanism from the government about sorting and recycling the waste at the household level. It is difficult the get steady supply.* (Commercial Director, supplier of Manufacturer D (SCDE), case study 4)

Manufacturer D mainly addressed environmental issues in its operation due to difficulty in identifying and mitigating social problems. The company had not focused on addressing social problems since there are numerous social problems. Addressing each of them required exceptional effort.

"*We only collect environmental data at this time because there are too many social issues that need solutions*." (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

**3. Maintenance and Evaluation**

Manufacturer D is residing in this phase. All respondents from Manufacturer D stated that the company records sustainability-related data. It uses the data to review its sustainability performance and show it to the government and NGOs. The firm assesses its business process for compliance and deviations from the desired goals.

"*We keep and monitor data about sustainability in real-time. It is mandatory. For example, last December, we received an award from the government regarding our tree planting initiative. We monitor all trees we planted and all recharge wells. They are all in an online database. We review it, whether we achieve the target or not.*" (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

As the results of the sustainability efforts, Manufacturer D has successfully transformed itself. It achieved a beyond compliance (green) rating on PROPER and green industry award from the Ministry of Industry (further discussed in Section 5.4.1). It also has attained various other awards for its environmental and social endeavours.

Despite the success, Manufacturer D still faces challenges in its sustainability transformation. Some participants from Manufacturer D and its supplier reported inconsistency in using IS is one factor hindering the sustainability transformation.

 "*Not in terms of infrastructure or software but rather about how to make people use IS consistently to do their tasks and how to maintain the practices. Because in many cases, failure to use IS and implementing sustainable practices is caused by the*

*inconsistency of the users."* (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

During Maintenance and Evaluation phase, Manufacturer D collects feedback on its sustainability performance. The feedback is evaluated against sustainability goals to look for opportunities for improvement. Hence, Manufacturer D circle back to introverted transformation phase to execute the improvement.

- IS Affordance

Interviews about IS usage in Manufacturer D disclosed five important IS affordances such as (1) reflective disclosure, (2) information democratisation, (3) active performance assessment, (4) output management, and (5) delocalisation.

First, IS allow for belief formation (**reflective disclosure** affordance). Manufacturer D uses ERP to record all transactional data from suppliers to customers. The use of IS by its employees and suppliers has allowed Manufacturer D to capture and analyse information about its water conservation and recycling effort. The data are used to assess its sustainability performance, reconsider the impact of its activities to the environment and society, and recommend an alternative to increase efficiency and effectiveness of its programs.

*"We use IS to collect and access real-time data, especially rainwater-related information, because we need to monitor the water level. We also use IS to report and assess our sustainability performance. We have an IS that we use to review all aspects of our sustainability implementation such as product, quality, claim, employee, environment, community etc. ... IS have been keeping us informed regarding whether we have achieved our sustainability targets or not."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Second, Manufacturer D uses IS to communicate its sustainability-related performance to stakeholders (**information democratisation** affordance*)*. IS have assisted Manufacturer D in showing to the stakeholders that the firm is compliant to the regulation and has taken the necessary actions to mitigate the negative impacts of its activities to the environment and society.

*"We keep and monitor data about sustainability in real-time. It is mandatory. For example, last December, we received an award from the government regarding our*

*tree planting initiative. We monitor all trees we planted and all recharge wells. They are all in an online database. We review it, whether we achieve the target or not.*" (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

Third, Manufacturer D uses IS to evaluate the sustainability-related performance of all business units (**active performance assessment** affordance). The company derived a set of criteria to measure the sustainability performance of employees and divisions from B Corporation certification. It is a certification issued by B Lab that measures the environmental and social performance of for-profit companies (Lab, 2020). Then, it embeds the standards and indicators in IS.

*"We have IS to see the performance of all business unit called [X]. It embeds standards and KPI. We can see the performance of each business unit compared to the standards and goals."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Fourth, Manufacturer D utilises IS to govern resource allocation and waste production (**output management** affordance). The firm uses IS to ensure responsible water consumption and wastewater processing.

*"We can monitor the data online and in real-time. We can monitor anything such as groundwater level, anytime on a computer or smartphone. We have to make sure we don't overexploit the water and monitor the trends because there is no certainty about water availability in the dry season.*" (Sustainable Development Director, Manufacturer D, Case Study 4)

Fifth, Manufacturer D uses IS to access remotely located data (**delocalisation** affordance). The company's ability to use IS has reduced the dependency of work practices to a specific location. Manufacturer D needs to monitor water supply in all of its springs and wells, which mostly located in remote areas. Hence, delocalisation affordance has largely contributed to efficient work process.

*"The government has a lot of infrastructures, but they still use the manual method. To get the data, they must go to the weather station and download it. But we can monitor the data online and in real-time. We can monitor anything such as groundwater level, anytime on a computer or a smartphone"* (Sustainable Development Director, Manufacturer D, Case Study 4)

- **Resources Affecting IS Affordance Actualisation**

Observation and interviews with participants from Manufacturer D revealed several resources employed in IS affordance actualisation such as (1) IS operational skill, (2) consistent use of IS, (3) leadership commitment and support, (4) trust between stakeholders, (5) relevant structure, and (6) sustainability-driven policy and practice.

First, **IS operational skill** was identified as a key factor in IS-enabled sustainability transformation. Manufacturer D develops the skill of its employees through training and collaboration with NGOs and research institutions.

Second, the success of IS adoption depends on **consistency**. Some respondents reported that one issue inhibiting the use of IS to support sustainability transformation is its inconsistent use. The users may want to use the IS at first, but maintaining consistency in using IS to complete the process has been a challenge.

> *"The main problem in using IS to support sustainability is not in terms of infrastructure or software but rather to make people accustomed to using it and using it consistently. For some people, it has been a challenge to maintain, monitor, and fully utilise IS to conduct sustainable practices. In many cases, failure to use IS caused by the inconsistent users."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Third, at the organisational level, all participants from Manufacturer D noted **leadership commitment and support** as an important enabler of IS-enabled sustainability transformation. The commitment of the CEO that is internalised into all layers of management is the main enabler of the firm's sustainability transformation

> *"In [Manufacturer D], it's more of a commitment of the top management. That commitment is driven by the commitment of our CEO that passed on to all employees."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Third, most participants from Manufacturer D outlined **trust between stakeholders** as an important resource in enabling IS-enabled sustainability transformation. Each stakeholder has a unique role in supporting the transition towards sustainability. The role of consumers' trust towards the quality of a product serves as a primary motivation for enacting sustainability transformation.

*"Awareness is growing now. Try asking customers why they buy our product even though the price is higher. It is because they trust our brand. That our product is sustainable, strong CSR (Corporate Social Responsibility), and compliant with regulations. This year, [Manufacturer D] classified as a B-corps company that is good for our image. The public sees that. It strengthens the brand."* (Supply Chain Collaboration Director, Manufacturer D, Case Study 4)

Fourth, the **structure of the company** reflects its commitment to sustainability. Manufacturer D has a dedicated division that oversees and manages sustainability implementation. This division is led by a senior manager to ensure proper resource allocation and environment and social aspects are considered in internal and external business processes.

*"We have a department called sustainability development. This department is collaborating with NGOs, scavengers etc. It is new. It is building up awareness related to sustainability."* (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

Lastly, data analysis shows that **sustainability-driven policy and practice** are needed to operationalise three aspects of sustainability into supply chain processes. Manufacturer D has a sustainability policy that guides business practices. This policy acts as a guide for integrating the three dimensions of sustainability into the company's activities.

*"The whole system must be aligned to achieve the sustainability goals, including IS and work practices because there must be guidelines or template that we should operate on."* (Supply Chain Collaboration Director, Manufacturer D, Case Study 4)

• Sustainability Capability and the Outcome of Its Application

Interviews with all participants from Manufacturer D revealed the essential capabilities required to support sustainability transformation, such as (1) sustainability data collection and sustainability reporting, (2) sustainability human capital development, (3) sustainability benchmarking, (4) sustainability risk management, (5) sustainability governance, and (6) sustainability collaboration. The combination of these capabilities has resulted in the development of (1) sensemaking, (2) relationship management, and (3) reflexive control abilities.

First, all participants from Manufacturer D revealed the fundamental capabilities in sustainability transformation are **sustainability data collection** and **reporting**. Manufacturer D captures rainwater data since its business depends heavily on water supply. The company also records data about trees it has been planting in its conservation effort. The data are then processed and reported into the stakeholders. The report includes the sustainable practices that they have been conducting and its plans to achieve the sustainability goals. Applying sustainability data collection and reporting capabilities enables Manufacturer D to measure, understand, and communicate its sustainability performance to its stakeholders that lead to trust building.

> *"Data collection is essential because everything has to be based on data."* (Supply Chain Collaboration Director, Manufacturer D, Case Study 4)

> *"We must report sustainability every two years to the external stakeholders. Internally, we make the report every year. We have a methodology or tools for assessing sustainability performance that we call the [Manufacturer D] Way. We review all elements starting from governance, policy, quality, claim, marketing, sales, employee, environment, community, etc."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Second, the next essential capability identified is **sustainability human capital development**. Manufacturer D realised that employee development is a vital part of implementing sustainability. If employees have a good understanding of sustainability, they would be able to align their tasks with sustainability principles and spread awareness to other employees. To do so, the company created a list of required skills and knowledge. Then, the employees are assessed against it. Finally, training is held to close the gap between the required and available skills.

> *"To enhance our sustainability initiative, we ensure every employee has a training program that is tailored based on the required skills in their current position. After competency is measured, if they lack competence, we conduct a need analysis. The human resources department tailors a development program for every employee."* (Commercial Director, supplier of Manufacturer D (SCDE), case study 4)

Third, most participants from Manufacturer D stated that their company's sustainability transformation was triggered by the identification of risks of conducting unsustainable practices (**sustainability risk management** capability). Manufacturer D concerns about

social responsibility risks related to public perceptions of water sources monopoly and over-consumption of water. This risk links to reputational risks, which potentially may damage the organisation's financial performance. Sustainability risk management enables early risk detection that may hinder sustainability transformation.

Fourth, Manufacturer D conducts benchmarking with its competitors nationally and globally (**sustainability benchmarking** capability). Manufacturer D created a benchmark tools to measure sustainability performance for each business unit. The result of such benchmark informs the company to develop a corrective plan and improve its business processes.

> "*Benchmark is important because we can see our position related to sustainability, compared to others. Then, we can know how far we need to go, what is the easiest way we can do now.*" (Supply Chain Director, Manufacturer D, Case Study 4).

Fifth, Manufacturer D practises **sustainability governance capability** to ensure alignment of sustainable practices towards the achievement of sustainability goals. Manufacturer D records all sustainability-related data. It uses the data to evaluate and showcase its sustainability performance to the government and NGOs. The firm assesses its business process for compliance and deviations from the desired goals. Sustainability governance capability helps Manufacturer D to gain stakeholders' support towards sustainability transformation since it promotes transparency and accountability showing that unethical practices will be dealt with accordingly.

> "*We keep and monitor data about sustainability in real-time. It is mandatory. For example, last December, we received an award from the government regarding our tree planting initiative. We monitor all trees we planted and all recharge wells. They are all in an online database. We review it, whether we achieve the target or not.*" (Director of Sourcing and Supplier Development, Manufacturer D, Case Study 4)

Sixth**,** collaboration with various stakeholders also beneficial to acquire other resources such as expertise, fund, infrastructure (**sustainability collaboration** capability). Manufacturer D collaborates with NGOs and research institutes to gain expertise in sustainable practices and addressing social conflicts. Sustainability collaboration capability is crucial in accessing necessary resources to support sustainability transformation.

> "*Related to expertise, we have been collaborating with several parties such as*

*NGOs, researchers, and universities. We have research cooperation with a university in France. This collaboration is important to acquire fund and infrastructure to enable sustainability implementation*" (Sustainable Development Director, Manufacturer D, Case Study 4)

Participants from Manufacturer D reported the outcomes of the combined application of sustainability capabilities, including (1) sensemaking, (2) relationship management, and (3) reflexive control abilities. First, sustainability data collection and reporting capabilities help to gain commitment from its employees (**sensemaking**). Manufacturer D collects and shares its sustainability data and insights with its employees that enable them to understand the complex issues and urgency of sustainability transformation.

*"We open access to our sustainability-related information [**sustainability data collection**] for all our employees in head offices and all factories. We want borderless [**sustainability reporting**]. We want to make them feel that they also need this [sustainability]. We continue educating them using IS."* (Sustainable Development Director, Manufacturer D, Case Study 4)

Second, the combined application of sustainability governance and sustainability collaboration capabilities enables Manufacturer D to effectively gain resources through effective management of its relationships with stakeholders (**relationship management** ability). The company acquires the necessary knowledge and expertise by collaborating with NGOs, research institutes, and universities. Participants from Manufacturer D admitted the urgency in gaining resources from various stakeholders within and beyond the supply chain.

Finally, Manufacturer D exercises a combination of sustainability benchmarking, sustainability risk management, and sustainability governance capabilities to ensure continuous changes within the company and its supply chains (**reflexive control** ability). Manufacturer D recognises the social, reputational, and financial risks related to public perceptions of water sources monopoly and over-consumption of water in its operation (sustainability risk management). In response, Manufacturer D evaluates its activities, compare its performance to competitors, and develops its own benchmark tools to measure sustainability performance for each business unit and supplier (sustainability benchmarking). Over time, it uses the benchmarking tool to review its business process for compliance and deviations from the intended goals (sustainability governance).

"*There is a water management issue. We operate in an area with abundant water, but people do not have the right infrastructure to get water, so they drill water. ... but they let it flow and the water is depleting. Meanwhile, we only take a small fraction of that water. ... We need to show that we conserve water [**sustainability risk management**]. We can see the performance per business unit, we have a tool for it. We can see the sustainability performance of other companies and each business units [**sustainability benchmarking**].... We also do that as part of B Corps. Currently in the process of obtaining certification from B Corps. It is a certification of recognition for performance related to socio-environment. There we can also benchmark with other companies, what areas are already good, which ones need to be improved (**sustainability governance**).*" (Sustainable Development Director, Manufacturer D, Case Study 4)

## 5.3.5 Case study 5 (Manufacturer E and its suppliers)

- ### Sustainability Transformation Process

Manufacturer E has implemented sustainability transformation to a smaller scale than the other participating manufacturers. It has undergone three phases with limited outcomes and did not involve suppliers in its transformation. Table 5.7 summarises the transformation process, sustainability goals, the primary stakeholders, and barriers in each stage.

Table 5.7. Sustainability Transformation within Manufacturer E and Its Suppliers

| Sustainability Transformation Phase | Goal | Other Primary Stakeholder | Barrier |
|---|---|---|---|
| Awakening sustainability conscience | Raising awareness about sustainability issues | The government | None |
| Introverted transformation | <ul><li>Costs saving</li><li>Reduced environmental impacts</li><li>employee safety, health, and welfare</li><li>improved communities</li></ul> | The government, industry association | <ul><li>Economic-focused mindset</li><li>Financial constraint</li></ul> |
| Maintenance and Evaluation | Sustained implementation of sustainable practices. | The government | Lack of long-term commitment |

**1. Awakening sustainability conscience**

Sustainability transformation in Manufacturer E was driven by its CEO's strategy for the company's growth. Initially, Manufacturer E resided in blue level/compliant on PROPER standard. The CEO wanted to achieve the green rating/beyond compliant. He wanted to take the company public. Hence, it has to comply with all requirements including environmental and social regulations from the government. In response, a team was formed to audit the company and develop a strategy to achieve sustainability goals.

> "*At the beginning of our sustainability journey, there was a directive from the CEO to assess our sustainability condition. He wanted the company to become bigger so all the requirements such as the environment, waste, toxic, safety, etc., must be met. So, we created a team to understand our current operation from a sustainability perspective, to build the culture and raise awareness among employees. Once, we knew the situation, we started to address the existing issues.*" (Head of Supply Chain, Manufacturer E, Case Study 5).

**2. Introverted Transformation**

Manufacturer E had limited sustainability implementation mostly driven by cost-saving opportunity, reducing the impact of its activities on the environment, ensuring employee safety, health, and welfare, and improving communities. It faced challenges in its transition towards becoming a sustainable organisation due to financial constraint.

Manufacturer E's sustainability approach focused on decreasing waste and emission from its manufacturing and distribution activities. It ensured its liquid and air wastes comply with regulation from the government. The by-products were either destroyed, supplied to other industries, or discarded. Manufacturer E set maximum age for freight and changing from cars to trains and ships to load more products, thus reducing $CO_2$ emission from its distribution activities. Unlike Manufacturer A, B, and C, it had neither conducted traceability nor recycling of its plastic packaging.

Besides the government, a Data Analyst from Manufacturer E remarked the function of industry associations to support the company's sustainability implementation. The association serves as a mediator between their members and the government and to build awareness towards sustainability.

> "*Industry associations act as a mediator between the industry and the government. They help socialising good governance and compliance to their members. They help*

*their members to be more aware of the impact of their activities on the environment."*
(Data Analyst, Manufacturer E, Case Study 5)

Sustainability was not a high priority for Manufacturer E due to its economic limitation. Manufacturer E was smaller in terms of revenue compared to other manufacturers examined in this study. It sold peanut and chocolate snacks, which were relatively cheap. It focused on fulfilling the requirements to be a public company that included compliance with environmental management regulations. The company's scale of economy was limiting it to conduct more advanced sustainability initiatives.

*"In this company, sustainability is something new. We have not done recycling because the products are cheap. However, our production at the factories has implemented zero-defect policy. So, we minimise waste. If waste is minimal, besides saving, the impact on the environment is also reduced."* (Head of Supply Chain Subdivision, Manufacturer E, Case Study 5)

### 3. Maintenance and Evaluation

Manufacturer E procures raw materials without a significant attempt in developing suppliers' sustainability situation. Thus, its sustainability transformation focuses on initiating, executing, maintaining, and evaluation of the company shift towards adopting internal sustainable practices.

During maintenance and evaluation phase, the main challenge faced by Manufacturer E is the lack of long-term commitment of its employees. This challenge is rooted in difficulty to change old habits. It takes a long time to shift behaviour and culture toward adopting sustainable work practices.

*"Employee consistency is a challenge in implementing sustainability because they are greatly affected, especially since we are a home industry company for quite a long time. Changing the mindset from home industry to a modern company requires education. It is challenging to prepare employees and sustain change. Without consistency, it is easy to fall back to the old way of doing things."* (The Head of Supply Chain, Manufacturer E, Case Study 5)

- IS Affordance

Interviews with respondents from Manufacturer E revealed four IS affordances in supporting sustainability transformation including (1) reflective disclosure, (2) output management, (3) delocalisation, and (4) collecting learning facilitation.

First, IS allow Manufacturer E to assess and identify problems in work practices that lead to a reconsideration of its belief and approach (**reflective disclosure** affordance). Manufacturer E extracts and processes sustainability-related data from IS resulting in the presentation of current sustainability performance based on data. This information enables the identification of pertinent issues and gaining buy-in from stakeholders.

> "*The amount of waste, productivity and service level are monitored. We have a dashboard that shows all of this information. We extract data from ERP. Then, we process raw data into information so that people understand and read the same data, so we do not waste time arguing about the same problem, but with different data, with the same data we can find a solution together.*" (Supply Chain Division Director, Manufacturer E, Case Study 5)

Second, IS afford for work processes governance and resource allocation (**output management** affordance). Manufacturer E mainly uses ERP to record and analyse transactional data. It uses ERP to assist its waste reduction and management. Production, distribution, and finance data from ERP are extracted to monitor and calculate waste.

> "*We have KPI to reduce waste. We use the SCM module in ERP to match supply and demand so we can reduce excess product. We use the results for end-to-end execution from production, supply chain, until finance. From the distribution side, we also look for how we can combine shipping, so that our transportation costs can be more efficient, hence reduce pollution.*" (Head of Supply Chain Subdivision, Manufacturer E, Case Study 5)

Third, Manufacturer E uses IS to enable mobility of its employees through digitisation of work practices (**delocalisation** affordance). The company allows for access to IS via mobile devices. Salespeople could visit stores to conduct a transaction and send data regardless of location.

> "*We have gadgets for mobile salespeople. It can facilitate transactions, no need for physically writing, but just enter the data directly into a gadget. It is directly transmitted to the office. So, while the salesman is still in the field, the warehouse*

*person can prepare the goods.*" (Head of Supply Chain Subdivision, Manufacturer E, Case Study 5)

Fourth, further interviews disclosed **collective learning facilitation** affordance. IS facilitate information sharing and knowledge dispersion to promote collective learning. It stores various kinds of documentation and information from which its employees and suppliers can access that knowledge repository and learn from it.

> *"We use IS for training, focusing on managing projects. It also includes a local wiki where we put all documentation and information there. So, every employee can see and share knowledge."* (Supply Chain Manager, Manufacturer E, Case Study 5)

- ● **Resource Affecting IS Affordance Actualisation**

Observation and interviews with participants from Manufacturer E disclosed several resources employed in IS affordance actualisation such as (1) IS operational skill, (2) consistency, (3) leadership commitment and support, and (4) sustainability-driven policy and practices.

First, **IS operational skill** is a fundamental resource in enhancing IS-enabled sustainability transformation. In Manufacturer E, there are many older employees who lacked the IS operational skill and preferred the old-fashioned manner of operating. However, despite employees' reluctance to change and their lack of IS practical ability, Manufacturer E is adamant about using IS. Thus, it develops employees' IS operational skills through training and mentoring.

> "*Change management from handwriting to typing is challenging. Even some of our managers could not operate IS. Changing the manner of operating is difficult. To address it, we conduct training and audit to ensure employees know about the company's sustainability objective and have the ability to operationalise IS.*" (Supply Chain Division Director, Manufacturer E, Case Study 5)

Second, **consistency in using IS** was found as a supporting resource in the actualisation process. Most participants from Manufacturer E commented that a challenge in using IS to support sustainability transformation is its inconsistent use. The users may want to use the IS at first, but maintaining consistency in using IT to complete the process is burdensome.

*"Employee consistency is an issue because they are greatly affected, especially since we are a home industry company for quite a long time. Changing the mindset from home industries to more modern companies requires education. It is challenging to prepare employees and sustain change. Without consistency, it is easy to fall back to the old way of doing things."* (The Head of Supply Chain, Manufacturer E, Case Study 5)

Third, **leadership commitment and support** were identified as primary resource of sustainability transformation and affordance actualisation in Manufacturer E. Manufacturer E is at Blue rate (compliant level) on PROPER. The CEO is determined to increase the higher rank since it helps with company' credibility and growth. This vision is communicated into all layers in the organisation. It drives the creation of appropriate business process and ensured the required actions to actualise IS affordances are implemented.

*"At the beginning of our sustainability journey, there was a directive from the CEO to measure our sustainability condition. He wanted the company to become bigger so all the requirements such as the environment, waste, toxic, safety, etc., must be met. So, we created a team to understand our current operation from a sustainability perspective, to build the culture and raise awareness among employees. Once, we knew the situation, then we started to address the existing issues."* (Head of Supply Chain, Manufacturer E, Case Study 5).

Fourth, the informants from Manufacturer B reported that **sustainability-driven policy and practice** are essential resources in IS-enabled sustainability transformation. Manufacturer E developed a sustainability policy that aims to embed sustainability across all operations and improve the community in which the company operates. The policy is operationalised in sustainable practices such as waste reduction.

*"We plan to reduce waste. At the factory up to shipment, we have the principle of not making, receiving, and sending defective products. If we do not make defective products, of course, it will not produce waste. We also audit every year, hold campaigns and competitions to reduce waste between units, and daily briefings to internalise the policy."* (Head of Supply Chain Subdivision, Manufacturer E, Case Study 5)

- **Sustainability Capability and The Outcome of Its Implementation**

Interviews with all participants from Manufacturer E revealed four essential capabilities required to support sustainability transformation, such as (1) sustainability data collection and sustainability reporting, and (2) sustainability benchmarking. The combination of these capabilities has resulted in the development of sensemaking and reflexive control abilities.

First, interviews with all participants from Manufacturer E revealed **sustainability data collection** and **sustainability reporting** as two fundamental capabilities in enabling sustainability transformation. Unlike other manufacturers, Manufacturer E collects more limited data, such as waste, productivity, and service level, to support its sustainability efforts. After processing the data, Manufacturer E reports the insights from processing the data to internal stakeholders. Similarly, Manufacturer E has not released a report on broader sustainability context other than the CSR aspect. These capabilities help Manufacturer E to identify areas for improvement and communicate the findings with relevant stakeholders.

The findings indicate that the combined application of sustainability data collection and reporting yielded in development of **sensemaking** ability among stakeholders. Various parties could recognise the pertinent issues in the business activities and understand the shortcoming of the current approach when confronted with data.

> "*The amount of waste monitored, productivity and service level are also monitored. We have a dashboard that shows all of this information. We extract data from ERP. Then, we process raw data into information so that people understand and read the same information, so we do not waste time arguing about the same problem, but with different data, with the same data we can find a solution together.*" (Supply Chain Division Director, Manufacturer E, Case Study 5)

Second, data analysis revealed that Manufacturer E conducts **sustainability benchmarking** for their internal programs. Therefore, they know what does not work properly and how to improve it. Manufacturer E wishes to benchmark against its competitors. However, domestic competitors are reluctant to disclose their data. Hence, Manufacturer E benchmarks its performance with overseas companies. Application of sustainability benchmarking helps Manufacturer E to learn what actions led to successful sustainability transformation.

"*We want to benchmark to [Manufacturer E's competitor], but they don't let us see their data. So, we benchmark with overseas companies.*" (Director of Supply Chain Division, Manufacturer E, Case Study 5)

## 5.4    Multiple Case Study Validation

Data triangulation is performed by using different sources of information to gain multiple perspectives. Data triangulation can increase the validity of a study (Patton, 2002; Yin, 2016) by seeking information from (at least) three different kinds of sources. The converging lines of information from these sources shows that the findings have been correctly represented. Therefore, this study interviewed relevant individuals from the government, NGOs, and business customers to corroborate the case study findings. Furthermore, this study analysed relevant documentation and archival records acquired from research participants and credible online sources.

The insights from these supplementary interviews support the identified barriers, resources, and sustainability capabilities from the five case studies, as shown in Table 5.8. Nevertheless, the additional interviews could not corroborate the IS affordances and the result of sustainability capability application, since IS affordances arise from the use of IS by manufacturers and suppliers. Similarly, the result of a combined application of sustainability capability is experienced by the manufacturers and suppliers. Hence, the participants from the government, NGOs, and customers were unable to corroborate these aspects of the findings.

Table 5.8. Triangulation from Interviews with Participants from the Government, NGOs, and Customers

| ELEMENT | GOVERNMENT | NGO | CUSTOMER |
|---|---|---|---|
| *Barrier* | | | |
| 1. Financial constraint | ✓ | ✓ | - |
| 2. Absence of regulation, incentive, and enforcement from the government | ✓ | ✓ | ✓ |
| 3. The economic-focused mindset | ✓ | ✓ | - |
| 4. Difficulty in detecting and addressing social issues | ✓ | ✓ | - |
| 5. Lack of long-term commitment | ✓ | - | - |
| *Resource* | | | |
| 1. IS operational skills | ✓ | ✓ | ✓ |
| 2. Willingness to share data | - | ✓ | - |
| 3. Consistency | ✓ | - | ✓ |
| 4. Leadership commitment and support | ✓ | ✓ | ✓ |

| ELEMENT | GOVERNMENT | NGO | CUSTOMER |
|---|:---:|:---:|:---:|
| 5. Trust between stakeholders | ✓ | - | ✓ |
| 6. Appropriate structure | ✓ | - | - |
| 7. Sustainability driven policy and practice | ✓ | ✓ | ✓ |
| *Sustainability Capability* | | | |
| 1. Sustainability data collection | ✓ | ✓ | ✓ |
| 2. Sustainability reporting | ✓ | ✓ | ✓ |
| 3. Sustainability human capital development | ✓ | ✓ | ✓ |
| 4. Sustainability benchmarking | ✓ | ✓ | ✓ |
| 5. Sustainability risk management | ✓ | ✓ | ✓ |
| 6. Sustainability governance | ✓ | ✓ | ✓ |
| 7. Sustainability collaboration | ✓ | ✓ | ✓ |

## 5.4.1 Government

In the past ten years, Indonesia has made tremendous progress in developing regulations and policies to address environmental degradation caused by industrial activities. Some of these regulations are shown in Table 5.9. The regulations cover various domains of supply chains (e.g., sourcing, production, labelling, and waste management). Hence, these regulations are developed by several ministries.

Table 5.9. Sustainability-related Regulations in Indonesia (Santosa, 2018)

| Domain | Regulator | Regulation | About |
|---|---|---|---|
| Sourcing | Ministry of Agriculture | Ministry Regulation No. 11/2015 | Indonesian Sustainable Palm Oil Requirement for Palm oil-based industries |
| Sourcing | Ministry of Trade | Ministry Regulation No. 64/2012 | The obligation of timber legality verification system on wood-based products |
| Production Process | Ministry of Industry | Law No. 3/2014 | The green industry standard |
| Incentive | Ministry of Industry | Government Regulation No. 2/2017 | The green industry standard |
| Production Process and Waste Processing | Ministry of Environment and Forestry | Ministry Regulation No. 3/2014 | PROPER |
| Production Label | Ministry of Environment and Forestry | Ministry Regulation No. 2/2014 | Eco-label implementation |

In September 2009, Indonesia signed the Manila Declaration on Green Industry in the Philippines (ABC-CBN, 2009). In this declaration, Indonesia expressed a determination

to establish policies, regulations, and institutional frameworks that promote a shift towards an efficient and low carbon industry, known as the green industry. The green industry is an industry that prioritises efficiency and effectiveness in the sustainable use of resources in production processes. It aims to align industrial development with environmental conservation to benefit society (K. P. R. Indonesia, 2019).

Since then, various programs have been developed to support the realisation of the green industry, including the development of the green industry standard and the provision of incentives for organisations who meet the standards through green industry awards. The green industry awards have been held since 2010 (Industri, 2019). It aims to encourage organisations to improve the quality of environmental management, social responsibility, and community development. Currently, participation is voluntary and available for all organisations operating in Indonesia (K. P. R. Indonesia, 2019).

Similarly, the Ministry of Environment and Forestry has a mechanism to evaluate the environmental performance of companies operating in Indonesia through its ranking system called PROPER. PROPER assesses companies' performance in managing air, water, and hazardous and toxic pollutants produced in their activities. The rankings are represented in five colours: black, red, blue, green, and gold. Black, the lowest ranking, is assigned to a company who is deliberately committing an act or negligence resulting in pollution or environmental damage. Red indicates that a company has reported its practices but still has some issues and is working towards solving them. Blue shows compliance with regulation and standards. Green level company has begun converting waste to a resource (e.g., processing used water and use it for another purpose) and conducted community development to a certain level. Gold, the highest level, is warranted to a company who consistently perform environmental excellence, ethical business, and responsibility to the community (Kehutanan, 2018). In 2018, 1629 companies were deemed compliant to the PROPER standard. Compared to 26 million companies in Indonesia (Statistik, 2016), only 6.2% of the companies have established compliant environmental management.

There seem to be overlapping initiatives between the green industry program by the Ministry of Industry and PROPER by the Ministry of Environment and Forestry. There are three assessment criteria in green industry award: production process (which account 70% of the assessment), waste/emission management performance (20%), and company management (10%) (K. P. R. Indonesia, 2019). In addition, PROPER focuses on

evaluating waste/emission management with additional community development criteria for the green and gold ranks (Kehutanan, 2018). Environmental management is central to both programs that are voluntary and open to all organisations operating in Indonesia. These overlapping initiatives indicate lack of synergy among government agencies as echoed by the Head of Research and Development Directorate of the Ministry of Agriculture. She revealed that the Indonesian government agencies are infamous for their reluctance to share information and resources among themselves, as it arguably is seen as control loss.

> *"Sinergy and harmonisation between government agencies, communities, and businesses are still weak. The egocentrism of each agency is impenetrable. This problem has hindered the [sustainability] development in Indonesia because each agency has limited resources. We need to build stronger collaboration inter-agencies so that we can share resources and make a bigger impact."* (Head of Research and Development Directorate, The Ministry of Agriculture).

Closer inspection of the initiatives by the government shows that the social issues seem to receive less attention. In PROPER, the social aspect is realised in community development metric that is only applicable to companies who intend to achieve green and gold ranks (both levels are beyond compliance). Similarly, the green industry policy includes five parts. Three of them are related to environmental dimensions such as energy efficiency, resources efficiency, and other environmental issues. The rest is social metrics such as community development and employee's health and safety measures. Approaches taken by both ministries suggest that the social dimension is not a priority compared to the ecological aspect.

Moreover, there is a lack of specific and effective regulations. For instance, there is a deficiency of a nationwide mechanism to effectively dump, collect, and separate waste. This absence of policy makes it difficult to implement large scale recycling effort since stable sourcing is not guaranteed. Furthermore, there is also a scarcity of incentive to process waste into energy due to the low price of energy in Indonesia.

In summary, interviews with ten government officials triangulate most of the findings of the five case studies. The results corroborate "financial constraint", "lack of regulation, incentive, and enforcement from the government", "the economic-focused mindset", "difficulty in detecting and addressing social issues", and "lack of long-term

commitment" as the barriers in sustainability transformation. Moreover, the findings also support most of the resources that emerged from the case studies such as "IS operational skill", "consistency", "leadership commitment and support", and "trust between stakeholders". However, there is no evidence found for "the willingness to share data" as a key resource in enabling the transition. Finally, the insights also validate all sustainability capabilities identified previously. Complete excerpts can be seen in Appendix F.

## 5.4.2   NGO

NGO is "any non-profit, voluntary citizens' group which is organized on a local, national or international level" (NGO, 2020, p. 1). It conducts various social and humanitarian functions. Some may focus on specialised areas such as poverty alleviation, environment, promoting citizen participation, or human rights. NGOs have dual roles in advancing sustainability transformation in Indonesian food supply chains.

First, NGOs as the advocacy for environmental degradation and social injustice in supply chains. Data analysis revealed that in the Indonesian food industry, the transformation towards sustainability proceeds slowly. Public's attention was ignited by NGOs' campaigns about environmental degradation caused by the food industry such as deforestation and loss of biodiversity. Figure 5.8 shows a campaign by an NGO against two food manufacturers regarding alleged deforestation in their supply chains. As a result, individual and organisational customers have become more vigilant about the ecological and societal effects of a company's operations. They put pressure, especially on the manufacturers, to engage in more environmentally and socially responsible practices, including taking responsibilities for their suppliers' actions.

Second, NGOs serve as the subject-matter expert or facilitator for capacity development in business players. NGOs can provide technical assistance and enable capacity development, especially for SMEs or marginally represented groups. NGOs in this study conduct trainings in environment conservation, sustainable practices, IS usage skill, and financial literacy. Figure 5.9 shows the training being held by an NGO in one of the suppliers' plantations.

Figure 5.8. Campaign Against Some Food Manufacturers by an NGO (Retrieved from: https://www.change.org/p/demand-that-nestleusa-and-marsglobal-protect-aceh-s-peatlands-from-palm-oil-companies-crimes )



Figure 5.9. Training about Sustainable Practices by an NGO Involved in This Study

Interviews with four participants from three NGOs confirm most of the insights that emerged from the five case studies. The results corroborate "financial constraint", "lack of regulation, incentive, and enforcement from the government", "the economic-focused mindset", and "difficulty in detecting and addressing social issues" as the barriers in sustainability transformation. Moreover, the findings also support most of the resources that emerged from the case studies such as "IS operational skill", "willingness to share data", "leadership commitment and support", and "sustainability driven policy and practice". Finally, the findings also corroborate all sustainability capabilities identified previously. However, there is no evidence found for "lack of long-term commitment" as

a barrier. Similarly, "trust between stakeholders", "appropriate structure", and "consistency" did not emerge from the interviews as the key resources in enabling the transition. Complete excerpts can be seen in Appendix G.

### 5.4.3  Customer

There are two kinds of customers of manufacturers: business customers and individual customers. There is pressure from the business customers to conduct sustainable practices within Indonesian companies and supply chains. Meanwhile, the individual Indonesian customers still prefer cheap products over sustainable products, although showing potential support towards the latter.

Strong demand comes from business customers, especially from Europe. Currently, European Union voted to phase out unsustainable palm oil-based biofuel by 2020 despite objection from Indonesia and Malaysia, which together supply 85% of the world's palm oil (Neslen, 2017). The European Parliament cited the massive environmental impacts of palm oil planting and processing (e.g., deforestation and emission from its processing). Although the restriction applies to the use of palm oil as a biofuel, by citing environmental concerns as the reason, there is an indication for banning a wider range of unsustainable palm oil-based products. An initial instance is Iceland, a major UK retailer, who ban palm oil from all of its own-brand foods (Smithers, 2018). This is echoed by Supply Chain Division Director from Manufacturer A that reported that customers demand, especially from developed countries, drives the sustainability transformation in the company.

> *"There is a growing aspiration from our customers, especially from developed countries. They do not want genetically modified products or unsustainable products."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Meanwhile, the awareness of sustainability in individual Indonesian customers is growing. A survey by Aurora and Suhirman (2015) on Indonesian's perception of sustainable palm oil reported that urban consumers recognised the environmental degradation, but mainly those confined within the city they live in. They were not aware of environmental and social issues in other regions as they were not directly affected. They viewed that addressing those issues was the responsibility of the government, plantation companies, and food manufacturers. It was difficult to shift their behaviour towards choosing sustainable palm oil due to high dependence on the current palm oil-

based products and lack of other options. However, when presented with an explanation about sustainable palm oil and the role of consumers, their support towards sustainable products almost doubled from 9% to 16%. Nearly all participants were willing to purchase sustainable palm oil products if the price was lower or similar. 27% was ready to pay a little more expensive or on par with 7.9 million people. This study shows there is an encouraging opportunity to increase awareness and preference for sustainable products.

This study only interviewed participants from business customers due to limited fund and time. The results from interviews with four respondents from two business customers moderately align with some insights that emerged from the five case studies. The results only corroborate "the economic-focused mindset" as a barrier in sustainability transformation. Conversely, the findings support most of the resources that emerged from the case studies such as "IS operational skill", "consistency", "leadership commitment and support", "trust between stakeholders" and "sustainability driven policy and practice" while rescinding "willingness to share data" and "appropriate structure". Likewise, the results confirm all sustainability capabilities that emerged previously. Complete excerpts can be seen in Appendix H.

## 5.5    Summary

This chapter has presented the examination results of the current state of sustainability transformation in Indonesia in general and in the food industry in particular. The dynamics of sustainability implementation in five manufacturers and their suppliers were also examined. The insights from these five case studies were triangulated with the interviews with the government, NGOs, and customers. The next chapter analyses insights across the cases to address the sub-questions of this study.

# CHAPTER 6: CROSS-CASE ANALYSIS

## 6.1 Introduction

The previous chapter describes the sustainability transformation in five food manufacturers and their suppliers. Insights from seven government agencies and three NGOs were included to provide the socio-political context that influences the sustainability transformation and validate the insights from the case studies. This chapter explains the cross analysis conducted on the case studies to address the following sub-questions:

1. What are the primary stakeholders' goals and barriers in transforming food supply chains towards becoming sustainable entities?
2. What IS affordances are relevant for supporting the achievement of the sustainability goals of the primary stakeholders?
3. What resources are affecting the actualisation of the IS affordances
4. What are the outcomes of IS affordances actualisation?
5. What dynamic capabilities are required in supporting sustainability transformation?
6. What is the process of IS-enabled sustainability transformation?

First, six primary stakeholders involved in supporting sustainability transformation within food supply chains are identified, i.e., manufacturers, suppliers, the government, NGOs, customers, and cooperatives. Data analysis was carried out to understand their goals for conducting sustainability transformation and the associated barriers. The goals direct the interaction between actors and IS. Then, this interaction has given rise to a set of affordances. Data analysis also revealed individual, organisational, and ecosystem resources influencing the affordance actualisation. The narrative that follows describes how the actualisation of these affordances contributes to develop or enhance seven sustainability capabilities. The combined application of these capabilities forms four dynamic sustainability capabilities. These dynamic sustainability capabilities help to smooth transformation towards achieving sustainability goals and managing associated barriers.

## 6.2 Primary Stakeholders' Goals and Barriers

This subsection addresses the sub-question one, **What are the primary stakeholders' goals and barriers in transforming food supply chains towards becoming sustainable entities?**, by first identifying the primary stakeholders in supporting sustainability transformation within food supply chains, i.e., manufacturers, suppliers, government, NGO, customer, and cooperative. Furthermore, this study identified seven sustainability goals from the interviews with the stakeholders. Additionally, data analysis revealed five main barriers in conducting sustainability transformation.

In the context of this study, the primary stakeholder is the party who can significantly enables sustainability transformation in food supply chains. From the description of case studies discussed in the Chapter 5 and summarised in Table 6.1 below, it is evident that manufacturers and suppliers are the drivers of sustainability transformation in food supply chains. Additionally, majority of the case studies corroborate the important roles that customer, government, NGO, and cooperatives play in supporting sustainability transformation in manufacturers and their suppliers.

Table 6.1. The Other Primary Stakeholders Identification

| Stakeholder | Case Study | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| Government | ✓ | ✓ | ✓ | ✓ | ✓ |
| NGO | ✓ | ✓ | ✓ | ✓ | - |
| Customer | ✓ | ✓ | ✓ | - | - |
| Community | - | - | - | ✓ | - |
| Industry Association | - | - | - | - | ✓ |
| Cooperative | ✓ | ✓ | ✓ | - | - |

It is important for manufacturers and suppliers to collaborate with these parties to gain and reconfigure resources among the involved organisations and resolve current and future misunderstandings. Manufacturers, suppliers, and the other primary stakeholders have varying values, beliefs, and demands that could affect the management of a business. The leading group, who have shown a superior environmental and social performances, have an excellent relationship with NGOs, the government, customers, and cooperatives. They have significant impacts on norms, practices, and performance of food supply chains. Hence, firms should manage their relationship with the other primary stakeholders effectively.

As shown in Table 6.1, only case studies 4 and 5 show evidence on the role of communities and industry associations, respectively, in supporting sustainability transformation in the manufacturer-supplier dyads. Communities mainly act as the beneficiaries of CSR programs from the manufacturers. This study observed that they are not actively involved in sustainability transformation. A similar pattern was also observed regarding the role of industry associations. Only one interviewee cited the role of industry associations as the intermediary between the government and their members. Hence, communities and industry associations are not classified as the primary stakeholders in sustainability transformation in food supply chains.

Building on this finding, this study then examined the primary stakeholders' goals in enacting sustainability transformation. This analysis aims to align their interests and conceptualise sustainability goals that meet the stakeholders' requirements. The analysis shows that the stakeholders have various sustainability goals, which can be grouped into the following seven primary sustainability goals:

[1] To gain financial gains such as business growth and reduced costs.

[2] To reduce the environmental impact of supply chain activities

[3] To maintain and improve consumer health and well being

[4] To ensure and enhance employee safety, health, and welfare

[5] To develop the community in which the organisations operate in

[6] To improve the sustainability performance of the suppliers

[7] To educate broader individual customers to choose sustainable products

The classification process from individual stakeholder's goal into the primary goals can be seen in Table 6.2.

Table 6.2. The Classification of Stakeholder's Goals

| Stakeholder | Goals for engaging in sustainable practice | Related Primary Goal number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Manufacturer | Reducing costs | ✓ | | | | | | |
| | Reducing the negative impact of business activities on the environment | | ✓ | | | | | |
| | Reducing the negative impact of business activities on the communities | | | | | ✓ | | |

| Stakeholder | Goals for engaging in sustainable practice | Related Primary Goal number | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | Health, safety, and welfare of its employees | | | | ✓ | | | |
| Supplier | Business growth | ✓ | | | | | | |
| | Reducing the negative impact of business activities on the environment and society | | ✓ | | | ✓ | | |
| Individual customer | Low price and high-quality products | ✓ | | | | | | |
| | Nutritious and safe products | | | ✓ | | | | |
| Business customer | Certified sustainable products and process | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| Government | Compliance to rules | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| NGO | No destruction to the environment | | ✓ | | | | | |
| | Not causing social problems and address the existing problems | | | ✓ | ✓ | ✓ | ✓ | |
| Cooperative | For its members to grow economically, environmentally, and socially. | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |

Data analysis further reveals various obstacles that the stakeholders experience in achieving their sustainability goals. At the same time, some of these barriers are caused by some of the stakeholders. These obstacles are categorised into four main barriers below, as shown in Table 6.3. Identifying the barriers is valuable to smooth transition towards becoming a sustainable entity. It guides organisations to develop a targeted approach in overcoming the barriers and formulate relevant strategy, especially those supported by IS.

[1] Financial constraint

[2] Absence of appropriate regulation, incentive, and enforcement from the government

[3] Economic-focused mindset,

[4] Difficulty in detecting and addressing social issues.

[5] Lack of long-term commitment to conduct sustainable practices use IS

Table 6.3. Barriers to Sustainability Transformation Identified from the Primary Stakeholders

| Barrier | Manufacturer | Supplier | Government | NGO | Customer |
|---|---|---|---|---|---|
| 1. Financial constraint | ✓ | ✓ | ✓ | ✓ | - |
| 2. Absence of appropriate regulation, incentive, and enforcement from the government | ✓ | ✓ | ✓ | ✓ | - |
| 3. Economic-focused mindset | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4. Difficulty in detecting and addressing social issues | ✓ | ✓ | ✓ | ✓ | - |
| 5. Lack of long-term commitment to conduct sustainable practices use IS | ✓ | ✓ | ✓ | - | - |

## 1. Financial constraint

Insights from the manufacturers, suppliers, the government, and NGO show support for this barrier. The stakeholders require specific resources to smooth sustainability transformation across supply chains. The resources can be tangible or intangible. Tangible resources include fund, labour, and infrastructure such as trucks, road, cold chain, internet connection etc. Intangible resources include data, information, knowledge, and expertise. The manufacturers and, in a greater level, suppliers lack funds and expertise in conducting sustainable practices, which has a detrimental effect on their willingness and lagging state of sustainability transformation.

## 2. The absence of proper incentive, regulation, and enforcement from the government

The absence of proper incentive, regulation, and enforcement from the government limits sustainability transformation in the food supply chain, as noted by participants from the manufacturers, suppliers, the government, and NGO. Business players need a strong

incentive to implement sustainability principles since it requires considerable efforts and costs. Furthermore, there is also impeding regulation, such as the requirement for paper-based transactions instead of electronic-based transactions. Although the government has shown a growing interest in creating regulation to guide businesses to engage in sustainable practices through PROPER and the green industry initiative, most interviewees in this study remarked that the enforcement of these regulations is insubstantial.

### 3. The economic-focused mindset.

Participants from the manufacturers, suppliers, the government, NGOs, and customers indicated the economic-focused mindset as one of the main inhibitors of sustainability transformation. The suppliers still prefer low-cost approach even when it is unsustainable. Individual customers seek cheap products over sustainable products. Customers demand for sustainability proof, but reluctant to share responsibility. The sole focus on the economic aspect such as selecting low costs products and process even at the environment and society expenses has originally caused environmental degradation and society harms in the pursuit of profit maximisation.

### 4. Difficulty in detecting and addressing social issues

Participants from the manufacturers, suppliers, the government, and NGOs expressed that it is more difficult to detect and solve social issues than environmental issues. Sustainability is complex and multilayered in nature. It includes multiple objectives and metrics. Unlike ecological impacts that can be quantified through various methods such as life carbon footprint calculation and life cycle analysis, social impact is significantly harder to detect and measure.

### 5. Lack of long-term commitment to conduct sustainable practices and use IS.

Lack of long-term commitment to conduct sustainable practices and to use IS is found as one factor hindering the IS affordance actualisation process and sustainable practices as reported by participants from the manufacturers, suppliers, and the government. The users may want to use the IS at first, but maintaining consistency in using IT to complete the transformation has been a challenge.

## 6.3    IS Affordances

This study addresses sub-question two ("***What are the IS affordances that support sustainability transformation?***") by identifying nine IS affordances. There are nine identified affordances: reflective disclosure, information democratisation, delocalisation, output management, collective learning facilitation, active performance assessment, transaction facilitation, creditworthiness assessment, and non-compliance & threat exposal. These IS affordances align with the sustainability goals and arise from certain IS material properties.

Affordance is defined as the potential for actions arising from the relation between an artefact and sustainability goal-oriented actor(s) (Jones, 2003). In this study, the artefacts are ERP and the traceability system used in the sustainability transformation. The actors are individuals and organisations undertaking professional tasks in the food supply chain. The study findings indicate nine affordances actualised in the interaction between the actors and IS. Majority of the case studies support the identification of all affordances as presented in Table 6.4.

Table 6.4. The Source Case Studies for Each Affordance

| Affordances | Case Study | | | | |
|---|---|---|---|---|---|
| | **1** | **2** | **3** | **4** | **5** |
| 1.  Reflective disclosure | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2.  Information democratisation | ✓ | ✓ | ✓ | ✓ | - |
| 3.  Delocalisation | - | ✓ | ✓ | ✓ | ✓ |
| 4.  Output Management | ✓ | ✓ | ✓ | ✓ | ✓ |
| 5.  Collective Learning Facilitation | ✓ | ✓ | ✓ | - | ✓ |
| 6.  Active performance assessment | ✓ | ✓ | ✓ | ✓ | - |
| 7.  Transaction facilitation | ✓ | ✓ | ✓ | - | - |
| 8.  Creditworthiness assessment | ✓ | ✓ | ✓ | - | - |
| 9.  Non-compliance    and    threat exposal | ✓ | ✓ | ✓ | - | - |

These affordances are crucial in understanding how the use of IS results in an organisational and inter-organisational change as they contribute to the achievement specific sustainability goals. Some affordances (e.g., reflective disclosure and information democratisation) support the fulfilment of all sustainability goals, while others assist specific goals, as shown by Table 6.5. In this table, the goal number corresponds to the order of sustainability goals identified before.

Table 6.5. How Affordances Contribute to Achieving Specific Sustainability Goal(s)

| Affordance | Goal Number | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. Reflective disclosure | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. Information democratisation | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3. Delocalisation | ✓ | ✓ | - | - | - | - | - |
| 4. Output management | ✓ | ✓ | - | - | - | - | - |
| 5. Collective learning facilitation | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 6. Active performance Assessment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 7. Transaction facilitation | ✓ | - | - | - | - | ✓ | - |
| 8. Creditworthiness assessment | ✓ | - | - | - | - | ✓ | - |
| 9. Non-compliance and threat exposal | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | - |

This study separates the identification of affordance and its actualisation. Hence it identified the related material properties from which each affordance arises, the specific action needed to actualise the affordance, and the immediate concrete outcome. These aspects are shown in Table 6.6.

Table 6.6. Affordances with Originating IS Material Properties and Actualisation Process

| Affordance | IS Material Property | Action Needed to Actualise the Affordance | Immediate Concrete Outcome |
|---|---|---|---|
| 1. Reflective Disclosure | Data collecting, monitoring, analysis, and presentation features | Individuals record and store all appropriate data | Enables presentation of current sustainability performance based on data |
| 2. Information democratisation | Interaction features | Individuals retrieve and analyse data and then communicate the information within and between organisations | Enables dissemination and utilisation of information |
| 3. Delocalisation | Interaction features especially, digitisation, file sharing and communication tools | Individuals digitise data and business process and access them regardless of location | Enables sustainable practices to become location-independent |
| 4. Output management | Configuration and controlling features | Individuals follow standards for resources consumption and waste reduction | Allows for work practices to be bound by standards and rules |

| Affordance | IS Material Property | Action Needed to Actualise the Affordance | Immediate Concrete Outcome |
|---|---|---|---|
| 5. Collective learning facilitation | Analysis, file sharing, and interaction features | Individuals use IS to store and disseminate training materials, facilitate discussions, and record training history | Allows for creation, distribution, and sharing of knowledge |
| 6. Active performance assessment | Analysis and presentation features | Individuals check IS for the compatibility of tasks and objectives, and take actions to ensure smooth operation | Enables early detection of low performance as well as recognition of accomplishment |
| 7. Transaction facilitation | Controlling and payment features | Individuals scan the ID card of the seller and record the transaction data | Enables automation and data collection of transactions |
| 8. Creditworthiness assessment | Analysis and presentation features | Individuals check IS and simulate profit and loss | Allows for profit and loss projection |
| 9. Non-compliance & threat exposal | Analysis, monitoring, and presentation features | Individuals check the IS' alerts and recommendation | Enables revelation of misconduct and possible issues. |

- **Reflective Disclosure**

Reflective disclosure affordance enables "the reconsideration of belief formation" and "outcome assessment related to work practices" (Seidel et al., 2013, p. 1282). Further analysis showed that this affordance is triggered by identification, evaluation, and prioritisation of risks related to economic, environmental, ethical, and social aspects supported by IS. This affordance arises from data collecting, monitoring, analysis, and presentation features of IS. To actualise it, individuals record and store all appropriate data by using these features, resulting in the presentation of current sustainability performance based on data.

This affordance contributes to the achievement of all identified sustainability goals, since it allows for the identification, evaluation, and prioritisation of risks related to the economic, environmental, and social aspect. All manufacturers involved in this study stated that their sustainability transformation was triggered by the identification of risks of conducting unsustainable practices. This risk links to reputational risks, which potentially may damage the organisation's financial performance.

To mitigate these risks, it is observed that the participating manufacturers use IS to examine the organisation's current work practices, assumptions, and outcomes by capturing various data. The organisations utilise the data and then analyse them to seek and assess alternative actions to achieve sustainability goals. The use of IS has presented them with a list of alternatives to achieve sustainability goals.

- **Information Democratisation**

Information democratisation "enable dissemination and interaction about sustainability-related information from both internal and external sources" (Seidel et al., 2013, p. 1282). It allows for discussion and knowledge generation and sharing among stakeholders, which eventually resulted in transparency. Via the use of interaction features such as messaging and discussion tools, individuals retrieve and analyse data and then communicate the information within and between organisations yielding in dissemination and utilisation of information.

This affordance contributes to the achievement of all seven sustainability goals since it enables discussion and knowledge generation and sharing among stakeholders that allow for transparency. In this study, all participating organisations expressed that transparency is crucial in achieving sustainability goals. In the participating organisations, IS enable instant communication among actors; for instance, manufacturers use IS to interact with NGOs and their suppliers regarding alleged irresponsible practices conducted in suppliers' site. IS also act as a knowledge centre where training materials and sustainability-related knowledge are stored for the suppliers' capacity development purpose.

- **Delocalisation**

Delocalisation affordance provides the possibility to eliminate the dependency of work practices to a specific location through digitisation of artefacts and work practices (Seidel et al., 2013). By using interaction features such as digitisation, file sharing, and communication tools, individuals digitise data and business process and then access them regardless of location. It can enable all sustainable practices to be carried out regardless of location, thus the emission waste as an impact of travelling is reduced. For instance, the traceability system is available in mobile and desktop versions. It provides access to data whenever it is needed, which leads to the improvement of timely information visibility across the supply chain.

The finding of this study revealed that this affordance contributes to reducing the impact of supply chain activities on the environment. This affordance also supports the achievement of all other goals indirectly. By allowing the independency of work practices to a specific location, delocalisation affordance significantly helps to decrease or eliminate the need to travel, which leads to lower air waste emission and fuel consumption. Furthermore, it can also enable all sustainable practices to be carried out anywhere anytime.

Delocalisation affordance contributes to reducing resource consumption and decreasing the digital divide. Previously, employees in some manufacturers print some documents so they can read them while travelling. IS has allowed employees to access relevant information and conduct work practices even when they are stuck in the traffic. As a result, delocalisation affordance has reduced paper consumption. This affordance also increases the possibility of inclusion of any parties who otherwise are excluded due to their location, such as suppliers in remote and hard to reach areas. This affordance can be actualised by using a mobile phone and making relevant IS mobile-friendly.

- Output Management

IS provides output management affordance which governs work processes and resource allocation as well as calculating and reducing the harmful impact of work practices. Individuals use configuration and controlling features to follow standards for resources consumption and waste reduction. When actualised, this affordance allows for work practices to be bound by standards and rules that contribute to reducing the effects of business activities on the environment.

This affordance contributes to minimising the effects of business activities on the environment and gaining financial gains through costs savings. All manufacturers in this study utilise IS to govern their resource consumption and waste production. For instance, Manufacturer A governs water usage in their factories and waste produced in their operational activities. The IT Division in Manufacturer C uses IS to capture data about the resource consumption and waste of the IT infrastructure. Furthermore, Manufacturer C advocates for the digitisation of data and activities to reduce paper consumption.

- **Collective Learning Facilitation**

This affordance provides the possibility to assist collective learning within and beyond an organisational boundary. The findings reveal that by using analysis and interaction features such as file sharing, forum, and wiki, individuals store and disseminate training materials, facilitate discussions, and record training history of all employees. When actualised, this affordance allows for the creation, distribution, and sharing of knowledge.

The findings show that this affordance contributes to the achievement of all identified sustainability goals. All participants of this study agreed that collective learning is a precondition of all sustainable practice since it enables employees to better conduct sustainable practices through skill development and awareness creation. The case organisations use IS to conduct a training need analysis for each employee to uncover the gap between current skills and desired skills. Furthermore, IS also store various kinds of documentation and information. Employees and suppliers can access that knowledge repository and learn from it.

- **Active Performance Assessment**

This affordance allows for real-time and ad-hoc performance evaluation. By using standards embedded in comparison and presentation features, individuals check IS for the compatibility of tasks and objectives and take actions to ensure smooth operation and completion of sustainable practices. When actualised, this affordance enables early detection of low performance as well as recognition of accomplishment.

This affordance supports the fulfilment of all identified sustainability goals. IS are playing an essential role in recognising whether the organisation is making progress towards achieving sustainability goals and suggesting future avenues for improvement. In the inter-organisational context, data analysis confirmed that one of the problems in achieving sustainability in a food supply chain is the low productivity of SME suppliers. IS provide action possibilities to address this problem through traceability system. The traceability system includes sustainability-related metrics and compares the performance of these suppliers to these metrics. It shows these data through a dashboard that conveniently summarise complex data into simple graphs and charts. This affordance serves as the basis for recommending improvement. It also streamlines the implementation process with the established goals. Moreover, it supports checking the compliance to the environment or social related rules and standards.

- **Transaction Facilitation**

IS enable transaction through traceability system. The traceability system facilitates trading via authentication tool and payment features. For each transaction, the farmer's identity is verified through scanning their QR code embedded card. Then, other relevant information such as the amount and quality of the crops are recorded in the system. This affordance, when actualised, enables automation and data collection of transactions which contributes to eliminating intermediaries in a supply chain.

Actualising this affordance contributes to eliminating intermediaries in a supply chain which leads to better income for the suppliers. Therefore, it helps to improve suppliers' sustainability performance. Suppliers can conduct a transaction via the system. Whenever a supplier sells their crops, their card, which displayed a QR code, is scanned to identify their identity. Then, the relevant data of the crops are collected. The data are stored and archived for future and further processing. Suppliers can access their profile, and their transaction details and manufacturers can track their purchases.

- **Creditworthiness Assessment**

This affordance allows for creditworthiness analysis of an organisation. Individuals use analysis and presentation features to appraise an organisation's asset and productivity and then simulate profit and loss. When actualised, this affordance enables profit and loss projection which affect decision making towards financing that particular supplier.

This affordance is most relevant to improving the sustainability performance of suppliers. Gaining the suppliers' cooperation is challenging. It requires a lot of visitation and communication. The suppliers attributed their reluctance due to the costs necessary for conducting sustainable practices and the lack of perceived benefits for them in implementing sustainability. Further analysis revealed that small suppliers are easier to be motivated to change their practices when they can see the gains from sustainable practices.

The team is addressing this concern by first showing the benefits of implementing sustainability for them by using analysis and presentation features of IS. Since the traceability system records the profile of the farmers and their transaction, this data can be analysed for profit projection of conducting sustainable practices and evaluating the creditworthiness of a specific supplier. A supplier can bring the simulation provided by

the system to a bank to apply for a loan. Hence, IS provides creditworthiness affordance that contributes to the improvement of suppliers' sustainability performance.

- Non-compliance and Threat Exposal

This affordance provides the possibility of disclosing misconduct and possible issues. Individuals check the alerts and recommendation provided by the analysis, monitoring, and presentation features and then take necessary actions. When realised, this affordance enables revelation and mitigation of misconduct and possible threat.

Similarly, this affordance contributes to the improvement of suppliers' sustainability performance. By preventing non-compliance and fraud, the suppliers are encouraged to enhance their sustainability performance.

## 6.4    Resources Enabling IS Affordance Actualisation

The third sub-question is ("***What are the resources affecting the actualisation of the IS affordances?***"). This study addresses this question by identifying individual, organisational, and ecosystem resources enabling sustainability transformation in manufacturers and suppliers.

This study observed that to achieve the intended outcome, affordance actualisation is not fully explainable through alignment of the affordance to the sustainability goals and material properties of the IS alone. The IS affordance actualisation is enabled by certain individual, organisational, and ecosystem resources pertinent in the participating manufacturers and suppliers. Resources can be tangible or intangible. Tangible resources include hardware and software, fund, and people. While these resources are mandatory, this study focuses on identifying intangible resources since they are imperfectly imitable and non-substitutable which is crucial in building differentiation that leads to competitive advantage (Barney and Clark 2007; Barney 1991). Furthermore, organisational, social, and political settings in which affordance is perceived may affect the actualisation process. Thus, it is vital to examine various individual and organisational resources utilised in affordance actualisation. The summary of these resources and the evidence for the case studies is shown in Table 6.7.

Table 6.7. Resources Enabling Affordance Actualisation

| Resource Enabling Affordance Actualisation | Case Study | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| **A. Individual** | | | | | |
| 1. IS operational skill | ✓ | - | - | ✓ | ✓ |
| 2. Willingness to share data | ✓ | ✓ | ✓ | - | - |
| 3. Consistency in using the IS | - | - | - | ✓ | ✓ |
| **B. Organisational** | | | | | |
| 1. Leadership commitment and support | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. Trust between organisational partners | - | ✓ | ✓ | ✓ | - |
| 3. Sustainability-driven policy and practices | ✓ | ✓ | ✓ | ✓ | ✓ |
| 4. Proper organisational structure | ✓ | ✓ | ✓ | ✓ | - |
| **C. Ecosystem** | | | | | |
| 1. Regulation, incentive, and enforcement from the government | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. Advocacy and capacity development from NGOs | ✓ | ✓ | ✓ | - | ✓ |
| 3. Market provision, and resource and cost sharing from customers | ✓ | ✓ | ✓ | - | ✓ |
| 4. Trading and learning intermediation and social capital provision from cooperatives | ✓ | - | ✓ | - | ✓ |

- **Individual Resources**

This study identified several resources supporting or—when absent—inhibiting affordance actualisation from an individual actor perspective, including (1) IS operational skill, (2) willingness to share data, and (3) consistency in using the IS.

**1. IS operational skill**

Manufacturers A, D, and E indicated that the capability to operate the IS enhances the actualisation of the affordances offered. The skill helps actors to perform the task faster, more efficiently and consistently. Having the IS operational skill also helps to close the knowledge gap between advanced and lagging actors, since the latter have similar access to information and broader opportunities. Accordingly, when an actor lacks the capacity to operate the system, and they do not act upon it, they would be unwilling to process further. Therefore, it is recommended for a user to seek help when facing difficulty in operating IS.

**2. The willingness to share data**

The case studies further show that the willingness to share data is a crucial resource in supporting affordance actualisation provided by IS. Sustainability starts with traceability because it reveals the real condition. Traceability relies on data provision. Thus, the willingness to share data is crucial. Data analysis revealed that one of the inhibitors in traceability is the reluctance to share data. People are afraid to share data with a fear that another party would have taken advantage of them financially. Hence, traceability could not be achieved if people do not want to share their data.

> *"Transparency is key. You need to be transparent to address the issue. If there is any problem, you need the information to address it. The effort in getting connected and transparency to suppliers is the key."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2)

**3. Consistency in using the IS**

Consistency in using IS is found as a supporting resource in the actualisation process. Several participants reported that one issue inhibiting the use of IS to support sustainability transformation is its inconsistent use. They may want to use the IS at first, but maintaining consistency in using IS to complete the process has been a challenge. Hence, consistency to use IS as a valuable resource in materialising IS affordances.

- **Organisational Resources**

The cross-case analysis found that the resources possessed by an organisation in which an actor operates is especially vital in supporting or inhibiting the actualisation process. The organisational resources include leadership commitment and support, trust between stakeholders, sustainability-driven policy and practice, and proper organisational structure.

**1. Leadership commitment and Support**

From all case studies, leadership commitment and support emerged as the primary resource for sustainability transformation and affordance actualisation. Sustainability vision must come from the top management, then internalised into all layers in the organisation, and further extended into its supply chain members. In Indonesian companies, most, if not all, policies are top-down. The top management's support and

commitment do not only ensure the allocation of necessary resources, but also smooth the internalisation process. It drives the creation of appropriate business process and ensures the required actions to actualise the IS affordances are implemented. It secures the necessary development program to develop skills in actualising the affordances and safeguard the consistency of IS usage.

> *"Our management made it very clear that sustainability is our priority. Our CEO is the leader of the sustainability plan. He puts the plan on top of the agenda, it starts from him, then it goes down to the department heads, and down to the employees. Each division is requested to contribute to achieving sustainability goals."* (IT Director, Manufacturer C, Case Study 3)

## 2. Trust between stakeholders

Affordances arise from the use of IS to support interaction between organisations in a supply chain. However, the actualisation of this possibility for actions requires more than just interactions. It requires trust between the organisational actors. The results of this study affirm that establishing trust is a crucial component in implementing sustainability across organisations, including in implementing traceability.

Without trust, traceability will be extremely difficult. Data analysis revealed that traceability is a prerequisite for sustainability. Initially, SME suppliers believed that sustainability was a scheme of large corporations to gain more control over their operation. This belief is especially prominent among the anxious middlemen that think the corporations would take the suppliers over and conduct business with them directly. Additionally, there is fear in suppliers that if they reveal their data and practices, they will be cut off. A lot of trust-building through meeting and visitation is held to convince suppliers that traceability is not there to cut them but to help them to be more sustainable.

## 3. Sustainability-driven policy and practice

Data analysis showed that sustainability-driven policy and practice are essential resources in IS-enabled sustainability transformation. Four manufacturers in this study developed a comprehensive and integrated sustainability policy. This policy aims to embed sustainability across all operations. It serves as a solid foundation for the creation and implementation of sustainable practices. It provides guidelines for expected behaviours, forms the basic structure of business operations, and ensures consistent completion of the policy.

The sustainability-driven policy also serves as the operational foundation for IS adoption. The policy launches and sustains IS adoption by defining the roles that IS play in sustainability transformation. Policy conveys what is expected of IS users and direct users' action so that users behave and operate in a collective, coordinated, and acceptable way.

**4. Proper organisational structure**

Based on patterns observed from the leading and advanced groups of manufacturers, it is evident that a certain organisational structure enhances sustainability transformation. Manufacturers A, B, C, and D developed and expanded their sustainability team into a division lead by a senior manager. According to most of the interviewees, this structure is effective, since it ensures the necessary change in work practices is initiated and sustained. In Manufacturer A and C, this division is chaired by its CEO. In Manufacturer B and D, the leader of the Sustainability Division is a part of the board of directors. The fact that this division is led by someone who resides in top management is critical, since it is likely the division needs to present contentious findings, thus be free from inappropriate influences. This structure also provides the division with the necessary authority to conduct a comprehensive evaluation of the organisations and everyone involved in them. Eventually, this structure also means that the division can affect decision making.

- **Ecosystem Resources**

It is observed that sustainability transformation within manufacturer-supplier is also heavily influenced by the organisation's macro social and political context. The majority of informants remarked the importance of collaboration with the key stakeholders to achieve sustainability goals. This study identified the key resources required from the other primary stakeholders (i.e., the government, NGO, customer, and cooperative).

**1. Regulation, incentives, and enforcement from the government**

The findings revealed that the government plays a critical role as the regulator, facilitator, and enforcer in creating a sustainable food supply chain. It establishes the sustainability-related regulations, as shown in Table 5.8. It also provides incentives for sustainability implementation through PROPER and green industry initiatives. Furthermore, the

government should control the sustainability implementation across industry and organisations, since the maturity and compliance of organisations vary.

> *"The government has a big role in sustainability implementation in Indonesia. The government is the regulator, who makes regulations and ensures that it is carried out by companies. They also perform the control function. The maturity of each company is different. Even if [Manufacturer A] is not controlled, we will continue to do so, but maybe other companies will not do it if they are not controlled. The government must ensure that the company does the right thing to ensure food safety from food sold in Indonesia."* (Supply Chain Division Director, Manufacturer A, Case Study 1)

Some informants expect the government to legalise the sustainability reporting to improve transparency. Since sustainability reporting is voluntary, only limited companies that had revealed how they manage the impacts of their activities on the environment and society. Even those who proactively report their sustainability performance, face difficulty to compare progress due to lack of available data from the industry peers. Hence, by making sustainability reporting mandatory, organisations can compare their performance and are exposed to sustainability-related innovation conducted by other firms.

However, the lack of transparency from the government impedes affordance actualisation. The government restricts access to various important information such as data of land ownership and land use permit, which has caused numerous land conflicts. This issue is especially relevant for the food industry who relies on lands for raw material production. Findings show that this lack of data availability poses a challenge for IS affordance actualisation.

2. **Advocacy and capacity development facilitation from NGOs**

The findings revealed that NGOs have monitoring, advocating, and collaborating functions in sustainability transformation. NGOs raise awareness of environmental and social problems as results of organisations activities. They gather complaints and reports from communities about ecological issues. Then, they demand organisations to be responsible for their actions. Their campaign has been effectively pushing customers to require producers to behave more responsibly. Furthermore, NGOs also play a role in educating customers about their rights and their power to force businesses to be more sustainable. This awareness pushes the customers to demand more sustainable products,

which eventually lead to companies to use their resources to implement sustainability, including IS.

Data analysis revealed that as a collaborator, NGOs provides capacity building to small farmers and bridge collaboration between organisations. NGOs conduct training and supervision in terms of IS adoption, sustainable agricultural practice, nutrition, environment, financial literacy, and business practices. It also provides training for banks to recognise the potential of a sustainable farm.

### 3. Market provision, and resource and cost sharing from customers

Customers provide the market and pressure for sustainable products. There is growing aspiration from organisational customers to ensure sustainable practices in producing and transporting the products that they buy. Meanwhile, the awareness regarding sustainability among individual customer in Indonesia is growing. A study by Aurora and Suhirman (2015) showed that individual Indonesian consumers are willing to purchase sustainable products over non-sustainable ones given the price is cheaper or similar. Customers are also a potential collaborator in sustainability transformation. Sustainability efforts and adopting its supporting IS require significant investment. Some participants from manufacturers expect business customers to contribute resources for sustainability efforts such as fund, human resource, infrastructure, and expertise.

### 4. Trading and learning intermediation and social capital provision from cooperatives

This study uncovered one new player in sustainability efforts, i.e., cooperative. Data analysis indicated that cooperatives hold unique roles in enabling sustainability transformation. First, cooperative acts as an intermediary between manufacturers and suppliers. Manufacturers A, B, and C deal with thousands of suppliers. It is not effective and efficient to interact with each of the suppliers, let alone conduct training and other improvement efforts. Hence, the manufacturers include cooperatives in their sustainability effort. Each cooperative can handle hundreds to thousand suppliers.

Cooperatives support learning, assist operational tasks, and provide a loan. Data analysis revealed that cooperatives support learning by providing a permanent infrastructure for training. They can also help with gathering seeds, processing raw materials, and marketing the products while the suppliers can focus on producing. Additionally, cooperative can provide funding for its supplier member with a lower interest rate, so the

suppliers do not need to get funding from loan sharks. This initiative likely incentivises more organisations to conduct sustainable practices.

Second, further analysis indicated that cooperative provides valuable social capital such as local knowledge, cooperation, and trust that arise from shared view, ties, and bonding capital. Indonesian people are familiar with the concept of cooperatives as a form of jointly-owned enterprise that exists to meet their economic, social, and cultural common needs and aspirations. Currently, Indonesia has 126,343 cooperatives across its 34 provinces (Menengah, 2018). Cooperatives are built by the community and democratically owned and managed to serve local needs. Thus, it has strong roots in the community. Since Indonesian people have strong social cohesion and tend to associate and bond with others, when one SME supplier joins a cooperative and shows improvement, other SME suppliers are easier to be persuaded to act accordingly. This social capital provides a valuable advantage in advocating for the transition towards applying sustainable practice within SME suppliers. In summary, cooperatives provide cooperation and structure in the effort to fulfil sustainability standards tailored to local circumstances.

## 6.5 Sustainability Capability as the Outcome of IS Affordance Actualisation

This study answers the sub-question four, **What is the outcome of the IS affordance actualisation?,** by showing that affordance actualisation contributes to the development of seven sustainability capabilities. These capabilities include sustainability data collection, sustainability reporting, sustainability human capital development, sustainability benchmarking, sustainability risk management, sustainability governance, and sustainability collaboration.

Sustainability capability is firm's capacity to effectively coordinate bundles of complex tangible and intangible resources to achieve sustainability goals and to deliver sustainable values to its stakeholders" (Dao et al., 2011, p. 65). These capabilities are developed through the implementation of sustainable practices enabled by IS. Certain factors also affect the development of these essential capabilities. Table 6.8 shows an overview of the essential capabilities and evidence from the case studies.

Table 6.8. Overview of The Essential Capabilities Emerged from Data Analysis

| Sustainability Capability | Outcome of Application | Originating Case Study | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Sustainability Data collection | Understanding of shortcoming of the current approach and enable opportunity identification arises from data and insights | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sustainability Reporting | Effective measurement and internalising an organisation's performance and commitment to sustainability | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sustainability Human capital development | Effective collective learning and improved skills | ✓ | ✓ | ✓ | ✓ | - |
| Sustainability Benchmarking | Effective performance evaluation and comparison | ✓ | ✓ | ✓ | ✓ | ✓ |
| Sustainability Risk management | Early detection and mitigation of risks | ✓ | ✓ | ✓ | ✓ | - |
| Sustainability Governance | Guided assessment against criteria referenced to the outcomes thus likely to lead to organisations achieving the specified sustainability goals. | ✓ | ✓ | ✓ | ✓ | - |
| Sustainability Collaboration | Effective coordination within and beyond a firm | ✓ | ✓ | ✓ | ✓ | - |

Some affordances are fundamental in supporting the development of all essential sustainability capabilities. For instances, the actualisation of "reflective disclosure", "information democratisation" and "delocalisation" affordances provides a solid foundation for developing all sustainability capabilities, since the capabilities depend on the capacity to record, access (reflective disclosure affordance), and share data (information democratisation affordance) preferably without the requirement to be in a specific location (delocalisation affordance). The actualisation of these affordances further provides standardisation of data and processes which ensure all practices are conducted in a safe, consistent, and reliable manner. The other affordances influence the development of specific capabilities, as explained below.

- Sustainability Data Collection

Sustainability data collection is the ability to gather a range of sustainability-related data (Kurnia et al., 2014). This capability is the outcome of the actualisation of the fundamental affordances and "transaction facilitation" affordance. The application of this capability resulted in the understanding of shortcoming of the current approach and

enable opportunity identification arises from data and insights. This capability is crucial because it acts as the basis of other capabilities.

All manufacturers confirmed the criticality of data collection as they all require information on various variables on interest. They stated that by using relevant data, the rate of success is improved as they can make data-driven decisions, which strongly enhances their sustainability transformation.

## • Sustainability Reporting

This study adopted sustainability reporting definition by Kurnia et al. (2014, p. 6) as "an ability that produces reports related to sustainability implementation and its impacts to inform internal and external stakeholders". These capabilities are the outcome of the actualisation of the fundamental affordances and "transaction facilitation" affordance. Although reporting relies on data collection, it is not just merely generating a report from data. For the organisations in this study, it is a way to measure, understand, internalise, and improve an organisation's performance and commitment to sustainability. It can be used as a base to set goals and manage change more effectively. It can also be used to demonstrate an organisation's impact on the economy, society, and environment to the internal and external stakeholders.

In this study, all manufacturers expressed that by reporting their sustainability performance, they can gain internal and external benefits. Internally, organisations can have a better understanding of sustainability performance, risks, and opportunities, comparing performance internally and between organisations and sectors, recognition of the link between non-financial and financial performance. Externally, stakeholders can recognise an organisation's value and sustainability performance, which may lead to a better reputation, brand loyalty, and trust. It is a pivotal platform to communicate an organisation's value and impact on the society, economy, and environment.

## • Sustainability Human Capital Development

Sustainability human capital development capability focuses on improving the ability of human resources within and beyond an organisational boundary. It involves training, knowledge creation, storage and sharing. This capability is the result of the actualisation of the fundamental affordances ("reflective disclosure", "information democratisation" and "delocalisation") and the following affordances: (i) "active performance assessment".

The actualisation of this affordance enhances human capital development capability by providing a reliable groundwork for performance improvement. (ii) "collective learning facilitation". Its actualisation supports the enhancement of sustainability human capital development capability by facilitating information sharing and employees' capability development.

The development of human capital in organisations along a supply chain emerged from the analysis as one of the necessary capabilities in implementing sustainability. Data analysis revealed that some employees and suppliers are reluctant to change their behaviour and practices due to a lack of awareness about the importance of implementing sustainability and lack of knowledge to do so. In response, Manufacturers A, B, C, D and their suppliers stated that they had been applying this capability internally for their employees to increase awareness and equip employees and suppliers with the necessary skills. They conducted training to implement sustainability practices such as natural resource stewardship, waste management, occupational safety, community development, and promoting sustainable consumption.

Beyond an organisation boundary, training has been an effective way to develop human capital's knowledge in conducting sustainability practices, especially for the suppliers. Previously, the farming practice of suppliers involved in this study has been very traditional. They follow the same methods that have been conducted for generations. Interviewees from suppliers revealed that their organisations' performance had improved substantially since they receive training, utilise the coaching offered by the manufacturers, and use the learning infrastructure to learn about conducting sustainable practices.

- Sustainability Benchmarking

This study adapted the sustainability benchmarking definition by Kurnia et al. (2014, p. 6) as the "ability of an organisation to compare the sustainability performance across various units (internal) and supply chain members (external)". This capability is developed from actualising the fundamental and "active performance assessment" affordances. Realising these affordances enables the measurement of the quality, effectiveness, and efficiency of an organisation's policies, strategies, and operations. This information can be utilised to compare an organisation's sustainability performance to

the industry bests and best practices. When applied, this capability enables effective performance evaluation and comparison.

All manufacturers in this study remarked sustainability benchmarking as one precondition for an organisation to be sustainable. They conduct internal and external benchmarking. Internally, they measure sustainability performance for each business unit and supplier. Externally, they compare their organisation's sustainability performance and practices with industry bests and best practices in the industry. They also conduct a benchmark with their competitors nationally and globally.

- **Sustainability Risk Management**

Sustainability risk management emerged as one substantial capability in conducting sustainability. It involves identification, evaluation, and prioritisation of risks related to economic, environmental, ethical, social aspects and their interrelations. Besides the fundamental affordances, this capability is the outcome of the actualisation of several affordances such as: (i)" active performance assessment", which this actualisation assists in sustainability risk management capability by identifying and assessing potential risks arise from the subpar performance of an organisation and its suppliers. Then, (ii) "non-compliance & threat exposal" affordance is actualised into this capability through early detection of non-compliance and potential problems. Its actualisation enhances risk management capability as organisations would be able to identify and address the risks sooner and then prioritise approach based on the risks involved. The findings of this study indicate that the application of this capability results in the early detection and mitigation of sustainability-related risks.

Four manufacturers involved in this study stated that the risks of conducting unsustainable practices triggered their sustainability implementation. For instance, water and land stewardship problems are not only environmental issues but also social and economic concerns. They affect the continuity of raw materials provision, production maintenance, and community relations and brand image. These risks link to reputational risk, which potentially may damage the financial performance.

- **Sustainability Governance**

Sustainability governance capability is the management and alignment of the sustainability goals and principles "across organisational units and supply chain

members" (Kurnia et al., 2014, p. 6). Similarly, other than the fundamental affordances, sustainability governance is the outcome of actualisation of the following affordances: (i)" active performance assessment". The actualisation of this affordance leads to more guided sustainability governance since it shows whether the alignment of sustainability principles and goals across organisational units and supply chain members is undeviating. Then, another is (ii) "non-compliance & threat exposal". The actualisation of this affordance informs sustainability governance capability by suggesting existing and possible diversions from sustainability principles and standards within the organisation activities. Another one is (iii) "output management". Its actualisation helps to align the resource consumption and waste emission to the desired goals. The application of this capability engenders practical approach and guided assessment against criteria referenced to the outcomes, so they are likely to lead to organisations achieving the specified sustainability goals.

Four manufacturers involved in this study use IS guided by sustainability-driven policy and practices to operationalise sustainability governance capability. They have comprehensive sustainability policy that provides a clear direction for all layers of management to implement sustainability initiative relevant to each units' responsibilities. Further data analysis revealed that sustainability governance capability is strengthened when the alignment expands beyond an organisational boundary into supply chain partners.

- Sustainability Collaboration

Sustainability collaboration is the ability to work across organisational boundaries to build and manage sustainable processes to better achieve sustainability goals. Sustainability collaboration capability is the outcome of the actualisation of the basic and the following affordances: (i) "non-compliance & threat exposal". The actualisation of this affordance improves sustainability collaboration capability by indicating the area for further discussion and collaboration between organisations. Another one is (ii) "collective learning facilitation". The facilitation of collective learning promotes sustainability collaboration, since one employee could learn from other employees.

This capability is frequently mentioned in the interviews as one of the essential capabilities. Through collaboration, supply chain member can gather, develop, and reconfigure resources crucial to support the implementation of sustainable practices.

Collaboration with various stakeholders also beneficial to acquire other resources such as expertise, fund, infrastructure. Manufacturer A, B, C, and D stated that they collaborate with NGOs to gain expertise in sustainable farming practices and addressing social conflicts. Sustainability collaboration capability is also crucial in supporting supplier development practices. Suppliers of all manufacturers involved in this study mentioned that they have been receiving supports such as mentoring, infrastructure, and fund in exchange for a continuous supply of higher quality sustainable crops.

## 6.6    Dynamic Sustainability Capability

This study addresses the fifth sub-question, "**What are the dynamic capabilities required in supporting sustainability transformation?**", by presenting four dynamic sustainability capabilities that is a type of dynamic capabilities that emerged from purposive combination of the sustainability capabilities. This enables the possessing entity to identify, acquire, reconfigure, and deploy resources to conduct sustainability transformation. These capabilities include sensemaking, relationship management, partner development, and reflexive control.

The food industry is a highly dynamic market. There is growing concern over food safety and health. In March 2018, Indonesia faced a nationwide food contamination scare as worm parasites were found inside packaged mackerel cans of various brands. The incident prompted a quick recall of these products in its domestic markets. The import and production of these products were halted until declared safe for consumption by the authority (Humas, 2018). Although the recall is only required for 27 brands (Kusumaningtyas, 2018), other brands and similar products such as packaged sardines were also affected. Customers refused to buy similar products. Retailers unnecessarily threw food products due to excessive precaution. Manufacturers had to stop their production and (temporarily) laid off their employees (Rachmawati, 2018). This unanticipated event caused financial loss and decrease of public trust.

This unforeseen circumstance provoked an interest in developing a mechanism to cope with the dynamic market requirement. In the sustainability context, the dynamic is even more complicated since organisations should also consider economic, environmental, and social circumstances simultaneously. Thus, various interviewees of this study stated the importance of developing specific capabilities that enable them to identify, acquire,

reconfigure, and deploy resources to navigate the market dynamic and excel in it. They reveal that possessing these capabilities allow them to gain a competitive advantage over competitors. Further data analysis revealed that there are higher-level abilities that arose from a purposive combination of the sustainability capabilities explained before. This study contends that these higher-level abilities are dynamic sustainability capabilities.

While sustainability capability and dynamic sustainability capability are two terms pertaining organisational ability, this study defines dynamic sustainability capability as a type of dynamic capability, discussed in Section 3.5, that enables the possessing entity to identify, acquire, reconfigure, and deploy resources to conduct sustainability transformation. Data analysis shows that dynamic sustainability capability developed from purposive combination of the sustainability capabilities. Table 6.9 shows the dynamic sustainability capabilities emerged from the analysis of the case studies.

Table 6.9. Dynamic Sustainability Capabilities and Their Source Case Studies

| Dynamic Sustainability Capability | Description | Originating Case Study | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Sensemaking | A cognitive capability to understand complex and multilayered issues of sustainability transformation (Seidel et al., 2013) | ✓ | ✓ | ✓ | ✓ | ✓ |
| Relationship management | A dynamic sustainability capability to identify potential stakeholders in conducting sustainability transformation and build an effective relationship with them. | ✓ | ✓ | ✓ | ✓ | - |
| Partner development | A dynamic sustainability capability to support the growth and improvement of supply chain partners' sustainability performance | ✓ | ✓ | ✓ | - | - |
| Reflexive control | A dynamic sustainability capability to continually check and evaluate business practices within and beyond an organisation | ✓ | ✓ | ✓ | ✓ | - |

- **Sensemaking**

Sensemaking is a cognitive capability to understand complex and multilayered issues of sustainability transformation (Seidel et al., 2013). This dynamic sustainability capability enables possessing organisations to recognise the shortcoming of current understanding and actions from the sustainability perspective. This recognition leads to the ability to gather insights and information, including those who challenge the existing belief. Thus, sensemaking is the primary dynamic sustainability capability required for sustainability

transformation since it provides strong motivation and foundation for the development of other dynamic sustainability capabilities. Continuous application of this dynamic sustainability capability supports organisations to actively reconfiguring and transforming itself.

The findings suggest that persistent deployment of sustainability data collection and reporting capabilities lead to the development of sensemaking, as depicted by Figure 6.1. Data collection and reporting capabilities hone sensemaking ability by enabling possessing organisations to recognise the shortcoming of current understanding and actions related to sustainability implementation through data gathering and information sharing.
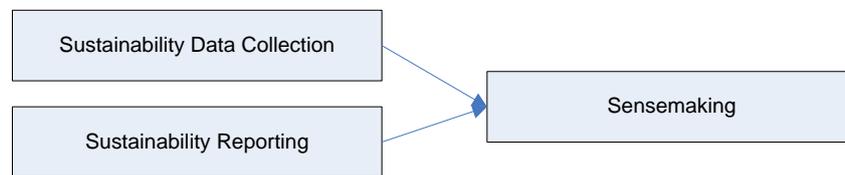


Figure 6.1. Formation of Sensemaking

In the case organisations, this study found that IS provide the possibility for developing sensemaking capability. IS help them to raise awareness and change mindset. The data collection, analysis, and reporting features give organisations the ability to understand the risks of engaging in unsustainable behaviour. The organisations' business objective used to be the lowest costs possible without considering environmental and social impacts. By using IS, organisations can calculate the (long term) impacts of their activities to the environment. Thus, they are willing to change their mindset and operation to minimise the effect. Similarly, IS also helps them to identify and create new opportunities in implementing sustainability and formulate strategies to realise them.

> *"IS has been instrumental in collecting and processing data and reporting the information efficiently [**sustainability data collection**]. There used to be a problem with different parties seeing different data. Then, we fix it so that all parties see the same data. With the same data, we can collaborate to find a solution. For example, we can overcome most of the environmental issues, but social conflicts are difficult, each occurrence needs a tailored approach. A lot of this happens in my operation that I am not aware of. So, with the traceability system, at least we know the conditions in the field and can identify the problems. Then, we can present it to top management*

*and other stakeholders to raise awareness and get their buy-in [**sustainability reporting**]."* (Supply Chain Traceability Head, Manufacturer B, Case Study 2)

## • Relationship Management

Relationship management is the dynamic sustainability capability to identify and build an effective relationship with current and potential partners to enhance sustainability implementation across a supply chain. The findings show that sustainability transformation requires collaboration with the stakeholders. These stakeholders have various, sometimes conflicting objectives that may bring conflict. Hence, relationship management reflects the ability to resolve dispute in an effective and timely manner. This ability rooted from a combination of sustainability collaboration and sustainability governance capabilities. It also enables organisations to reconfigure relationships and recognise new stakeholders that would be beneficial in supporting its sustainability transformation. Furthermore, this ability helps the organisations to cope with dynamically changing customer demand and non-transparent market.

This dynamic sustainability capability emerges from repeated application of sustainability collaboration and sustainability governance capabilities as depicted in Figure 6.2. Sustainability collaboration facilitates clear communication and the ability to understand other stakeholders' point of view, needs, and potential misunderstandings. Meanwhile, sustainability governance capability helps the organisations to align their various needs toward realising sustainability goals. The combination of sustainability collaboration and sustainability governance enables goal integration, fair and timely conflict resolution, and trust-building.
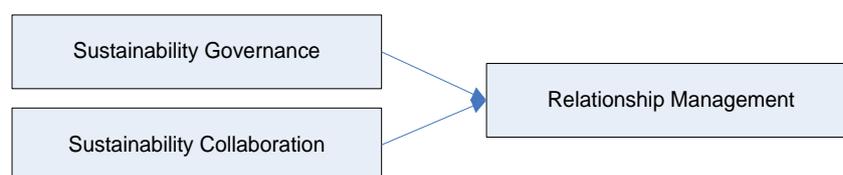


Figure 6.2. Formation of Relationship Management

Participants from manufacturers stressed the negative impact of NGOs' campaign on their company's image and stated their dissatisfaction about how NGOs applying the first world standard in Indonesia. The manufacturers in the leading group exercise the relationship management capacity by showing leadership in aligning goals and efforts, mediating conflict, and displaying self-regulation and accountability. Towards the

suppliers, manufacturers apply this capability by formalising agreements and setting rules and standards. The manufacturers also actively build trust with suppliers, NGOs, and customers.

> "*For traceability, we capture the needs of traders, suppliers, customers, and manufacturers. Then, we integrate these needs into the traceability system, so the requirements from these stakeholders can be fulfilled. However, this is not a stagnant system, we keep learning and collaborating with the stakeholders* [**sustainability collaboration**] *to accommodate their needs, so we can successfully implement traceability* [**sustainability governance**]." (Traceability Manager, Manufacturer C, Case Study 3)

## • Partner Development

Partner development is the capability to support the growth and improvement of supply chain partners' sustainability performance. As the performance of a supply chain is measured through the performance of its weakest member, transforming the food supply chain to be more sustainable should take a more holistic approach. Thus, partner development is a crucial dynamic sustainability capability which enables the supply chain-wide sustainability transformation.

The result of this study indicates that manufacturers are the most advanced in terms of sustainability implementation. Nevertheless, pressures from NGO and customer root in sustainability issues along the supply chain, especially the suppliers. Thus, it is imperative for manufacturers to have the capability to develop their suppliers. Manufacturers ensure suppliers' compliance with sustainability policy and standards through a series of communication, training, and support. After the suppliers have understood the importance of sustainable sourcing, the gap between the current and the necessary capabilities is identified. Whenever a discrepancy exists, training was conducted to ensure suppliers have the relevant capabilities and knowledge to carry out sustainable sourcing.

This dynamic sustainability capability arises from the application of sustainability collaboration and sustainability human capital development capabilities as depicted in Figure 6.3. Repeated practice of these capabilities facilitates effective collective learning and coordination across and beyond a supply chain which enables the possessing firms to form relationship and collaboration with trading partners (e.g., suppliers and retailers) as well as external parties (e.g., NGO, the government, and cooperative).
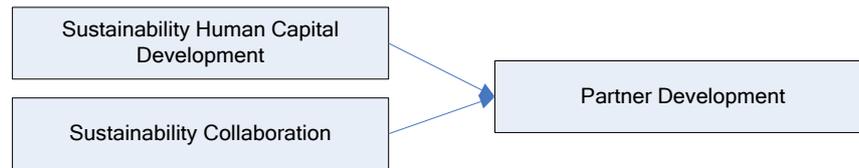
Figure 6.3. Formation of Partner Development

The case organisations stated that partnership within and beyond the supply chain has allowed them to gather, extend, and modify their collective resource base. Initially, manufacturers attempted to improve their sustainability performance individually, but only witnessed limited success due to other priorities and limited resources. Then, they consider gathering resources from NGO, business customers, and cooperatives. They collaborate with NGO and corporate customers to gain expertise in sustainable farming practices and addressing social conflicts. Equally important, cooperatives provide infrastructure and institutional resources. Suppliers, who sometimes do not have skill and hardware to access IS, can use IS installed in the cooperatives' offices to connect to the manufacturers' system.

The ability to integrate and manage all relationships and resources have been shown as a distinctive capability that distinguishes sustainable organisations and the rest. Each Manufacturer A, B, or C, considered as the leaders in sustainability transformation in the Indonesian food industry, have admitted the urgency in gaining resources from various stakeholders within and beyond the supply chain. Partner development ability enables them to collaboratively transform the supply chains through a series of technical and logistical integration, communication, and joint development.

- Reflexive Control

Reflexive control is the ability to continually check and evaluate business practices within and beyond an organisation. This ability develops from a combination of sustainability benchmarking, governance, and risk management capabilities. It enables possessing organisations to observe and analyse practices and performance in progressing towards achieving sustainability goals.

 This dynamic sustainability capability evolves from the exploitation of sustainability benchmarking, governance, and risk management capabilities as shown in Figure 6.4. Sustainability benchmarking is materialised in the form of monitoring, evaluation, and auditing. Sustainability governance and sustainability risk management enable

information gathering on compliance level, findings communication, and if necessary, corrective or enforcement action recommendations. The combination of these capabilities serves as a powerful tool to ensure that commitment, ethics, and compliance process continues to work and improve as well as consistent use of IS to support the process.
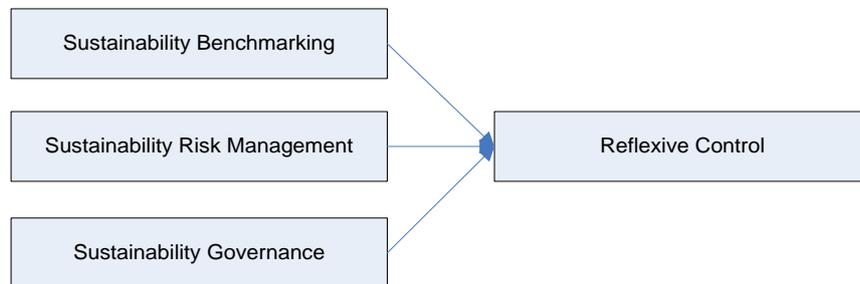


Figure 6.4. Formation of Reflexive Control

Manufacturers A, B, C, and D apply reflexive control ability to ensure perpetual changes within the company and its supply chains. They recognised the social, reputational, and financial risks related to irresponsible practices within their companies and supply chains. As a response, they developed a comprehensive and restricted policy governing their internal and external work practices. They use the policy to benchmark suppliers to ensure the enactment of sustainability transformation along the supply chains.

## 6.7    IS-Enabled Sustainability Transformation Process

This section addresses the last sub-question, **"what is the process of IS-enabled sustainability transformation?"**, by explaining four phases of sustainability transformation in the manufacturers and suppliers. In the first phase, NGOs, the government, and customers demand for responsible and sustainable practices to be conducted in food supply chains. In response, organisations, especially manufacturers, seek to understand the assumptions, options, and the impact of their activities to the environment and society. In the second phase, manufacturers conduct sustainable practices that aim to achieve internal changes. They change either their business model, costs, organisational culture, or work processes to improve their sustainability performance. In the third phase, manufacturers support their suppliers to transform their operation towards becoming sustainable entities. The fourth and final phase, manufacturers and suppliers use process and technology, including IS, to evaluate the sustainability performance of organisations to ensure their alignment with achieving sustainability goals.

The manufacturers have become the driving force towards implementing sustainability within their supply chains due to several factors. First, manufacturers have access to numerous suppliers, giving them the power to pressure their suppliers to behave more sustainably, or otherwise, the sourcing may be terminated. Second, manufacturers also tend to have more resources than suppliers that allow them to develop relevant capabilities, conduct necessary practices, and support their suppliers. Third, manufacturers are usually the brand owners who suffer the most as the effect of the backlash about unsustainable practices held in their supply chains. Hence, they have stronger motivations.

However, interviews with various players in food supply chains revealed that it is challenging to extend sustainable transformation to suppliers, especially SMEs. Data analysis shows that there is a correlation between awareness about sustainability and the size of the organisation. Large organisations tend to be aware of sustainability, and some of them have implemented it to a certain degree. However, most SMEs have lower to non-existent awareness about sustainability since SMEs focus on meeting the economic bottom line and less about environmental and social dimensions. They still see sustainability as beyond their responsibility and treat it as an additional cost or a part of CSR. Compared to large enterprises, SMEs also have limited access to resources such as fund, qualified human resources, information, and required capabilities, which makes it more difficult for SMEs to conduct sustainable practices. Thus, the manufacturers lead the efforts in transforming their suppliers' practices by providing funds, infrastructure, and human resources.

Based on the data analysis and observation, sustainability transformation in food supply chains occurs through four phases: (1) awakening sustainability conscience, (2) introverted transformation, (3) inter-organisational transformation, and (4) continuous maintenance and evaluation. Three out of five manufacturer-supplier dyads (Case Studies 1, 2, and 3) undergo four phases of the sustainability transformation process. The other two dyads (Case Studies 4 and 5) skip the third phase and proceed to the last stage, as depicted by Figure 6.5 and Table 6.10. Table 6.11 summarises the description and main barriers of each phase.
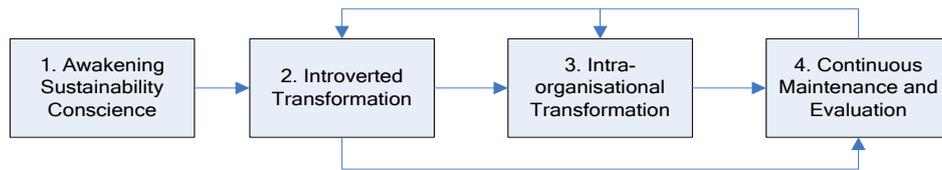
Figure 6.5. Sustainability Transformation Process

Table 6.10. Sustainability Transformation Phases and the Evidence from Case Studies

| Phase | Case Study | | | | |
|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1. Awakening sustainability conscience | ✓ | ✓ | ✓ | ✓ | ✓ |
| 2. Introverted transformation | ✓ | ✓ | ✓ | ✓ | ✓ |
| 3. Inter-organisational transformation | ✓ | ✓ | ✓ | - | - |
| 4. Continuous Maintenance and Evaluation | ✓ | ✓ | ✓ | ✓ | ✓ |

Table 6.11. Sustainability Transformation Phases, Sustainability Goals, and Main Barriers

| Phase | Description | Sustainability Goal | Main Barrier |
|---|---|---|---|
| 1. Awakening sustainability conscience | At this phase, organisations seek to understand the assumptions, options, and the impact of their activities | Raising awareness about sustainability issues | None specified |
| 2. Introverted transformation | This phase is defined by the implementation of sustainable practices that aim to achieve changes within an organisation. | • Business continuity and cost-saving<br>• Reduced environmental impacts<br>• Employee safety, health, and welfare<br>• Improved communities<br>• Educating customer to prefer sustainable products | • Financial constraint<br>• Absence of regulation, incentive, and enforcement<br>• Economic-focused mindset |
| 3. Inter-organisational transformation | A more advanced member of a supply chain expands sustainability transformation into its supply chain counterparts. | • Reduced environmental impact<br>• Improved suppliers' livelihood<br>• Ensuring consumer health | • Economic-focused mindset<br>• Financial constraint<br>• Difficulty in detecting and |

| Phase | Description | Sustainability Goal | Main Barrier |
|---|---|---|---|
| | | | measuring social issues |
| 4. Continuous Maintenance and Evaluation | Organisations continually evaluate business processes for compliance or deviations from their intended objectives. | Sustained implementation of sustainable practices. | Lack of long-term commitment to conduct sustainable practices |

## 1. Awakening Sustainability Conscience

This phase is the beginning of sustainability transformation, where organisations seek to understand the assumptions, options, and the impact of their activities. This phase is characterised by organisations' reaction to complaints from NGOs and demands from the government regarding unsustainable or unethical practices conducted within the organisations or their suppliers. Then, all the case organisations conduct a systematic and objective assessment of an on-going or completed projects or programme concerning their effects on the environment, employees, consumer, and community.

This phase involves data collection dan reporting, followed by interpretation of the results to work out the lesson learnt. Organisations engage in discussion on critical issues in an organisation's sustainability condition to alter beliefs and perceptions, so actions become natural, and the change is more likely to be permanent. By the end of this phase, organisations have developed future strategies on operational, tactical, and strategic levels. The plan serves as a reliable and operational foundation for sustainability implementation.

## 2. Introverted Transformation

Upon retrospection conducted in the previous phase, the internal transformation phase is where the actions take place. Organisations conduct significant change in either their business model, costs, organisational culture, or work processes to improve their sustainability performance. This phase is defined by the implementation of sustainable practices that aims to achieve changes within an organisation. Data analysis revealed that the organisations in this study focus on four sustainability goals in this phase: (1) reducing costs by increasing efficiency in work practices, (2) reducing their natural resources consumption and by-products of their manufacturing activities, (3) improving employee's health, safety and growth, and (4) improving communities in which they operate.

Some barriers firms face in transforming their internal practices are economic-focused mindset, financial constraint, absence of regulation, incentive, and enforcement from the government. Firms have a strong belief and purpose on profit maximisation that resulted from years of operation. Hence, it is challenging to reshape their worldview to accommodate new uncomfortable realities related to the impact of their activities on the environment and society. Even when they let go of pre-existing mindset and embrace a new way of operation, companies must invest in people, technology, and infrastructure. This financial constraint may hinder them from shifting towards becoming sustainable entities. Additionally, the lack of regulation, incentive, and enforcement from the government may further impede sustainability transformation. For instance, the requirements for paper-based documents with stamp and handwritten signatures have downplayed digital-based work practices. Furthermore, there is also no mechanism for nationwide recycling which has hindered a large-scale recycling program.

## 3. Inter-organisational Transformation

In this phase, a more advanced member of a supply chain expands sustainability transformation into its supply chain counterparts. Initially, the manufacturers integrate sustainability principles internally, allowing themselves to acquire the necessary knowledge and experience. This knowledge, along with other resources, helps their effort to expand sustainability transformation into their supply chain counterparts, or in this case, the suppliers. In the inter-organisational transformation phase, Manufacturers A, B and C extend the sustainability transformation to their suppliers. The manufacturers evaluate their suppliers' performance and communicate with them to improve it. This effort includes changing unethical and unsustainable practices exercised in suppliers' sites. Based on the cross-case analysis, this study identified three sustainability goals from all case studies in this phase: (1) Reduced impact of supply chain activities to the environment, (2) Improved the suppliers' sustainability performance, and (3) Maintained and improved consumer health and well-being.

The findings revealed three barriers in expanding sustainability into their suppliers: economic-focused mindset, financial constraint, and the difficulty in detecting and measuring social issues. Majority of participants from Manufacturers A, B, and C described that it is challenging to change the belief and mindset of suppliers to adopt sustainable practices as most of them are SME suppliers who are still struggling to improve their economic performance. They view environment preservation and ensuring

labour welfare as additional costs. Furthermore, there are numerous social problems in supply chains, especially in suppliers, among others, child and forced labours, and violation of labours' rights, safety, and welfare. Many interviewees highlighted the difficulty to address this issue several times.

**4. Maintenance and Evaluation**

In the Maintenance and Evaluation Phase, organisations focus on the effort to continually evaluate business processes for compliance or deviations from their intended objectives. This phase is the fourth and final stage of the transformation process that is instrumental in ensuring perpetual changes within manufacturers and their suppliers towards sustainable organisations. This phase involves the process and technology used to evaluate the sustainability performance of organisations to ensure their alignment with achieving sustainability goals. This objective includes the detection of compliance, risks, and problems associated with sustainability implementation. These activities support more accurate and timely decision making regarding where and when to focus on resource and attention. By the end of this phase, manufacturers and their suppliers have already achieved some magnitude of the transformation.

Additionally, most respondents from manufacturers and suppliers indicated that the sustainability transformation is a loop. Although they have reached Phase Four, the manufacturers and suppliers cycling back to Phase Two and Three. This means that the improved process becomes the new baseline and the firms keep looking for ways to improve their organisational and inter-organisational sustainability performance.

Some participants expressed that ensuring perpetual changes within manufacturers and their suppliers towards becoming sustainable organisations is complicated. Concerns were expressed about maintaining commitment and consistency in conducting sustainable practices and using IS in doing so. This challenge is rooted in difficulty to change old habits. It takes a long time to change habits and culture to adopt sustainable work practices.

## 6.8   Summary

This chapter explained the cross-case analysis conducted on the case studies to address six sub-questions. First, it presented affordances necessary in an IS designed to support sustainability transformation. Then, the chapter elaborated the actualisation process of

these affordances and its enabling resources. The outcome of the affordance actualisation contributes to the development of sustainability capabilities. These capabilities are required to foster the dynamic sustainability capabilities that enable sustainability transformation. Finally, the chapter explained the four phases of sustainability transformation. The following chapter discusses and compares the findings presented in this chapter to the existing literature and theories to answer the research question of this study. The contributions of this study to research and practice are also explained.

# CHAPTER 7: DISCUSSION

## 7.1    Introduction

The previous chapter presents the overall findings of this study that address the six sub-questions of this study. The findings inform the development of an IS-enabled sustainability transformation model as the key result of this study. The details of this model elaborate on how IS affordances lead to the development of the sustainability capabilities in sustainability transformation. These capabilities serve as building blocks to build the necessary dynamic sustainability capabilities that help firms mitigate barriers hindering advancement through the sustainability transformation.

This chapter discusses these findings to address the research question of this study. Where relevant, how this research relates to the broader debates in the existing SSCM and IS literature is explained. Then, the chapter outlines the contribution of the findings to SSCM and IS literature and practice. The chapter concludes by summarising all of the key points.

## 7.2    Addressing the Research Question

This study presents an IS-Enabled Sustainability Transformation Model to address the research question: "***How do IS support sustainability transformation in food supply chains***?" The model, as seen in Figure 7.1, shows how the interaction between IS and organisations is, who have certain sustainability goals, which leads to the emergence of a set of IS affordances. These IS affordances are then actualised into a set of essential sustainability capabilities. The exercise of the combination of specific capabilities contributes to the development of dynamic sustainability capabilities. The dynamic sustainability capabilities support organisations to mitigate the distinctive barriers in each phase, which in turn enhance the transition to the advanced state of sustainability. In sum, this study suggests the following four propositions to answer the overarching research question.
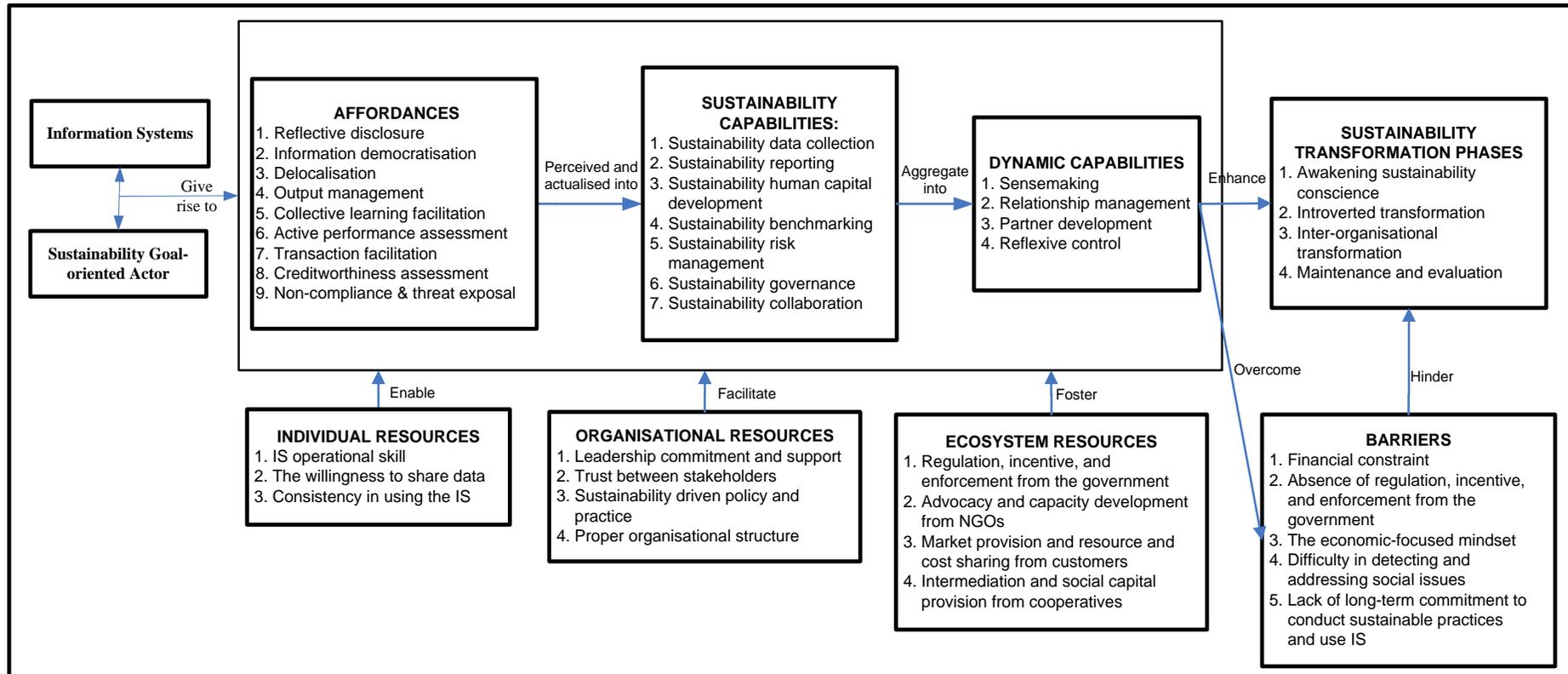
Figure 7.1. IS-Enabled Sustainability Transformation Model

**Proposition 1: Interaction between IS and actor driven by sustainability goals leads to perception of IS affordances relevant for sustainable practices.**

This study demonstrates that to understand IS-enabled organisational change, we must understand how interaction between IS and actor provides affordances. Since an actor's ability to perceive an affordance depends on whether it is relevant to achieve their goal, the goal creation is an essential factor in affordance perception and actualisation.

This study analyses stakeholders' goals and organisations journey in reconfiguring their IS, goals, and practices, which lead to the emergence of relevant affordances. Data analysis resulted in a set of specific affordances that are suited to stakeholders' sustainability goals. The sustainability goals guide the perception of affordances during interaction between actors and IS material property. This interaction resulted in the emergence of nine IS affordances such as reflective disclosure, information democratisation, delocalisation, output management, collective learning facilitation, active performance assessment, transaction facilitation, creditworthiness assessment, and non-compliance & threat exposal.

These affordances are crucial in understanding how the use of IS results in an organisational and inter-organisational change as they contribute to the achievement specific sustainability goals. Some affordances (e.g., reflective disclosure and information democratisation) support the fulfilment of all sustainability goals, while others assist specific goals, as explained in section 6.3.

Moreover, this study identified the IS material properties that enable the emergence of each affordance. Identifying the IS material properties that allow the emergence of key affordances can enhance our understanding of how to guide their perception and actualisation by including these material properties in IS design.

The identification of above IS affordances fills the need for a clearer view about IS role in supporting SSCM. The previous studies have identified IS as a crucial enabler in assisting organisational transformation towards becoming more sustainable entities (N. P. Melville, 2010; Seidel et al., 2014). However, only a few studies have investigated how exactly IS influence sustainability transformation. This research exemplifies previous studies that indicate the needs to identify sustainability goals to unleash the transformative power of IS (Seidel & Recker, 2012; Volkoff & Strong, 2018). These goals guide the perception of affordances offered by IS. An affordance has to be perceived first to affect

change, which is more likely to happen when it is relevant to the actor's goal (Gibson, 1986). Hence, identifying appropriate sustainability goals that guide the process of perceiving affordances is substantial.

**Proposition 2: The actualisation of IS affordances may result in the development of a set of sustainability capabilities if equipped with relevant individual, organisational, and ecosystem resources.**

As suggested by Strong et al. (2014) and Volkoff and Strong (2018), this study separates the identification of affordance and its actualisation. As shown by Figure 7.1, identifying affordance is the first step in understanding how IS affecting change towards sustainability. As affordance is a possibility for actions, to affect change, actors need to act upon it (perform actions). It is observed that to achieve the intended outcome, affordance actualisation is not fully explainable through alignment of the affordance to the sustainability goals and material properties of the IS alone. Affordance theory postulates that technology does not determine effects (Seidel, Kruse, Sze´kely, Gau, & Stieger, 2017). The effects depend on the actual configurations of resources, behaviours, and structures that cause the action (Volkoff & Strong, 2018). Thus, it is essential to identify specific resources that affect the actualisation process so that the IS affordances are materialised as intended and are more likely to produce the desired outcome.

Accordingly, to materialise the outcome of IS affordance, this study investigates the enabling resources and outcome of IS affordance actualisation. The finding shows that actualisation process requires individual, organisational, and ecosystem resources. The individual resources include IS operational skill, the willingness to share data, and the consistency in using IS and exercising sustainable practices. Additionally, the organisational level consists of leadership commitment and support, trust between stakeholders, sustainability-driven policy and practices, and proper organisational structure. The actualisation process also requires ecosystem resources from the other primary stakeholders such as regulation, incentive, and enforcement from the government, advocacy and capacity development from NGOs, market provision, and resource and cost sharing from customers, and trading and learning intermediation and social capital provision from cooperatives. These resources are deployed in IS affordance actualisation process that resulted in the development of sustainability capabilities.

The findings are consistent with the earlier studies suggesting the importance of individual actors' capability to operate IS in actualising the affordances (Leonardi, 2013; Strong et al., 2014). This study extends the previous works by identifying the willingness to share data as a critical individual resource in enabling sustainability transformation. Previous studies (e.g., (Lehmann et al., 2012; Schniederjans & Hales, 2016; Watson et al., 2012) have emphasised the capability of IS to capture and share data. However, this requirement seems to assume that users always willingly share their data without hesitation. On the contrary, this study found that reluctance to share data has been a major constraint in sustainability effort. Thus, by highlighting this issue, it is expected that organisations take necessary measure to address it. In addition, consistency was examined in a study by Burton-Jones and Volkoff (2017) who linked the consistency of users working with an electronic healthcare record with its effective use. This connection also concurs with this study's finding that the consistent use of IS is an essential factor in affecting changes through IS.

Regarding the organisational resources, the finding corroborates previous studies reporting top management support and commitment as a crucial enabler in sustainability transformation (Ageron et al., 2012; Beske & Seuring, 2014). It also aligns with Cantor et al. (2012), which argued that policies could gain employees commitment to engage in sustainable practices. Moreover, the result reflects studies of Gopalakrishnan et al. (2012) and Wolf (2011) who also found that there is a need for a dedicated department for sustainability implementation. This study extends these earlier studies by reporting the need for this department to be led by a top manager who can influence the company level decision making. In addition, this finding supports the earlier conclusion drawn in the literature that state trust as one of the preconditions for inter-organisational collaboration in a supply chain (Alvarez et al., 2010; Ciliberti et al., 2008; Grimm et al., 2014).

Lastly, the ecosystem resources identified in this study align with previous studies that highlighted pressure and regulation and incentives support from the government (Govindan, 2018; Smith, 2008) and advocacy and expertise from NGOs (Baliga et al., 2019; Rodriguez et al., 2016) as resources in sustainability transformation. Additionally, this study corroborates the findings of Baliga et al. (2019) and Kirchoff et al. (2016) that stated customers provide market for sustainable products. This study extends our knowledge of the potential of cooperatives as an important resource provider in

sustainability transformation, especially regarding the social capital provision that is a valuable, rare, imperfectly imitable, and non-substitutable resource.

Furthermore, the results of this study show that IS affordances actualisation enabled by relevant individual, organisational, and ecosystem resources may result in the development of a set of sustainability capabilities. This study operationalises a theoretical research model of Dao et al. (2011), which argues that integrating relevant SCM, IS, and human resources may lead to the development of the required capabilities in sustainability transformation. Accordingly, this study identified relevant resources and how they enable the development of sustainability capabilities through affordance actualisation process. These are the firm's ability to utilise its resources via business processes to conduct sustainable practice. The sustainability capabilities include sustainability data collection, sustainability reporting, sustainability human capital development, sustainability collaboration, sustainability benchmarking, sustainability risk management, and sustainability governance. The findings show that all manufacturers and suppliers involved in this study have employed these capabilities to support their sustainability transformation.

The identification of the sustainability capabilities in this study extends (Kurnia et al., 2014)'s work by redefining sustainability risk management and adding sustainability collaboration capabilities. This study redefines their sustainability risk analysis capability into sustainability risk management capability because implementing sustainability requires further actions than identifying and analysing risks by managing them. Moreover, this study proposes sustainability collaboration as one of the key capabilities to enact sustainability transformation across supply chains effectively.

**Proposition 3: The application of a combination of the specific sustainability capabilities results in the development of a set of higher-level capabilities referred to as dynamic sustainability capabilities.**

This study demonstrates that to achieve long term superior sustainability performance, higher-level capabilities are needed. As described in Section 5.3, the manufacturers involved in this study are classified based on their sustainability performance into three groups: leading, advanced, and promising. The leading group owns more higher-level capabilities than their counterparts that enable them to gain competitive advantage. These abilities allow firms to dynamically integrate and reconfigure resources to mitigate

obstacles prevails in a turbulent market such as food industry. This study defined these abilities as dynamic sustainability capabilities that include sensemaking, relationship management, partner development, and reflexive control. The findings of this study revealed that the dynamic sustainability capabilities emerge from a repeated application of a combination of specific sustainability capabilities, as explained in Section 6.6 and shown in Figure 7.2.
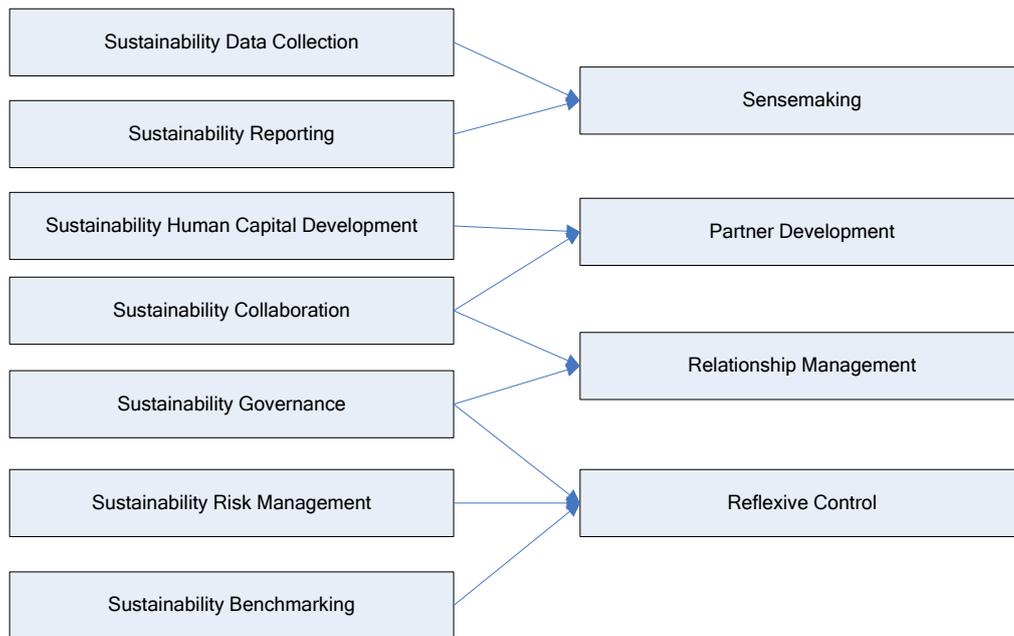


Figure 7.2 Combination of Sustainability Capabilities in Developing Dynamic Sustainability Capabilities

Drawing on RBV and Dynamic Capability Theory, this study identifies the sustainability capabilities as static capabilities and are not adequate for successful sustainability transformation. Sustainability capabilities are developed from the deployment of tangible and intangible resources such as IS infrastructure, skills of individual employees, leadership etc., that enable a possessing entity to perform some tasks or activities (Grant, 1991). Nevertheless, the insights of this study revealed that developing a sustainability capability may not be sufficient to produce long term sustainability value in this turbulent market. For example, sustainability human capital development capability must be combined with sustainability collaboration to affect effective partner development since the required resources (e.g., expertise, fund, and trust) may be owned by different parties.

The finding is consistent with the previous studies (e.g., (Beske, 2012; Kirci & Seifert, 2015; Reuter, Foerstl, Hartmann, & Blome, 2010), which argued that firms require certain

dynamic capabilities to respond to challenges posed by emerging environmental and social issues. Additionally, this result corroborates the study of K. M. Eisenhardt and Martin (2000), which argues that dynamic capability is developed from simpler capabilities.

The proposed set of dynamic sustainability capabilities also provides empirical evidence and extend the conceptual study by Beske et al. (2014), which identifies a set of dynamic capabilities to achieve sustainability in the food supply chain. Their proposed capabilities include knowledge acquisition and assessment, partner development, supply chain reconceptualisation, co-evolving, and reflexive control. The cross-case analysis found empirical evidence for partner development and reflexive control. This study extends knowledge assessment capability into sensemaking, since knowledge acquisition and assessment are insufficient to provide a solid foundation for other capabilities as it does not imply what the expected outcome is**.** Moreover, this study merges supply chain reconceptualisation and co-evolving capabilities into relationship management. The merge is because none of the "supply chain reconceptualisation" nor "co-evolving" is sufficient to encapsulate the complex interplay among stakeholders described in the findings of this study.

**Proposition 4: Possessing specific dynamic sustainability capabilities enables organisations to address barriers inhibiting sustainability transformation process.**

This study shows that the dynamic sustainability capabilities are significant tools in addressing specific barriers that exist in different sustainability transformation phases as summarised in Table 7.1. Consistent with the synthesis of sustainability transformation phases explained in Section 2.5.2, the finding reveals that the sustainability transformation occurs through four phases. Different stages of sustainability transformation have certain sustainability goals and experience distinct barriers, as explained in Section 6.7 and summarised in Table 6.11.

Data analysis revealed five main barriers across different phases in sustainability transformation phases i.e., (1) financial constraint, (2) absence of appropriate regulation, (3) economic-focused mindset, (4) difficulty in detecting and addressing social issues, and (5) inconsistency in using IS and conducting sustainable practices. The identified dynamic sustainability capabilities are required to mitigate these barriers in sustainability transformation phases.

Table 7.1. Dynamic Sustainability Capabilities and Corresponding Barriers

| Dynamic Sustainability Capability | Corresponding Barrier | Transformation Phase |
|---|---|---|
| Sensemaking | Economic-focused mindset | 2 and 3 |
| Relationship Management | Financial constraint, absence of appropriate regulation, incentive, and enforcement from the government. | 2 and 3 |
| Partner Development | Financial constraint, the difficulty of addressing social problems in supply chains | 3 |
| Reflexive Control | Lack of long-term commitment, the difficulty of addressing social problems in supply chains | 3 and 4 |

Sensemaking is essential to overcome the barrier of "economic-focused mindset" in phase two and three, that prefers low costs when choosing or producing products even at the expense of the environment and the society. Collecting and reporting data enables individuals and organisations to understand the broader and long-term impacts of their preferences and actions to the environment and society. The understanding becomes the real tangible force guiding them to consciously choose to engage in sustainable practice and purchase sustainably sourced products. Although initiating sustainability transformation may require higher upfront investment than performing the business as usual, by having this dynamic sustainability capability, the acting organisations will not perceive it as sacrificing their present for the future but see it as a successive action that will yield cumulative results.

Relationship management capability assists in overcoming the "financial constraint" barrier in phases two and three. The case organisations stated that collaboration within and beyond the supply chain has allowed them to gather, extend, and modify their collective resource base. For instance, manufacturers coordinate training efforts with NGOs who specialise in sustainable farming practices.

Furthermore, relationship management capability helps to mitigate the "absence of appropriate regulation, incentive, and enforcement from the government" barrier. The manufacturers are advanced in term of sustainability implementation compared to suppliers because they usually have more resources to support it. These manufacturers also go beyond the compliance standards set by the government. However, these manufacturers could only progress to a certain level without an enabling ecosystem. Various parties are needed to create a supportive ecosystem where sustainability is

encouraged and appreciated. The characteristics of this ecosystem include appropriate policy and regulation accompanied by proper enforcement. This goal requires cross-sector relationship and collaboration, which is enabled by possessing relationship management capability.

Partner development is a crucial dynamic sustainability capability to solve some social issues such as poor working conditions, forced and child labour, and violating labours' rights. Mostly, the reason for these labour issues is costs efficiency (Chiesa & Przychodzen, 2019). Partner development dynamic capability contributes to solving these issues. When a supplier thrives and prospers, it has a better chance and ability to improve its workplace conditions and provide better health and safety for its labours. Hence, this capability is required in phase three. This finding aligns well with the study of (Yawar & Seuring, 2015) that proposes supplier development as a tool to improve a firm and a supply chain's social performance.

Reflexive control is the ability to observe, and analyse practices and performance is substantial in addressing social issues relevant in phases two and three. This dynamic capability includes the ability to detect unsustainable and unethical conduct such as hazardous working condition or employment of child labour. It is pivotal to affect changes towards total compliance where codes of conduct are not enough. This finding is consistent with the study of (Yawar & Seuring, 2015) that suggests compliance strategy is required to ensure the implementation of socially responsible practices across supply chain partners.

This section has described the path from IS affordance perception and actualisation that yields the development of sustainability capabilities. Then, these capabilities, aggregated into dynamic sustainability capabilities, enable organisations to progress through the sustainability transformation. By elaborating the path dependency describing the change process towards materialising sustainable supply chains enabled by IS, this study answers the main research question.

## 7.3 Implications to Research

The findings of this study offer several important theoretical contributions to SSCM and IS literature and theory, as follows.

First, this study improves our understanding of **IS and the potential affordances emerging from its material properties, stakeholders' sustainability goals, and socio-technical conditions** that are specific and necessary for sustainability transformation. The previous studies have identified IS as a crucial enabler in assisting organisational transformation towards becoming more sustainable entities (N. P. Melville, 2010; Seidel et al., 2014). Nonetheless, the existing studies tend to treat IT as a standalone system that improves performance in solitude while the interaction between IT and the user is largely ignored. This study extends the existing IS-enabled change research by providing *empirical supports* for *four previously identified affordances* (Seidel et al., 2013) and identifying *five new IS affordances* to support sustainability transformation in food supply chains. It enables better IS design so that these affordances are easily perceived and actualised as intended to achieve the desired goals. This is consistent with Affordance Theory that posits material properties of an object also determine the affordance generation and perception (Anderson & Robey, 2017; Leonardi, 2011; Zammuto et al., 2007).

Second, this study enhances the current understanding of **how IS enable the development of essential sustainability capabilities by applying a novel combination of Stakeholder theory, Affordance Theory, and Dynamic Capability Theory**. There are relatively few studies exploring how the resources can be employed to develop the required capability to implement SSCM. This study fills this gap by providing insights into the development of sustainability capabilities as the outcome of IS affordances actualisation. The findings show that the affordance actualisation process deploys *individual, organisational, and ecosystem resources* resulting in the *development of sustainability capabilities*. Identifying these resources affects the appropriation of IS in line with developing sustainability capabilities. Additionally, *this study answered the call for applying a combination of theories to address diverse aspects of sustainability transformation* (Melville, 2010) from various perspectives.

Third, this research provides rich empirical evidence to demonstrate that **possessing sustainability capabilities is unlikely to be adequate to progress towards sustainability transformation phases and sustain it**. **Firms require certain dynamic capabilities** to respond to challenges posed by emerging environmental and social issues. Organisations who pursue sustainability values are more prone to unpredictable changes, since they are not only measured against economic performance, but also environmental

and social performances. In this dynamic environment, achieving sustainability goals requires the ability to create, integrate and reconfigure resources that may be owned by different parties along a supply chain, or referred to as dynamic sustainability capability. This study identified *four dynamic sustainability capabilities* that arise from the combined application of the sustainability capabilities. These dynamic capabilities contribute to producing long term sustainability value in turbulent markets.

Fourth, this study extends the literature by **presenting a holistic view of sustainability transformation that substantiates the evolution of traditional food supply chains toward sustainable entities** from the conception to maintenance and evaluation stages. There has been little attention in the SSCM literature that provides an integrated view of sustainability transformation from the awakening sustainability conscience to maintenance and evaluation. This study proposes the *IS-enabled sustainability transformation model* (Figure 7.1) as a guidance for organisational change toward attaining superior environmental and social performances**.** It provides a tangible output in the form of a model or framework that construes how various factors reinforce or hinder organisations or supply chains from moving upward in the sustainability transformation process.

Fifth, this study enhances our understanding of **how IS can support firms to anticipate and deal with challenging social issues in supply chains**. Previous studies focusing on the social dimension is significantly limited compared to the environmental dimension. This research closes the gap by *empirically examining how IS can contribute to enhancing the health and well-being of the employee, supplier, and customer in the supply chain*. This study argues that the central role of IS in addressing social issues in food supply chains is by identifying social problems in supply chains, enabling a multi-stakeholder approach in addressing the social issues, facilitating supplier empowerment by providing learning access, and accommodating collective control. Hence, by addressing this gap, this research enhances the current understanding of how IS supports sustainability transformation by considering the social dimension.

Sixth, the empirical findings in this study provide a novel understanding of how **sustainability transformation occurs in a developing country**. There is a lack of understanding of the effective adoption and implementation of sustainable practices in developing countries. The existing studies demonstrate that many of the sustainability best practices are created for developed countries. Meanwhile, the globalisation of

supply chains means that firms trade with both developed and developing countries. To fill this gap, this study deepens our understanding by *analysing the primary stakeholders' goals and obstacles, and necessary resources and capabilities* for sustainability transformation in a developing country.

## 7.4    Implications to Practice

This study provides four main contributions to practice.

First, for practitioners in the food supply chain, the results of this study act as a guide to **identify the primary stakeholders, barriers, relevant resources, sustainability capabilities, and dynamic sustainability capabilities** required for sustainability transformation. The findings help them to assess their supply chains and identify the potential stakeholders, the resources and capabilities that have not been developed, and manage the barriers. The study findings also guide organisations in prioritising IS investments depending on which capabilities they need to develop further.

Second, this study **provides practical insights for practitioners attempting to affect change through the effective use of IS**. Although this study explicitly acknowledges that the effect of IS use is nondeterministic, it demonstrates the possibility to guide actualisation process so that the desired outcomes is attainable. This study identifies several non-technical factors that affect affordance actualisation so that organisations can take necessary actions to appropriate them. For example, the finding shows that unwillingness to share data inhibits the overall affordance actualisation. Thus, the organisations might need to engage relevant stakeholders and communicate with them about the importance of sustainability and IS use and how it will benefit them. Understanding the relation between IS and its users could provide valuable insights for recognising the reason and mechanism behind the success or failure of affordance actualisation.

Third, for IS designer, conceptualising IS affordances, and their originating material properties can *help to improve IS design* **by raising the awareness of possible actions offered by IS in supporting organisational change**. This study provides a guide for IS designers to embed these affordances and make them explicit for the actor to perceive.

Fourth, the findings of this research **provide valuable insights into the *role of the government, cooperative, customer and NGO*** in providing ecosystem resources

sustainability transformation. This study assessed the current condition of sustainability implementation in Indonesian food supply chain and provided practical recommendations in Chapter Eight. This recommendation can guide the stakeholders in facilitating and coordinating collective action towards producing change.

## 7.5  Summary

This chapter interpreted the findings presented in the previous chapter to answer the research question of this study. The findings were also discussed in relation to the broader context of IS and SSCM studies. Finally, the research and practical contributions of this study were explained. The next chapter concludes the study by summarising the research background, findings, and main contributions of this study. Then, the chapter outlines the limitations of this study and suggestions for future research. It ends by proposing several practical recommendations.

# CHAPTER 8: CONCLUSIONS AND FUTURE DIRECTIONS

## 8.1 Summary

Business activities have been straining the earth's rare resources, producing massive air, water, and land waste, and creating undesirable social consequences. There is an increasing consumer pressure to improve the environmental and social impacts of supply chain activities, forcing organisations to adopt sustainable supply chain management (Baliga et al., 2019). However, the management of a sustainable supply chain is complex because it is inter-organisational in nature, involving different and sometimes conflicting objectives and priorities among various stakeholders (Govindan, 2018). Successful implementation of sustainable supply chain practices requires a set of specific organisational capabilities (Beske, 2012). Currently, little is known about what capabilities are required and how IS can enable the development of those capabilities. Furthermore, causal factors leading to the successful sustainability transformation in the food supply chain remain speculative. Uncertainty still exists about the interrelationship among IS usage, capabilities, and other non-technical factors in enabling the sustainability transformation.

This research project addresses the current knowledge gap by answering the research question of *How do IS support the sustainability transformation in food supply chains?* A multiple case study was designed to investigate the sustainability implementation in-depth. Five food manufacturers and their suppliers were selected, interviewed, and observed forming five case studies. Further interviews with government agencies, NGOs, business customers were conducted to provide a socio-political context that influences the sustainability transformation and validate the insights from the case studies. Furthermore, this study applied Stakeholder Theory, Affordance Theory, and Dynamic Capability Theory as the underlying theories to guide the overall research design.

This study began by reviewing the existing literature about SSCM and the contribution of IS in supporting it. Several other gaps were identified, including the lack of SSCM studies in developing countries and inadequacy of attention to address the social dimension of sustainability. This phase provided a foundation for the study through the identification of various issues affecting the change towards SSCM as well as the adoption of IS in this field. This information informs the empirical phase afterwards.

The empirical phase involved semi-structured interviews, observations through fieldwork, and collecting relevant documents from five food manufacturers and their supplier. Finally, in the data validation phase, interviews with seven government agencies, three NGOs, and two business customers were held to corroborate the insights emerge from the previous phase.

The Indonesian food supply chain was selected due to its urgent matters in terms of environmental and social concerns over business activities. It also provides a novel context to study sustainability transformation since the existing research in SSCM field tends to focus on developed countries. With the globalised food industry, where supply chain activities span across countries, uncertainty and risks related to operating in developing countries may affect the entire supply chain. Thus, it is imperative to understand various factors affecting the successful implementation of sustainability in this region.

Stakeholder Theory provides a useful lens in identifying relevant stakeholders and examine their roles in moving towards becoming a sustainable supply chain. Specifically, this study applies Stakeholder Theory to identify the primary stakeholders in enabling sustainability transformation, assess the current state of sustainability implementation in the Indonesian food supply chain based on their perspective, recognise the roles they play in the sustainability transformation, and identify appropriate sustainability goals and associated barriers.

Affordance Theory was also employed to examine how IS can support the achievement of these sustainability goals. The theory is a suitable lens to understand the socio-technical mechanism in understanding how IS have been affording organisations to change their practices to be more sustainable. By employing Affordance Theory, this study conducts a rich and novel investigation into how IS can enable sustainability transformation by

identifying the necessary affordances in sustainability transformation and investigating the factors affecting the actualisation of these affordances and the outcome.

Furthermore, Dynamic Capability Theory was applied to unveil the capability building process that supports sustainability transformation. This study uses Dynamic Capability Theory to identify essential dynamic capabilities required in sustainability transformation and examine how IS can be utilised to acquire this set of necessary capabilities.

Data analysis and the application of the three theories as analytical lenses in this study have resulted in the development of the model of IS-enabled sustainability transformation in the food supply chain, as seen in Figure 7.1. This model presents various aspects that contribute to successful sustainability transformation within manufacturers and with their suppliers.

The model shows that sustainability goals direct actors in their interaction with IS resulting in the emergence of a set of IS affordances. This study identifies nine key affordances necessary in supporting sustainability transformation. The actualisation of these affordances yielded in the creation or enhancement of sustainability capabilities in an organisation. This study identifies seven sustainability capabilities pertinent to the sustainability transformation process. The exercise of a combination of the capabilities contributes to developing the dynamic sustainability capabilities required for smoothing transformation process. By developing specific dynamic sustainability capabilities, organisations can mitigate barriers and enhance their changes process towards becoming sustainable entities.

Another interesting finding was the identification of individual and organisational resources necessary for the actualisation of IS affordances. The individual resources include the IS operational skill, the willingness to share data, and the consistency in using IS. This study further revealed four organisational resources that affect the affordance actualisation, i.e., leadership commitment and support, trust between stakeholders, sustainability-driven policy and practice, and proper organisational structure.

At the food industry and national levels, this study found that the government, NGOs, customers, and cooperatives play critical roles in providing ecosystem resources for sustainability transformation. The government provides regulations, incentives, and enforcement necessary to encourage proactive and compliance to sustainability standards. NGOs bring sustainability advocacy and capacity development functions for supply chain

players. Customers demand sustainably produced products and contribute to providing resources for sustainability transformation. This study extends the previous studies by identifying cooperative as the new player in supporting sustainability transformation. Cooperatives serve as an intermediary between manufacturers and suppliers and provide social capital such as local knowledge, cooperation, and trust.

In summary, this study has made the following theoretical contributions: (1) this study extends the current knowledge of how IS enable the development of essential sustainability capabilities; (2) it provides rich empirical evidence to illustrate that firms require certain dynamic capabilities to respond to challenges posed by emerging environmental and social issues through novel application of Stakeholder theory, Affordance Theory, and Dynamic Capability Theory; (3) it extends the literature by presenting a holistic view of sustainability transformation; (4) it provides insights into how IS can support firms to anticipate and deal with challenging social issues in supply chains; and (5) it enhances our understanding of how sustainability transformation occurs in a developing country.

This study also offers contributions to practice by: (1) recognising relevant resources, capabilities and dynamic sustainability capabilities required for sustainability transformation that allows practitioners to prioritise their efforts in managing the change necessary towards sustainable supply chain; (2) providing practical insights for practitioners attempting to affect change through the effective use of IS; (3) improving IS design by integrating necessary affordances to support organisational change; and (4) providing insights for government, NGOs, customers, and cooperatives to provide an enabling ecosystem for sustainability transformation.

## 8.2    Limitations and Future Research

Despite the efforts that this study has taken to address the important research gaps, several limitations, outlined below, need to be addressed in future research.

First, since this study is qualitative research, the context greatly influences meaning, actions, and statements occur within. While the findings are likely to apply to different contexts, but it is not backed by empirical evidence. Thus, the generalisability of the results of this study must be taken cautiously because the findings may be distinctive to the participants explored in this study and, hence, may not be applicable in other contexts.

This study recognises that the selection of the food industry in Indonesia as the context may limit the generalisability of this study. Thus, future research could investigate whether the IS-enabled sustainability transformation is valid in a different industry or country.

Second, this study collected data from interviews with 43 participants from manufacturers and suppliers, ten from ministries, four from NGOs, and four from business customers. The researcher was not able to gather more interviews due to (1) limited availability of companies who have used IS, especially a traceability system, in their sustainability efforts, (2) difficulty in acquiring cooperation from potential respondents, and (3) time and fund limitations. However, the saturation was reached after around five respondents in all case study. Future studies may benefit from a wider pool of participants.

Third, this study used a dyadic approach by examining the relationship between manufacturer and supplier. It would be interesting to assess sustainability implementation in other members of the supply chain. For instance, investigating sustainability transformation within a different combination of dyads or triads such as between retailer, manufacturer, and supplier would be useful to understand how sustainability can be implemented within the rest of a supply chain.

Fourth, this study identifies nine affordances emerged from IS use by the participating organisations. However, among the identified sustainability goals, one goal is extremely underrepresented, i.e., "to educate broader individual customers to choose sustainable products". The current efforts are limited to displaying general sustainability information in the manufacturers' websites. Hence, future studies could analyse other IS affordances that could achieve this goal.

## 8.3    Three Pillars and 22 Principles for Sustainable Food Supply Chains

The findings of this research provide valuable insights into producing three key pillars for creating sustainable food supply chains: Resource, Capability, and Practice. The three pillars are broken down into 22 principles for sustainable food supply chains, as outlined below. This study proposes that by developing these three pillars and adopting the 22 principles, companies can transform themselves and their supply chains into sustainable entities.

Pillar one: Resource

1. Design and develop a user-centred information system (by incorporating relevant material properties to ensure affordance actualisation)
2. Ensure leadership commitment and support
3. Develop sustainability-driven policy and practices
4. Form a dedicated division that manages and oversees sustainability implementation
5. Promote inter-industry and inter-disciplinary collaboration to gain resources
6. Provide sufficient resources and infrastructure to perform sustainable practices
7. Provide appropriate regulations and incentives for sustainable companies

Pillar two: Capability

1. Develop and exercise the key sustainability capabilities
2. Develop and exercise the dynamic sustainability capabilities by combining the application of relevant sustainability capabilities
3. Provide sufficient training for workers to perform sustainable practices

Pillar three: Practice

1. Conduct monitoring to track the continuous implementation of sustainable practices
2. Drive sustainability transformation across a supply chain (by helping less advanced members)
3. Enforce a stricter punishment for non-compliant organisation
4. Procure products from suppliers that guarantee fair and safe work conditions for their workers
5. Provide clear labelling for food options
6. Provide sustainable and affordable products alternatives
7. Source sustainable materials
8. Reduce single-use packaging
9. Promote recycling
10. Communicate sustainability goals, commitments, and efforts broadly
11. Conduct a comprehensive waste management strategy
12. Promote water and energy efficiency

To conclude, it is expected that the findings of this study contribute to providing a greater understanding of how IS can support sustainability transformation. In the increasingly

volatile and uncertain world, the need for a sustainable supply chain is imminent. Conducting environmentally and socially responsible practices should be the new business as usual. However, the challenges are enormous. Thus, this study emphasises on the need for collaboration between stakeholders and invite future research on sustainability, social studies, information system, and other disciplines to tackle this herculean task collectively.

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# Appendix A: Invitation Letter to Participate in An Interview

Melbourne, 12 February 2018

To the Director of Air Pollution Control Division

Directorate General of Environmental Pollution and Control

Ministry of Environment and Forestry

Republic of Indonesia

Dear Sir,

This letter confirms a request for assistance in a supervised research project conducted by:

| | |
|---|---|
| Name | : Imairi Eitiveni |
| Student ID | : 838534 |
| Research title | : IT-Enabled Capabilities Development in Sustainable Supply Chain Management |
| Ethics ID | : 1750224 |
| Department | : School of Computing and Information Systems, The University of Melbourne |

The assistance from your institution is critical to the success to this research project. You will find more information about the project in the approved ethics application and plain language statement. If you require more time or have any questions, please let us know.

Thank you in advance for your assistance in this research project. We look forward to hearing from you.

Principal supervisor,

A/Prof. Sherah Kurnia

Computing and Information Systems
Melbourne School of Engineering
Doug McDonell Building, room 10.16
Email: sherahk@unimelb.edu.au
T: +61 3 8344 1534

# Appendix B: Interview Questions for Food Manufacturers and Suppliers

**Note:**

[Case manufacturer/supplier] indicates the question asked was relevant to all manufacturers and suppliers. [Case manufacturer] or [case supplier] means that the question is asked to manufacturers or suppliers, respectively.

**Understanding sustainability transformation within a case organisation**

- What are your roles and responsibilities in [case manufacturer/supplier]?

- What is your understanding of sustainability transformation?

- What do you know about sustainability transformation within [case manufacturer/supplier]?

- What drives [case manufacturer/supplier] to implement sustainability? What is the goal?

- Are any of your tasks related to the sustainability transformation?

- Have your work practices changed since the sustainability transformation started? If yes:

    a. What has changed?

    b. What triggered the change?

    c. How did the change happen?

- How did your behaviour, as an individual, change to allow for sustainability transformation?

- What do individuals in an organisation need to have/change to support sustainability transformation?

- Did the [case manufacturer/supplier] influence the individual change? If yes, how?

- Have your team/division work practices changed since the sustainability transformation started? If yes:

    a. What has changed?

    b. What triggered the change?

      c.   How did the change happen?

- What does [case manufacturer/supplier] need to have/change to enable sustainability transformation?

- What capabilities required for a successful sustainability transformation in [case manufacturer/supplier]?

- How do you and [case manufacturer/supplier] develop these capabilities?

- What are other resources needed to conduct sustainability transformation successfully?

- How does the resource relate to the sustainability transformation?

- Does the sustainability transformation affect [case manufacturer/supplier]'s economic, environmental, and social performances? If yes, how?

- What are the challenges that [case manufacturer/supplier] face in starting and implementing sustainability initiatives? How do [case manufacturer/supplier] address them?

- Is there any external organisation involved in [case manufacturer/supplier]'s internal sustainability transformation?

- How does the external organisation influence the sustainability transformation within the [case manufacturer/supplier]?

**Understanding the relationship between manufacturers and their suppliers in enabling sustainability transformation**

*Specific for case manufacturers:*

- Are any of [case manufacturer]'s suppliers involved in the sustainability transformation? Why or why not?

*If the answer to this question is yes, then the manufacturers and suppliers were asked the following questions:*

- How does sustainability transformation happen within [case supplier]?

- What is the role of [case manufacturer] within its [case suppliers] to support sustainability transformation?

- How do [case manufacturer] coordinate and collaborate with [case suppliers] to conduct sustainability transformation?

- What factors affect this collaboration?

- What are the challenges in collaborating and coordinating sustainability transformation between [case manufacturer] and [case supplier]? How do [case manufacturer/supplier] address them?

**Understanding how IS support sustainability transformation**

- Was IS involved in the [case manufacturer/supplier] sustainability transformation?
- What role does IS play in the [case manufacturer/supplier] sustainability transformation?
- What are technologies and IS that [case manufacturer/supplier] use to support sustainability transformation?
- How is IS utilised in supporting sustainability transformation in [case manufacturer/supplier]?
- What does IS enable you to do concerning sustainability transformation?
    - What IS feature enables you to do that?
    - What is the impact of using IS to do that?
- What are the challenges that [case manufacturer/supplier] experience in using IS to support sustainability initiatives? How does [case manufacturer/supplier] address them?

**Closure questions**

- What aspects do you want to add other than what we have discussed that is crucial in sustainability transformation in [case manufacturer/supplier] and its supplier?
- If we need to talk again, may I contact you back to arrange another meeting?
- Do you know any participants that may be suitable for this study?

# Appendix C: Interview Questions for the Government, NGO, and Customer Participants

**Note:**

[The government/NGO/ customer] indicates the question asked was relevant to either government, NGO, or customer participant.

**Understanding sustainability transformation in Indonesian food supply chain**

- What is your understanding of sustainability transformation?
- What do you know about sustainability transformation within the food supply chain in Indonesia?
- What are the factors that support the implementation of sustainability transformation in the food supply chain in Indonesia?
- What capabilities required for a successful sustainability transformation in the Indonesian food supply chain?
- What are other resources needed to conduct sustainability transformation successfully?
- How does the capabilities and resource relate to the sustainability transformation?
- What are the challenges that the food manufacturers and suppliers face in starting and implementing sustainability transformation?
- What is the effect of sustainability transformation in the food supply chain?
- What Information systems are used to support sustainability transformation in the food supply chain in Indonesia?
- Who have used the information systems?
- What is the role of [the government/NGO/customer] in materialising sustainable food supply chain?
- How does [the government/NGO/customer] work with food manufacturers and suppliers to realise sustainable food supply chain?

**Closure questions**

- What aspects do you want to add other than what we have discussed that is crucial in sustainability transformation in food supply chain in Indonesia?

- If we need to talk again, may I contact you back to arrange another meeting?

- Do you know any other participants that may be suitable for this study?

# Appendix D: Observation Note Sample

Location: one of Manufacturer D's factories

Date: June 1$^{st}$, 2018

Upon entering one of Manufacturer D's factories, the researcher was greeted by a security officer and then ushered to a room where the officer presented the security and safety protocols in the facility. The researcher was given a bright yellow vest and a guest ID, and then accompanied to the reception area. On the way, the researcher could see various reminders to prioritise health and safety in the workplace.

In the reception area, the researcher was greeted by one of the managers. She gave a brief introduction to the factory and took the researcher to the manufacturing side. The researcher could see thousands of plastic water jugs were neatly stacked inside a special rack made of iron or jug racks. The jugs were empty and just taken from the suppliers. They would be sorted and then refilled or destroyed.

Manufacturer D applied an in-line process system in manufacturing its products. This system automated manufacturing process from making to delivering its products. In the factory, the initial process was receiving and sorting empty water jugs. They were loaded into conveyor belts. Several employees were working along the conveyors. Although almost all of the production used machines, certain processes required human checking. Several officers checked the cleanliness, leakage, and scent of the incoming jugs. If any jug has dirt, damage, or strange smell in or on it, it was separated from the rest to be manually fixed. After the jugs were filled with water, some officers visually checked the overall condition of each jug. The rest of the process was automatic. The jugs were washed several times, sprayed with disinfectant, dried, filled, stamped with batch number and expiry date, and ready to be shipped. The water was sourced from near water well. It was filtered and sterilised several times to meet the health requirements set by the government.

All Manufacturer D's factories used an ERP system and connected to the headquarter through a VPN network. Manufacturer D utilised the Supply Chain Management module

in the ERP system to support its activities. It collected various operational data, such as stock inventory, purchasing, production plans, and key performance indicators. It also monitored its emissions of nitrogen oxides (NOx) and sulphur oxides (SOx) to ensure that the amount of NOx and SOx gas was below the quality standard set by the government. The suppliers had access to the SCM module and procured and sent materials when necessary ensuring uninterrupted flow of production and distribution.

# Appendix E: Coding Sample

| Open Code | Representative Quote | Axial Code | Selective Code |
|---|---|---|---|
| IS allow for the reconsideration of belief formation | *"We have a dashboard for each division. One thing that we evaluate is paper consumption. The dashboard shows how much printing each user has done. Every month we report it. We aim to encourage people to lower their paper consumption."* (IT Director, Manufacturer C, Case Study 3) | Reflective disclosure | IS affordance |
| IS allow for the action formation | *"There are a lot of requests from the customer to measure GHG, water usage, things like that. All that should be recorded. IS is useful to capture all of this information and act upon it."* (VP of Commercial Sustainability, Manufacturer B, Case Study 2) | | |
| IS allow for the outcome assessment related to work practices | *"IS play a very important role to ensure or assist in the implementation of the sustainability initiative. For example, I have data about our trucks. Wherever any truck goes, I can calculate the actual CO2 emission released by our shipping."* (Supply Chain Division Director, Manufacturer A, Case Study 1) | | |
| IS enable the dissemination of sustainability-related information from both internal and external sources | *"We put all the relevant information on our sustainability dashboard. There is a lot of information about sustainability there. We use that to communicate with the stakeholders."* (Head of Supply Chain Engagement and Grievance Handling, Manufacturer B, Case Study 2). | Information democratisation | |
| IS enable interaction about sustainability- | *"IS can ensure compliance with the policy. We have a list of things that must be obeyed. IS* | | |

| Open Code | Representative Quote | Axial Code | Selective Code |
|---|---|---|---|
| related information from both internal and external sources | *can help to check that. Then, we can convince our buyers that we produce sustainable products by using IS. They access the IS and can see the information about the supplier and the product."* (Sustainability Lead Analyst, Manufacturer B, Case Study 2) | | |
| IS eliminate the dependency of work practices to a specific location | *"The government has a lot of infrastructures, but they still use the manual method. To get the data, they must go to the weather station and download it. But we can monitor the data online and in real-time. We can monitor anything such as groundwater level, anytime on a computer or smartphone"* (Sustainable Development Director, Manufacturer D, Case Study 4) | Delocalisation | |
| IS allow for digitisation of artefacts and work practices | *"We have been digitising our document and workflow by creating end-to-end online connectivity to reduce the need to travel.* (IT Director, Manufacturer C, Case Study 3) | | |
| IS govern work processes | *"We have a dashboard that shows the amount of printing for each user and each division. We report it every month to encourage our employees to read documents with a laptop or a mobile phone, instead of printing them. We also try to automate processes using EDI to reduce the number of transactions with paper"* (IT Director, Manufacturer C, Case Study 3) | Output management | |
| IS govern resource allocation | *"But we can monitor the data online and in real-time. We can monitor anything such as groundwater level, anytime on a computer or smartphone. We have to make sure we don't overexploit the water and monitor the trends because* | | |

| Open Code | Representative Quote | Axial Code | Selective Code |
|---|---|---|---|
| | *there is no certainty about water availability in the dry season.*" (Sustainable Development Director, Manufacturer D, Case Study 4) | | |
| IS calculate and reduces the harmful impact of work practices. | "*IS play a very important role to ensure or assist the implementation of the sustainability initiative. For example, I have data about our trucks. Wherever any truck goes, I can calculate the actual $CO_2$ emission released by our shipping.*" (Supply Chain Division Director, Manufacturer A, Case Study 1) | | |
| IS facilitate discussions | "*The training material does not need to be distributed physically but is shared via IS. It does not stop after the training. We also actively discuss our progress via IS*" (Head of Agricultural Research and Development Agency, Ministry of Agriculture). | Collective learning facilitation | |
| IS record training history of all employees | "*All data about training is recorded in our information system. Who has done what training. Internal training is automatically recorded by human resources into the system, but we must enter data about external training into our system.*" (Supply Chain Division Director, Manufacturer A, Case Study 1) | | |
| IS store and disseminate training materials | "*We use IS for training/technical guidance/socialisation. For example, we conduct the socialisation of our sustainability projects using IS. We do face to face training, but it is based on IS. The material does not need to be distributed physically but just shared via IS*". (Head of Agricultural Research and Development | | |

| Open Code | Representative Quote | Axial Code | Selective Code |
|---|---|---|---|
| | Agency, Ministry of Agriculture) | | |
| IS embed standards and indicators | *"We have IS to see the performance of all business unit called X. It embeds standards and KPI. We can see the performance of each business unit compared to the standards and goals."* (Sustainable Development Director, Manufacturer D, Case Study 4) | Active performance assessment | |
| IS compare performance to indicators and standards | *"IS are crucial in performance assessment, so we can measure what we do, we know whether we make progress or not. If the progress is slow, we have the data to analyse how we can accelerate progress* (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1) | | |
| IS verify a supplier's identity | *"All information about suppliers are captured in the traceability system, such as name, land, productivity, etc. The suppliers also have an ID card with QR code. When they sell their crops, we scan their card to verify their identity to seek whether they produce sustainably"*. (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1) | Transaction facilitation | |
| IS record transaction data | *"When a supplier sells a product to a trader, the trader captures data about the weight of the crops and how much more that is expected of him. We track all of this information. From this collector, until the goods arrive at the factory, we can trace the crops back to the origin."* (Sustainable Agriculture Development and Procurement Director, Manufacturer A, Case Study 1) | | |

| Open Code | Representative Quote | Axial Code | Selective Code |
|---|---|---|---|
| IS appraise an organisation's asset and productivity | *"Our IS capture all of the interaction as it happens. We have information about this material comes from which suppliers, how many kilograms. We want to measure how productive they are"* (Vice President of Commercial Sustainability, Manufacturer B, Case Study 2) | Creditworthiness assessment | |
| IS simulate profit and loss | *"In the traceability system, suppliers can see the projection of the result that he can get from doing something. For example, if the supplier does X to increase the quality of their production for Y year using the Z method, he can calculate the profits for the next 5-10 years"* (Corporate Affairs Manager, Manufacturer A, Case Study 1) | | |
| IS embed standards and indicators | *"We have IS to see the performance of all business unit called X. It embeds standards and KPI. We can see the performance of each business unit compared to the standards and goals.*" (Sustainable Development Director, Manufacturer D, Case Study 4) | Non-compliance & threat exposal | |
| IS identify misconduct | *"We analyse the data for anomalies whether any of our suppliers are doing anything suspicious. For example, they register in the system that they have 2 hectares of plantation but how come they deliver 10 hectares?* (Vice President of Commercial Sustainability, Manufacturer B, Case Study 2) | | |

# Appendix F: Findings from Interviews with Government Officials

| ELEMENTS | QUOTE |
|---|---|
| **Barrier** | |
| 1. Financial constraint | *"Large corporations are aware of regulations about the environment. Some home industry or small companies know, some do not know or know but do not implement it because of their limited resources. They focus on covering production costs. If they manage the environment, they might not be able to survive."* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 2. Absence of regulation, incentive, and enforcement from the government | *"Supervision [by the Ministry of Environment and Forestry] is layered, starting from the district, city, provincial and national. Sometimes, people report to us [at national level] directly, that is an indication that something is wrong at the city or provincial level. For example, people from Nias reported to us. It is very far. It is an indication that community complaints have not been responded to by the local government. There are also people who think that the regional government does not care."* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 3. The economic-focused mindset | *"Companies pursue profit, but we must ensure that they manage the environment as well. They do not value environmental management. I gave waste management training to companies, ... but most of the time there are no directors at the training, those who were sent were the middle to lower-level employees."* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 4. Difficulty in detecting and addressing social issues | When asked how to address social issues in supply chains: <br><br> *"We need control from all stakeholders involved. There is no control in the conventional market, only sellers and buyers who knows the details of a transaction. Because conventional control is rather difficult, when we use ICT, stakeholders can check the transaction whether the price is fair or whether the labours are treated fairly. Unfair cases can go viral."* (Head of the Trade Assessment and Development Directorate, Ministry of Trade) |
| 1. Lack of long-term commitment | *"Not all of them [companies] intend to manage the environment intrinsically but out of fear of being punished. It is different if they have the intention, then they will be honest. If people are afraid of being punished, the possibility of dishonesty exists. So, there is compulsion to comply with the rules which may change in the long term, if the regulation change."* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| **Resources** | |

| ELEMENTS | QUOTE |
|---|---|
| 1. Knowledge and skill | When asked about the necessary resources in sustainability transformation:<br><br>"*We need knowledge, skill, and technology. Knowledge and skill to operate the technology and to comply with all the rules that we provide. It requires knowledge about permits, liquid waste disposal, reporting, parameters that must be tested, quality standards, so the wastewater that the company discharges to body of water meets the quality standards.*" (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |
| 2. Willingness to share data | No evidence was found. |
| 3. Consistency | When asked about the necessary resources in sustainability transformation:<br><br>"*Skills from employees, skills in the green industry, and commitment. It is enough. If the company is committed, it carries out continuous improvement. It is equipped a commitment that is expressed in the form of target and key performance indicator. If it conducts a consistent evaluation and improvement, it can be a sustainable [entity].*" (Head of Green Industry Directorate, Ministry of Industry) |
| 4. Leadership commitment and support | When asked about the necessary resources in sustainability transformation:<br><br>"*Commitment of directors/management. If management is committed, they look for/allocate good resources. If management does not have it, it will not be considered in the business strategy, it will not work.*" (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |
| 5. Trust between stakeholders | "*It is hoped that the data that companies submitted is truly valid and can be trusted. According to the rules, if they do not report the real data based on the field, they will be sanctioned. When submitting the data, they are responsible for the validity of the data. Because it is impossible to verify each of the millions of companies. So, we trust our stakeholders to submit the accurate data.*" (Head of Manpower Planning and Development Directorate, Ministry of Manpower) |
| 2. Appropriate structure | When asked about the necessary resources in sustainability transformation:<br><br>"*An organisational structure that has health and safety/ environment division. That division oversees environmental management.*" (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |
| 3. Sustainability driven policy and practice | "*A company must do the mandatory practices and add the voluntary ones to reach the green [rating in PROPER]….it has to reduce resource consumption. …Additionally, it also develops the community, as a part of CSR. … If it wants gold, it must scale up by* |

| ELEMENTS | QUOTE |
|---|---|
| | *ensuring the sustainability of its community development."* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| *Sustainability Capability* | |
| 1. Sustainability data collection | "*We measure the impact of business activities to the environment by using automatic continuous tool. Factories are required to measure [the impact] using this tool, but it is not connected with our office yet. The plan is that we will connect the factory measurements automatically so that we can see the emission of each chimney online. ... For the small companies, we collect data manually, because automatic continuous tools are expensive. They report their emission via SIMPEL [an online reporting system]"* (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 2. Sustainability reporting | "*After companies process the waste, they must report; otherwise, the government does not know. It is impossible for the government to check one by one. After treating waste and reporting it, then it can be blue [rating in PROPER]. Without report, it is red. We have an electronic reporting system called SIMPEL for reporting… the companies are then evaluated based on data on SIMPEL. Then the rating comes out of it*." (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 3. Sustainability human capital development | "*We provide technical guidance. We invite the industries to the office every year for regular training. Particularly, we hold special technical guidance for those with red PROPER ratings*." (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |
| 4. Sustainability benchmarking | "*Benchmarking is done between one company with another. A company who has gold rating now may not get it next year, if another company is better. So, we encourage companies to benchmark themselves against other companies. If they are superior compared to others, they are a gold candidate*." (Head of Air Pollution Control Directorate, Ministry of Environment and Forestry) |
| 5. Sustainability risk management | "*If a company gets red rating, it means it is non-compliant. We see where the disobedience, whether the fulfilment of quality standards or the reporting. ... if it gets red rating thrice, it is subject to administrative sanctions such as termination of operation or further law enforcement actions*." (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |
| 6. Sustainability governance | "*To monitor emission, we use six compliance points. ... Any breach to any of the points means not compliant. There are compliances with permits, structuring points, quality standards, parameters, technical provisions, and reporting. They must report every month. If a company want to get the next higher rating, it must align its activities based on these compliance points*." (Head of Industrial Waste Control Sub-Directorate, Ministry of Environment and Forestry) |

| ELEMENTS | QUOTE |
|---|---|
| 7. Sustainability collaboration | When asked how to address social issues in supply chains:<br><br>"*We need control from all stakeholders involved. There is no control in the conventional market, only sellers and buyers who knows the details of a transaction. Because conventional control is rather difficult, when we use ICT, stakeholders can check the transaction whether the price is fair or whether the labours are treated fairly. Unfair cases can go viral.*" (Head of the Trade Assessment and Development Directorate, Ministry of Trade) |

# Appendix G: Findings from Interviews with NGOs

| ELEMENTS | QUOTE |
|---|---|
| **Barrier** | |
| 1. Financial constraint | When asked "what it takes to realise sustainability": <br><br> *"Willingness of customers and chocolate companies to pay for it. Sustainable supply chain requires certain number of suppliers. If you just find a hundred suppliers somewhere, it does not make sense, it is getting too expensive. You need at least 2000-3000 farmers for it to be feasible. Then, it requires more funding."* (Vice Executive Director, NGO A) |
| 2. Lack of proper regulation, incentive, and enforcement from the government | *"The majority of businesses are doing a lot of violations of the law. They already know the regulations but they still violate them because they know that the monitoring and law enforcement from the government are weak. So, they take advantage of it."* (Executive Director, NGO B) |
| 3. The economic-focused mindset | *"They [businesses] do not think about technology transfer or productivity improvement. For example, businesses in the environmental and natural resource sector, they focus on they can get more land. That is their main mission of how to have the maximum assets in Indonesia, how to reduce costs as low as possible by ignoring the environment and also pressing labour, for example [by giving] low wages etc., that's what is happening now."* (Executive Director, NGO B) |
| 4. Difficulty in detecting and addressing social issues | *"There are so many hidden stories in palm oil plantations that have not changed since the Dutch colonialization era. Labours are afraid of the foreman because, in the garden, the absolute ruler is the foreman. It is difficult for them [labours] to access the outside world because the plantations are thousands or hundreds of hectares. It is very far from public roads or facilities. If they have motorbikes, they have to go through several guard posts."* (Executive Director, NGO B) |
| 5. Lack of long-term commitment | No evidence found. |
| **Resources** | |
| 1. IS operational skill | When asked about the necessary resource in sustainability transformation: <br><br> *"I think it's knowledge. We want the beneficiaries have the required knowledge and are independent from NGO1. We want the know-how or knowledge can be adopted in full, so they are knowledgeable to perform their tasks."* (General Manager, NGO A) |

| ELEMENTS | QUOTE |
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| 2. Willingness to share data | "*We demand further explanations of what the government has to say, so there is a check and balance. There must be a balance of information for the public. So, the public is not just brainwashed or receiving one-sided information. They can understand what is happening. We need information disclosure. It is difficult to ask for information from the government such as about palm oil concessions. It should be public information. ... Information disclosure will help the government because public can help monitoring.*" (Executive Director, NGO B) |
| 3. Consistency | No evidence found. |
| 4. Leadership commitment and support | *"Actually, businesses already have everything needed to perform sustainability. What is missing is leadership in the company and political will. Strong desire from the leadership level in the company to change is what is needed because they have all other resources."* (Executive Director, NGO B) |
| 5. Trust between stakeholders | No evidence found. |
| 6. Appropriate structure | No evidence found. |
| 7. Sustainability driven policy and practice | *"The suppliers also play role because they have to follow certain standards and practices. if they use banned pesticides, they cannot be [sustainably] certified."* (Vice Executive Director, NGO A) |
| *Sustainability Capability* | |
| 1. Sustainability data collection | "*The farmers have QR codes, whenever they come to the traders, they scan the code, so we can collect data about the transaction, on what price, quantity and what dates. It is very helpful. Companies can choose their clients, from where their cocoa is sourced.*" (Vice Executive Director, NGO A) |
| 2. Sustainability reporting | "*Customers must be educated. They must have knowledge and the right to information. This right has not been fulfilled by many producers, especially in Indonesia. Because consumer awareness is not there yet. If we compare it to Europe, customers are very concerned about what information is available about certain products. The role of the government is very strong. ... They make rules and regulations. In Indonesia, there are no rules like that. ... So that indeed there needs to be a continuous campaign to consumers [to demand reporting about products]. Still, there are also needs for enforcement from the government, especially about information disclosure from businesses.*"  (Executive Director, NGO B) |
| 3. Sustainability human capital development | *"We train them in good agricultural practice, in nutrition, environment, financial literacy, business practices."* (Country Vice Executive Director, NGO A) |
| 4. Sustainability benchmarking | *"If we compare it to Europe, customers are very concerned about what information is available about certain products. The role of the government is also very strong. Even the ingredients have* |

| ELEMENTS | QUOTE |
|---|---|
|  | *standards created by the government. There are periodic reviews. They make rules and regulations. In Indonesia, there are not many rules like that, not about health problems, the environment, not much about food safety etc."* (Executive Director, NGO B) |
| 5. Sustainability risk management | When asked about the benefits of sustainability implementation for business: "*They do not have to incur additional costs in managing risks and conflicts. Managing conflict is a high cost for companies. They must pay the police to defend the company; they must bribe the government. So, there are costs that cannot be recorded which is bothersome. If they obey all regulations and do not cause environmental and social problems, they are safe. They can do good and long-term business because there will be no turmoil and protest, and no need to pay the police and the government."* (Executive Director, NGO B) |
| 6. Sustainability governance | "*The government is supposed to protect the citizen, but what is happening is that it is protecting the private sector more than the citizen. ... The government or the state now facilitates the interests of business and private sectors, then it has an impact on society and communities, their rights are not protected including the right to a clean and healthy environment since the government more focus on economic and sides with large businesses. ... Well, we want to restore the government's role in accordance with the constitution."* (Executive Director, NGO B) |
| 7. Sustainability collaboration | "*NGO A collaborates with nine other private sectors. This is not a CSR project; they actually chip in money into the project to ensure supply and sustainability. They will talk to each other because they are competitors. However, NGO A convince them to collaborate since sustainability is a common problem. ... It [sustainability collaboration] becomes a part of business strategy, not just donations or CSR."* (General Manager, NGO A) |

# Appendix H: Findings from Interviews with Customers

| ELEMENTS | QUOTE |
|---|---|
| ***Barrier*** | |
| 1. Financial constraint | No evidence found. |
| 2. Absence of regulation, incentive, and enforcement from the government | "*The main obstacle is the current regulations. Not all of our sustainability principles are protected or supported by the regulations. So, there are many gaps that make this implementation not run as expected.*" (Corporate Responsibility Head, Retailer B) |
| 3. The economic-focused mindset | No evidence found. |
| 4. Difficulty in detecting and addressing social issues | No evidence found. |
| 5. Lack of long-term commitment | No evidence found. |
| ***Resources*** | |
| 1. Knowledge and skill | "*There are three things that we need to conduct sustainability: knowledge, tools, and discipline. Knowledge is important to ensure the internalisation of change practices that must be enhanced through training.*" (General Manager, Retailer A) |
| 2. Willingness to share data | No evidence found. |
| 3. Consistency | "*The third resource is discipline. If tools and infrastructure have been provided and their knowledge is sufficient, but they [employees] do not work or at first work but eventually stop, you need to discipline them. If it does not work, they must leave.*" (General Manager, Retailer A) |
| 4. Leadership commitment and support | "*Directives from the top management is required. We have a corporate affair that directs whatever needs to be done, but then we are given a space and resources to innovate.*" (General Manager, Retailer A) |
| 5. Trust between stakeholders | "*We place strict requirements for our suppliers. We hope to always have always win-win solutions with our business suppliers because they need profit and we also need profit. They are our partners, hence we must maintain each other's trust.*" (Head of Supply Chain Division, Retailer B) |

| ELEMENTS | QUOTE |
|---|---|
| 4. Appropriate structure | No evidence found. |
| 5. Sustainability driven policy and practice | *"We have policies and procedures for quality control. In every distribution centre, we follow procedure in waste processing. We ensure waste processing in accordance with the Environment, Health and Safety procedure. For instance, if the goods are not suitable for consumption and are not possible to be used, we will destroy it. ... we separate the waste so that they do not contaminate the environment."* (Head of Supply Chain Division, Retailer B) |
| *Sustainability Capability* | |
| 1. Sustainability data collection | *"We perform data collection since we need data for decision making such as comparing the performance of garbage trucks.*" (General Manager, Retailer A) |
| 2. Sustainability reporting | *"Currently, we use a software to monitor the sustainability implementation in the supply chains. This software is used as a channel for sustainability implementation reporting to simplify monitoring. We can get periodic reports that ease the development of the appropriate strategies to enhance our sustainability implementation.*" (Corporate Responsibility Head, Retailer B) |
| 3. Sustainability human capital development | *"We clearly need training so that they [the employees] are more responsive and have the ability to develop this company in accordance with the company's vision, mission, and target."* (Head of Supply Chain Division, Retailer B) |
| 4. Sustainability benchmarking | *"Benchmarking is needed. For example, benchmarking vendor performance can help decision making and suggest improvement. Nonetheless, the we do not benchmark our [sustainability] performance to competitors since they are rather closed, mostly more about sale performance.*" (Head of Supply Chain Division, Retailer B) |
| 5. Sustainability risk management | *"Risk management is required. There is even a division for risk management.*" (General Manager, Retailer A) |
| 6. Sustainability governance | *"We assess our suppliers to ensure that the production is in accordance with our sustainability initiatives. For example, for products that contain palm oil, we check whether it is obtained through sustainable methods or whether the fresh fish products were obtained from a certified freshwater fish cultivation, or assess whether the suppliers comply with Fair Working Conditions standard."* (Corporate Responsibility Head, Retailer B) |
| 7. Sustainability collaboration | Q: Is there pressure from end consumers to be more sustainable?<br><br>*"Yes. Every month, we do Coffee Morning with consumers. We ask for feedback on our products and services. It is imperative for us. We analyse both positive and negative feedback."* (General Manager, Retailer A) |