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Dual agenda innovation: How firms pursue economic and environmental goals simultaneously

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Dual Agenda Innovation: How Firms Pursue Economic and Environmental Goals Simultaneously

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I hereby declare that this PhD dissertation is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in this dissertation.

This PhD dissertation has also not been submitted for any degree in any university previously.

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Abstract

With the increasing prevalence of UN SDG (Sustainable Development Goals) and ESG movement, more and more companies have started to include environmental performance as part of their strategic goals. From both risk management and value creation perspectives, not only is the positive environmental performance socially desirable, but it also can affect the economic performance. Companies strive to achieve superior environmental and economic performance (i.e.E2 performance), but few have succeeded.

In this dissertation research, the author proposed that firms are more likely to achieve superior E2 performance by engaging in dual agenda innovation that integrates environmental goal and economic goal in the innovation process. Based on extensive interviews of sixteen large companies in different industries, this study identified common challenges that companies are facing, how these challenges could be overcome by dual-agenda innovation in those companies with successful E2 performance, and what the key capabilities are that can lead to such success. The research also explored the role of digital transformation in the dual agenda innovation to achieve E2 performance.

The in-depth examination of the interview data reveals four themes in the key capabilities that require to be embedded in dual-agenda innovation: Value Identification & Quantification, Stakeholder Management, Cross-boundary

Collaboration and Digital Transformation. Based on these findings, the author developed an evaluation scheme to assess the performance of dual-agenda innovation in the sixteen companies. Next, the author applied fuzzy-set qualitative comparative analysis (fsQCA) method to analyze how different combinations of these key capabilities may contribute to the E2 performance of the sample companies. The analysis indicated that not all key capabilities contribute equally to the superior E2 performance, and some combinations of the key capabilities can have a stronger effect on E2 performance than other combinations. Thus, the qualitative and quantitative analysis in this study supported the proposed dual-agenda innovation hypotheses. The dissertation concluded by discussing the theoretical and managerial implications of the empirical findings for companies to find win-win solutions in achieving superior E2 performance.

Keywords: innovation, economic performance, environmental performance, sustainable development goals, digitalization, sustainability

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Last but not least, I would like to thank my wonderful daughter Jiayi, who provided me an unimaginable support and inspiration to carry on when facing all kinds of challenges. The help and encouragement she gave me is beyond what I could ask as a mother. I am truly blessed to have her in my life.

Dedication

This work is dedicated to those who are passionate about sustainability and have been working towards a better world for future generations. It is the small step from each of us that makes the big change we desire to happen.

1. Introduction

"It's time to make peace with nature. Making peace with nature is the defining task of the 21st century. It must be the top, top priority for everyone, everywhere."

-- The UN Secretary-General, António Guterres, 2 December 2020

Over the past few decades, the effect of economic development on environment has become a common cause of concern for the society. In 2015, 193 United Nations member states adopted 17 Sustainable Development Goals (SDGs) to achieve a sustainable agenda by 2030. Building around 17 agendas with 169 targets, the SDGs can be categorized in three layers: Environment, Society and Economy, among which Environment is the foundation that supports Society and Economy and has been integrated into many other sustainable development goals (Elder & Olsen, 2019). Since then, countries have been exerting efforts on tackling the environment challenges, but the progress has been slow (Arora & Mishra, 2019). According to the Sustainable Development Goals Report 2020, the natural environment has continued to deteriorate at an alarming rate, and changes are not happening at the required speed or scale (United Nations, 2020). Efforts from both the public and private sectors are required to tackle the challenges.

From the public stakeholder perspective, governments have been institutionalizing the measures to improve SDG performance. Policies regarding environment reservation and incentives of a green economy have been enforced in many countries (Abad-Segura et al., 2020; Jepson, 2004; Yuan & Zhang, 2020).

Consumers have started to pay attention to the private companies' environmental effect and take it as part of their purchase decision (Huang & Rust, 2011; Ziesemer et al., 2019). More investors include sustainability performance as their portfolio selection criteria. The external force pressures companies to start looking at the environmental effects as part of the strategy (Eweje, 2011). Recent cases of natural disasters and health events indicate that the most fundamental, environment issues are not a future problem; it is a problem that needs to be taken care and treated as a priority now. It becomes prominent that for companies to achieve sustainable business growth, they have to keep economic and environmental performance on their agenda and take actions to drive substantial results on both (Garvare & Johansson, 2010; Orlitzky et al., 2003a). Based on a survey conducted by KPMG, around three quarters of the large and mid-cap companies around the world reported initiatives addressing SDG by 2017 and most of the world's largest companies have integrated financial and CSR data into their annual report cycle (KPMG, 2017).

Despite the growing awareness of the environmental performance mandate, we see mixed results from companies acting on the agenda. Some companies have been actively engaging in sustainability activities which may help in improving the environment and economic performance significantly (Camilleri, 2017a). Although some achieved quite a significant improvement on environmental performance, they were facing cost challenges and are unable to beat competitors on economic performance (Esfahbodi et al., 2016) There are companies that, despite their success in economic results and the allocation of resources on activities related to sustainability, struggle to demonstrate significant improvement in terms of

environmental performance, or even be criticized for “cherry-picking” or “green-washing” (Brough et al., 2020). While there are many factors that may affect the effectiveness of the efforts, understanding what the factors are and how to integrate them into the process will not only help companies achieve better E2 performance, but also create a significant positive effect on our environment and planet.

Previous studies have investigated the mixed results and tried to untangle the relationship between economic and environmental performance. Three types of relationships were presented based on theory development and empirical research: 1) Positive correlation between economic and environmental performance (Porter, 1991; Al-Tuwaijri et al., 2004; Porter & Linde, 1995); 2) Negative effect of environmental performance on economic performance (Hassel et al., 2005); 3) Neutral relationship between environmental performance and economic performance (Elsayed & Paton, 2005). No conclusive result was obtained from the studies on the relationship between economic and environmental performance (Horváthová, 2010). However, recent studies show that if the organizational variables are addressed properly, we will be able to find a positive correlation between the two performances and achieve a win-win situation (Grekova et al., 2013). Furthermore, studies have been conducted to explore the driving factors behind the type of relationships of economic and environmental performance, as well as the mediating and moderating effects (Dal Maso et al., 2018; Epstein et al., 2015; Grekova et al., 2013). Several empirical studies have found that innovation plays an important role for firms to achieve superior economic and environmental performance simultaneously (Fujii et al., 2013; Ong et al., 2019), mainly through

cost optimization or revenue improvement associated with environmental improvement results.

Rooted in the Resource-Based View (RBV) theory, innovation is the application of new ideas resulting from organizational process in which different resources are combined (Rauter et al., 2019). Through the process, innovation creates an inimitable advantage for the company to achieve superior economic performance. The same applies when the company addresses environmental performance issues. Whether it is voluntary or motivated by compliance, the companies that adopt environmental innovation (new or improved products, services, or processes that benefits environment) appeared to achieve better results compared with those that do not (Ramanathan, 2018). This can be explained by the spillover effect from the know-how and reputation from innovation that is difficult to be imitated by competitors. Organizational capability established through the process becomes competitive advantage and leads to superior performance (Rueda-Manzanares et al., 2008).

Built on previous literature, the author defined the dual agenda innovation as the adoption of a new idea or process to deliver a new product, process, or business model with the objective to improve economic and environmental performance simultaneously. There has been plenty of studies examining the effect of dual agenda innovation on economic and environmental performances (Rehman et al., 2021; Rexhäuser & Rammer, 2014; Weng et al., 2015). However, few systematic studies have explored the mechanism of how the effect works, especially

from an organizational capability perspective. Considering the lack of coverage and the importance of organizational capabilities as an inimitable competitive advantage, we want to close the gap in an E2 performance context, in which this study examines the following research questions:

- **What are the difficulties that companies face to address both economic and environmental performance simultaneously?**
- **How can dual-agenda innovation reconcile the conflicts and drive both agendas effectively?**
- **What are the key capabilities needed for a successful dual-agenda innovation?**

To gain a deep understanding at the corporate level, the author used an interview-based case study approach in the research (Yin, 1994). The author first developed the theory and hypotheses of the four key capabilities for dual-agenda innovation. Based on it I designed the interview questionnaire and selected 12 companies with a mixed low-high economic and environmental performance in the past five years (2015 – 2019) according to Bloomberg data. During phase one, a total of 12 interviews were conducted in the first half of 2021. The aim of conducting those interviews was to identify and verify the key challenges and core capabilities during dual-agenda innovation and understand how the capabilities apply in the innovation process and drive E2 performance. The information

collected were supplemented by the company's annual report to address the bias of using a single source of data.

In phase two, the author coded the information and derived four themes that corresponds to each of the hypothesized capabilities. The author then mapped out the information from interview and annual report into the metrics and invited two subject matter experts to provide relative scores of the level of capability for each company. They applied the scheme to the interview data and annual report and provided the score without knowing the name and performance of the company. The relationship between the assessment score and economic and environmental performance was studied using a Fuzzy-set qualitative comparative analysis (fsQCA), a methodology applied to small sample sizes for causational effect (Kraus et al., 2018) to identify the pre-condition effect of the capabilities and the optimal combination to achieve superior economic and environmental performance. The process and expectation during the two stages is summarized in Section 3.

The findings indicate that the **conflict among short-term and long-term performance**, perceived **resource constraint and trade off** (rooted from stakeholder alignment instead of company size or economic performance), and **functional/design dilemma** are the top challenges that companies are facing. The interviews in the case study revealed that engaging in sustainable initiatives does not necessarily lead to superior E2 performance. The informants' responses confirmed that the capability of value identification and quantification (VIQ),

stakeholder management (SM), cross-boundary collaboration (CC) and digital transformation (DT) play important roles in achieving superior E2 performance.

Specifically for digital transformation, both the interview and fsQCA test shows that digital transformation capability not only addressed the functional/design dilemma, but also helped the other capabilities of value identification and quantification, stakeholder management and cross boundary collaboration to address the challenges. The application of digital solutions and technology can form new solutions to deal with design dilemmas in the process or product optimization, reduce negative effect and increase positive effect on environment. With digital tools and technologies, companies can also make better decisions based on data, measure the benefits of innovation, and communicate with stakeholders more effectively.

Using the extracted themes from interview notes, subject matter experts scores and the fsQCA analysis, we found that the combination of stakeholder management, cross-functional collaboration and digital transformation capability through an innovation process is positively associated with superior economic and environmental performance at the same time. Four out of five hypothesis were supported by the study result. It helped us better understand what leads to successful dual-agenda innovation. The result is consistent with previous studies about the role that innovation plays to achieve sustainable performance (Brem & Ivens, 2013). It answers the questions of how companies reconcile the conflicts between economic

and environmental performance and provides a guideline to deal with the challenges during dual-agenda innovation.

The study contributes to the literature from multiple perspectives. First, it identified the common challenges that companies face when pursuing E2 performance and validated them through the interview-based case study. Second, building on absorptive capacity (ACAP) model of innovation (Zahra & George, 2002.; Zou et al., 2018), in which the study brought new construct of dual-agenda innovation and identified key capabilities to achieve superior economic and environmental performance simultaneously. Third, through the study, we found the important role that digital transformation capability plays to address the challenges and its multiplier effect on other key capabilities. These findings can be used as a guideline for companies to pursue superior economic and environmental performance and provides a reference for policy makers if they want to incentivize companies for developing sustainable capabilities.

The rest of paper will be unfolded as follows: Part two summarized the previous studies conducted on E2 performance and innovation; Part three introduces the theory development and brought up the hypotheses; Part four is research design; Part five is a summary of the findings from interviews and case studies; Part six will discuss the findings, its contribution from the academic and practical perspective, and the limits of the study. We hope that the results of the research can address the challenges in pursuing economic and environment

performance simultaneously and provide a practical guidance for companies and policy makers to foster dual agenda innovation.

2. Literature Review

In this section we will be exploring previous studies about innovation, including its definition, process, capability, and effect on economic and environmental performance.

2.1 Traditional innovation – economic agenda driven

2.1.1 Define innovation

Based on Resource-based View (RBV) theory, a VRIO (Valuable, Rare, Inimitable, Organized) framework and dynamic capability are key to addressing a rapidly changing environment and maintaining a sustainable advantage of the company (Barney et al., 2001). Built on that theory, innovation is defined in previous literature as a process and a set of distinctive capabilities to help companies create competitive advantages through superior products or services (Knight, 1967; Zou et al., 2018b). Innovation can be categorized per type: Product or Service innovation, Process innovation, Business Model innovation and Organization innovation and so on (Kahn, 2018) or per the extent of changes: Radical, break through innovation and incremental innovation, which is defined as a relatively small and almost unnoticed improvement that counts of the most of innovation (Knight, 1967). Besides the outcome and process review of innovation, there is also

a mindset view of innovation, which addresses the internalization of innovation by individual members of the organization. It also identified key skills that lead to disruptive innovation: associating, questioning, observing, networking and experimenting (Barak et al., 2020; Johnson, 2012) and differentiated discovery and delivery skills during innovation.

Regardless of the type and extent of innovation, one of the prominent definitions is the "adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization"(Damanpour, 1991). Garcia and Calantone further defined innovation as the development, production, and market commercialization of an invention as well as product diffusion and adoption by customers (Garcia & Calantone, 2002).

2.1.2 Relationship between innovation and firm's performance

A lot of studies have been conducted to explore the relationship between innovation and the firm's performance, whether and to what extent innovation contributes to the economic performance of the firm, and how the mechanism works. Many empirical researchers found that, as RBV theory predicted, innovation provides superior financial performance by creating competitive advantages in the marketplace (Ahuja, 2000; Han et al., 1998; Rousseau et al., 2016). Expanding the definition of economic performance from value creation, value delivery, and value capture to the avoidance of value destroyed and value missing, studies demonstrated even stronger positive benefits of innovation on firm's performance.

The benefits were delivered through first mover advantages, adaptation to market uncertainties and improved stakeholder relationships (Busch et al., 2011; Pedersen et al., 2018).

Despite the positive association between innovation and firm's performance, other researches have also pointed out that innovation is a context-dependent efforts (Wolfe, 1994). Due to the resource invested and risk associated with innovation, the act of innovation does not necessarily lead to successful outcomes and it may decrease the performance if not managed properly (Markham & Griffin, 1998). Previous studies have found that the quality of innovation process (Dervitsiotis, 2011), firm size (Rosenbusch et al., 2011) and capabilities such as stakeholder management, integration and other organizational capabilities also influence the link between innovation and performance (Rousseau et al., 2016; Vincent, 2004.).

Other than the process and capability, studies have also established various inputs or macro environment as antecedents of successful innovation. The input can then be categorized as following. First, tangible and intangible resource storage, including innovation budget, knowledge management, and talent pipeline (Klomp & Van Leeuwen, 2001). These are the prerequisites to start an innovation process. Second, management support and organization structure. Innovation is a change management process that associates with risks. It requires transformational leadership to aspire the organization for revolutionary changes and achieve high levels of exploratory and exploitative innovations (Jansen et al., 2008). Although there are no conclusive findings of the type of organization structure that

contributes to effective innovation, it is a common understanding that leaner, matrix organization structure and empowered decision making are antecedents to superior innovation(Zou et al., 2018a). Lastly, entrepreneurial, and collaborative culture are considered as important for innovation as well. To be more specific, a collaborative culture foresters information sharing and builds a safe environment for radical, breakthrough innovation ideas. It facilitates changes implementation and feedback sharing which help refine the innovation in implementation stage (George & Lin, 2017).

Besides innovation itself, there are also challenges at organizational levels that impact the effectiveness of innovation and its effect on firm's performance. Two challenges have been commonly discussed in innovation literature are 1) bureaucracy and complicated routine associated with company size, and 2) organization inertia associated with company maturity (Sørensen & Stuart, 2000). Both impact the economic return of traditional innovation.

As a company grows, the process and routine unavoidably increase. It creates difficulties for timely information flow, team coordination and socialization and learnings and replication. The inefficiency process may lead to a long lead time to make decisions and response to market change, which in turn affects the economic performance of the company. The challenge can be even more so for environmental innovation (innovations that have beneficial effects on environment), which usually has more stakeholders to engage and align with. The heavy process may have an effect on cost, which reduces the profitability of product or service

(Watson et al., 2018). To address the challenge, organizations may consider segregating innovation process from routine process and create informal communities to compensate for information sharing and learnings. Cross-functional interfaces, stakeholder management and participation in joint decision-making and job rotation help to address the issues as well (Jansen et al., 2005)

Another challenge is organization inertia, usually emerging as companies become mature. Compared with start-up and young companies, mature companies tend to be more risk averse and emphasize more on predictability and control systems. The compliance oriented mindset and the pursuit of predictability discourages people from taking risks (Kelly & Amburgey, 1991). Organization may fall in the trap of the "good enough" mentality and become less proactive to seek external opportunities. Even when the innovation opportunities are detected, mature companies tend to seek incremental improvement that addresses short term issues, instead of radical, fundamental changes that bring breakthrough economic performance (Hannan & Freeman, 1984). The incremental innovation may not generate enough return when launching a new product or service, resulting in a negative effect on economic performance. Same applies to environmental innovation. The negative effect of organizational inertia can be mitigated by promoting an outside-in mindset and allocating dedicated roles and resources to keep the company updated with innovation pipeline. Adding organization diversity, encouraging risk taking, agile approach, incentives, innovation culture will help to address the issue as well (Sørensen & Stuart, 2000).

2.1.3 Process and capability of innovation

Previous studies have suggested that successful innovation requires systematic processes and capabilities to achieve economic performance from both the top line and bottom-line perspectives (George & Lin, 2017; Zou et al., 2018a). A typical innovation process consists of three stages of Design/Creation, Development/Testing and Marketing (Klomp & Van Leeuwen, 2001). It starts with discovering the need of something new or different from existing portfolio or practice, a new product, new process, or new business model, which can be driven by market value realization, also known as "white space", or risk mitigation. After the initial sensing, the problem needs to be further defined with clear goal, scope, specific measurements based on a feedback and adaptive loop (George & Lin, 2017) before the new product or new practice reach the market or massive implementation.

Further looking into the process, it has been widely acknowledged that the center of innovation is the absorptive capacity (ACAP), defined by (Cohen & Levinthal, 1990). ACAP refers to the ability of a firm to ''recognize the value of new external information, assimilate it and apply it to commercial ends''. It consists of four capabilities across the two stages of identifying and retaliating potential opportunities: Acquisition, Assimilation, Transformation and Exploitation (Zahra & George, 2002). Besides, it distinguishes companies' capability of identifying potential opportunities from the capability of realizing those opportunities and generating economic results (Zou et al., 2018a).

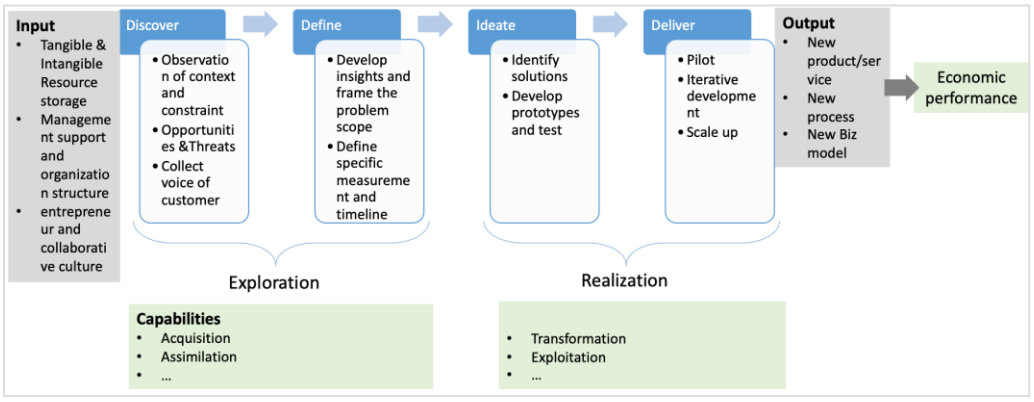
Previous studies indicate that an effective exploration stage requires acquisition and assimilation capabilities (Zahra & George, 2002), which help the company acquire and digest the information in a timely manner. According to the study, acquisition capability refers to a firm's efforts to identify and acquire external knowledge, and the quality of the capability is defined by speed, intensity and direction (Kim, 1997). Assimilation is about the firm's routine and process to analyze, interpret and understand the information acquired (Kim, 1997; Szulanski, 1996). These two capabilities define the potential ACAP and enable the firm to receive or acquire external knowledge (Cohen & Levinthal, 1990; Lane & Lubatkin, 1998)

Following the exploration process, the innovation team needs to come up with improvement or brand new solutions to address the problem or capture the opportunity, develop prototypes, pilot in reality and scale up to generate economic results, so called realization stage of innovation (Knight, 1967; George & Lin, 2017; Sheu & Lee, 2011). The effectiveness of realization depends on Transformation and Exploitation capability, which is about reassembling the internal and external knowledge, building new connections of information, and applying the knowledge to generate solutions (Zahra & George, 2002). In order to realize the value from the knowledge acquired externally, the firm also needs the capability of Transformation, which is defined as the capability to develop and refine the routines to combine the new knowledge with existing knowledge, and by doing such, shape the entrepreneurial mindset and actions of the organization (McGrath & MacMillan, 2000); and the capability of Exploitation, which is defined as the firm's capability

to incorporate acquired and transformed knowledge into its operation (Zahra & George, 2002). Realized ACAP plays a key role in transforming the acquired knowledge into a successful innovation, which in turn leads to an improvement in the company's performance.

With the input and capabilities, the innovation process generates outputs of new or improved products/services, new operating processes or a new business model that contributes to company's economic performance either by generating more revenue or saving costs. Figure 1 illustrates the end to end structure of economic agenda innovation that I summarized based on previous literature (Zou et al., 2018a).

Figure 1: End-to-end structure of Economic Agenda Innovation



2.2 Environmental Innovation – environmental agenda driven

2.2.1 Define environmental innovation

Environmental agenda driven innovation, also known as “Green Innovation”, “Social Innovation”, “Sustainable Innovation”, “Environmental Innovation” “Eco-innovation”, is defined as new or improved products, services, or processes that aimed at social equity and environmental integrity (Albareda & Iñigo, 2016; Arranz et al., 2019; Jaskolka et al., 2017; Leach et al., 2012). According to (OECD, 1995), environmental innovation includes all innovations that have beneficial effects on environment regardless of whether the effect was the main goal of the innovation. They include process, product, and organizational innovations (Bernauer et al., 2006). Environmental process innovation typically refers to an improvement or redesign of production process that results in reduced greenhouse gas emission and other environmental pollution, better energy usage efficiency and waste management. Due to the nature of the innovation, it may have a positive effect on cost efficiency as a by-product (Grekova et al., 2013). Environmental product innovation typically refers to an improvement or redesign of product or service that leads to a reduction in environmental effect during the product’s entire life cycle (Bernauer et al., 2006).

Companies adopt environmental innovation for different motivations. Some set improvement objectives for a reactive attitude as a response to external pressures such as risk mitigation from shareholders and compliance requirement from regulators (Arranz et al., 2019), some take a more proactive approach to seek green

innovation and acquire or build VRIO capabilities that contributes to companies' sustainable competitive advantages (Camilleri, 2017b).

Previous studies summarized five lenses that innovation helps tackle climate change and sustainable development: planetary boundaries, grand challenges, social entrepreneurship, institutional entrepreneurship and sustainable entrepreneurship (George et al., 2020). From an individual firm's perspective, the motivation and success factors of environmental innovation can be retrieved from the stakeholder theory. Based on the theory, firms need to identify, prioritize and cater to the needs of different stakeholders instead of only focusing on maximizing the profit for shareholders (Garvare & Johansson, 2010). Literature has covered different types of environmental innovation based on improvement areas, motivation, and identified key success factors: collaboration, stakeholder management, technology adoption and so on. (Doran & Ryan, 2014a; Picazo-Tadeo & García-Reche, 2007; Wu, 2013).

2.2.2 Relationship between environmental innovation and firm's performance

As an extension of RBV theory, a natural-resource-based view (NRBV) was brought up by Hart in 1995, which is a theory of competitive advantage based upon company's relationship to the natural environment. Hart proposed that by adopting the strategy of pollution prevention, product stewardship and sustainable development and developing relevant capabilities, companies can build significant competitive advantage (Hart, 1995). Unlike the widely established positive

relationship between traditional innovation and firm's performance, empirical literature of environmental innovation's contribution to firm's economic and environment performance has mixed findings. Through a study of 442 Chinese firms, Cai and Li found that environmental innovation significantly promotes a firm's environmental performance by reducing energy consumption, wastes and other environmental damages with the launch of green products, processes, technologies and systems (Cai & Li, 2018). Due to the high cost and risk associated with environmental innovation, it does not directly contribute to firm's economic performance in short term. However, environmental innovation may contribute to economic performance indirectly through the mediator effect of environmental performance.

Similar to Cai and Li's findings, many studies support the positive association between environmental innovation and a firm's environmental performance (Rehman et al., 2021). According to the 17 SDGs defined by UN, environmental challenges are associated with GHG emission, Deforestation, Water usage, Oceans pollution, Biodiversity, Chemicals and Waste handing (United Nations, 2012.). Innovation contributes to **environmental performance** by reducing resource consumption and pollution (avoid harm) and creating environmental related value (do good) (Luo et al., 2015). Using relevant R&D spending as the proxy for environmental innovation, (Fernández et al., 2018) found that environmental innovation contributes positively to environmental performance.

What remains unclear is whether environmental innovation contributes to **economic performance**, either through the innovation itself or through the indirect effect and intangible benefits from environmental performance. The hypothesis of positive correlation between environmental performance and economic performance was brought by Porter back to 1990s when he advocated environmental regulations and argued that environmental improvement can be beneficial to the firm and to the wider society, and it is possible to achieve win-win result of economic and environmental performance(Porter & Linde, 1995). Since then, there has been decades of inconclusive evidence regarding the relationship between environmental and economic performance and a lot of debates regarding the definition, measurement and method of the study (Busch et al., 2011; Carroll & Shabana, 2010; Margolis & Walsh, 2003)

Through empirical studies, some conclude that environmental innovation contributes to economic performance through efficiency improvement and cost savings (Szekely & Strebel, 2013) and there are huge opportunities to increase revenue and market share. Previous research suggests that environmental initiatives can be instrumental in improving stakeholder satisfaction and building intangible assets such as reputation, which will eventually influence financial performance from long term perspective (Korsunova et al., 2016; Orlitzky et al., 2003b; Surroca et al., 2010). Aldieri also found that through environmental innovation, there is knowledge spillover effect that improves firm's productivity and contributes to economic performance (Aldieri et al., 2019). Other than environmental innovation itself, studies also demonstrated positive contribution

from environmental performance to economic performance (Hart, 1995; Karagozoglu & Lindell, 2000; Shrivastava, 1995).

However, building on the similar concerns of resource investment and risks associated with traditional innovation, some studies found negative association between environmental innovation and economic performance, or no direct linkage between the two. Camilleri argued that the discretionary expenses in CSR initiatives (environmental innovation included) could distract company's resource without adding much value from both tangible and intangible perspectives (Camilleri, 2017b). Under the context of budget constraints and cost-sensitive customers, research supports a negative relationship between environmental innovation and economic performance (Yan et al., 2016). (Rexhäuser & Rammer, 2014) also found that environmental innovations which do not improve company's resource efficacy do not generate positive economic return.

On the contrary to the scenario brought by Porter, Palmer et al. (1995) strongly argues against the win-win relationship between environmental and Plaza-Úbeda et al., (2009) suggests that the win-win scenario is not easy to achieve in practice. Rather, given the costs of many environmental initiatives, there is a trade-off between environmental and economic performance that company needs to choose at least in short-term. Through dynamic panel data analysis, (Elsayed & Paton, 2005) concludes that environmental performance has a neutral effect on firm performance. This finding is consistent with theoretical work suggesting that firms invest in environmental initiatives until the point where the marginal cost of such

investments equals the marginal benefit. Salem et al. (2018) and Weng et al. (2015) also claimed no direct linkage between E2 performance. Similarity to traditional innovation, there is no guaranteed positive effect on firm's E2 performance from environmental innovation.

2.2.3 Challenges in environmental innovation

Looking into the process and capabilities of environmental innovation, a study conducted by Seebode et al. (2012) shows that on top of Absorptive Capability (ACAP) process and core capabilities from general innovation theory, companies need to develop new knowledge, new tools and to work at a system level in environmental innovation. This is mainly due to the unique challenges in environmental innovation, which will be elaborated on below.

The first unique challenge in environmental innovation is a lack of transparency and data support during the end-to-end environmental innovation process from identification to solution, implementation, and communication. Studies demonstrate that a good environmental performance is significantly associated with more extensive and quantifiable environmental disclosures of specific measures (Al-Tuwaijri et al., 2004). However, there's lack of systematic methods or indicators of environmental innovation. Barriers range from the mismatch between market price and investment, unclear or too detailed regulations, insufficient research efforts and so on (Ilinitch et al., 1998) The challenge not only makes it difficult for companies to select the most relevant and impactful issue to

work on, but also creates issues to communicate and engage with stakeholders and seeking their continuous support on driving environmental agenda.(Billio et al., 2020)

The second challenge, relevant to the first challenge is the difficulties in translating the environmental improvement results to economic values for the companies, which is important for seeking the alignment of shareholder and getting continuous funding and other resources for environmental innovation (George et al., 2020). Some studies raise the question of whether the efforts on improving environmental sustainability yields benefits for company and call for further empirical research (King & Lenox, 2001; Rexhäuser & Rammer, 2014). This could due to the barriers from the technological, financial and managerial perspectives. Due to the challenges, it may add difficulties in seeking alignment with stakeholders and getting the resources needed for the innovation, which in turn impacts its performance (Fernández et al., 2018).

The third challenge is a lack of collaboration among different stakeholders, including public and private stakeholders, companies, and consumers. Previous studies have established that internal and external collaboration are beneficial to environmental innovation and environmental performance (Albino et al., 2012a). However, this is also a common challenge reported in literature to a different extent. Some reported it as dealing with the influence from partners along the value chain such as suppliers, retailers and customers (Simms et al., 2020). Some reported it as conquering the barrier of insufficient cooperation, including co-investment and co-

creation during the innovation process (Garcia et al., 2019; Urbaniec, 2015). Given the complexity and the requirement of a wide resource and knowledge to environmental innovation, it is unlikely for a firm to achieve superior performance of environmental innovation just by itself.

With the challenges mentioned above, a successful environmental innovation will need something "more" on top of ACAP theory developed for traditional innovation. According to RBV theory, capability is harder to copy than product, process and practice, thus improving innovation from the capability perspective is critical for companies to establish sustainable competitive advantage and it's been demonstrated in previous studies of the effect of innovation (Wang & Chen, 2010). Further developed on the theory is natural-resource-based view (NRBV), which is defined as "allocation of firm's resources and capabilities for new products/services, processes and technological developments which increase firm's operational efficiency on the one hand and reduce environmental adversities on the other" (Alam et al., 2019). Although there has been a lot of studies about ACAP as a core innovation capability, the complexity and challenges mentioned above suggest that just relying on ACAP may not be enough to achieve successful environmental innovation which leads to superior environmental and economic performance. Some studies pointed out several key capabilities in an environmental context such as technological capability (Horbach, 2008) and stakeholder management capability (Salem et al., 2018), but there's no comprehensive, systematic study about capabilities that lead to superior environmental performance per the author's awareness. Thus, I picked up the capability lens for this study and

further developed ACAP theory in a dual-agenda innovation context. My aim is to identify the key capabilities to achieve superior E2 performance simultaneously and find out how the mechanism works through dual-agenda innovation.

3. Hypothesis Development

Previous studies indicate that, despite the efforts and investments made on economic and environmental innovation, it is not easy to achieve the win-win results of E2 performance. In this section I will be exploring common conflicts between economic and environmental agenda and coming up with a new concept of dual-agenda innovation. I then proposed some key success factors for dual-agenda innovation from a capability perceptive. These hypotheses will be tested during the interview-based case study.

3.1 Conflict and trade-off between economic and environmental agenda

Based on the learnings from previous study and observations in real life, there seem to be inherited conflicts and trade-offs between economic and environmental performance. Here summarized three common challenges as following.

1) Conflict between short-term and long-term. Earlier studies have casted doubts on the relationship between environmental sustainability and economic performance and raised questions that whether "green" efforts and investments pay

off (Krüger, 2015).The question has been answered by empirical studies afterwards with results showing a positive relationship between the two, and stakeholder value does contribute to shareholder value over time (Weidner et al., 2020). Real life examples also indicate that pursuing shareholder value with the sacrifice of stakeholder value dampens the company's value in the long run. According to the NRBV theory, Hart (1995) advocated that a firm can enjoy sustainable competitiveness by using its resources and capabilities for long-term environmental-friendly products, processes and technologies rather than short-term profits and benefits. Instead of debating shareholder vs. stakeholder value, what remains more relevant is the conflict between short-term and long-term benefit and the trade-off between maximizing short-term profitability and long-term consequences (Epstein et al., 2015).

Commonly measured by green-house gas emissions, waste generation, energy consumption, water. usage and so on, environmental performance improvement could result in cost savings, or increased revenue and market share when the product or service appeals to customer needs. However, it normally requires a significant investment upfront, which increases the cost of goods sold or operating cost. If consumers are not ready to accept the change and the massive market is not there yet, the new product or service may not be able to generate enough sales to compensate the cost, making it a loss-making new product or service launch. A real-life example is Tesla's electricity car business, which has been struggling to demonstrate positive accounting performance for a long time. Because the company's performance is mainly measured by short term results such

as quarterly and annual reports, the management tends to prioritize the delivery of short-term results instead of pursuing long-term opportunities that subject to the uncertainties of return and market response (Epstein et al., 2015).

2) **Resource constraint and trade off**. Relevant to short-term vs. long-term conflict is resource constraint and trade-off between environmental and economic performance. Previous studies have established the importance of resource investment on the success of innovation (Fernández Fernández et al., 2018) . R&D investment was adopted as approximate measurements of the extent of innovation in early studies for general innovation. There are five resource domains as (Buysse & Verbeke, 2003) identified in environmental context: investment in conventional green competencies for green products and process development; investment in employee skills; investment in organizational competencies measured by the involvement of functions in environmental management; investments in end-to-end performance management systems; investment to reconfigure the strategic planning process.

It's also been empirically verified that the efforts and R&D investments have a positive effect on improving environmental performance (Rousseau et al., 2016). However, there might be time lag between the spending and performance improvement results (Fernández Fernández et al., 2018). Because of the substantial resource investment, time lag and challenges of measuring environmental benefits, it might be difficult to justify the business case of environmental innovation. When the company is facing economic pressure and there is a resource constraint, it will

have to make a trade-off between economic and environmental innovation and choose the one that gives higher economic return.

Resource constraint and trade-off could also be due to the lack of recognition of the interaction and reinforcement between economic and environmental performance. When a company considers environmental innovation as cost initiative that takes resources without generating economic returns, it may deprioritize the investment on environmental innovation, instead of considering win-win opportunities and find common improvement areas to improve performance in both areas, such as environmental innovation that contributes to cost savings.

3) Design/Functional dilemma. After the company has aligned the priority between short-term and long-term, and secured resource investment for environmental innovation, there could still be challenges of design or functional dilemma that led to unaccepted processes or products by users. With existing technology and methods, an environmental driven solution may require a higher cost, longer delivery time, or compromised functions of the product or service. An examples could be an innovative package of drinks that uses environmental friendly materials with costs beyond consumer's acceptance.

Solving such dilemma normally needs technology breakthrough. However, previous research has found that the degrees of disruption of environmental innovation affects its profitability of adoption. (Dowell & Muthulingam, 2017)

found that it is more likely for companies to adopt moderately profitable but easy initiatives, as compared with a more profitable but disruptive innovation. Other than technology, the challenge associated with change management may require sophisticated stakeholder management and communication to solve.

Because of the difficulties and challenges, previous studies found that only one-sixth of large companies has investigated has a "good" CSR performance; despite the fact that 60 percent of the companies surveyed indicated that they had sustainable strategy in place, only two-thirds of these companies reporting that this strategy is profitable (Moratis, 2014). Although the study is regarding CSR initiative in general, it implies the challenges to reconcile the value gap between sustainable and economic agenda and a missing opportunity to bring the linkage of the two.

3.2 Dual-agenda innovation and core capabilities

With the complexity and challenges of the economic and environmental innovation mentioned above, here I proposed dual-agenda innovation as the solution to solve the problem and reconcile the challenges mentioned above.

3.2.1 Define dual-agenda innovation

Build on RBV theory and previous definition of innovation, I define **Dual-agenda innovation** as the adoption of a new idea or process to deliver a new product,

process, or business model with the objective to improve economic and environmental performance simultaneously. A previous definition of environmental innovation is the innovations that have beneficial effects on environment regardless of the intention (OECD, 1995). It could be an innovation with a specific environmental improvement goal in mind, or a traditional innovation with undesired environmental benefits through the new product or new ways of working. What is unique about dual-agenda innovation is it has specific, desired intention to achieve economic and environmental performance simultaneously. The dual-goal was imbedded in the process from the beginning as a guidance to decide what to innovate and how to innovate, and as the success measure of the outcome of innovation. Following this logic, an innovation with only environmental performance improvement as its objective while bringing unintentional economic benefits such as cost saving, will not be accepted as dual-agenda innovation. Although there could be a spillover effect from environmental innovation that benefits economic performance, the result is an unconscious by-product instead of an intentional achievement. Similarly, an innovation with economic performance improvement as its only goal (such as innovative package for cost saving purpose) and contributed to environmental performance as the result (reduced plastic waste) is not counted as dual-agenda innovation as the win-win intention was not there at first place.

From a motivation perspective, dual-agenda innovation can be motivated by environmental compliance mandate or voluntary reasons. Based on the literature of environmental innovation, one could argue that a voluntary driven dual-agenda

innovation is likely to be more effective as it creates a differentiator for the firm on top of compliance mandate that every player needs to follow. On the other hand, one could also argue that a compliance driven dual-agenda innovation has more favorable condition in terms of the readiness of eco-system. Therefore, it is easier to create an integrated solution that appeals to the needs of massive customers, which is important for achieving economic benefits. A life example is the mandate of phasing out internal combustion engine (ICE) car by certain timeline that has been adopted by many governments. Such a policy will force car manufactures and other players along the value chain to shift their production and operation from ICE to electric car. Thus, there's higher chance for them to form a partnership to leverage resources and develop new products, new processes and/or new business model together. Companies who have strong execution capabilities and agile to the markets will be the ones to build first mover advantage and achieve both economic and environmental performance. Due to the complexity of policies across jurisdictions and the difficulties in observing and measuring, the motivation behind dual-agenda innovation is out of the scope of this research and can be an area for future study.

3.2.2 Core capabilities for dual-agenda innovation

Since dual-agenda innovation is an innovation in its nature, it shares the same process exploration and realization, and the same four core capabilities of acquisition, assimilation, transformation, and exploitation according to the APAC theory. On top of the challenges associated with single agenda innovation, dual-

agenda innovation also needs to deal with the three common challenges between E2 performance as mentioned earlier. Thus, the four ACAP capabilities may not be enough to lead to a successful dual-agenda innovation. Previous literature has found positive correlation between some capabilities and environmental and economic innovation, such as stakeholder management, collaboration, technology adoption (Albino et al., 2012a; Judge & Elenkov, 2005; Watson et al., 2018). Based on it I identified four critical capabilities for dual-agenda innovation as an extension of ACAP theory.

Besides the general process and capabilities from traditional (economic agenda) innovation, dual-agenda innovation requires some unique capabilities to address the challenges mentioned above to fulfill the goal. Previous literature summarized the capabilities into two big groups of Operational Capabilities (Marketing, Environmental, Technological) and Dynamic Capabilities (External & Internal integrative, Value Framing, Systematized Learning) (Watson et al., 2018). To avoid the duplication with economic agenda innovation, here I focus on dynamic capabilities and come up with **four unique capabilities** to achieve successful dual-agenda innovation as hypothesis: **Value Identification and Quantification (VIQ)**, **Stakeholder Management (SM)**, **Cross-boundaries Collaboration(CC)** and **Digital Transformation(DT)**. The definition and background of each capability will be further elaborated as following.

3.2.3 Value identification and quantification capability

Build on previous literature, VIQ capability is defined as the capability to identify and translate the benefits from environmental initiatives into quantified, monetary benefits (Hinterhuber, 2017). The value could be quantitative as revenue, cost saving, and qualitative such as customer satisfaction, reputation improvement and so on. Previous studies of value identification and quantification capability mainly concentrated in sales process especially in business-to-business context. Through empirical study, research finds that value identification and quantification capability improves company's performance, and they further breakdown the capability into the practice of proposition design, quantification and communication (Hinterhuber & Snelgrove, 2016; Töytäri & Rajala, 2015).

Under dual-agenda innovation context, VIQ contributes to E2 performance by addressing the challenges of short-term vs. long-term and resource constraint. Unlike traditional innovation whose investment and business case can be justified with incremental sales or commercial benefits, the value from environmental innovation may not have a direct effect on commercial bottom-line, making it difficult to justify investment and get resources. Adding to the difficulty is the lack of established standard measurements in environmental performance, making it even more difficult to quantify the effect. Previous studies explored the topic from business case perspective and pointed out that there is lack of descriptive studies on the importance and role of the business case and value quantification perspective, such as managers' economic arguments used to drive environmental performance, the usage of qualitative or quantitative tools during the process, and the effectiveness of such argument (Salzmann et al., 2005). Although it's been

criticized of the economic driven agenda, the business case review of environmental innovation is not necessarily bad. According to (Moratis, 2014), economic value quantification not only helps to choose the relevant environmental issue to solve, but also helps to communicate the progress and result with stakeholders.

To reconcile the conflict of short term vs. long term benefit, companies need to establish a proactive approach to seek environmental benefits as part of its strategy and cascade through the organization. Compared with reactive, compliance driven environment initiatives, which normally imply cost than value (Trumpp & Guenther, 2017), proactive strategy seeks environmental value from the upstream of value chain, product stewardship and sustainable development (Haffar, 2015) . It promotes a more fundamental, structural change to seek value from green innovation and will influence the capability and process as well. Accordingly, including environment performance as part of formal performance appraisal will help to put the issue on short-term agenda and institutionalize it in the organization.

To address perceived resource constraint and trade-off between economic and environmental results, innovation process needs to include formal steps to screen environmental issues and opportunities, quantify their effect and prioritize environmental outcomes based on the return of investment from allocated resources (Veltri & Ramsay, 2009) . The “Business case” approach will help the management of the company better allocate resources based on calculated benefits, seek for synergies between the two agenda and avoid too-much or too-little issues. Value identification and quantification capability can also help to build measurement tools

and set lag and lead measures through the innovation process (Kaptein & Wempe, 2001). The data and measurements not only keep innovation deliverables on track, but also helps communicate with the stakeholder along the process. Based on it, I came up with hypothesis 1 of:

H1. Superior capability of Value Identification and Quantification is positively associated with superior E2 performance.

3.2.4 Stakeholder management capability

Stakeholder management has been defined by many previous studies, it's been referred to as the activity to identify and engage with different parties who might have an effect or be impacted by the practice. Previous research pointed out four groups of stakeholders such as organizational stakeholder, regulatory stakeholder, community stakeholder and media stakeholder (Kassinis & Vafeas, 2006). It is identified that different stakeholder has different influence power on environmental performance. Compared with economic innovation, environmental innovation influences broader group thus requires a more sophisticated stakeholder management capability. Build on literature (Korsunova et al., 2016), here I define stakeholder management capability as the capability of identifying relevant internal and external stakeholders, collecting their input from various channels, analyzing, synchronizing and prioritizing the needs or problems to tackle, and reaching consensus of the change brought by the innovation.

Besides internal stakeholder, environmental innovation usually involves a big range of external stakeholders such as customers, suppliers, government, communities, and NGOs (Watson et al., 2018). Stakeholder comes from different background usually have different institutional origins and review value differently (Szekely & Strebel, 2013), which means the innovation team needs to understand and reconcile different opinions and potential conflicts. Previous research has found that the perceived conflict between economic and environmental agenda can be solved by recognizing the financial value of stakeholder reactions to environmental performance, and achieve a "win-win" scenario (Epstein et al., 2015).

By recognizing and communicating the value with different kinds of stakeholders, company can reconcile the conflicts between short-term and long-term performance and help stakeholders understand the benefits that dual-agenda innovation brings. The consensus can also help to gain more resources for the innovation and explore ways to achieve both economic and environmental performance instead of a trade-off between the two. By doing such companies will have higher chance to achieve superior E2 performance. On the other hand, if the company is not able to identify and engage with stakeholders effectively, the results and benefits of their environment innovation may not be appreciated by stakeholders, and the company might even get accused with "green wash" which will jeopardies its reputation and performance. Based on it, I brought hypothesis 2 that:

H2. Superior Stakeholder Management capability ***is positively associated*** *with superior E2 performance*

3.2.5 Cross-boundary collaboration capability

While both economic and environmental innovation require new or improved product and process, environmental innovation has a higher chance lead to business model or organizational innovation (Seebode et al., 2012), thus requires more multidisciplinary solutions and strong cross-boundaries collaboration capability. Even for product and process innovation, a significant improvement of environmental effect normally requires knowledge and resource beyond single function and organization. Previous studies looked into the collaboration from the partnership with different parties such as suppliers, customers, competitors, NGOs, government agencies, universities and research institutions and established that such collaborations are beneficial for a company's environmental performance and its environmental reputation (Albino et al., 2012b). Build on the findings, here I define cross-boundary collaboration capability as the capability of working with different parties who can bring additional resource, expertise, or knowledge within or outside of the organization. The collaboration can be cross internal boundary (functions), vertical boundary (upstream or lower stream along the value chain), and horizontal boundary (competitors within the same industry or partners from other industries).

Working with cross-boundary partners can help the company address the challenge of resource constraint. From social capital perspective, previous study identified the role that relational capital, structural capital and cognitive capital plays in collaboration and concluded that through knowledge sharing, cross-boundary collaboration has a significant effect on environmental innovation (Chen & Shiu-Wan, 2014). Cross-boundary collaboration is also critical to solve the conflict in function or design dilemma. Collaboration with external parties promotes fresh, radical ideas and provides different perspectives to deal with the constraint or promote reconsolidation. One example of cross-boundary collaboration practice in dual-agenda innovation is open innovation, which has been adopted by many companies to seek inspirations to address some long hanging issues to improve environmental effect. Studies demonstrate that open innovation is an important way to extract the value to fulfill the dual agenda of environmental and economic performance. Firms are less willing to cocreation has negative effect to capture such value (Garcia et al., 2019). Based on the findings, I come up hypothesis 3 as following:

H3. Superior Cross-boundary Collaboration capability ***is positively associated*** *with superior E2 performance*

3.2.6 Digital transformation capability

There have been quite a lot of studies about digitalization, however its concept remains vague and divergent. Some define it as the adoption of technology, some

define it as the usage of technology to create business value (Parida et al., 2019). Previous studies combine digitalization with innovation together and use “digital innovation” to describe the innovation process that adopt technology to a big extend, or with digital function, process, or business model as its output (Chanias, 2017). The adoption and integration of technology and digital tool is considered as enabler for innovation and it can be integrated into its input, process and output to deliver economic and/or environmental performance (Dong & Yang, 2016).

Build on previous study, I define digital transformation capability as the capability to identify and acquire new technologies that can help the company improve performance (explorative capability), and the capability to apply the technology during their operations to achieve the results (exploitative capability). Inspired by previous study (Irimiás & Mitev, 2020), I also explore how the capability interacts with other key capabilities mentioned above in dual-agenda innovation process. There have been some studies about the positive effect from digital transformation to innovation and E2 performance (Gasser & Palfrey, 2007; Westerman & McAfee 2012). However, previous study also indicates that the adoption of digital tools and technology alone does not necessarily generate superior performance on either agenda (Del Río Castro et al., 2021; Seele & Lock, 2017). The author believe that the core of value generation and environment performance are the input, process steps and capabilities as described in innovation structure. The adoption of digital tools can amplify the contribution from innovation to economic and environmental performance by helping address the challenges and conflicts as discussed in previous sections.

To address the first conflict of short-term vs. long-term of dual agenda, digital transformation, specifically digital collection, connection, and creation, will help quantify the short-term effect from the improvement of environmental performance and predict how it will contribute to company's economic performance. The data transparency and increased certainty will increase the chance for management to take proactive environmental improvement strategy, and better define an integrated performance appraisal through the organization.

Accordingly, the data-based transparency and prediction will help companies better address the second conflict of resource constraint and perceived trade-off during the exploration stage of innovation. A high-level digital data collection and connection will make the screening process more effective and comprehensive. It can capture potential opportunities and risks of economic and environmental performance from a broader perspective. The adoption of digital tool also (Loreal and Nestle example) helps establish formal process and measurement mechanism thus making it easier to follow compared with manual process. Data based ROI calculation helps company better prioritize the opportunities and better allocate resources with more certainties of performance. With the support of data, it becomes easier to communicate and align with stakeholders as well.

To address the third conflict of functional or design dilemma, digital transformation especially regarding data collection, connection and production can help identify and screen economic and environmental improvement opportunities

during ideation process. The digital tool can also help collect the feedback during pilot. With timely feedback, company can adjust the prototype of new product or service in early stage before putting more resources in the innovation process. It is also worth to mention that the spillover effect of digital transformation capability can help companies identify new ways to deal with the bottleneck in design and solve functional dilemma.

Many companies have adopted digital production to reduce and eliminate waste during product or service generation, by doing such reduce negative environmental effect and save operational costs. The adoption of big data, model simulation can help reduce the uncertainties during innovation and minimize the risk of failure. AI and machine learning make it easier to predict the performance of innovation outcome, increasing the odds of innovation success ratio (Nielsen BASE model for FMCG new products launch). Digital connection also fosters the capability of cross-boundaries collaboration, making it easier to learn and leverage best practice from different domains and providing more options in new product, process, and business model design. Finally, digital transformation capability helps improve stakeholder engagement and communication, which is critical in delivery stage of dual agenda innovation. Digital connection offers more channels to reach out to different stakeholders and engage with them in effective ways. Machine learning in digital creation can individualize the content of communication to address specific concerns or deliver educational message in a way that resonate the most with audience (Saxton et al., 2019). With massive data support, it becomes easier to explains the reason of expected changes from stakeholders, the decision

to act on certain areas, and the results have been achieved through the changes, which address the doubts and potential critics of "green washing". Based on above, I come up with hypothesis 4 as following:

H4. Superior Digital Transformation capability is positively associated with superior E2 performance.

3.2.7 Combined effect of core capabilities

Besides identifying the four capabilities that are critical to deal with three common challenges, it is worth to mention that just relying on one single capability is not enough to achieve superior E2 performance. Previous study suggests that due to the complexity of the problem to be solved in environmental innovation, it requires integrative systematic capabilities at different levels: operational capabilities, engagement capabilities, value framing capabilities and systematic learning capabilities (Watson et al., 2018). An empirical research conducted by Doran and Ryan in 2014 also indicated that in order to maximize the gains from green innovation, a firm should choose a combination of different initiatives instead of one (Doran & Ryan, 2014b).

The need of combined capabilities can also be explained by the interaction among the three common challenges of long-term vs. short-term, resource constraint and function/design dilemma through the innovation process. For example, an organization focusing on short-term instead of long-term is likely to

de-prioritize the investment on green or dual-agenda innovation, which contributes to the challenge of resource constraint; a product or process that faces functional/design dilemma usually requires a lot of resource to innovate and generate green solutions. Adding to the complexity is the interaction and spillover effect among the four capabilities. A superior value identification and quantification capability can convert long-term, reputation improvement benefit into monetary amount in present value. But it may not be able to realize the benefits if the functional/design dilemma cannot be solved through collaboration and digital transformation capabilities. Similarly, the challenge of resource constraint could be solved through superior cross-boundary collaboration capability in theory. However, without a strong stakeholder management and value quantification capability, it is difficult to get commitment from different resource owners within or outside of the organization. Other than the multiplier effect of digital transformation capability as mentioned above, a superior stakeholder management capability can help identify the right party for cross-boundary collaboration, and a superior cross-boundary collaboration capability may help companies develop digital transformation capability as well.

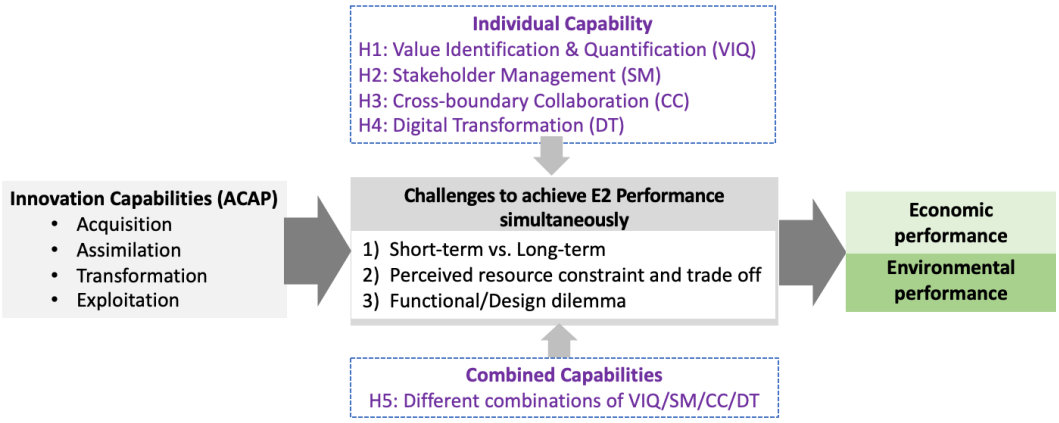
Previous studies have been focusing on testing the contribution from one or two individual capabilities, however there is no study conducted regarding the combination or interaction of the capabilities per the author's awareness. Because of the complexity of the challenges and the inter-related relationship among the four capabilities, the combination effect of the capabilities could provide a guideline to

help companies prioritize the capabilities that need to be developed first, and by doing so complement to other core capabilities

*H5. A single superior capability **is not enough** to achieve superior E2 performance; Different combination of the core capabilities has different impact on E2 performance; Combined effect of superior capabilities has higher impact on E2P than the effect of single superior capability*

The way how the four capabilities address the challenges through innovation process can be illustrated in Figure 2. Each capability contributes by addressing one or more common challenges through the innovation process and plays a critical role in achieving E2 results.

Figure 2. A summary of theory framework and hypothesis

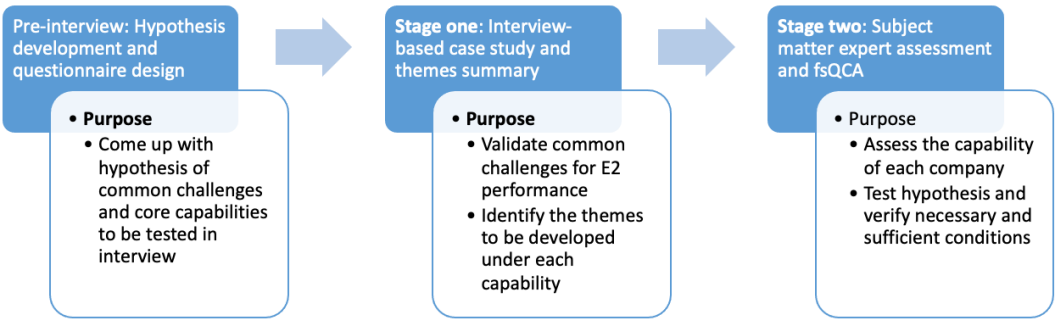


4. Data Collection

To test the theory, I used interview based case study to collect qualitative evidence and explore insights of how the mechanism works (Yin, 1994). The conversations provided a deep and rich understanding of companies' perspectives and efforts regarding E2 performance and explored how the capabilities contribute to E2 results. In order to verify the relationship between capabilities and E2 performance, we used subject matter experts' scores to convert qualitative information to quantitative data, and applied fuzzy-set qualitative comparative analysis (fsQCA) to test the causational relationship between individual and configuration of capabilities and E2 performance (Fiss, 2007).

There are two stages of data collection. Stage one is collecting primary data through private interviews of case study companies. The goal is to validate common challenges and key variables in dual agenda innovation. Particularly, how the structure contributes to both economic and environmental performance simultaneously, what are the key elements, and what role does the key capability play in it. Stage two is data analysis based on subject matter expert score of the input collected from case study. Using fuzzy-set qualitative comparative analysis (fsQCA), the goal is to test the hypothesis and identify the optimal combination to achieve E2 performance. Stages and expectation of each stage is summarized as following:

Figure 3: Stages of study and the expectation of each step



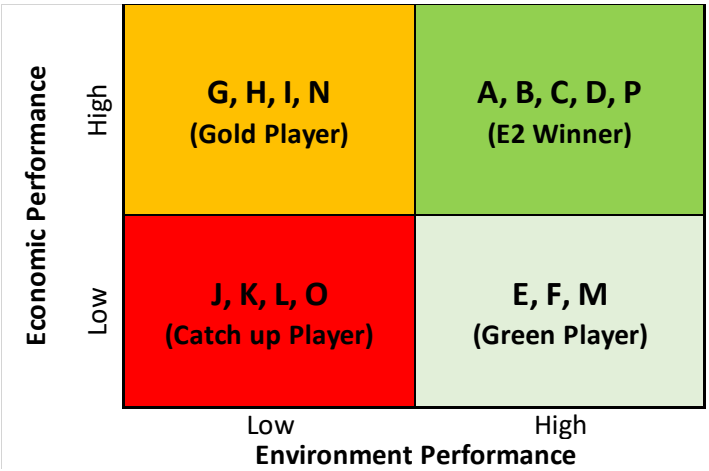
4.1 Case selection

To highlight the conflicts and struggles that companies face between economic and environmental agenda, the author first looked at the industries that are identified as having top negative impact to environment per the SDGs defined by UN: Oil and Gas, Agriculture, Transportation, Food retail, Fashion, Construction, and Chemicals. Environmental impact from these industries is mainly about GHG emission, Water usage, Soil & water pollution, and Biodiversity. Considering the impact from different industry, the author selected most case study companies from fast-moving consumer goods (FMCG) sector, with a couple of solution and service provider companies.

To identify the varies distribution of E2 performance, the author selected companies from each grid of the matrix of economic and environmental performance. Figure 4 is an illustration of the case study candidates. Considering companies' access of

resource, stakeholder management context and data availability, the author chose public companies only and they are mainly top MNC players in the selected industries.

Figure 4: E2 performance matrix and case study candidates distribution



To identify E2 performance extremes, the author first found companies with above peer average economic performance, which was defined by the company's price to earnings ratio, enterprise value to earnings before interest, taxes, depreciation & amortization (EBITDA) ratio, enterprise value to revenue ratio and price to book value ration of the past five years in Bloomberg. This gives us a pool of candidates of Gold Players and E2 Winners. The author then referred to environmental metrics in Bloomberg to identify the candidates of green players and E2 winners, companies with above sector average environmental performance in the past five years. Key metrics used in Bloomberg for environmental performance are Green-house gas emissions to revenue ratio, energy consumption to revenue ratio, water usage to revenue ratio and waste generation to revenue ratio.

Combining these two data set together, the author identified companies of E2 winners, green players, gold players and catch-up players with their profile in Table 1. The reason of choosing those firms are because they are public, big-size companies which are less impacted by capital-size limitation (Rosenbusch et al., 2011). Besides, these companies in the selected industry have a wide range of direct impact from business on environmental performance during their daily operations, which provides more data points in terms of Green-house gas emission, energy consumption, waste treatment and water usage - four main environmental performance metrics per Bloomberg.

Table 1. Case study company profile

Industry	Annual Revenue 2020 Range ($US billion)	Number of Employees 2020 Range ('000)	Reletive Economic Performance	Relative Environmental Performance
FMCG	1~10	1~50	High	High
FMCG	1~10	1~50	High	High
FMCG	51~100	101~200	High	High
FMCG	11~50	51~100	High	High
FMCG	11~50	51~100	Low	High
FMCG	51~100	101~200	Low	High
FMCG	51~100	51~100	High	Low
Industrial & Manufacturing	11~50	101~200	High	Low
Service	11~50	101~200	High	Low
Industrial & Manufacturing	11~50	51~100	Low	Low
FMCG	51~100	201~300	Low	Low
Service	1~10	1~50	Low	Low
FMCG	11~50	1~50	Low	High
FMCG	1~10	more than 300	High	Low
Service	11~50	51~100	Low	Low
FMCG	11~50	51~100	High	High

4.2 Stage one - Interview process

Due to the number of variables and different levels of effect on performance, the author started with explorational interview with the key persons in the innovation process of the company. Target interviewees are middle to senior leader who holds the position of strategy, sustainability, marketing, and general management. The purpose of the interview is to answer below questions:

1. How does the company perceive E2 performance, what are the challenges that companies face to address both economic and environmental performance at the same time?

2. How does dual-agenda innovation address those challenges and conflicts? And What are the key capabilities to make it successful?

3. What is the Digital Maturity level of the company and how does the adoption of Digital transformation and technology help achieve E2P simultaneously?

Based on the literature review on relevant topics, the construct and scale of each variable were operationalized and elaborated during the interview. An example of the main questions is provided in appendix. Estimated interview time is 60 minutes to have a meaningful conversation.

The interviews were conducted from February to December 2021 with representatives from E2 winner, green player, gold player and catch-up player. Together I conducted 16 interviews from 16 companies, about 19 hours of

conversation. Due to the impact of pandemic (2021), all the interviews were conducted virtually with recording or notes taken subject to participants' consent. Table 2 is a summary of informants' background.

Table 2. Informants' background

Title	Function	Years in Organization	Years in Industry
Packaging Development Director	R&D	3	16
Director	Marketing	3	22
General Manager	Product line Division	13	13
Senior Manager	Strategy	6	15
Manager	Operations	9	19
Manager	Operations	7	18
Director	Digital Transformation	5	18
Director	Global Strategy	6	20
Customer Development Manager	Sales & Marketing	8	20
Regional CEO	Management	25	25
Brand Manager	Sales & Marketing	4	15
Director	Sustainability	14	19
Senior Manager	Strategy	6	15
Manager	Operations	9	19
Manager	Operations	7	18
Director	Digital Transformation	5	18

4.3 Stage two - data Analysis based on SME score

After the interview, contents were translated into scripts and categorized for coding and analyzing. Over the six months, the analytical process was iterative and running with interview process in parallel, which is a method adopted in previous study to improve the accuracy of response (Vuori & Huy, 2016). The interview from early stage helped us refine the questionnaire, simplify the questions, and focus on identifying and applying key capabilities in dual-agenda innovation process. 1st order coding was conducted based on repetitive input from interviews, based on which the 2nd order coding was extracted as the themes for each key capability (Vuori & Huy, 2016).

To address the potential biases of single source self-evaluation, the author cross-checked the input from interviews with relevant contents from the annual report of interviewed companies. Supplementary information was added to the theme of each capability. Based on the two source of information, two subject matter experts assessed the capability of each company individually. They provided score 1-10 without knowing the name or the category of the firm to keep it objective. The score was then normalized between 0 to 1 among the 16 companies to measure how each firm performs in relative to peers, which is consistent with the way E2 performance was measured.

With quantified E2 performance and capability levels of each company, the author used fuzzy-set qualitative comparative analysis (fsQCA) to identify causal conditions to E2 performance with a relative small sample size (Fainshmidt et al., 2020). Defined as a set-theoretic method for establishing sufficient and necessary conditions to produce a given outcome, fsQCA offers an alternative solution for linear regression analysis. It is particularly suitable for complex phenomena and causal relationships (Fainshmidt et al., 2020; Llopis-Albert et al., 2021). Results are presented as following.

5. Results

5.1 Stage one: Appreciation of E2 performance and common challenges

All 16 case study companies demonstrated the attention to environmental impact and have conducted different types of initiatives to avoid harm or do good to the environment. However, the motivations behind the initiatives might be different. Some initiatives were due to regulations and compliance obligation, such as adopting environment friendly materials in production; some were due to commercial incentives such as using environmental claim as unique selling point for their product or sales; some were derived from company's sustainable strategy and organized in a structured way to achieve specific environmental KPIs being GHG emission, water usage and so on.

> *"Environment delivers the value of the company, not only helps its brand position and consumer recognition, but also helps with its long-term social responsibility" (E2 winner)*

> *"As an organization, there is a lot of focus on environmental performance, primarily in the supply chain function. Given that throughout the manufacturing process, the supply process, as well as our packaging, there is a huge focus on environmental sustainability on how we reduce the carbon footprint…. especially on the packaging, the entire focus of our innovation in packaging is also where I would say environmental sustainability is one of the key ingredients there." (E2 winner)*

“Company D being a global leading company of the industry definitely has a strong responsibility in terms of sustainability and caring for the environment given that the number of products that that we produce around the world. Definitely I think every effort to be friendlier to the environment in all ways has a very real generate a very strong impact to the environment” (E2 Winner)

“We do have ESG agenda. The good thing in the case of our company is the ESG agenda is embedded in our company purpose. It certainly goes hand in hand, and this guide us in good times and in challenging times, because as you know, sometimes you may be facing a big challenge, you just focus on the business and leave all the all the other topics behind. In this case, since it's embedded in our purpose. This allows us to maintain it in top of our priority in good times and in challenging times. Also, the board's ESG, and Public Policy Committee assist, or mainboard, in overseeing the company policies and programs and related risks to the company that concern environmental, but also, as I was telling you earlier, social, legislative, regulatory public matter, all including towards the company's ESG goals.” (E2 winner)

“We pay a lot attention to environment; we also have sustainability roadmap, especial target on carbon emission, water pollution

improvement, resource preservation. Environment is at high priority for us." (Catch up player)

"From company's perspective, environmental performance must be combined with economic performance, and I won't scarify economic performance to achieve environmental performance. Another consideration is company's reputation. At least I should do no evil to hurt companies imagine under this condition, if I can drive environmental performance or gain some value, it's nice to have. Of course, we need to comply to the law, if environment initiative/innovation can generate value, that would be a certain go. If there's no value generation, why should I spend big amount of money on Innovation, R&D." (Green player)

Regardless of the motivations behind dual-agenda innovation, informants relate to the conflict of short-term vs. long-term, resource constraint and design/functional dilemma as three common challenges. The challenges exist in all four types of E2 performance, although the demonstration and severity of the challenges might be different in each organization:

"We do face short-term vs. long-term conflicts in such (dual-agenda innovation) initiatives. The short-term challenge mainly from the rise of cost. However, from long-term perspective, we're not the only player

in the market, if we are able to connect the full value chain from upstream to downstream, there's cost optimization opportunity. The current value measure may appear negative since we spend more money (on sustainability products). However, once the consumer image is established, consumers will appreciate the "Care" value that we provide and it will build positive brand value, which drives commercial value of sales into a positive cycle. But currently it's difficult to quantify how much the positive cycle contribute to incremental sales. ..." (E2 winner)

"When we face the trade-off (of perceived resource constraint), company choose sustainability as long-term priority." (E2 winner)

"It is very difficult to balance the investment on environmental performance with company's ultimate goal to drive sustainability, as we're facing huge pressure from investors..." (Catch up player)

"Resource constraint comes from priorities within the organization. For example, the priority from marketing (Market share, sales) and strategy team (environment) are different. If the company doesn't specify that I also need to drive environmental performance, most of my resource will be spent on how I can compete with competitors better, gain more market share etc. environmental impact will not be my priority. If sustainability is not a priority across function, environmental

initiative will get very low if any attention and resources." (Green player)

"For us, the severity of short-term vs. long-term conflict is six out of ten. Mainly because that we don't rush into the sustainability. It's like a decade of effort for us to reach there. So how we segregated is that we have our mass brand, which is the core pillar to help support the business with a decent P&L. The P&L of sustainable initiative may not be so good economically compared to those mass product, but it's just a small portion of our business. So generally, we don't have much issue funding these initially. Actually, I think we have two (challenges) rather than three. The first one is what you mentioned in terms of the costing (short-term vs. long-term). When we look at the gross margin of all these environment friendly products, naturally, the last module may not be so ideal, and it will pull down our P&L, so we try to sustain it by treating it like a small percentage of the business first. Yet, they slowly going up. Once you have the scale, your supply chain costs will definitely go down accordingly. Then you can get it began. ...The other challenge is on the products itself (functional/design dilemma). We have this product A is a very environment friendly product. Unfortunately, because of the packaging material, we received a lot of feedback from the efficacy of the products from consumer who care much about environment friendly, yet the package to get very much damaged during

transportation (design dilemma). So, we have to get a lot returned..."(Green Player)

"We see all the three challenges here. For short-term vs. long-term, it's manifested by the short-term P&L cost increase while the long-term benefit may not be obvious. With limited budget, we do need to do trade-off from time to time and decide where to put resource. Thirdly, the design dilemma, sometimes the sustainable solution may not replace the function of original package well. For us, we also have big client using paper cup but plastic cap, we're working on joint solution to replace plastic cap. Need to try different material and different design…. Innovation decides the number of materials used in package and the quality of package. And different amount decides the funding (cost), so innovation can help relieve the challenge of short-term vs. long-term. As long as the environment concern is about "making/producing something" innovation department must participate, and it plays an important role. " (Catch up player)

"From company strategy perspective, it may require decision of portfolio management (investment and divestment), need leadership decision and courage to build a sustainable portfolio, it will also have impact on business performance in long term. – Portfolio transformation. Consumer/end-user's insights and acceptance of the product, whether their perception is aligned with us. Such as certain

materials, we want to promote more environment friendly material, but it may require higher cost and impact on product performance, such as less flexible material. To better drive sustainability, it should not be driven by company, but need to listen and align with consumer." (Catch up player)

*"Environment is an important topic for us. As far as I know, we don't have specific environmental related KPI, but we have a lot of products and solutions that relate to environment. It's a value proposition to customers: Carbon neutral, Energy saving, Emission reduction etc. through our products and Solutions. Upgrade to new development is very improvement. Investment is needed***." (Gold player)**

5.2 Stage one: The application of four key capabilities in dual-agenda innovation (appendix 2 themes)

Based on previous literature review, the author designed a questionnaire based on the hypotheses of core capabilities of VIQ, SM, CC, and DT. Following the question of the perception of environmental impact and common challenges, informants were asked about their assessment of the four key capabilities, and how each capability helped address those challenges.

First, value identification and quantification capability are defined as "the capability to identify and quantify the economic value from environmental innovation initiatives". This includes two parts of 1) identify the areas where the launch of new environment friendly product or process may contribute from both value generation and cost saving perspective, and 2) quantify the direct and indirect value associated with the new product or process. Real life examples were provided to help informants relate to their business. Informants were asked to assess the level of the capability and provide supporting examples in their organization.

Build on previous research of environment management system and its relevance to measuring and quantifying financial impact (Ilinitch et al., 1998; Orlitzky et al., 2003a), the author also asked if the interviewed company has environmental related KPIs through the organization, whether such KPIs are cascaded through the organization and imbedded in innovation process to make decisions about product, service, or business model. The result varies among different companies, although there is no pattern observed among different types of E2 performance groups.

> *"We have environmental KPI set from top-down across all the functions, but it carries different weight in different functions during implementation. The difficulty is the alignment among different functions, for example, Environment KPI is the No.1 priority for R&D, but commercial function's priority is sales volume or gross margin. Although environment KPI is our priority, but how to promote and*

allow other people to buy-in what we're trying to deliver is a challenge. Such as the challenge of price/cost of similar products in the market (from competition). So, we need to do some explanation of the value we add to the product from sustainability perspective… we have process to measure and quantify the materials cost, but no system for the brand value." (E2 winner)

"Yes, there's such KPI but I may not be aware of. Actually, the environmental KPI is quite important to us. It's a join-efforts with cross functional efforts such as production, branding, led by senior management…., environment KPI may sits under supply chain department to drive together with suppliers, but not to commercial departments…We have specific solutions that is quantified such as Reduce, Recycle, Re-invent plastic has specific actions, such as reduce the amount of plastic in different layers, reduce kg per package, etc. Big, general environmental KPI has been operationalized in daily, specific, executable actions and solutions with quantified impact that link to cost or benefits" (Catch up player)

"Manufacturing and Sourcing have more specific and clearer environment KPI compared with other functions, mainly linked with compliance and government regulation requirement, cost and sustainability considering. Other functions also have related KPI, such as new idea and new product development has a requirement of

contribution to sustainability and need to understand if any negative impact on environment. There's expectation from top-down, but not put in specific form of KPI. For us, company has put more and more attention on sustainability. Overall, we will raise the bar for commercial functions as well." (Catch up player)

"We have a clear quantified R&D KPI such as its investment ratio to total sales, but we don't have specific KPI for Environment initiatives except for compliance related KPI, such as the usage of certain raw material in a new product." (Green player)

"Top 3 challenges in pursuing E2 performance, the first one is to build a logic relationship – i.e. Why Environmental Performance is important to the company. If we look from brand promotion perspective, say that we want to build a positive public image, and by doing such environmental initiative it will help to promote brand image, but how much economic benefit that can be gained from brand image promotion is hard to measure. This is the second challenge. The third challenge comes from priorities within the organization. For example, the priority from marketing (Market share, sales) and strategy team (environment) are different. If the company doesn't specify that I also need to drive environmental performance, most of my resource will be spent on how I can compete with competitors better, gain more market share, environmental will not be my priority. If sustainability is not a priority

across function, environmental initiative will get very low if any attention and resources" (Green player)

Next capability hypothesis is stakeholder management. Informants were asked to assess the capability of identifying and engaging with stakeholders during dual-agenda innovation process, and how often they were able to reach consensus when there were different opinions. Examples from real live were given to invite informants consider a wide definition of stakeholders both internally and externally.

" (to address short-term and long-term conflict) Not from within company, but from the alliance in the society, and how to build a platform connect upstream and downstream players, and the awareness from consumers."(E2 winner)

"We mainly use engagement to influence stakeholder (peer management), meanwhile R&D is considering how to leverage cost increase, for example, env-friendly paper is more expensive (than normal paper as a material), but R&D can explore if we can reduce the usage from structure design, reduce the size of box to maintain the same cost with env-friendly paper, this would be easier to get stakeholder's buy-in. But, if we're still not able to get stakeholder's buy-in due to their different priority of economic value, we will have to use stakeholder identification to manage up, seeking top-down cascading to make them

accept the change proposal. … Among 10 cases, 4-5 cases for win-win solutions, total can achieve 9 out of 10 with top-down influence, one case has to drop due to design or technology challenge." (E2 winner)

"Our external stakeholder management is more regarding stakeholders of government and consumer. With government, we normally attend the forum, manage public image, meanwhile we also work with suppliers to make sure compliance with government requirements of energy saving and emissions reduction. Consumer engagement is ongoing. Such as global ocean day, we will participate and communicate our environmental initiatives" (Catch up player)

For the third hypothesis, the author asked informants' opinion about cross-boundary collaboration in dual agenda innovation, and whether they have such examples with internal and external partners. All informants acknowledged the importance of the capability, especially in addressing resource constraint and design dilemma challenge. Compared with gold players and catch-up players, E2 winners and green players emphasize more about ecosystem and the collaboration among government, company, and individual.

"The stakeholder management example I just mentioned is a negotiation within the company. This is just one aspect. Another aspect is we're taking steps outside the company. Such as communication with direct suppliers, and we go even further up to the value stream to

explore solution with recycler and raw material provider to explore solutions…. Collaboration happens from ideation stage. There are several benefits if we start reaching out to broader stakeholders at early stage. If we start approach different methods and areas, we may receive unexpected solutions, which is much wider compared with close door ideation and prototype with only internal team." (E2 winner)

"In one of our packaging innovation initiatives, PCR materials (post-consumer recycle) is very expensive at the moment due to manual collection process from individual collectors. If government can consolidate the process and reach a critical mass, it will lead to cost reduction in long-term." (E2 winner)

"(Design/Functional dilemma) it's a common bottleneck in tech development, but I believe it will be solved with the development of technology. How to solve it relies on explore externally…. It's a process of utilizing different resource from different parities, sometimes it's not enough to only rely on the resource from one function/company, but if I can utilize the resource from others, we can achieve the goal." (E2 winner)

"Within value chain collaboration can address tech and cost constraint challenges, vertical (cross different value chain) collaboration may solve the challenges to address consumer and society attitude. Public-

Private-Partnership, such as garbage sort policy is also critical to achieve sustainability goals." (E2 winner)

"Among the four capabilities, CC is the most important to align and engage with everyone together." (Catch up Player)

"(difficulties of CC come from) internally to reach alignment is difficult, and it's more complicated to reach alignment with external parties. Previously I proposed to R&D that if we aim to pursue existing concepts, we need to explore many suppliers in order to get a proper one. But company's strategy is we only focus on 1-2 suppliers. But this limits the availability. By design, their mindset doesn't consider external collaboration. It's impossible to just rely on yourself, right? But if there's no such mindset, if you don't welcome market competition, of course you won't get the best economic value." (Green player)

Finally, the author asked informants to assess the level of digitalization in their organization, which was defined as the extent of digitalization from the perspective of digital capture, digital connection, digital production, and digital creation. With the baseline established, informants provided their assessment of digital transformation capability from exploration and exploitation perspectives, and how such transformation helped to achieve E2 performance during innovation. Many examples were given about how digitalization helped provide data and transparency in the process. The adoption of technology also improved resource

utilization and operational efficiency, contributing to both economic and environmental results.

> *"DT help solve short-term vs. long-term conflict from big data perspective. It can provide a lot of data support to the company and its consumers about the concept (of sustainability). Besides, DT contributes a lot of raw data to support us find solutions to solve the problems. Such as company X use big data to analysis consumers and design product. We're doing the same, and we also assess how to use the big data to design product and release human resource. The released human resource can support other areas such sustainability." (E2 winner)*

> *"Digital transformation has been integrated in the daily operation of all the functions. Example can be 3D printer to test packaging design and process. Digital marketing, scan QR code to collect consumer information etc. We only started recently, not a pioneer in this area, but we're pushing it as a priority now." (Catch up player)*

> *"DT help reduce internal resource waste and improve efficiency. Our organization is undergoing transformation, inevitability company needs to adjust its talent and resources towards future direction, including change to organization and structure, both are happening at the same time." (Catch up player)*

"The 3rd core capability would be operationalization and digitalization, it helps organization react fast to external environment, accelerate the iteration; and through digitalization we identify who we should connect and collaborate. Through Collaboration there're a lot about benefits exchange, Digitalization can provide data, visibility, and unified standard through collaboration. On one hand, digitalization facilitates the transfer of benefits, on the other hand, Digitalization also provides a unified communication supported by data." (Green player)

Based on the description that informants provided during interviews, the author used open coding method (Corbin & Strauss, 2014) to go through interview transcripts and summarize the 1st order codes of key capabilities. The codes were further extracted into four themes for each capability as demonstrated in Table 3 (Vuori and Huy, 2016). The conversion provided a structured, operationalized overview of the constructs and facilitated assessment in next stage.

Table 3: Key capabilities input coding

Key Capabilities	1st Order Codes	2nd Order Themes
Value Identification & Quantification	- Specific targets set for GHG, Water, Waste, Plastic usage etc. - Relative goals with % or absolute amount improvement compared with baseline	SMART environmental KPIs are identified at corporate level and tracked regularly
	- Environmental KPIs were defined at global or strategic level - KPIs are cascaded to different functions although they may carry different weights	Environmental KPIs are cascaded from senior leadership to frontline
	- Process to evaluate economic and environmental impact of new product/process	Both economic and environment benefits are imbedded in innovation process
	- Cost associated benefits from environmental innovation -Able to quantify the financial impact of environmental indicatives although its small	Specific economic benefits are evaluated at project/product level for "green" innovation
Stakeholder Management	- Internal stakeholders from other functions, peers, managers - External stakeholder such as owner/shareholder, customer, government - Stakeholder from up value stream: supplier	Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.
	- Build brand image of sustainability - Seek alignment of different priorities - Key to get stakeholder's buy-in	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")
	- Develop new product/process based on the voice of customer - Formal stakeholder engagement program to collect input	Engage stakeholders effectively by taking their input into dual-agenda innovation process
	- Give consumer the options of environment friendly - Transparency enabled decision making	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance
Cross-boundary Collaboration	- Collaboration between R&D and Commercial functions - Collaboration with supply chain - Team work among different functions	Collaborate with different functions within the organization during E2 innovation
	- Collaborate with external parties - Learn from other companies and industries - Make positive impact through ecosystem - Form/participant in industry forums	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)
	- Collaboration happened from ideation process - Innovation council formed by different parties through the process - Collect feedback and improve/refine product	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages
	- Collaboration through E2E from supplier to consumer - Build circular economy, work with ecosystem partners - Improve environmental impact through the whole product life	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results
Digital Transformation	- Acquire and apply external technology - Digitalize/Automate production line - Digital customer experience	Digital Exploration: Create new business model or operational model by Appling the latest technology from outside
	- DT support in finding solutions to the problem - Support new product development - Drive sales and revenue from digitalization	Technology is applied in core area of the business to generate economic and/or environmental benefits
	- Digital helps in data analysis - Digital data measurement - Digital monitoring	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits
	- Efficacy and cost optimization through DT - Environmental result - Say-do, execution	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency

5.3 Stage two: Capability assessment and distribution among four types of companies

After identifying the themes for each capability, the author mapped the information collected from interview into each category using the original words. To address the potential bias of self-evaluation and the limitation of single source data, the

information collected during interview was cross-checked with the content in the latest sustainability report that published by each company. Themes that could not get information from either of the two sources were marked as blank.

Based on the fact sheet, two subject matter experts (one from academic and one from practical background) assessed the capabilities without knowing the name of the companies and their performance. A scale of 1-10 was used with 1 being the lowest and 10 being the highest. Blank information was treated as 0 during average score calculation. Score distribution among the four capabilities and four types of E2 performance companies is summarized in Table 4. It was demonstrated that E2 winner companies have higher than average score of stakeholder management, cross-boundary collaboration and digital transformation capability compared with peers identified as green player, gold player and catch-up player. For value identification & quantification capability, green player companies have the highest score compared with the other three groups.

Key Capabilities	1st Order Codes	2nd Order Themes	E2 Winner	Green Player	Gold Player	Catch up Player
Value Identification & Quantification			**6.3**	**7.9**	**6.1**	**6.7**
	- Specific targets set for GHG, Water, Waste, Plastic usage etc. - Relative goals with % or absolute amount improvement compared with baseline	SMART environmental KPIs are identified at corporate level and tracked regularly	8.4	9.0	7.6	6.9
	- Environmental KPIs were defined at global or strategic level - KPIs are cascaded to different functions although they may carry different weights - KPIs are imbedded in daily operations	Environmental KPIs are cascaded from senior leadership to frontline	6.1	7.7	5.8	6.4
	- Process to evaluate economic and environmental impact of new product/process	Both economic and environment benefits are imbedded in innovation process	5.9	7.8	6.5	6.1
	- Cost associated benefits from environmental innovation -Able to quantify the financial impact of environmental indicatives although its small	Specific economic benefits are evaluated at project/product level for "green" innovation	4.6	7.2	4.5	7.4
Stakeholder Management			**7.4**	**7.0**	**7.1**	**6.9**
	- Internal stakeholders from other functions, peers, managers - External stakeholder such as owner/shareholder, customer, government - Stakeholder from up value stream: supplier	Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.	8.4	7.8	7.0	8.5
	- Build brand image of sustainability - Seek alignment of different priorities - Key to get stakeholder's buy-in	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")	8.1	7.5	7.4	6.5
	- Develop new product/process based on the voice of customer - Formal stakeholder engagement program to collect input	Engage stakeholders effectively by taking their input into dual-agenda innovation process	8.2	6.8	7.1	7.5
	- Give consumer the options of environment friendly - Transparency enabled decision making	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance	4.9	5.7	6.9	5.3

Table 4: Capability/Themes/Type of companies

Key Capabilities	1st Order Codes	2nd Order Themes	E2 Winner	Green Player	Gold Player	Catch up Player
Cross-boundary Collaboration			**7.9**	**7.5**	**7.7**	**6.4**
	- Collaboration between R&D and Commercial functions - Collaboration with supply chain - Team work among different functions	Collaborate with different functions within the organization during E2 innovation	8.5	7.5	7.8	9.0
	- Collaborate with external parties - Learn from other companies and industries - Make positive impact through ecosystem - Form/participant in industry forums	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)	8.7	8.8	8.4	8.0
	- Collaboration happened from ideation process - Innovation council formed by different parties through the process - Collect feedback and improve/refine product	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages	6.7	5.5	6.5	5.4
	- Collaboration through E2E from supplier to consumer - Build circular economy, work with ecosystem partners - Improve environmental impact through the whole product life	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results	7.8	8.2	8.1	3.3
Digital Transformation			**7.8**	**7.1**	**6.1**	**4.4**
	- Acquire and apply external technology - Digitalize/Automate production line - Digital customer experience	Digital Exploration: Create new business model or operational model by Appling the latest technology from outside	8.3	5.0	4.5	6.5
	- DT support in finding solutions to the problem - Support new product development - Drive sales and revenue from digitalization	Technology is applied in core area of the business to generate economic and/or environmental benefits	8.2	8.5	6.3	2.4
	- Digital helps in data analysis - Digital data measurement - Digital monitoring	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits	6.5	7.5	5.9	5.1
	- Efficacy and cost optimization through DT - Environmental result - Say-do, execution	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency	8.1	7.5	7.8	3.6

Table 4 (Continue): Capability/Themes/Type of companies

5.4. fsQCA results and hypothesis validation

In order to validate the hypothesis of causal conditions of the capabilities to achieving superior E2 performance simultaneously, the author used fsQCA to compare capability assessment results with E2 results of the studied companies. As a tool to study organizational configurations and complementarities theory, qualitative comparative analysis (QCA) and fuzzy-set QCA was brought by Ragin to examine the causal conditions of certain outcome (Ragin, 2014). It has been accepted as an effective tool to test causational and pre-conditional relationship with small sample size (Kraus et al., 2018). Compared with tradition method of regression, which assume independence of different variables, fsQCA derives from complex interactions among interrelated causational factors (Fainshmidt et al., 2020). Unlike crisp-set QCA, which uses binary values (0 or 1) to define the membership or non-membership of the causal set to the outcome, fuzzy-set QCA uses fine-grained measures that define causal conditions with any value from 0 to 1, thus it helps to better understand how the configuration works (Fiss, 2007). It has been considered as a reasonable method for sample size of 12 or more, depending on the number of causal conditions in order to cover potential configurations (Fainshmidt et al., 2020). Since I identified four core capabilities as potential causal condition, the preferred sample size is 16 (2x2x2x2) which matches our interviewed companies.

Since the E2 performance was defined as relative value of a company's performance compared with its peers based on Bloomberg data, the author

normalized the level of capability through the calculation in below to get relative score of a company's capability level in relevant to others in the study.

Normalized score of capability = (Sum of assessment score of individual company – Minimum assessment score among the study companies) / (Maximum assessment score among the study companies - Minimum assessment score among the study companies)

The expectation is to use fsQCA to test causal condition of each capability and the combination effect when two or more capabilities present together. Specifically, the causal condition is defined based on the necessary and sufficient condition fulfilment per the consistency value from the analysis outcome.

Following fsQCA study guide (Elliott, 1995.), the author calibrated the score using the commonly accepted standard of 5^{th},50^{th} and 95^{th} percentiles to transform the quantitative value into a degree of member of each category (Longest & Vaisey, 2008), and then tested the coincidence among the four capabilities as. Result shows coincidence more than 0.5 among positive VIQ, SM and CC, DT with other factors, and SM and CC. This can be explained with the correlated activities of using VIQ to engage with stakeholder and partners, the similarity of SM and CC activities such as communication, influence, negotiation, and the application of DT during those activities. When tested the absence of the capability, ~VIQ and ~SM, ~SM and ~CC have coincidence higher than 0.5, which reinforced the correlation mentioned above.

Table 5: Set Coincidence, (~) indicates the absence of the capability

```
coincidence(VIQ,SM,CC,DT) = 0.377617
coincidence(VIQ,CC,DT) = 0.419808
coincidence(VIQ,SM,CC) = 0.540438
coincidence(VIQ,SM,DT) = 0.401998
coincidence(SM,CC,DT) = 0.473254
coincidence(VIQ,DT) = 0.507653
coincidence(VIQ,SM) = 0.646247
coincidence(VIQ,CC) = 0.621297
coincidence(CC,DT) = 0.595312
coincidence(SM,DT) = 0.544944
coincidence(SM,CC) = 0.734661
```

```
coincidence(~VIQ,~SM,~CC,~DT) = 0.199629
coincidence(~VIQ,~CC,~DT) = 0.239341
coincidence(~VIQ,~SM,~CC) = 0.312994
coincidence(~VIQ,~SM,~DT) = 0.277623
coincidence(~SM,~CC,~DT) = 0.263759
coincidence(~VIQ,~DT) = 0.422732
coincidence(~VIQ,~SM) = 0.518214
coincidence(~VIQ,~CC) = 0.425971
coincidence(~CC,~DT) = 0.381862
coincidence(~SM,~DT) = 0.384365
coincidence(~SM,~CC) = 0.50885
```

Next step, the necessary conditions of each individual capability was tested with result as following.

Table 6: Analysis of necessary condition

```
Analysis of Necessary Conditions

Outcome variable: E2P

Conditions tested:
     Consistency    Coverage
VIQ  0.717514       0.723235
SM   0.828249       0.711650
CC   0.873446       0.673932
DT   0.820339       0.811173
```

```
Analysis of Necessary Conditions

Outcome variable: ~E2P

Conditions tested:
      Consistency    Coverage
~VIQ  0.660140       0.653740
~SM   0.584615       0.733333
~CC   0.476923       0.752759
~DT   0.763636       0.774468
```

Result shows that CC has the highest consistency (0.87), followed by DT (0.82). According to Schneider & Wagemann (2012), a factor is considered necessary if the consistency is higher than threshold value of 0.9, which means without the factor we won't be able to get the outcome. The consistency value as above suggests that none of the single capability is a necessary condition to achieve E2 performance (support Hypothesis 5). This is consistent with what I discussed earlier about the interrelationship and complexity among the challenges and capabilities. It supports that superior E2 performance depends on a combination of different, superior capabilities due to the complexity of the issue. For the same reason, one weak capability does not necessarily lead to weak E2 performance. Companies still have chance to catch up in other capabilities.

Next step the author used subset/superset analysis to test sufficient condition of individual and the combination of capabilities to E2 performance. A single or combined set will be considered as sufficient if the consistency value is higher than 0.8 as commonly accepted threshold (Greckhamer et al., 2018, Rihoux & Ragin, 2009). It means that the presence of the causal condition will lead to the desired outcome. Result of individual factor shows that only DT has consistency more than 0.8 (0.81), which suggests that superior DT capability has strong association with superior E2 performance (support Hypothesis 4). While none of the other individual capability has consistency higher than 0.8: VIQ (0.72), SM (0.71), CC (0.67), the combination of one or two of them with DT creates consistency more than 0.8 (refer to table 7 in below), which reinforced the effect of DT as sufficient factor to E2 performance (Llopis-Albert et al., 2021).

Table 7: fsQCA Subset/Superset test of sufficient conditions with the presence of DT

```
**********************
SUBSET/SUPERSET ANALYSIS
**********************

Outcome: E2P

                          raw
                 consistency  coverage     combined
                 ----------  ----------  ----------
VIQ*SM*CC*DT     0.881453    0.520904    0.699750
VIQ*CC*DT        0.878521    0.563842    0.728019
VIQ*SM*CC        0.791608    0.639548    0.701749
VIQ*SM*DT        0.881453    0.520904    0.699750
SM*CC*DT         0.871272    0.627119    0.763689
VIQ*DT           0.884422    0.596610    0.748875
VIQ*SM           0.755674    0.639548    0.654597
VIQ*CC           0.780928    0.684746    0.716631
CC*DT            0.818898    0.705085    0.769592
SM*DT            0.879234    0.674576    0.796305
SM*CC            0.749458    0.780791    0.712400
VIQ              0.723235    0.717514    0.645103
CC               0.673932    0.873446    0.576116
SM               0.711650    0.828249    0.668771
DT               0.811173    0.820339    0.820170
```

Given the finding of the important role that DT plays, the author also tested the sufficient conditions without DT. Result shows the consistency of all the configurations dropped below 0.8 without DT, including the combined capabilities of VIQ*SM*CC. This indicates that digital transformation capability plays a critical role for E2 performance, hypothesis 4 is supported. Results are shown in table 8 in below.

Table 8: fsQCA Subset/Superset test of sufficient conditions with the absence of DT

```
************************
SUBSET/SUPERSET ANALYSIS
************************

Outcome: E2P
```

	consistency	raw coverage	combined
VIQ*SM*CC*~DT	0.741240	0.310734	0.442451
VIQ*CC*~DT	0.718274	0.319774	0.423171
VIQ*SM*~DT	0.679012	0.310734	0.356933
SM*CC*~DT	0.651911	0.366102	0.325837
VIQ*SM*CC	0.791608	0.639548	0.701749
VIQ*~DT	0.643498	0.324294	0.290373
VIQ*SM	0.755674	0.639548	0.654597
CC*~DT	0.582456	0.375141	0.212172
SM*~DT	0.579606	0.366102	0.209600
VIQ*CC	0.780928	0.684746	0.716631
SM*CC	0.749458	0.780791	0.712400
VIQ	0.723235	0.717514	0.645103
~DT	0.476596	0.379661	0.123233
CC	0.673932	0.873446	0.576116
SM	0.711650	0.828249	0.668771

To further validate the implication of the absence of capabilities, the author tested the sufficient condition of different combinations without VIQ, SM and CC. Result shows that while the absence of SM and CC reduce the consistency of the combination compared with their presence, the consistency still maintains above 0.8 when two or three other capabilities are present as in table 9 and 10. Surprisingly, the absence of VIQ increased the consistency of the combination VIQ*SM*CC*DT and VIQ*SM*DT (refer table 11), which suggests there might be some contradiction effect between the presence of SM*DT and VIQ.

Table 9: fsQCA Subset/Superset test of sufficient conditions with the absence of SM

```
************************
SUBSET/SUPERSET ANALYSIS
************************

Outcome: E2P

                          raw
                   consistency  coverage     combined
                   ----------  ----------  ----------
VIQ*~SM*CC*DT      0.864629    0.223729    0.453685
VIQ*~SM*CC         0.777385    0.248588    0.428900
VIQ*~SM*DT         0.879845    0.256497    0.491027
~SM*CC*DT          0.780000    0.308475    0.477777
VIQ*CC*DT          0.878521    0.563842    0.728019
VIQ*~SM            0.678474    0.281356    0.335473
VIQ*DT             0.884422    0.596610    0.748875
~SM*DT             0.783019    0.375141    0.530430
~SM*CC             0.718310    0.345763    0.440031
VIQ*CC             0.780928    0.684746    0.716631
CC*DT              0.818898    0.705085    0.769592
~SM                0.640351    0.412429    0.321103
VIQ                0.723235    0.717514    0.645103
CC                 0.673932    0.873446    0.576116
DT                 0.811173    0.820339    0.820170
```

Table 10: fsQCA Subset/Superset test of sufficient conditions with the absence of CC

```
************************
SUBSET/SUPERSET ANALYSIS
************************

Outcome: E2P

                          raw
                   consistency  coverage     combined
                   ----------  ----------  ----------
VIQ*SM*~CC*DT      0.876923    0.193220    0.423904
VIQ*~CC*DT         0.870293    0.235028    0.467521
VIQ*SM*~CC         0.734127    0.209040    0.357091
SM*~CC*DT          0.895197    0.231638    0.469102
VIQ*SM*DT          0.881453    0.520904    0.699750
VIQ*~CC            0.716129    0.250847    0.371438
VIQ*SM             0.755674    0.639548    0.654597
~CC*DT             0.855346    0.307345    0.528851
SM*~CC             0.708738    0.247458    0.362150
VIQ*DT             0.884422    0.596610    0.748875
SM*DT              0.879234    0.674576    0.796305
VIQ                0.723235    0.717514    0.645103
~CC                0.631347    0.323164    0.272631
SM                 0.711650    0.828249    0.668771
DT                 0.811173    0.820339    0.820170
```

Table 11: fsQCA Subset/Superset test of sufficient conditions with the absence of VIQ

```
************************
SUBSET/SUPERSET ANALYSIS
************************

Outcome: E2P
```

	consistency	raw coverage	combined
~VIQ*SM*CC*DT	0.936556	0.350282	0.585898
~VIQ*CC*DT	0.851220	0.394350	0.595748
~VIQ*SM*CC	0.763043	0.396610	0.523126
~VIQ*SM*DT	0.936937	0.352542	0.587785
SM*CC*DT	0.871272	0.627119	0.763689
~VIQ*DT	0.863931	0.451977	0.644840
~VIQ*SM	0.680154	0.398870	0.404397
~VIQ*CC	0.673575	0.440678	0.409216
CC*DT	0.818898	0.705085	0.769592
SM*DT	0.879234	0.674576	0.796305
SM*CC	0.749458	0.780791	0.712400
~VIQ	0.610803	0.498305	0.291053
CC	0.673932	0.873446	0.576116
SM	0.711650	0.828249	0.668771
DT	0.811173	0.820339	0.820170

The final conclusion the author drew from fsQCA is fuzzy-set analysis of truth table, which is used to exam the equifinality of the causal condition of different configurations and identify the minimum causal factors to achieve the expected outcome using counterfactual analysis (Fainshmidt et al., 2020; Fiss, 2007).

Using intermediate solution result as suggested by Elliott (2013), configuration SM * CC * DT has consistency of 0.87 and configuration ~VIQ * ~SM * DT has consistency of 0.84, both illustrate a high degree of which the configuration is a subset of the membership in the outcome (Ragin, 2008). However, taking coverage into consideration, which measures the proportion of membership in the outcome explained by the configuration and represents its empirical relevance (Greckhamer et al., 2018; Llopis-Albert et al., 2021), the author draw conclusion that the combination of SM * CC * DT is a causal condition to E2 performance, with consistency 0.87 and raw coverage 0.63, supported by 6 cases from the study (ref. table 12).

Table 12: Truth Table Analysis - Intermediate solution of causal configuration to E2 performance

```
Model: E2P = f(VIQ, SM, CC, DT)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 1
consistency cutoff: 0.818815
Assumptions:
                    raw       unique
                  coverage    coverage   consistency
                 ----------  ----------  ----------
~VIQ*~SM*DT      0.320904    0.099435    0.845238
SM*CC*DT         0.627119    0.40565     0.871272
solution coverage: 0.726554
solution consistency: 0.850529


Cases with greater than 0.5 membership in term ~VIQ*~SM*DT: C (0.81,0.5),
  E (0.6,0.7)
Cases with greater than 0.5 membership in term SM*CC*DT: D (0.93,0.93),
  M (0.85,0.7), N (0.78,0.5), P (0.61,0.93),
  F (0.58,0.84), A (0.55,0.93)
**********************
*TRUTH TABLE ANALYSIS*
**********************
```

Table 13 is a summary of hypothesis validation result through fsQCA. After checking the necessary and sufficient condition of the individual and combined effect of superior capabilities, hypotheses 4 and 5 are supported. Through the equifinality study, the author found that the combination of superior SM, CC and DT capability has the strongest causal effect to superior E2 performance.

Table 13: Hypothesis test result

Hypothesis	**Result**
H1: Superior capability of Value Identification and Quantification is positively associated with superior E2 performance	Not supported

H2: Superior Stakeholder Management capability is positively associated with superior E2 performance	Not supported
H3: Superior Cross-boundary Collaboration capability is positively associated with superior E2 performance	Not supported
H4: Superior Digital Transformation capability is positively associated with superior E2 performance	Supported
H5: A single superior capability is not enough to achieve superior E2 performance; Different combination of the core capabilities has different impact on E2 performance; Combined effect of superior capabilities has higher impact on E2P than the effect of single superior capability	Supported

6. Discussion and Conclusion

Despite the commonly acknowledged importance and adopted practice, achieving superior economic and environmental performance simultaneously is not a common phenomenon. Developed from previous literature, the author proposed that dual-agenda innovation leads to win-win results and identified four core capabilities on top of ACAP. Through the interview-based case study and fsQCA, the author verified the three common challenges and identified how the four capabilities may contribute to superior economic and environmental performance.

Answers to the three research questions and their implications are discussed as follows.

- What are the difficulties that companies face to address both economic and environmental performance simultaneously?
- How can dual-agenda innovation reconcile the conflicts and drive both agenda effectively?
- What are the key capabilities for a successful dual-agenda innovation?

6.1 Companies acknowledge the importance of E2 performance, yet they are facing challenges to achieve superior E2 performance simultaneously

Interviews with four types of companies have shown that the importance of environmental performance is well recognized through the organization. All informants acknowledged that companies have both economic and environmental performance as part of their strategy. However, they are facing the challenges of a short-term vs. long-term conflict, resource constraints and functional/design dilemmas when pursuing E2 performance. Inspired by previous studies, the author defined dual-agenda innovation as the adoption of a new idea or process to deliver new products, processes, and business models to achieve economic and environmental performance simultaneously. The core of dual-agenda innovation is a clearly defined goal of E2 performance improvement as the outcome of the

innovation, and the intentional actions through the entire innovation process to achieve the goal.

The importance of innovation, especially product and process innovation are acknowledged by these companies, and they agreed that innovation could be an effective solution to solve the challenges. All the companies have ongoing innovation initiatives, but not all of them can be qualified as dual-agenda innovation, and not all the companies were able to achieve superior economic and environmental performance based on Bloomberg data. Focusing on the capability lens, the study assessed the level of value identification and quantification, stakeholder management, cross-boundary collaboration and digital transformation capabilities in each company using a specific scheme extracted from the interviews.

As expected, study results demonstrated that a positive association exists between the level of individual capability, the configuration of these capabilities, and the E2 performance of the company, in which the higher the level of capabilities, the better the economic and environmental performance of the firm would be. FsQCA results verified that while each individual capability plays a role in dealing with the common challenges, relying on just one single capability to achieve superior E2 performance is insufficient. To have successful dual-agenda innovation, companies need to develop multiple capabilities at the same time and integrate them through the entire process to address the challenges effectively. Besides, result implies that the combination of superior stakeholder management, cross-boundary collaboration and digital transformation capabilities is sufficient to achieve superior

E2 performance, even without a superior value identification and quantification capability.

Specifically for digital transformation capability, both qualitative and quantitative results indicated that digital transformation capability plays a critical role in addressing common challenges and amplifying the effect of other capabilities. The application of digital transformation includes areas from data collection, data analysis, process automation and insight generation. It helps companies improve the efficiency of resource utilization, which leads to productivity improvement and cost optimization. With the adoption of advanced technology, digital transformation capability can help address the functional/design dilemma and come up with new ways of working or use new materials to deliver the same or better solution to customers with less negative effect on the environment.

Other than the individual effect of digital transformation capability, fsQCA results indicated that digital transformation plays a decisive role to the sufficiency of the configuration of other capabilities to achieve E2 performance. This can be explained by the amplification effect of digital transformation on other capabilities when addressing the common challenges. With the combination of VIQ and DT capabilities, companies can use data to measure the effect and benefits of innovation and provide the transparency of the performance. It can also help companies in quantifying the future value in the discussion of short-term and long-term conflict. Through digital tools, companies can better identify and reach out to stakeholders

and communicate a comprehensive content in an effective way. Many FMCG companies have adopted digital marketing to connect with consumers. Through customer profile analysis, companies can engagement with customers who appreciate the environmental benefits of the product proactively and persuade them to make green choices in future purchases. The awareness and need of technology development also increased the need for cross-boundary collaboration, and the application of digital tools made it easier to connect with internal and external partners, like what we experienced during the pandemic. A combination of digital transformation and collaboration capability opens a new lens to solve the challenges and leverage resources from different parties, which helps in addressing resource constraints and design/functional dilemma more effectively.

Surprisingly to our hypothesis, fsQCA results indicated that VIQ plays a less important role compared with individual capabilities, and even a negative role when it combines with SM and DT (table 11). Among the four types of companies, green players have the highest VIQ score followed by catch up players, E2 winners and gold players. The high VIQ capability may help green players in achieving superior environmental performance, but their economic performance is not as good as E2 winners. This could be explained with the debate of value quantification and KPI driven performance that the beneficial effects of goal setting have been overstated and companies should look at deep into the motivation driven performance (Ordóñez et al., 2009). Interviews with green players and E2 winners indicated that the conflict of short-term vs. long-term in their organization is not serious as the company always put long-term benefits at primary position and it's

been cascading through the organization. Thus, informants considered VIQ as a less important capability compared with other core capabilities. Taking economic performance orientation as a given, companies that integrated environmental performance as part of their strategy and culture are more likely to take long-term initiatives even if it may not yield significant short-term outcomes. Informants from E2 winners and green players also mentioned that they have different expectation of return of short-term economic driven initiative and long-term environmental driven initiatives, and they will not sacrifice the efficacy of the product when designing environmentally friendly features. With superior stakeholder management, cross-boundary collaboration and digital transformation capabilities, these companies were able to demonstrate the benefits of dual-agenda innovation, which may further reinforce their choice of long-term benefits over short-term outcomes.

6.2 Theoretical implications

With the empirically validated result, the research contributes to theory from below two perspectives.

6.2.1 New construct of dual-agenda innovation

The research complemented the existing literature by verifying the common challenges that companies face when pursuing E2 performance. Built on the existing definition of traditional, economic agenda driven innovation and

environmental innovation, the author brough up a new construct of dual-agenda innovation that empathizes the importance of intentional efforts to drive both economic and environmental performance simultaneously. There have been numerous debates on the relationship between economic performance and environmental performance, and relating to them, the debates of the impact from economic and environmental innovation on companies' performance. Dual agenda innovation brings another perspective of the argument and explores the approach to achieve win-win results.

What differentiates dual agenda innovation from green or environmental innovation is the intentional efforts to pursue both economic and environmental results during the entire innovation process of discover, define, ideate, and deliver. Although both share similar major activities in each stage, the intention to generate win-win results simultaneously leads to different choices and decisions that companies make at each step of innovation, thus affecting the result of E2 performance. For example, to reduce GHG emission, a green or environmental innovation may explore the solutions of equipment or materials upgrade that require a big amount of upfront investment without direct economic return. To achieve the same GHG reduction result with a positive return of investment as the purpose, company may explore solutions to transform business model or utilize the resource from partnership to minimize cost and maximize value through the innovation, which may lead to more cross-boundary collaboration and digital transformation activities.

6.2.2 Core capabilities of dual-agenda innovation

Based on the four capabilities under ACAP model: acquisition, assimilation, transformation and exploitation (Chauvet, 2015, Gluch et al., 2009), the author identified four more capabilities to address the common challenges when company pursuing superior E2 performance. Proven by companies from different E2 performance category, these capabilities became the key success factors of dual-agenda innovation, especially the capability of digital transformation.

Through case-study based interview, the research demonstrated how VIQ, SM, CC and DT capabilities contributed to E2 performance individually, which reinforced previous studies about how to achieve superior E2 performance (Chen & Shiu-Wan, 2014; Dal Maso et al., 2018). Not only the study reveals the mechanism of individual capability, but it also demonstrates the combined effect from different configurations of the capabilities, and how those capabilities interacted with each other. This is a breakthrough from previous studies. Besides, the interaction and spillover effect of the capabilities further enriched the theory of RBV (Judge & Elenkov, 2005; Ramanathan, 2018) and NRBV (Haffar & Searcy, 2017) that by solving the complex issues of E2 performance, wherein companies can develop a set of organizational capabilities that becomes its competitive advantage.

6.3 Practical implication

This study has practical implications from three perspectives. First, the research reinforced that E2 performance is an unnecessary a trade-off and provided successful real-life examples of E2 winners. Looking into the specific metrics of environment and economic performance, companies can identify the sweet spot of overlapped improvement areas and develop new product or service to achieve them. Examples such as reducing the materials used for plastic packages which reduces the cost of the product and minimizes the harm to the environment, energy saving initiatives which save operating costs and reduce green-house-gas footprint, environment friendly product that appeals to certain customer segment and generates significant sales, and so on. Second, to build a sustainable competitive advantage, companies should place more focus to acquire and develop the core capabilities that may lead to successful dual-agenda innovation. Compared with other resources, organizational capability provides more propounding and unique advantages that are difficult to be observed and replicated by competitors. Finally, knowing the different effects of the configuration of the capabilities, companies can identify focus areas of organization development initiatives given their current level of each capability. While a weak VIQ capability can be compensated through the alignment of stakeholders and the integration of environmental agenda at the strategy and cultural level, companies need to develop superior stakeholder management, cross-boundary collaboration, and digital transformation capabilities to achieve superior E2 performance. The acquisition and development of the capability should come as a higher priority than acquiring new products or processing from the market. If resources are really a constraint, investment in digital

transformation capability has the largest effect to achieve E2 performance according to the study result.

6.4 Limits and future study suggestions

Given the small sample size, the study does have limitations to generalize across different industries or different types of companies. A single source bias and time gap effect may exist because the assessment of the capability reflects the status while the relative E2 performance is based on the past five years. Future studies may further explore the drivers and success factors of dual-agenda innovation by looking into the area of how the capabilities are applied at different stages of innovation process and/or across different types of innovations (process, product, business model and so on). The interrelationship among different capabilities is another interesting area to be further explored, such as the relationship between VIQ and other capabilities, and the boundary conditions where VIQ may contribute to jeopardize superior E2 performance.

Besides capabilities, other organizational factors such as leadership, team dynamic, organization design and practice adoption are also promising areas for future study. It was mentioned by multiple E2 winner and green player companies that a determinant leadership and consistent strategy play critical role in pursuing E2 performance. Studies including the samples of small- or median-sized companies and measuring the development of core capabilities over time could be beneficial as well.

6.5 Conclusion

Through the interview-based case study of 16 companies in different industries, the study identified common challenges in pursuing economic and environmental performance simultaneously and explained how dual-agenda innovation can help solve the problem. It brought four key capabilities developed based on the ACAP model. The result supported the proposed dual-agenda innovation hypotheses, and the findings can be applied to guide companies to find win-win solutions in achieving superior E2 performance.

References

Last Name, F. M. (Year). Article Title. *Journal Title*, Pages From - To.

Last Name, F. M. (Year). *Book Title.* City Name: Publisher Name.

Appendix 1 – Case Study Interview Questions

1. Self-introduction of both parties, informant's experience in the organization

2. What is your perspective about environment performance of the company, how important is it to the business, do you have environmental KPIs through the organization?

3. Previous study indicates that there are three common challenges that companies are facing in pursuing superior economic and environmental (E2) performance simultaneously:

- Short-term vs. long-term conflict
- Perceived resource constraint or trade-off
- Design/functional dilemma

3a. At scale 1-10, how serious do you consider each challenge in your organization (based on past 5 years' experience), can you provide specific example of each?

3b. What are the other challenges in pursuing E2 performance in your organization?

4. What role does innovation (product/process/business model innovation) play in achieving superior E2 performance? Could you provide some examples of E2 Innovation?

5a. Based on your experience in the past 5 years, how does the capability of **Value Identification & Quantification** help to address the three common challenges through innovation?

5b: At a scale of 1-10, what is your assessment of Value Identification & Quantification capability in the organization? Could you provide some examples?

6a. Based on your experience in the past 5 years, how does the capability of **Cross-boundary Collaboration** help to address the three common challenges through innovation?

6b. At a scale of 1-10, what is your assessment of Cross-boundary Collaboration capability in the organization? Could you provide some examples?

7a. Based on your experience in the past 5 years, how does the capability of (internal &external) **Stakeholder Management** help to address the three common challenges through innovation?

7b. At a scale of 1-10, what is your assessment of Stakeholder Management capability in the organization? Could you provide some examples?

8. Previous study indicates that the extent of **Digitalization** can be demonstrated in below four areas:

- Digital capture – adopt information and communication technology in end-to-end value chain to capture and store data
- Digital connection – build connection of data collected among internal (e.g., cross-functional information sharing and workflow design) and external stakeholders
- Digital production – use technology and robot to reduce/replace manual work
- Digital creation – data analysis, new insights and predictions built on AI, sustainability knowledge management, new business model and so on.

8a. At scale of 1-10, how do you assess the extent of Digitalization in each area? Could you provide an example of each?

8b. Based on your experience in the past 5 years, how does Digital Transformation help to address the three common challenges (Q3) in pursuing E2 performance?

8c. At a scale of 1-10, how do you assess the company's explorative and exploitative capability in Digital Transformation?

- Explorative Capability: Acquire and assimilate external knowledge and technology that is new to the organization
- Exploitative Capability: Refine, extend, and apply existing knowledge and technology into operations to generate value

9a. At a scale of 1-10, how would you assess the importance of the four capabilities (Q5-Q8) in achieving superior E2 performance through innovation:

- **Value Identification & Quantification**
- **Cross-boundary Collaboration**
- **Stakeholder Management**
- **Digital Transformation**

9b. Is there anything else that you consider important to a successful dual-agenda innovation?

10a. What is your review of below factors in pursuing Economic and Environmental performance?

- Leaders' determination
- Performance Measurement
- External Policy compliance
- Corporate culture

10b. Besides innovation, does the company use other approach to achieve Economic and Environmental performance at the same time?

Appendix 2 – Summary of content mapping from interview notes and annual reporting of each company

IV	Themes	A	B	C	D
Value Identification & Quantification	**SMART environmental KPIs are identified at corporate level and tracked regularly**	1. reducing both our direct and indirect GHG emissions (scope 1-3) by -30% in absolute terms by 2025 through energy mng in production and 100% green energy, blue building and green logistics. 2. "Plastic Pledge", which aims to compose 100% of packaging refillable, reusable or recyclable by 2025, 30% recycled material content in our plastic packaging by 2025. Fully circular resources 3. Sustainable Palm oil, shea butter, and paper-based materials 4. Regenerative water: annual Water Risk Analysis and water recycling	1. Increasing the amount of carbon stored in forests, regeneration and management of young stands by 30% from the 2018 level and increase the amount of products storing carbon 2. Our objective is to utilise our production side streams by 100%. • Our objective is to decrease the use of process water by 25% from the 2018 level. 3. Increasing the amount of decayed wood (high biodiversity stumps in 90% of thinnings and regeneration logging sites and retention trees in all regeneration logging sites) 4. Fossil free mills and resource efficient production, fossil free raw materials and sustainable supply chain"	"The company is committing $800 million through 2030 to support sustainable product development as part of its sustainable Mission. As part of the initiative, its brands will aim to use 100% recyclable, reusable or compostable plastic packaging and certified/post-consumer recycled paper- and pulp-based packaging."" The company's brands will use 100% recyclable, reusable or compostable plastic packaging and certified/post-consumer recycled paper- and pulp-based packaging by 2025. Meanwhile, four partners are seeking to use 100% recycled plastic in their bottles by 2030." Global achievement per 2020 report: 45% CO2 reduction till 2020 compared with 2010; 54% of electricity is produced from renewable energy sources	Public reported sustainability 2030 goals include: 1. Water Leadership: 100% regenerative water use in all leadership locations; Drive advanced water efficiency improvements in water-stressed contexts; 100% compliance with global water stewardship requirements 2. WWW: 100% of packaging recyclable by 2025 and use at least 50% recycled material in packaging by 2030 (Design, Collect, Partner) 3. Climate: Reduce absolute GHG emissions 25% by 2030; Ambition to achieve net-zero carbon emissions by 2050 "we have six metrics overall. One that talks about water leadership, until 2020, or objective was to return to nature, the equivalent of the 100% of water we used in finished products. And that was reached three years ago. So our new mission is to increase water security, where we operate, source ingredient and [illegible]
	Environmental KPIs are cascaded from senior leadership to frontline	"Environmental KPI was set from top-down across all the functions, but it carries different weight in different functions during implementation"	Company has long-term strategy of sustainability with clear economic value in mind. Environment indicatives contribute to company's cost saving and productivity improvement target		"… example of environmental friendly initiative, but not so much environmental KPI cascaded to frontline, for example, reduce carbon footprint by certain amount by 2025" "The good thing in the case the company is the ESG agenda is embedded in our company purpose, which is refresh the world and make a difference. Certainly goes hand in hand, and this guide us in good times, and in challenging times, because as you know, sometimes you may be facing a big challenge, you just focus on the business and leave all the all the other topics behind. In this case, since it's embedded in our purpose. This allows us to maintain it in top of our priority in good times, and also in challenging times"
	Both economic and environment benefits are imbedded in innovation process	"We have process to measure and quantify the materials cost, but no system for the brand value"	Metsä Group has set three focus areas for research, development and innovation work. 1.circular economy and resource efficiency 2.renewable raw material as a competitive edge that focuses upon reducing carbon footprint, new biobased products for new value chains, and sustainable forest management. 3. seek new ways for adding value to products and services by light weighting and less energy-intensive structures.	"Medical related products are mainly driven by R&D; Value identification is critical in term of how we communicate and build business case. The r&d people can identify and quantify the value is also about how they communicate how they present value."	
	Specific economic benefits are evaluated at project/product level for "green" innovation	"Is there an existing process to quantify the value from Environmental Innovation? - Cost quantification: Yes, - Brand value quantification: No"			"In each of the operating business, we have a sustainability here. And that sustainability had made sure that everything that we developed, it's in compliance with our sustainability agenda, and every single hour you precedent, and they're in their leadership team, they all have embedded in this matrix and their goals"

IV	Themes	E	F	G	H
Value Identification & Quantification	**SMART environmental KPIs are identified at corporate level and tracked regularly**	The Committee recommended, and the Board agreed, this step-change in the scale and pace of addressing our impact on the environment by committing to a goal of net zero impact on climate and a positive impact on nature across our value chain by 2030 Underpinning these goals, the company has set new targets across its different businesses, including: 100% renewable electricity usage and good water stewardship at all our sites; 100% of materials sustainably sourced and deforestation free and transitioning to 100% usage of electric vehicles by sales representatives worldwide. More information on the goals and the targets are available on the company.com.	REDUCING ENVIRONMENTAL IMPACT by 1/2: (Greenhouse gases; Water; Waste) Goals: 1. Deforestation-free supply chain by 2023 (palm oil, paper and board, tea, soy and the companya). 2. Implement water stewardship programmes in 100 locations in water-stressed areas by 2030 3. 100% of our ingredients will be biodegradable by 2030 4. By 2025 we will halve the amount of virgin plastic we use in our packaging (2018 baseline) 5. By 2025 we will increase the recycled plastic material content in our packaging to 25%. 6. Help collect and process more plastic packaging than we sell by 2025 7. By 2025 all of our plastic packaging will be designed to be fully reusable, recyclable or compostable. 8. By 2025 we will halve food waste in our operations	Ambition 2030: -Brand- 100% of our leadership brands will enable and inspire responsible consumption - Reduce, Reuse, Recyle, Have 100% recyclable or reusable packaging by 2030; reduce global use of virgin petroleum plastic by 50% by 2030 - Achieved 2020 sustainability goal ahead of schedule: purchasing 100% renewable electricity in US, Canada and Western Europe Specific goals breakdown in sustainability report "Sustainability is part of our strategy of how to sell, how to communicate and how to pricing."	Environmental Goals: Carbon neutral in facilities and operations by 2035 -Reduce scope 1&2 GHG by 10% from 2018 -Deploy at least 10 renewable energy opportunities -Achieve certification to ISO50001 Energy Management standard at 10 facilities "No environmental KPI as per employee's experience" the company's health, safety and environment programs integrate HSE considerations into all aspects of business: -We actively promote and develop opportunities for expanding sustainable capacity by increasing energy and water efficiency, improving security and safety, and reducing emissions of harmful pollutants - We are committed to compliance with all of our health, safety, environmental and legal requirements everywhere we
	Environmental KPIs are cascaded from senior leadership to frontline	"Environmental KPI has not been adopted both at organization/strategic level and project/product level" "We have a clear quantified R&D KPI such as its investment ratio to total sales, but we don't have specific KPI for Environment initiatives except for compliance related KPI, such as the usage of certain raw material in a new product. "	"we do have a department that is specially as specialized in sustainability. So they are the one who actually develop innovations that are environmentally friendly, they're on top of that, in all our KPIs,we have this thing called three plus one internally. So we have three business KPI and one non business KPI. So this one non business KPI is usually tied to things that we want to do like environment, different things"	2020 Environmental Goals are broken down to Climate, Water, Waste, Waste and tracked progress vs. 2010 baseline: -Reduce energy use at the company facilities by 20% per unit of production by 2020 - Reduce absolute GHG emissions by 30% by 2020 - Ensure 70% of machine loads are low-energy cycles - Have 100% of the virgin wood fibers used in our tissue/towel and absorbent hygiene products be third-party certified by 2015 - Reduce truck transportation kilometers by 20% per unit of production - Ensure plants are powered by 30% renewable energy - Create technologies by 2020 to substitute top petroleum-derived raw materials with renewable materials as cost and scale permit - Reduce water use in manufacturing facilities by 20% per unit of production with conservation focused on water-stressed regions	
	Both economic and environment benefits are imbedded in innovation process	"Value identification & quantification is one of the fundamental capabilities, mainly in commercial function, who provide market insight and quantify values."	The The company Sustainable Living Plan - USLP has also helped us avoid costs. Through our eco-efficiency programme , for example, we have avoided over €1 billion in costs since 2008, by improving water and energy efficiency in our factories, and by using less material and producing less waste.	"Our bottomline is can not be end up with making loss. The purpose of innovation is about sustainability not very high. … but we are able to quantify environmental impact into dollar benefits" Brand 2030, Brand needs to innovate to have meaningful impact in the brand's key environmental impact area E.g. "Cold Water Cleaning" initiative with big size of prize.	"Our R&D process is focused on customer's pinpoint from concept to prototype to pilot and massive production"
	Specific economic benefits are evaluated at project/product level for "green" innovation	"About translating to economic value, our R&D team doesn't have much commercial sense, and they don't have much data or insight to guide R&D, not receive information from commercial/marketing team."	"we have the project gateway, whereby we are presenting products that are going to be launched in three to five years, even now we are seeing like a long line up for products, even without existing mass product right there. We think small changes on the architecture of the word make it more environmental friendly"	"Clear goal set up such as from plastic package to paper package, size of package, Tide example"	"… very strong mindset on financial benefits. Have high standard on financial ROI expectations with 3 years cycle time. Also consider gross margin, impact on existing portfolio, competition's response, pricing etc. a completed framework of evaluation"

IV	Themes	I	J	K	L
Value Identification & Quantification	**SMART environmental KPIs are identified at corporate level and tracked regularly**	2025 Sustainability and Social Impact Goals: 1. 15% water intensity reduction (2016 baseline) 2. 30% carbon intensity reduction 3. 45% waste-to-landfill (and 50% food waste) reduction 4. 30% renewable electricity 5. 100% of hotels will be certified to a recognized sustainability standard 6. 650 hotels LEED®,BREEAM®, or Estidama certified or registered hotels 7. 250 adaptive reuse projects 8. 95% responsible sourcing in our top 10 priority categories	Detailed Measurable goals with: 1: Science for circular: 6 KPIs, meet goals except for water efficiency 2: Science for climate: 4 KPIs, energy efficiency & CO2 emission are behind target https://www.the company.com/the company/en_US/sustainability-us/goals-progress/	Sustainability goal by 2025: -set an ambitious new target to achieve net-zero emissions by 2040; reduce absolute GHG emissions across direct operations (Scopes 1 and 2) by 75% and indirect value chain (Scope 3) by 40% by 2030 (against a 2015 baseline). - Improve water-use efficiency by 15% in our agricultural supply chain (focused on corn and potatoes) in high water-risk areas; Improve operational water-use efficiency by 25% in high water-risk areas; Replenish more than 100% of the water that we use back into the local watershed in high water-risk areas; - Design 100% of packaging to be recyclable, compostable or biodegradable; -increase recycled content in our plastics packaging to 25% "Globally Pepsi has made public commitment of 2025 goal zero sustainability goal, such as sustainability packaging goal : 25% usage of recycle [illegible]	Reduce global energy use per sqft by up to 5% by the end of 2020 By the end of 2019, upgrade data storage to all-flash for energy reduction and enchanced efficiency Engage 100% of travel suppliers on overall sustainability practices. Ensure none of global e-waste is sent to landfill by the end of 2020 "... good capability to understand, to quantify, because we do have an understanding of our climate risks. And in that we do know what our physical risks are. We've done a climate risk assessment, which we will do again, we know what our physical risks are, we know what regulatory risks, at least to the best of our ability, we are aware of any regulatory risk, reputational risk technological risks" "So if we are picking something at the end, we understand the importance of it. Looking at a holistic picture, we [illegible]
	Environmental KPIs are cascaded from senior leadership to frontline	"More from cost perspective, difficult to execute at hotel management level, the company is about hotel brand management. RE owner will pick up hotel management team based on HQ guideline, but they run independently about cost efficiency and environmental friendly. " "From Starwood to the company, both companies have put a lot emphasis on environment initiatives and communication internally and externally – "Green Choice" program. A lot emphasize on Green Choice is about cost consideration and customer experience"	" Environmental for the company: Company face pressure on economic performance from shareholder, need to balance among long-term sustainability value to short-term financial performance. not much has been formalized to quantify the value from environmental initiatives." "Manufacturing and Sourcing have more specific and clear environment KPI compared with other functions, mainly linked with Compliance and government regulation requirement, cost and sustainability considering. Other functions also have related KPI, such as new idea and new product development has a requirement of contribution to sustainability and need to understand if any negative impact on environment. There's expectation from top-down, but not put in specific form of KPI. For the company, company has put more	"Yes there's such KPI but I may not be aware of. Actually the environmental KPI is quite important to us. It's a joint efforts with cross functional efforts such as production, branding, led by senior management. With the global commitment, such goal has been cascaded to each country with quantitative measures. But such measures may only be discussed during senior leadership meeting that I didn't participate. ... not to commercial department, environment KPI may sits under supply chain department to drive together with bottlers"	"these goals that we are setting are across the company, they might be function specific, but it's a very collaborative effort" "I'll give an example of one of our goals, which we just wrapped up is energy reduction per square footage of the company's portfolio. And that is that that's our facilities specifically. So we may work, it may fall more so with real estate, because its facilities, but for us to be able to reduce energy consumption, different teams have to contribute like there are data centers, there's technology. So different teams have kind of plugged have had to plug in for any kind of movement to that towards that goal statement"
	Both economic and environment benefits are imbedded in innovation process	As a part of our materiality and goal-setting process used in developing our Serve 360 sustainability and social impact platform, we reviewed data from Ethe companyb's Water Risk Monetizer, the WRI Aqueduct Tool, and other tools to assess the performance of our properties in water-stressed regions. Across all our regions, hotels continued to improve planning and purchasing practices to reduce the amount of food produced in the first place and strategically divert food waste from landfills via food donation, composting, and other diversion options In our CDP Climate Change disclosure, we provide details on the potential financial implications of physical, regulatory, and other risks and opportunities associated with climate change. From a company-wide perspective, the	the company employees will be asked to consider attributes such as reusability, recyclability, energy efficiency, waste reduction, water savings, responsible sourcing and renewability from the beginning to the end of a product lifecycle	"Innovation decide the amount of materials used in package and the quality of package. And different amount decide the funding (cost), so innovation can help relieve the challenge of short-term vs. long-term. As long as the environment concern is about "making/producing something" innovation department must participate and it plays an important role. "	The management of climate change and energy reduction efforts is integrated into our management review process with senior leadership and through our technology/Operations Sustainability Council
	Specific economic benefits are evaluated at project/product level for "green" innovation		Since 2019, require 100% products entering the new product commercialization process to include a Sustainability Value Commitment (SVC in New Product Introduction) that demonstrates how it drives impact for the greater good.	"We have specific solutions that is quantified such as Reduce, Recycle, Re-invent plastic has specific actions, such as reduce the amount of plastic in different layers, reduce kg per package, etc. Big, general environmental KPI has been operationalized in daily, specific, executable actions and solutions with quantified impact that link to cost or benefits" In 2021, we plan to assess the environmental footprint of all new innovation products with packaging changes or ingredient reformulations through the SftS Program. We expect to formalize the program's key performance indicators and set internal impact reduction goals, building on data and lessons learned from the program's first year.	"depending on what the project is the goal is always to be able to quantify that is always our goal, that we have some kind of, because how do we know we've reached our goal if we are not measuring it against something? So, that is always our goal that we are able to quantify and track"

IV	Themes	M	N	O	P
Value Identification and Quantification	**SMART environmental KPIs are identified at corporate level and tracked regularly:** **- Specific: What exactly is an indicator of success** **- Measurable: Can we physically track the KPIs** **- Achievable: Are the KPIs realistic** **- Relevant: Does the KPI reflect the overall goals of the business** **- Time bounded: when should KPIs be met**	"We have two parts of response. The first part is social responsibility. The 2nd part is operational improvement, such as examining the usage of water, electricity and gas, setting KPI for utilities, and set target such as 90% of last year to save energy." The company have group level KPI with mission achieve in 2025, but at local or every individual level, there's no such target such as 10-20% saving, we're still at early stage of data collection and goal validation." It is our goal to reduce emissions across our entire value chain by 30% by 2030 thus paving the way for climate neutrality by 2050. Specific goals for Own operations, External supply	2030 Goals: - 50% reduction in scope 1,2,3 GHG emission - 50% water withdrawal will be conserved or replenished - 50% reduction in waste sent to landfill from stores, driven by a boarder shift towards a circular economy From FY19 to FY20, we are able to report an 11% reduction in carbon emissions against our 2030 carbon goal; 4% water reduction against our 2030 water goal; and 12% reduction in waste against our 2030 waste goal.	- Sustainable and inclusive trade: helping connect 50% of global containerised trade to digital solutions by 2025 - Climate change / Decarbonising logistics: 60% relative CO2 reduction from shipping By 2030 compared to 2008 levels; By 2030, have commercially viable, net zero vessels operating in our fleet. By 2050, have net zero CO2 emissions from our own ocean operations. - End-to-end responsibility in supply chains	The five issues big goal: 1. Create a food supply chain that fights climate change and protects biodiversity 2. Help address health challenges at every stage of life 3. Promote healthy diets that are better for the planet 4. Fight waste, recycle and reuse: toward the cirtular economy 5. Act locally for a virtual food model Specific action and impact are avaiable in annual report, but no tangile SMART goals.
	Environmental KPIs are cascaded from senior leadership to frontline	"Our initiative is top-down instead of bottom-up, every function is assigned with some task and budget, in my area, it's reducing energy consumption in store operation, I will communicate with each country for them to execute."	Five key strategies to meet 2030 goals: 1. Expand plant-based menu options 2. Shift away from single-use to reusable packaging 3. Invest in regenerative agriculture, reforestation, forest conservation and water replenishment in our supply chain 4. Invest in better ways to manage our waste 5. Innovate to develop more sustainable stores, operations, manufacturing and delivery. "We have environmental related KPIs such as GHG emission reduction top-down to related function and individuals, especially for my	"The company has soft KPI to select suppliers/vendor, maybe at project or vessel level, but no hard/tangible/quantified KPI at individual level."	"I think the company is quite leading edge on this topic, everyone's bonus is linked to both corporate (E2) And then there's, so one is corporate and the other is social responsibility, which would uncover environment that would also uncover several different factors as part of that."
	Both economic and environment benefits are imbedded in innovation process	To be able to quantify our environmental impact along the value chain, we developed an internal tool. This tool uses data from various IT systems and departmental sources to calculate a monetized environmental footprint that accounts for the complete value chain from raw material production to product use and disposal.	"There should be economic assessemnt in our new product launch or new initiatives, but I don't have accessbility to the details… Overall it's mainly the investment from the company. We reserve budget for the initiatives during annual plan and it's just get executed top-down."	Four priority fuels for net zero emissions shipping: Biodiesel; Methanol; Lignin fuels; Ammonia	"I'd say quantifying is not that strong. I don't think we were that good at quantifying the value, but there was an inbuilt assumption that consumers are going to, I would say in niche areas are demanding this now. And what is needed today, probably from early adopters is going to become more mainstream tomorrow. To position ourselves ready for the mainstream tomorrow. There was an inbuilt assumption that it's going to
	Specific economic benefits are evaluated at project/product level for "green" innovation	" the first step is to collect data of energy consumption. Our feedback to global team is, by this kind of initiative, what kind of achievement we can do,… At the beginning, they also (the global team) don't know by doing this… (can save billions?)." Currently, the tool is primarily used for measurement as well as internal and external reporting. As such, it provided key insights for the development process of our new strategy. A future objective is to directly interface	No visibility of such process but there're examples of product/process/business model innovation that generate both good environmental and economic results.	"Every future investment (investment pipeline) in The company has CO2 assessment. But it's a soft metric instead of hard metrics as there's limited/lack of established data to track and measure GHG emission."	"Everyone interviewed would be measured on it. But I think the action is probably quite connected. For example, there may have been a factory becoming a counter to the terminology but not on the usage of water becoming neutral in some way in terms of how we use water. So that was something that I might as an individual, my bonus will be linked to. I don't think that I personally actually did anything related to achieving all that. But the achievement of that, or not achieving that would reflect on my take home

IV	Themes	A	B	C	D
Stakeholder Management	**Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.**	"The stakeholder management example I just mentioned is a negotiation within the company. This is just one aspect. Another aspect is we're taking steps outside the company. Such as communication with direct suppliers, and we go even further up to the value stream to explore solution with recycler, and even connecting with Sinopec, Dow, Shell to explore solutions"	"the company's shareholder structure (private forest owner) requires that it must be able to grow the value in a sustainable way: 1. How can I grow the forest resource in a sustainable way (continuous grow) 2. How can I cash in (realize) the value"	"Take contact lenses as examples, stakeholders identified are eye care professionals, regulators, customers ." As a global healthcare company, Johnson & Johnson interacts with numerous stakeholder groups at the global, national and local levels	"first of all, let me share with you that cross boundary collaboration, because I think that everything has that in common. Everything that you mentioned, has the cross boundary collaboration. It's ranked among, or our top priorities now. And the reason is that early in the journey, we understood that we were not able to solve these challenges alone, and that we require collaboration of subject matter experts, academia, industry, competitors, other key enterprises, NGOs. "
	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")	"Among 10 cases, how many can reach win-win? A: 4-5 cases for win-win solutions, total can achieve 9 out of 10 (with top-down), one case has to drop due to design or technology challenge"	Stakeholder buy-in driven by a clear, long-term focused strategy.	Our Credo, written more than 75 years ago, embraces the diversity of stakeholders to whom we are responsible, and serves as our guide to creating long-term value for our Company and for society. Ongoing and proactive engagement with these groups makes our Company stronger and better informed. It helps us gain valuable insight into our stakeholders' perspectives and the topics that matter to them. It enables us to develop products and services that are responsive to their needs. This engagement also allows us to share information about our Company's strategy, practices and performance.	"Communication to stakeholders about environment is not like a loud shout all the time, but small initiatives imbedded in small areas of daily work and life, such as the recycle bin in office." "So based on the fact that each stakeholder pursues the same vision and goal, I believe that we are doing extraordinary well in in keeping them informed and more importantly, act behind the key workstream developed by our enterprise"
	Engage stakeholders effectively by taking their input into dual-agenda innovation process	"We mainly use engagement to influence stakeholder (peer management), meanwhile R&D is considering how to leverage cost increase, For example, env-friendly paper is more expensive (than normal paper as a material), but R&D can explore if we can reduce the usage from structure design, reduce the size of box to maintain the same cost with env-friendly paper, this would be easier to get stakeholder's buy-in."	"No matter it's an application or a need improve material utilization efficiency, it's not just decided by us. Without partner and customer, without the lead od customer needs, the operational initiatives won't have meaning"	Stakeholder engagement on ESIG: The PTA is an important mechanism to engage with and understand the views of our key stakeholders on ESG topics that they believe are priority for Johnson & Johnson.	"We have done very good exercise in terms of industry partners, NGOs, customers, not only governments and I think that's where that's where we need in order to really develop the structural foundation to develop a more robust agenda. " Beyond our existing efforts in packaging and agricultural procurement, we are implementing more robust supplier engagement programs on cold drink equipment and renewable energy. several of our bottling partners have announced their own Science-Based Targets, which will help drive even more positive climate action across the Coca-the company system.
	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance		Metsä Spring is the venture capital arm of Metsä Group, which invests worldwide in promising startups and early-stage companies with a visible path to the Metsä Group business ecosystem. In addition to financing, Metsä Spring also provides access to Metsä Group's global network and expertise.		Give people options and choices by offering 200 brands including reduced-sugar drinks and smaller packages: 40%+ of our sparkling brands come in smaller packages

IV	Themes	E	F	G	H
Stakeholder Management	**Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.**	Engaging and building trust with the broad range of stakeholders that interact with, or are impacted by, our business is key to delivering our strategy and ensuring our success over the long term: -for each stakeholder group, have specific How we engage, What matters, and What we are doing (p.17-19 AR)	"there's an external party for us, we also to particularly choose sustainable retailers to do this value, add "	"Government, B2B and B2C customers are our key stakeholders. They are at different level of buy in and require different engagement strategies"	In addition, relevant interested parties – including customers, neighboring facilities, government partners, and other stakeholders – are consulted about matters pertaining to the HSEPS Management System
	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")	"it's not easy to reach internal alignment due to different functions have different priorities."	"it's not just we do but we also communicate, and then through the organization, each department or embedded with the environmental KPIs" "beside launching new products, a lot of education has been given at a top down level. Day to day, they will actually give us workshop of environmental sustainability to understand how important it is. So in terms of the quality, the message that our global team is putting down right is very, very consistent over the last five years." "I found it quite challenging. Because if we don't consistently have amount of burst of media or like communication going out to the consumer, it's very hard for them to understand that"	"B2C- understand the importance of environmental impact but no "need' to buy sustainable product, it's nice to have, not must have. Communication focus on mindset change from "I don't care" to "I want to be more conscious" Most B2B customers care more about economical indicators than environmental impact, especially in countries such as JP, PH, KR." Brand leverage their voice in communication and advertising production to promote environmental sustainability. Not only innovating with product ingredients and sourcing choices, the company also sharing more about those choices with greater ingredient transparency	Based on this dialogue, we have implemented actions over the last several years to increase shareowner rights, enhance the Board's structure, increase transparency, and augment our commitment to sustainability and corporate responsibility.
	Engage stakeholders effectively by taking their input into dual-agenda innovation process	"Product identification and commercialization are actually happening in commercial team, not much to do with R&D. "	Our food waste commitments: -Halve food waste in our direct operations by 2025 -Zero waste to landfill and no good food destroyed -Enrol key supply partners to follow our lead and tackle food loss and waste in their operations -Help foodservice customers to tackle food waste through prevention and redistribution -Through our brands, help consumer waste less food at home	"The approach we're using is "do more with less", the first step is not to create something new, but to do more with things that have already started in the company" "The long-term 4-5 years goal will need to be driven through innovation, such as the whole supply chain may needs to be changed" the company launched "It's Our Home" campaign to highlight how small actions at home can make big difference for planet.	"Listening to VOC is very important for us to develop new products and solutions."
	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance		Hellmann's inspires people to taste not waste: Food thrown away at home contributes 40% of global food waste. That's why Hellmann's is on a mission to make people feel good about food and love their leftovers.	Engage consumer on water efficient products: Tide Puls in India, Pantene Foam Conditioners Answering consumers's call for transparency about ingredients used in beauty products, also ask for products to use ingredients they trust as safe.	Responsible Care is practiced today in 68 economies around the world. Program implementation leads to improved efficiency; lower environment, health and safety costs; and improved relations with stakeholders through open and transparent communications. Responsible Care companies have reduced air pollutants by 44% and safety incidents by 48% since 2000. The ACC members have also reduced greenhouse gas intensity by 24% and improved their energy efficiency by 19% since 1992. As part of continuous improvement, ACC has established a goal to reduce Tier 1 Process Safety Events by 20% by 2025. ACC has also created Sustainability Principles, including a sustainability framework for the chemical industry defining primary focus areas, sustainability metrics and processes to assist all member companies in their sustainability journey

IV	Themes	I	J	K	L
Stakeholder Management	**Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.**	"The reason hotels are behind other industries in renewable energy is because hotel companies often do not own the buildings they operate in. The businesses that own hotel buildings are fragmented across the world, making energy initiatives difficult to spark -> Building owners management challenge"	The 2020 study explored people's perceptions of the company's sustainability strategy and its three pillars: Science for Climate, Science for Community, and Science for Circular. TA survey that included customers, suppliers, and external stakeholders. (NGOs, corporate/private sector, academics, government, media, finance, etc.) and was representative of the company's four business groups and all regions of operations.	We define our key stakeholder groups as those who impact - directly or indirectly - our business success, or who are impacted by our operations. The insights that we receive from customers, consumers, shareholders, employees, suppliers, governments, and civil society including non-governmental organizations (NGOs) is critical to how we develop, implement, and evolve our sustainability agenda.	"I define stakeholders as clients, investors, consumers, employees." "They are also our stakeholders, they are telling us what is the most important question to ask, given the current ESG scenario, what are our competitors doing? What are the other businesses doing? For me, all of these are stakeholders." Stakeholders include Client, Media research, Suppliers, Consumers, investor, industry associations and employees
	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")	"SM is very important, from top-down communication to individual hotel execution. the company China Branch only gain massive market share after acquire Starwood, they put a lot emphasis on customer feedback and internal communication. Such as hygiene related. Compliant from individual customers" "They put a lot emphasis on external communication and relationship building, but there're challenges in execution. "	"the company has a lot engagement with consumers about their needs, but I feel not much alignment internally about environment initiatives" "From company strategy perspective, it may require decision of portfolio management (investment and divestment), need leadership decision and courage to build a sustainable portfolio, will also have impact on biz performance. – Portfolio transformation. Consumer/end-user's insights and acceptance of the product, whether their perception is aligned with the company. Such as fibber materials, the company wants to promote more environment friendly material, but it may require higher cost and impact on product performance, such as less flexible fibber. To better drive Sustainability, it's not driven by company, but need to listen and align with consumer. "	"more regarding stakeholders of government and consumer. Government, attend the forum, manage public image, work with bottlers, compliance with government requirements of energy saving and emissions reduction "	Interacts with a variety of external stakeholders through the process of conducting regular nonfinancial materiality assessment.
	Engage stakeholders effectively by taking their input into dual-agenda innovation process	Thermostats with occupancy sensors adjust heating and AC temperatures. Utilizing Internet of Things (IoT) technology, these same room amenities can be connected to apps so guests can change settings remotely. -> Interview: the company puts CX before anything else they do thus adoption of new tech is slow with concern of impacting customer experience	"We have a model in place for customer engagement that uses our current product offerings and development opportunities. - Customer Inspired Innovation."	"Consumer engagement is ongoing. Such as global ocean day, we will participate and communicate our environmental initiatives."	"they are the reason why we do what we do. When I think about environment, I'm like it's the right thing to do. And I'm like, yeah, I'm a stakeholder, I'm the employee who's saying is important, but my board may say, investors are not asking about it. So that might put it down on the priority list, but it is still driving my ESG strategy. So what we are doing and why we are doing it is very heavily driven by stakeholders" Beyond seeking understand how stakeholder view the company, also use the feedback to identify future potential risks and opportunities.
	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance	"Hotel association doesn't have much power on sustainability, the environmental perspective is still missing in China, need more government policy. "		Transparently sharing information with consumers to allow them to make Positive Choices	"That's how materiality is done right, non financial materiality, materiality is after talking to stakeholders, let's find out where our areas of focus should be. And that's how we actually try to build our strategy as much as possible to find our areas of focus. So that so that the limited resources are not dispersed"

IV	Themes	M	N	O	P
Stakeholder Management	**Identify stakeholders from full eco-system: suppliers, employee, customers, government, partner, competitors etc.**	Our holistic approach to sustainability responds to the challenges that endanger our planet and people. Consequently, sustainability is an integral component of our strategy 'Own the Game' and we have a clear roadmap for 2025 and beyond. It tackles the topics that are most material to our business and our stakeholders, and translates our overall sustainability efforts into tangible goals.	"The way we work in the company is mainly top-down. Our no.1 principle is we will never do anything that goes against government policy or regulation. After putting principles in place and managing legal risks, there's little room for autonomy or internal stakeholder conflicts...."	"There's been a lot discussion on different agenda from different stakeholders, but it's difficult to reconcile all the different needs. The bottomneck of innovation sits with scaling up, which due to service constraint. And the solution sits with differentiating the service such as premium sailing line." Five stakeholder groups are prioritised for sustainability strategy, reporting and engagement: customers, employees, investors, authorities and NGOs/thought	With our food system and society facing major challenges, joining forces with stakeholder is vital to bringing our "One planet, One health" vision to life and create sustainability value for all.
	Communicate/Educate stakeholders effectively through different communication channels (get buy-in of E2 changes, no "green wash")	"I haven't encountered such issue (of push-back from coutnry during execution), because it's a top-down initiative mainly driven by global team and they will review with us every quarter. Global-APAC-Country communication is quite smooth." In addition, we are proactively addressing the impacts of climate change by supporting global initiatives that aim to drive change for our industry. For example, in the past two years, we signed the Fashion Pact presented at the 2019 G7 Summit and the UN Fashion Industry Charter for Climate Action. In addition, we committed to the Science Based Targets initiative in 2020 and are preparing to have our targets approved. adidas has been a member of the UN Climate Neutral	"Internal communication is not very difficult for us. For routine transportation, we just follow process. In case there's special request from marketing, as long as they're willing to take the additional cost, we're ok to accommodate… One area that the company is doing well is to win interests from customers, such as Earth Day event. Although there's cost for such initiative, the long-term effect on consumer's preference is huge."	It is a cornerstone of our decarbonisation ambition to provide transparency to capital markets on greenhouse gas emissions across all scopes, our transition pathways, and climate-related risks and opportunities. The key framework which guides our reporting is the TCFD (Task Force on Climate-related Financial Disclosures) framework which is also incorporated into CDP, a platform to which we have reported since 2010, and into new benchmarks such as the Climate Action 100+ net zero company benchmark launching in early 2021.	"this one's a bit controversial because the global CEO, who was a big advocate of this Dual-contract and combining… he was pushed out so he was basically sacked. A lot of media reporting mentioned that maybe he was a bit too bold in, placing too much importance on the environment as opposed to economic factors. My personal opinion is I think this experience demonstrates that there's a real tension actually.
	Engage stakeholders effectively by taking their input into dual-agenda innovation process	"We communicate the guideline to countries and tell them that we only collect your data at the moment, country needs to come up with plan and tell us how you want to implement phase 1 and what can be achieved. It's like an open question to country team." Engaging openly with stakeholders and establishing ways to increase transparency and disclosure has long been central to our approach. Our stakeholders are those people or organizations who affect or are affected by our operations, including our employees, consumers, suppliers and their workers, customers, investors, media, governments, and NGOs. The adidas Stakeholder Relations Guideline specifies key principles for the development of stakeholder relations and details the different forms of stakeholder	With growing interest among our partners in sustainability, more than 28,000 worldwide have now enrolled in in the Greener Apron sustainability training program through the company Global Academy. We continue to expand opportunities for partners to engage on sustainability, in part because increased awareness and adoption of environmentally friendly practices among partners is key to the success of our overall sustainability goals.	In 2020, our engagement with customers on sustainability has focused particularly on providing transparency on responsible business practices and visibility of logistics emissions, as well as on sustainability innovation, encompassing our currently available and future solutions for net zero carbon shipping. Our engagement with investors, banks and insurers on ESG/sustainability has likewise centred on decarbonisation, but ship recycling, air emissions, ocean health and safety are also topics important to our large investors.	"At the same time, as it relates specifically on the environment, the company I think was the first big company to gain the Corp qualification that you feel would be cool. Because I've seen that in other companies to be called is mostly small companies that it's got a sustainability quality accreditation. It's mainly small companies that achieve that. the company was one of the first multinational big companies to achieve that status, which is quite honours in sort of checking your you know, everything you do in the company and ensuring it's gonna tick certain boxes. "
	Empower stakeholders effectively to make the right decisions in order to achieve E2 performance	"Each country works out plan and come back tell us which stores they choose, what initiatives they will take, they will review and come up with solutions."	"Company's target needs to go with the requirement from government, so most of the cases it's just do it, we didn't encounter much push back in the organization. For example, the procurement needs to find a solution with supplier and manufacture, the logistics need to find solutions for on-time-delivery" "Another example is CNY4 reduction if customer brings their own cup. Due to the discount, customers may increase their consumption of coffee from once per week to twice per week, which increases our revenue as well. "	One key feature in this is the company product. Launched in 2019, it remains one of only a few options for carbon-neutral emissions shipping on the global market so far. the company ECO delivery uses externally certified biodiesel in the form of used cooking oil to power vessels in our network. The CO2 savings generated from this are used to neutralise emissions related to transport of specific cargo by customers. In 2020, customer uptake of the company ECO delivery shipping exceeded our expectations. So far, approximately ten major customers have chosen to purchase this carbon-neutral emissions transport solution, and we expect this number to increase. We are also in conversation with some customers on the possibility of converting all their shipments to the the company ECO delivery	"I would say in terms of engaging in internally it's very high. If you look at why people join that company, many people are very attracted to this idea of a Dual-contract. So actually, in terms of attracting talent. It's actually very, very positive. It's actually not just a nice to have thing, it's actually can play a pivotal role in attracting people to work for the company. In terms of, suppliers or vendors or third parties engaging, I would say it's not that strong, but it's still positive. Not as positive as employees who really you know, we've vision but it would still be positive."

IV	Themes	A	B	C	D
Cross-boundary Collaboration	**Collaborate with different functions within the organization during E2 innovation**	Scope of CC: - Cross companies and cross-industry	A lot internal & external collaboration through the whole eco-system value chain from forest to wood processing to consumer.	"There is a huge amount of collaboration among r&d, innovation, commercial, and so on. And then, of course, also the manufacturing a prototype to a final product may look different."	"because we have various departments, such as MPD, new product development department, that work very closely with marketing and supply chain team for any new product in innovation, and they in turn work very closely with our brand team as well to get the support for whatever innovations that the company wants to put in place or any opportunities that they have identified. So, I think in terms of the resources, I do think that we have that kind of infrastructure to look into it, I probably do not know the exact process of it, but I it gives me a feeling that we do have the capability to do any sort of cross collaboration across boundaries boundary. " Very close team work and communication between supplier and brand owner.
	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)	Collaboration boosts innovation For Beiersdorf, collaboration with external partners is an integral component of our research and development work. "Trusted Network" online platform	A lot internal & external collaboration through the whole eco-system value chain from forest to wood processing to consumer.	Received the EcoVadis 2021 Sustainable Procurement Leadership Awards in the Best Value Chain Engagement category.	"we also have identified the need to work with external stakeholders, also with industry competitors, and also some other leading companies. " "So I think that collaboration with other industries is what really makes because we don't compete on that what we want to do is to scale up sometimes there's no technologies or new innovation out there" Example of partnership events: World economic forum, UN Global Compact, CERES (climate, water, natural resrouces)
	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages	"Time/Stage of CC: From Ideation, There are several benefits if we start reaching out to broader stakeholders at early stage: If we start approach different methods and areas, we may receive unexpected solutions, which is much wider compared with close door ideation and prototype with only internal team"		"We have an innovation Council, basically all the new innovations is a collaboration between innovation team that is looking at external indicators, on what to innovate what to develop, that goes to red to really translated into more product ideas, or packaging ideas, whichever way you look at it, then the commercialized."	Partnership across business, government and civil society is fundamental to scaling solutions and critical to reaching our climate target and achieving a circular economy. We remain committed to help drive collective action, working with stakeholders, suppliers, nonprofits, communities, customers and industry peers to invest in recycling innovation, facilities, organizations and initiatives.
	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results	"The technology centre will offer room for exchange and cooperation – not only between internal experts, but also with external partners. This includes universities, research institutes or start-ups, but also customers and suppliers."	"Efficiency improvement from supply chain management to energy consumption"	When it comes to our sustainability efforts, perhaps our most noteworthy program is a product-focused initiative called EARTHWARDS®.Earthwards® challenges our product development teams to incorporate sustainable thinking across the entire product lifecycle, including design, manufacturing and product use. As they are developing products, our teams look at all aspects of sustainability, from the water and energy used to make the product to the environmental impact of its ingredients. Johnson & Johnson Innovation looks to crowdsource the best ideas in single-dose packaging for its latest JLABS QuickFire challenge	"Unfortunately, we do very bad with the post consumed bottles with sometimes community just throw them into the ocean drum. So if we are able to provide a circular economy for those post consumed bottles, we were going to be able to collect them important back in the value chain" "it's not about only recycling. It's about really building the circular economy" Key initiatives will be needed across the supply chain from ingredients, packaging, manufacturing, distributoin and cooling and dispensing

IV	Themes	E	F	G	H
Cross-boundary Collaboration	**Collaborate with different functions within the organization during E2 innovation**	"Both internal and external alignment are difficult, and it's more complicated to reach alignment with external parties. Previously I proposed to R&D that if we aim to pursue existing concepts, we need to explore many suppliers in order to get a proper one. But company's strategy is we only focus on 1-2 suppliers. But this limits the availability. By design, their mindset doesn't consider much external collaboration. "	"all the function has this embedded KPI so even like as a sales team, we know that we need to help the sustainability in the years to go so I will think that our capabilities wise actually all of us are very much equate (high)" "You can see us actually pushing harder for all these environmental friendly products or wherever they coming from marketing finance or trademark thing or even sales steam. we are very particular about like thines that we do"	"Internally, there's no tension of R&D vs. Branding or commercial. The priority has been set globally, it's non-negotiable." "the company is a lean organisation with strong CC capability. Decision is made centrally and execution is fast"	"the company has a complicated matrix organisation with high cost of internal communication"
	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)	"As we seek collaboration especially with external parties, Digitalization can provide data support and transparency of the benefits to other parties. "	Implementing open innovation for sourcing of sustainable food ingredients and packaging materials	the company was the first FMCG to partner with international recycling leader TerraCycle in the Loop program. The 50 Liter Home concept brings companies, policy makers, influencers and communities to develop and scale innovation to solve urben water crisis.	"Strong collaboratoin especially with external parties. Attend B2B demo, free test with client to collect feedback. … "
	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages		"we get feedback from the retailer, and the consumer. And then we will redesign the product. " "it's the external portion whereby our niche right our main focus of the business is actually coming from Super & hyper market which is the main chunk of our business and the next main challenge is actually General Trade. So if we look at these two sector right these two sector are really not consumers profile they're actually going towards sustainability"	Strive for circular solutions through supply chain, reduce footprint at early stage	"R&D procss has typical 6 gate review with collaboration and integrateion among different depatments. "
	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results	Green Chemistry Project: •using greener methods of chemistry: materials that are less toxic, easier to dispose of or recyclable •working with processes that need less material and produce less waste •developing ways to recycle the solvents used in chemical processes •implementing a new waste water treatment system •using fewer products and packaging As a result, we have been able to cut by 80% the volume of water and zinc we were sending to waste, and 21.5 million fewer tablets and 850,000 fewer plastic bottles have been produced for use in clinical trials.	"And with this actually wrote a long campaign to clean up the ocean. And with the launch, we also coupled with a long message of throwing litter back to the ocean. Yeah, and we work with the retailer as well. So some of the retailers are also very into sustainability. So like, because Apple for Watson's right, we actually have a joint recycling program together with them, whereby you can bring your empty bottle to be few, like less than perfect products, and you save a lot of times from there. And we also give up like our green plants, if you buy like left with the app. So all these are actually very, very linked back to the message that we want to drive"	2019, joined forces with more than 40 companies that make plastic, use plastic in their products and packaging, and those who recyle and manage plastic waste to form the Alliance to End Plastic Waste, a not-for-profit organization that plans to invest 1.5b in next 5 years to help end plastic waste in the world.	"Work with ecosystem partners, industry associations, LEAD, green building management, partners from upstream and downstream and cross industries"

IV	Themes	I	J	K	L
Cross-boundary Collaboration	**Collaborate with different functions within the organization during E2 innovation**	Understanding the risks of climate change, the company created the Global Green Council in 2007.2 The council is made up of ten global offices representing various departments such as Lodging Development, Marketing, Global Design and Sustainability.	PPP (Pollution Prevention Program) to engage people from different functions to come up with ideas to improve environmental performance.	The SftS Program is managed with input from functional experts such as Supply Chain, Research and Development, Commercialization, and Marketing. Our assessment tools were developed in partnership with external sustainability experts, and they are reviewed and updated annually for accuracy with best available data, supporting packaging, climate and water sustainability goals.	"I would still say we find ourselves very much in the midst of cross functional work all the time." "And as we look forward to setting up new goals and investigate things like sbts or net zero, we expect a lot more cross functional collaboration, because this resource constrained short term long term, we are going to be figuring out cross functionally, how do we contribute, or come together to invest in solutions that are going to be short term and long term, which do not sit with a particular function? They're kind of a the company mission, it's a the company goal"
	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)	the company partnered with Legrand and Samsung to create a "smart room" wherein all devices respond to voice activation.	Tech Forum is a key enabler of collaboration. One of 51 core Technology Platforms is Sustainable Design, which features our capability to incorporate sustainable design into our products, processes, and packaging.	Our Open Innovation platform helps identify and explore technologies, business models and partnership that have potential to dramatically impact food & beverage portfolio. the company's External Innovation team, part of the company's Global Research & Development (R&D) organization, actively scouts for, identifies and develops strategic partnerships with external collaborators. The goal is to locate key external insights, business models, technical unlocks and new capabilities that, when partnered with our robust R&D expertise, will yield disruptive innovation in our core products and new and emerging products	"there are the windows as our external partners, who are a part of our footprint, there are scope three Folks, so there's definitely ESG collaboration"
	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages	The focus of the council is to continue enhancing the company's sustainability efforts by evaluating their current practices and utilizing their environmental strategy as guidance to set long-term goals.	launched our second-generation sustainability assessment tool, Sustain: The tool provides a common language and framework for new product development and measures qualitative and quantitative data to set out a product's environmental profile at every stage. .	As we work to roll out our the company Positive agenda, we are embedding life cycle thinking in our product ideation and stage-gate approval processes, with the goal of making new products more sustainable than the previous generation, building a Positive Value Chain a Sustainable from the Start (SftS) provides tools to estimate a product's potential greenhouse gas footprint, water consumption impact and packaging recyclability during its early design and development phase. It also provides guidelines on reducing impacts with changes to alternative ingredients, improved packaging, and more sustainable technology and distribution. Overall results from the tools are then incorporated into the new product development business process for visibility and decision-making.	
	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results	We view partnership as the new leadership and we're embracing collaboration with others for change – that includes suppliers, retailers, our peers and governments. Together we are advocating for food system reform to address food waste, food insecurity and mitigate climate change. We know we've got a long way to go. A global coalition of leaders from governments, businesses and civil society, we've committed to halve food waste. Together, we're calling for: Countries with more than 95% of the global population to set specific food loss and waste reduction targets by 2021, and to have a quantified baseline and report progress by 2027. Harmonised regulations that set 'use-by' dates for foods with shorter durability on the basis of safety, and 'best-before' dates for foods with longer durability on the grounds of quality.		Our partnership with Danimer Scientific (NYSE: DNMR), which has led to promising research and testing of 100% industrially compostable thin-film plant-based packaging for snack products. We expect insights gained from this research to help us further develop packaging that will compost or biodegrade under a wide range of conditions	

IV	Themes	M	N	O	P
Cross-boundary Collaboration	**Collaborate with different functions within the organization during E2 innovation**	"To give an example, many of our products are made world-wide, we're recruiting a team to check the materials utilization and waste (water) treatment at factories, either from their raw material sourcing or from their waste treatment."	"Collaborating with other functions is not difficult for us. Our principle is to serve stores (customers) 100%, as stores represents customers. Another principle is we can't accept any sold-out situation (out-of-stock) for any reason. Based on these principles, everyone is just following/working towards the same goal, playing the same rule."	"Internally, we have strong cross-functional participation of the impact from CO2 reduction to container turnaround or business." To drive this and coordinate all related processes, a new Decarbonisation function was launched in January 2021, tasked with ensuring collaboration across commercial, operational, technological, and corporate entities. With the new setup, decarbonisation will be an even stronger strategic priority across the business. The new team, counting more than 50 people, will assist, inspire, set the direction and transition pace and ensure that decarbonisation is a business priority embedded across the entire company.	"There could be work with suppliers, with customers with different data from different industry. I would say for FMCG including the company, cross functional cooperation is actually quite difficult. The standard way of working is what I think is why the FMCG companies are getting very disrupted. Because the traditional model is that each function works in a silo. Yeah, they have their own KPIs. The hierarchy is within the function. And so, you know, breaking that and having a thing worth is possible, but not easy. That's the starting point."
	Collaborate with different companies within or outside of the industry during E2 innovation, (demonstrated by participating in industry associations or sponsor industry wide initiatives)	Adidas participates in a variety of industry associations, multi-stakeholder organizations, and non-profit initiatives. Through these memberships, we work closely with leading companies from different sectors to develop sustainable business approaches. We use collaborations and partnerships to build leverage for systemic change in our industry, such as for strengthening chemical management practices and raising standards in the cotton supply chain.	Through our partnership with the World Wildlife Fund (WWF), we're leveraging WWF's Water Risk tool to map our highest risk basins and better understand the challenges in those basins across origin countries and store communities, helping ensure long-term access to freshwater. And in FY20, we joined the new Transform to Net Zero initiative as a founding member. Comprised of nine founding members, the Initiative's objective is to accelerate the transition to a net zero global economy no later than 2050 by developing and delivering research, guidance and roadmaps to guide businesses in achieving net zero emissions.	"Externally also keep a good communication with customers and partners." We are very proud to have been part of the recent launch of the Center for Zero Carbon Shipping. This independent centre will engage scientists from all over the world in trying to find solutions on fuels for shipping. Additionally, we have joined hands with Ørsted, the largest energy company in Denmark, and other leading Danish companies in establishing a project to develop a new hydrogen plant, which can be part of the solution for creating e-fuels in the future	In 2019, we collaborated with multiple parners to build pre-competitive business coaliation to promote biodiversity and inclusive growth, by scaling up regenerative farming practices, diversifying crop production, eliminating defroestation and conserving ecosystem.
	Collaboration happens through the e2e innovation process from ideation, exploration, pilot and implementation (massive rollout) stages	We are committed to steadily increasing the use of more sustainable materials in our production, products and stores. We push toward sustainable innovation and circular business solutions. Since 2015, adidas has partnered up with the environmental organization ‚Parley for the Oceans' and uses Parley Ocean Plastic as an eco-innovative replacement for virgin plastic.	"At this stage the company hasn't started sharing its resource with external parties. Maybe it's quality related, currently we only use our own special vehicle for transportation. Now we're considering using EV for within city delivery. The direction has been decided and we will start pilot from next year." Through our open-source the company Greener Stores framework, developed in partnership with the World Wildlife Fund (WWF) and in collaboration with other nongovernmental organizations, we have created a new benchmark in retail for design, construction and operation.	We continue to engage actively in the Getting to Zero coalition, and beyond our own sector we have joined with a group of other leadership companies in the Transform to Net Zero initiative, launched in July 2020, which aims to lead by example, developing guidance and pilot projects to enable all businesses to achieve net zero emissions.	"For example would be even like removing packaging from a water like a bottle of Evian water. So that's may sound simple, but actually, even something simple like that actually is not that easy to do. In order to do that, basically the key key ingredients would be in a top down statement that this is a big priority... Having some kind of steering committee way of working so that the cross functional people working on that thing, know that it's important and who that things are going to get measured and reviewed. And in that case, a small number of these sort of high visibility high priority projects can succeed. But in terms of having many of these projects succeeding simultaneously, very difficult."
	Establish an ecosystem from supplier to customer and achieve tangible E2 performance results	Adidas takes responsibility for the entire life cycle of a product and follows a clear game plan for moving toward a circular business model. Already in 2019, we successfully showcased proof-of-concept products against circular and regenerative loops by presenting our first fully recyclable and biofabricated products.	A priority in FY20 was expanding our roster of renewable energy projects in the U.S., supporting the growth of green energy onto the grid close to the stores that use the energy. We used our scale to drive innovation across the energy sector and support not only our stores but also the communities around our stores. Early in FY21, the company launched projects with Conservation International (CI) to protect and restore at-risk forests in key coffee landscapes near our supply chains. the company is now supporting the Dairy Net Zero Initiative, a partnership of the U.S. dairy community seeking to achieve net zero greenhouse gas emissions and improvements in water quality on farms.	Our role in decarbonising logistics will be very different compared to our role in ocean transport, where the company holds a leadership position and is a significant asset owner in an industry dominated by relatively few, large companies. The inland logistics industry landscape is very different, and we typically have limited operational control of the assets such as trucks, trains, warehouses. This will imply a different, more collaborative, approach where we partner with our logistics suppliers to work towards decarbonisation of our endto-end logistics offerings (scope 2 and scope 3, as well as the small portion of our scope 1 emissions outside ocean transport). As part of this, we are working towards integrating environmental sustainability into procurement criteria in tenders	the company co-founded the Farming for Generation alliance of agriculture sector leaders to support dairy farmers in the US, Europe and Russia in perserving and renewing resources, respecting animal welfare and ensuring economically viable farming for the next generation.

IV	Themes	A	B	C	D
Digital Transformation	**Digital Exploration: Create new business model or operational model by Appling the latest technology from outside**	E.g.: e-commerce business such as new product skin analysis web app	"DT is our advantage and it's a must have. Assets intense company like us, annually 30m cubic meter wood and various products handled by 9,000 plus people, we need to apply technology to optimize process and realize the maximum utilization of resource. Without technology the optimal utilization and efficiency is hard to achieve"	"all our manufacturing is automated and digitalized, because contact lens has a lot of aspects that require use of technology. So, obviously, digitalization is like given, is like fully adopted within the organization across functions, whether it's in terms of data collection through manufacturing process, whether workflow like you mentioned here as well as our I would say interaction with external parties vendors"	"The only automation that I know is our factory in an SEC. I've been the factory once, whereby they produce the goods. It is mostly automated. And I'm not sure how to correctly describe this whereby even less at the after the goods are produced, and you need to store away in a certain area, right? It is all being done automatically, not by human driving the forklift to another place"
	Technology is applied in core area of the business to generate economic and/or environmental benefits	"DT can contribute a lot raw data to support us find solutions to solve the problems. Such as our competitor use big data to analysis consumers and design product. We're doing the same, and we also assess how to use the big data to design product and release human resource. The released human resource can support other areas such sustainability."	Data and Digitalization supported current products and new innovations "Digitalization, especially Data Exploration is a key enabler to the organization's growth strategy. Digital capability has been integrated as part of its overall management capability development. I can give you some examples of digital initiatives, but I won't call it a strategic strength as it's imbedded in our daily operations. For an organization with such big variety and volume of product to be processed with 9,000 employees, we have to leverage technology and optimize process to maximize the utilization of resources. It's a must do for us to achieve the efficiency and build competitiveness. For example, we use X-ray to scan wood to detect the inner condition and decide which piece of the wood can be used for what purpose."	"Data analysis and technology also plays a critical role here. we capture enough data, we can kind of predict right based on the previous model. If we do this, maybe in the first six months or 12 months, this is how the sales we're going to impact the market will react."	"I'm not sure can I use the example whereby the merchandiser uses iPad to take orders. And I think eventually, they are going to implement this to the modern trade merchandising team, as well. So I also understand that they are also looking into our data Insights Team are also looking to be using another system versus our current one on how we extract our data. The new system is supposed to help us more efficiently. " Likewise, our investments in renewable energy, combined with increased adoption of low-carbon technologies, will contribute.
	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits	"DT help solve short-term vs. long-term (importance: 7-8) from big data perspective. It can provide a lot data support to the company and its consumers about the concept (of sustainability). "	" We also have an innovation branch of the company Spring. It's our innovation vehicle, we invested 2 billion Euro between 2015 to 2018, and then another 2.5 billion to 2019, to continuously develop productivity, technology and equipment. Such as use the leftover parts of the wood to generate energy (electricity) through burning, which equal to 250% of its energy need. The unused electricity is sold to national grid – a contribution to bio-energy. "	Deploying digital health technologies Building connected health systems by making mobile technology accessible, supporting real-time information technology and using digital platforms to help educate health workers Areas of progress in 2020 include initial deployments of: Digital acceleration: With the rise of digital, artificial intelligence (AI), and Big Data we are advancing our digital strategy in different ways	"We're also testing new technologies in terms of paper bottles, it's not easy to use paper models, to be honest, because you will always require some type of plastic within the bottles. But we are trying to get in touch of all of that. And then the other key element for us that we like a lot is their refillable packages, they were able to develop packages that can be used once" Circulate Capital, an investment fund focused on ventures, infrastructure and innovations that prevent the flow of plastic into oceans and advance the circular economy, took steps in 2020 to invest in seven pioneering companies in India and Indonesia using technology to fight plastic pollution and transform the waste management and recycling value chain. In 2020, we invested in our digital Environmental Occupational Health and Safety (EOSH) performance
	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency	"Say-do, Effectiveness of implementation: - Once the company identify a useful technology, they're willing to adopt and apply it. "	" The utilization ratio of material is mainly driven by innovation and it's a win-win-win for the company, customer and environment. Such as a cube of wood can produce 20,000 paper boxes compared with 10,000 boxes 30 years ago. By doing such I improved profitability, reduced cost for customers, and protected environment (use less wood). "	Using data science to advance innovation in combating NTDs: We are currently working on the development of an affordable Artificial Intelligence (AI)-based digital pathology tool that will enable country programs to effectively monitor and target treatment for STH	"for instance, when we were talking about water stewardship know that there are now new things and that we produce, I mean, when we're running a production line for building product, there's water that needs to be put in place in order to clean that line to produce a different type of product. Now, and we were using one type of technology, now there's new technologies that help us clean the production line, that can reduce the energy consumption, as well as the water waste" Since 2009, the initiative has worked with 900 diverse local partners on water governance, cut freshwater abstraction and wastewater discharge by billions of liters and facilitated nearly $900 million of investment into infrastructure and technology

IV	Themes	E	F	G	H
Digital Transformation	**Digital Exploration: Create new business model or operational model by Appling the latest technology from outside**	" DT is one of our focus area, working on transformation journey."			
	Technology is applied in core area of the business to generate economic and/or environmental benefits	the company has launched a three-year digital transformation project with Accenture in APAC, designed to drive greater sales for its consumer healthcare brands. The Asia Pacific Digital Accelerator project will see experts from Accenture placed into the the company teams across a mix of APAC markets, with the objective to build digital capacity in internal teams, as well as find more agile ways of working.	"As part of R&D, SEAC is a team of industry-leading safety and environmental sustainability scientists, use the latest techniques, deep scientific expertise and an evidence-based approach to ensure that our products are safe for consumers and workers and better for the environment. SEAC scientists are at the forefront of modern advances in safety and environmental sustainability science, sharing our work and partnering with many other leading experts around the world to continue to advance this science. "		"Work with university and institutions, start-ups, software partners to venture and develop new technology that applied to product/service to client"
	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits	the company built its analytics platform on Cloudera Hadoop, but the stack also includes Kafka and Spark, along with an array of technologies from multiple vendors. StreamSets, a Cloudera partner, provides data ingestion technology while Tamr provides machine learning data curation. the company also uses At Scale virtualization technology and Zoomdata for data visualization	"we assemble key consumer trends, leading-edge science, and the application of data and digital technology to deliver extraordinary products, services and experiences"	"System is in place for R&D" Use technology to enform palm oil sourcing policies, working with peers and suppliers to evaluation how sytem can be implemented and maintained to monitor supplier operations of Palm oil. With tech partner: MIMOS (Malaysia's national r&d center completed the first phase of OPDW (Oil Palm data warehouse) with track & trace capability Pampers is the 1st brand to use new advanced tech to recycle diapers.	The lab is equipped with technology systems that simulate, learn, and develop innovative smart systems aimed at reducing energy consumption. Technology used includes oscilloscopes, smart meter communication probes, and consumption simulation sources
	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency	Recently we integrated partner's analytics technology with our R&D Information Platform. After implementation, the company reduced the time taken to assemble and analyse data from across multiple clinical trials from several months to a few minutes	Our foodservice business, The company Food Solutions (UFS), teamed up with digital provider Orbisk to develop a super smart camera and scale to tackle kitchen waste. The camera and scale sit under an organic waste container and use artificial intelligence (AI) to quickly identify and log every bit of food thrown away.	Since Jan 2019, more than 20 tons of diaper waste - more than 100,000 diapers have been collected for recycling.	the company Forge Predictive Maintenance was deployed to analyze and optimize building systems maintenance at the hospitals. The solution has helped the hospital reduce electricity usage by an average of 8% of expected consumption and reduce gas usage by almost 12% against the target over the first few months of the deployment. Data centers are very energy intensive, and the company's operational technology experience will help reduce energy use in data centers by combining intelligent selection of energy resources with centralized visibility of operations. Combined, the companies will sell industry-leading product brands that provide best-inclass differentiated support to data centers including the company Forge Energy Optimization.

IV	Themes	I	J	K	L
Digital Transformation	**Digital Exploration: Create new business model or operational model by Appling the latest technology from outside**	The digital aspects of the guest experience have taken on heightened importance in recent years. These aspects include everything from the process of booking a room to engaging with customer service to personalized mobile experiences	"DT help reduce internal resource waste and improve efficiency. Organization is undergoing transformation, inevitability company needs to adjust its talent and resources towards future direction, shock including change to organization and structure, both are happening at the same time."	"Digital transformation has been integrated in the daily operation of all the functions. Example can be 3D printer to test packaging design and process. Digital marketing, scan QR code to collect consumer information"	
	Technology is applied in core area of the business to generate economic and/or environmental benefits	Today, many hotels are taking the guesswork out with technology: Smart showers limit the length of showers to a pre-set time, alerting users when their time is almost over. Room sensors automatically detect light levels, increasing and reducing the bulb brightness.			
	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits		Demonstrated in carbon emission, water pollution improvement, resource preservation examples	DATA AUTOMATION We maintain solutions to efficiently capture, consolidate, and validate data to measure performance against goals and meet numerous sustainability reporting requirements. We continue to invest in technical solutions to streamline and automate manual efforts to drive efficiency, improve visibility and enable meeting Sustainability targets. These investments, paired with our continued commitment to sound data governance, support our drive for continual improvement. We have also deployed a digitized platform enabling internal global collaboration for sustainability reporting. This simplifies reporting processes, delivers increased security and accessibility, and enhances our governance and certification documentation.	"for us when this environmental program started not that long ago, having an energy management system, having a tool and finding that there is technology that allows you to capture track, calculate, measure your emissions and KPIs and itself was a huge mind opener"
	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency	"A lot digitalization was applied to economic and customer experience, but not much for environmental purpose"	" the company is good at exploring external resources. DT help reduce internal resource waste and improve efficiency."		"technology, a big step that what is the tool that is out there that can help us track manage? Our next thing might be okay, how do we make our fleet green? What technologies out there are? If you look at science based targets, of course, I'm sure we are going to be looking at renewables and renewables is mostly long term investment. So are we ready to make that those kind of long term investments, so technologies is a big thing"

IV	Themes	M	N	O	P
Digital Transformation	**Digital Exploration: Create new business model or operational model by Appling the latest technology from outside**	Two enablers will set us up for success. The first is applying a mindset of deep and broad innovation across all dimensions of our business. The second is using the speed and agility of Digital throughout our entire value chain. These enablers will be particularly powerful when it comes to executing on the three strategic focus areas – Credibility, Experience, and Sustainability – that support us in intensifying our focus. The adidas app is where we amplify our key brand territories such as sustainability and innovation on the consumer and driving growth.	"For business model innovation, we launched a new function of "Fei Kuai" a couple of years ago, which is a function that you can order from mobile APP, and you can save waiting time at store. Since the orders are received automatically, stores can arrange order accordingly and improve in-store efficiency"	"the company can take 10 out of 10, example as digital platform for customer's access. The premium line design was developed based on data mining. But having said that, MSK doesn't have a clear clue of weather the solution works or not. Blockchain has also been used in "trade-lane" – collaborate with Amazon "the company Growth": investment in innovation/venture for start-ups to provide e2e services for B2B and B2C. 10 out of 10 for both Explorative & Exploitative capabilities."	"The way that we defined digital transformation was around data. as it relates to that, context of acquiring technology, or people or things like that, I mean, it's probably more around talent rather than technology. For example, we were building tech teams, data analysts, data engineers, data scientists, it was almost like we were creating like, a data related capability, maybe a bit similar to what existed in Nielsen but in a food company, so it was a bit forward looking."
	Technology is applied in core area of the business to generate economic and/or environmental benefits	In addition, direct touchpoints with consumers via our own digital channels and direct communication with consumers on social media platforms strengthen our understanding of consumer preferences and behavior, and, as a result, help us to reduce our vulnerability to changes in demand. Through continuous monitoring of sellthrough data and disciplined product lifecycle management, in particular for our major product franchises, we are able to better detect demand patterns and prevent overexposure.	"Currently the company is driving a big initiative of digital transformation. For example, when store needs to place order previously, they need to key in SKU, amount and confirm receiving of the cargo. The project we're implementing now is to replace all such manual process with technology, using weight sensing system to identify the quantity of cargo, using video scan to identify cargo, and using historical data/machine learning to calculate & foresee coming order, come up with automatically replenishment quantity. Store staff just needs to take a look and confirm the order if it's ok, or make small adjustment if needed"	Through Twill, our digital logistics offering for small and medium-sized customers, and the company Growth, the company's corporate venture arm, we pursue our commitment to connecting 100,000 SMEs, including women-operated business to international trade by 2025.	"I think the two ways that the digital transformation and how it can help on it, one is just based on visibility. So providing all employees or whatever in an organization with visibility… And the second one would be on the traceability part, being able to trace. So, for example, actually it would be like, even for a physical product, being able to trace where it's been, and you think that the carbon footprint or that you could think about other things about where things have come from."
	Technology is applied in peripheral area of the business to generate economic and/or environmental benefits	We have also strengthened social media capabilities and created various digital newsrooms around the globe that enable continuous monitoring of social media content related to the company's products and activities and allow early management of potentially damaging social media discussion.	As a continuation of our ethical sourcing commitment, in FY20 we launched the new the company Digital Traceability web tool, which provides a way for customers to engage directly with their coffee and learn more about its journey, from bean to cup. We are continuing to explore how digital tools can empower farmers and best support farming communities by leveraging the traceability technology and platform to give farmers the ability to trace their coffee beans, so they can see where their beans go and the final product they become. In FY20 in Rwanda, we piloted a call-in platform for farmers to get agronomy tips and green coffee price information for their local markets. More than 19,000 farmers used the service over three months	NA	NA
	Application of digital technology yields significant result such as: cost savings, efficiency & efficacy improvement, information sharing & transparency	We believe developing industry-leading technologies, materials and consumer experiences is only one aspect of being an innovative leader. Equally important is the successful commercialization of those innovative concepts. In 2020, we continued to serve consumers with innovative technologies and sustainable concepts built into our products.	"All our automatic initiatives have generated a lot revenue and high margin."	NA	"And in terms of making money out of it, that's where we made a lot of mistakes in early days. But then we learned from them and we created a model by the end that was quite good. Basically. Most companies have a quite a robust product innovation cycle. it's like a familiar with a Stage Gate process, like the Bane funnel basis, starting with many ideas and then filtering and refining until you get some products...But what we created which was quite useful was creating the same logic, but for digital product or a data product. In other words, shifting our mindset from, we're going to create a baby attentive baby formula and then sell it (a new product), to we're going to create a mini program or an app or whatever. And we'll either going to sell it or we're going to give it for free to consumer and then as a way of engaging them."