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How to establish Sustainable Performance Indicators? ~ Barriers and Motivations linked to the Designing and Implementation Processes ~

Sustainable Entrepreneurship Project (SEP), MSc Sustainable Entrepreneurship Program

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Date of Submission: 10th, June 2022

Keywords: sustainable performance measurement, sustainable performance indicators, designing and implementation process, barriers, motivations

ABSTRACT

This research examines the process of Sustainable Performance Indicators (SPIs) and the relevant barriers and motivations in order to reveal how to implement Sustainable Performance Measurement (SPM) by taking the case of a chemical compound manufacturer who is in the process of SPIs implementation. The research question is: what does the process of design and implementation of SPIs look like, and what are the main barriers and the motivations linked to the process? Through the research, the main barriers linked to the process are identified: changing corporate culture, developing new data management system, and achieving fundamental changes for sustainability. Also, the main motivations for implementing the SPIs are identified: external communication about sustainability, internal understanding of the sustainability goals, and an effective management system for better sustainability performance. These findings also clarify the SPIs' contribution to the practical implementation of sustainability and the importance of internal stakeholders' involvement through the process.

INTRODUCTION

For all people, no matter our organizational ties, it is our collective responsibility as humans to listen to the grief of the earth and act toward sustainability by recognizing what to preserve for the future (Meckenstock, Barbosa-Póvoa & Carvalho, 2016). In response to the call, many conventional organizations in the business sector try to become more sustainable. This results in an increasing need for organizations to set up effective indicators to measure their sustainable actions and promote their sustainability. A lot of companies try to implement their Sustainable Performance Indicators (SPIs), a sort of the sustainable performance measurements (SPM), however, these indicators are still separated from their financial performance or company's strategy and thus are not widely propagated within the organizations (Hristov & Chirico, 2019). Therefore, it is a crucial challenge for business sectors to implement effective SPIs in line with their corporate strategies.

In academic fields, a lot of researchers already developed certain frameworks or methodologies for measuring corporate performance. For example, Chardine-Baumann and Botta-Genoulaz (2014) identified the qualification of a framework which shows the balance of the three dimensions of sustainability: environmental, social, and economic performance for Sustainable Supply Chain Management practices. This shows up in business fields as well. For example, Unilever, a leading company in sustainability, already developed their unique SPIs and disclosed the figures to the public (Unilever, 2022). However, little literature focused on the process of SPIs implementation. Some articles identified SPIs themselves but mentioned nothing about the steps (Chardine-Baumann & Botta-Genoulaz, 2014; Hristov & Chirico, 2019). Others focused on the overall framework of SPIs components but lacked the process view (Ciemleja & Lace, 2011). Therefore, there is a lack of investigation of the whole process of SPIs implementation, even though a lot of "how" questions are raised during the designing and implementation phases of SPIs. One possible way to develop this field is to apply existing Key Performance Indicators (KPIs) practices which are critical indicators of progress toward an intended result, for example, those surrounding the development and implementation of KPIs (KPI.org, 2022; Moktadir et al., 2020). Moreover, from the change management perspective, a process is more important than an output itself in order to make lasting changes in organizations (Harvard Business School Online,

2020). Monitoring and evaluating the performance measurement are relatively clear, but the designing and the implementation phases are hard moments for companies (Shah, 2005). Hence, this research aims to establish the framework of the process at the beginning phases of SPIs and to identify the barriers and the motivations that exist in each process of SPIs implementation. Considering these research gaps and the scope, the research question is: *'what does the process of design and implementation of Sustainable Performance Indicators (SPIs) look like, and what are the main barriers and the motivations linked to the process?'*.

This research is conducted with a qualitative method, a single case study of a chemical compound manufacturer in the Netherlands. The company produces one of the most important raw materials for current technologies such as semiconductors or electric vehicles. They aim to reduce waste and emissions along their production life cycle and ensure their position as the most reliable, eco-friendly, and energy-efficient producer worldwide. The research question is addressed by multiple ways of data collection, including document analysis and semi-structured interviews. More specifically, this research has two parts. First, to identify the process toward the SPIs implementation, a literature review and interviews with the sustainability team are conducted. In order to compensate for the lack of research on SPIs, research and best practices around KPIs are also taken into account, while carefully looking at the differences between them. Second, to identify the barriers and the motivations at each process of the SPIs implementation project, semi-structured interviews with the division heads (e.g. Sales, Industrial, Energy, HR) are conducted.

This research fills in a gap in research by looking at the process taken by a real company. Academically, this research contributes to the provision of new insight into the SPI establishment at the manufacturing company and an establishment of a new type of framework focusing on the process view of the SPIs. Practically, this finding guides business managers toward the implementation of their SPIs by indicating the steps and the related points of consideration. This also helps funders to verify the investees' performances effectively (Ebrahim & Rangan, 2014). In addition, from a macro-societal view, this contributes to increasing business sectors' efforts and impacts on sustainability by promoting performance measurement which enables them to improve their actions.

The paper continues as follows. First, some key theories such as the history and characteristics of SPM, KPIs, and SPIs are explained as a result of literature reviews. Then, the nature of the research setting is outlined. After that, the research results are described. Finally, this paper is concluded with reflections on the results, contributions, and limitations which connect to the future research.

LITERATURE REVIEW

History of Sustainable Performance Measurement

Performance measurement practice has increased predominantly in the last three decades (Taticchi, Garengo, Nudurupati, Tonelli, & Pasqualino, 2015; Taticchi, Tonelli & Pasqualino, 2013). With the spread of international efforts on solving environmental and social challenges such as the adoption of the Kyoto Protocol in 1997, the Paris Agreement and the United Nations Sustainable Development Goals in 2015, research on SPM has also been promoted in both academic and business fields. According to Tangen (2005 as cited by Searcy, 2012: 240), ‘‘a successful performance measurement system is a set of performance measures that provide a company with useful information that helps manage, control, plan, and perform the activities undertaken by the company.’’ In addition to that, SPM has characteristics of long-term and ‘‘Triple Bottom Line (TBL)’’ of economic, environmental, and social performance (Searcy, 2012).

There are a lot of methods of SPM that have been developed. For instance, cost-benefit analysis is the main tool in the decision-making process, particularly in the public sector (Grace, 2005). Global Reporting Initiative (GRI) and Carbon Disclosure Project (CDP) are leading initiatives of framework development worldwide (Taticchi, 2013). Likewise, guidelines for Environmental Management System (EMS), Life Cycle Assessment (LCA), Sustainability Balanced Score Card (SBSC), Supply Chain Operations Reference (SCOR) model, and KPIs are developed (Beske-Janssen, Johnson & Schaltegger, 2015). Also, the Global Compact (Rasche & Kell, 2010) proposed some key principles and certification standards that are highly specialized. In the

accounting field, Impact-Weighted Accounts: a new integrated way of making Profit & Loss and Balance Sheet is under the development for creating financial accounts that reflect organizational performance from financial, social, and environmental dimensions (Impact Economy Foundation, 2022; Serafeim & Trinh, 2020). Among the investors, Impact Reporting and Investment Standards (IRIS): a comprehensive system for impact measurement and management is largely utilized (Global Impact Investing Network, 2022). Even though a lot of methods of SPM exist, a bibliometric analysis showed that the majority of research focuses solely on performance enhancement by using these methods, and less research on specific methods of measurement and management (Beske-Janssen et al., 2015). Thus, investigating "how" questions on the topics can be an added value to the fields.

Characteristics of Sustainable Performance Measurement

SPM is attracting attention in the field of sustainability because of its unique characteristics and its benefits. Characteristics of the SPM have fourfold. First, this is based on the TBL approach of economic, environmental, and social performance. Yet, Taticchi et al. (2015) argued that most of the current frameworks are based on individual elements of the TBL concept, at least as of 2015. This implies the difficulty of consolidation of all TBL dimensions. Second, a causal link of inputs, activities, outputs, outcomes, and impacts of each initiative, so-called a logic model or Theory of Change (TOC), is carefully considered in SPM. By definition, outputs are tangible products from the activity, outcomes are effects or changes on the beneficiaries produced by the outputs, and impacts are broader and longer-term outcomes at the community or society level (Ebrahim & Rangan, 2014). However, many frameworks such as SBSC do not make a distinction between outputs, outcomes, and impacts (BSC Designer, 2012). Even some funders do not expect their investees to classify those (Ebrahim & Rangan, 2014). Third, this differs from ordinary financial performance in two perspectives. One is the uncertain nature of data for measuring the impact. The other is the decision-making of what is important for organizations, which should be aligned to their mission to empower beneficiaries (Nicholls, 2018). Fourth, exhaustiveness and non-redundancy are required for SPM (Roy, 1996 as cited by Chardine-Baumann & Botta-Genoulaz, 2014: 140). Exhaustiveness means that one should not

have too few elements; otherwise, some points of measurement will miss being considered. Non-redundancy is a condition in which all elements should not be duplicated.

There are six benefits of SPM. First, this improves the transparency of the organizational activities towards sustainability and thus, is a powerful tool for stakeholder communication (Taticchi et al., 2015). Second, it supports the decision-making processes of managers by identifying the impact compared to the investment (Taticchi et al., 2015). Third, this also helps to improve an alignment of operation and strategy, possibly to be an organization-wide shared vision (Taticchi et al., 2015). Fourth, by measuring the impact of their activities related to sustainability, organizations can acquire legitimacy from society by both increasing positive impact and reducing negative impact (O'Neil & Ucbasaran, 2016). Fifth, this increases the competitiveness and economic performance of organizations by clearly showing the impact of their initiatives as superior to the competitors (Rao & Holt, 2005). Lastly, implementing SPM contributes to creating a culture of achievement: willingness to achieve the sustainability targets set in the SPIs (Isaac Mwita, 2000).

However, there are drawbacks to SPM as well. First, it is a complex approach without a concrete standardized methodology compared to financial measurement. Organizations that try to measure the sustainable impact often encounter issues of lack of a balanced approach, system thinking, and connection with strategy (Taticchi, 2013). Second, huge time and effort are required to measure sustainable performance. Unlike financial accounting where required data is easily extracted from organizations' data management systems or other simple external sources, a lot of data from a number of sources both internal and external is needed in order to calculate sustainable performance, even more, since some required data does not exist. Third, this is often selective and biased. Because organizations cannot measure every aspect of performance, they must decide on the most important metrics to focus on. This often causes biased evaluation that is advantageous for them, which is criticized as "greenwash", misleading consumers regarding the organizations' sustainable performance (Blome, Foerstl & Schleper, 2017). Because of these drawbacks, many organizations do not start or abandon the measurement even though they realize the importance.

Key Performance Indicators (KPIs) and Sustainable Performance Indicators (SPIs)

One of the specific approaches to SPM is to establish Sustainable Performance Indicators (SPIs) at organizations. SPIs are one sort of organizational KPIs that contain TBL of sustainability. By definition, KPIs mean “those indicators that focus on the aspects of organizational performance that are the most critical for the current and future success of the organization” (Parmenter, 2015: 7). KPIs measure progress toward intended results, namely strategic and operational improvement at organizations, by regularly comparing the targets and the actual results of each indicator (KPI.org., 2022). In addition, Parmenter (2015) emphasized a nonfinancial aspect of KPIs, including intermediate operational outcome, which is distinguished from Key Result Indicators which illustrate end-result financial performance such as return on investment or sales. The concept of KPIs is largely used in the business fields to track required actions towards achieving the goals of the business (Moktadir et al., 2020).

In this paper, SPIs are defined as “those indicators that focus on the aspects of organizational performance that are the most critical for the current and future success of the organization from all the three dimensions of sustainability: economic, environmental, and social” by getting insight from Parmenter’s work (2015). Characteristics of SPIs are basically the same as SPM as mentioned in the previous part: TBL approach, a logic model from inputs through impacts, the uncertainty of data & unique decision-making process, and exhaustiveness & non-redundancy. However, SPIs are more tangible measures focusing on tracking the activities of the organizations compared to the other measurements. In that sense, application of a logic model, specifically making indicators about outcomes and impacts, is not mandatory for SPIs. Also, SPIs are representations of organizational sustainable activities so these are varied from the organization’s strategies, the business models, or the scales. For example, Chardine-Baumann & Botta-Genoulaz (2014) and Hristov & Chirico (2019) showed some example elements of SPIs (see **APPENDIX A**). In principle, organizations set a measurable target on each SPI and monitor their performance by comparing the target and the actual result. While KPIs basically consider a single dimension of profit maximization of businesses, SPIs are more multidimensional by considering the TBL approach (Schaltegger & Wagner, 2006).

Then, how do organizations implement SPIs in practice? SPIs can be established when we put sustainability aspects into a package of KPIs by adding some indicators regarding environmental and social performance. This is because both indicators describe the most critical organizational performance, and then the determinant factor is whether organizations consider sustainability as critical for them or not (Hristov & Chirico, 2019; Moktadir et al., 2020; Parmenter, 2015; Sustainability, 2022). Thus, we can logically conclude that the basic process of SPIs implementation is similar to the one for KPIs, despite a variety of these processes depending on the companies (no matter KPIs or SPIs are).

Parmenter (2015) explained the six-stage process of establishing KPI as follows. First, getting a commitment from the CEO and senior management is of utmost importance (***top management's commitment***). Second, appointing in-house resources, such as a chief measurement officer, and up-skilling them to manage the KPI project (***team appointment***). The team also should have a direct reporting line to the CEO. Third, leading and selling the change by establishing a sense of urgency, developing a change vision and strategy, generating quick wins, and so on (***appealing the importance***). Fourth, finding operational critical success factors (CSFs) of the organizations (***CSFs identification***). Operational CSFs link between the strategy and KPIs, and they should be specifically phrased in what is important to the organizations (e.g. recruit the right people all the time, deliver in full/on time/all the time to our key customers). Fifth, determining measures that will work in the organizations (***method development***). At this stage, there are some important tasks such as ascertaining operational CSFs, designing appropriate measures, and thinking of how the measures are utilized. Finally, getting the measures to drive performance, specifically identifying the reporting framework and facilitating the use of the KPIs (***go live***). These steps are summarized in **APPENDIX B**.

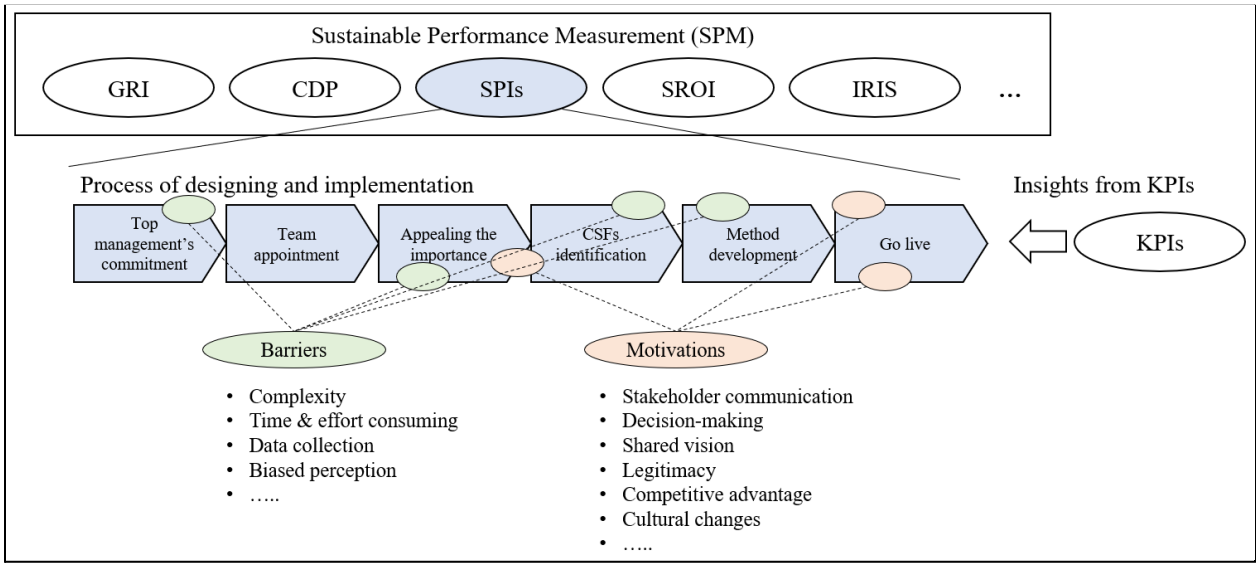
With regards to the implementation process, there are some noteworthy steps of SPIs compared to KPIs. One is putting more focus on stakeholder involvement with employees, partners, investors, or other external stakeholders (Nicholls, 2018). It is essential at the stage of defining SPIs to secure the support of key stakeholders for promoting sustainability (Kendall & Rich, 2019) and to identify what is important for them and key stakeholders (Nicholls, 2018). Moreover, it is more difficult to clarify a logical path between a core strategy of sustainability

and an associated sequence of activities when designing SPIs, in order to align with the core strategy (Oertwig et al., 2017). The other uniquenesses are identified throughout the research.

FIGURE 1 summarizes the aforementioned theories and describes the research concepts. The barriers (in green) and the motivations (in red) are identified and mapped to the process of designing and implementation of SPIs (in blue) through the research.

FIGURE 1

The theoretical framework of the research



(Blome et al., 2017; Isaac Mwita, 2000; O'Neil & Ucbasaran, 2016; Parmenter, 2015; Rao & Holt, 2005; Taticchi et al., 2015)

METHODOLOGY

Research design

The analysis in the research is based on a single case study of a chemical compound manufacturer in the Netherlands. In the social science field, a case study is an empirical inquiry that uses multiple sources of evidence to investigate a contemporary phenomenon within its real-life context (Yin, 2018), and it helps to uncover rich insights related to existing theories

(Alasuutari, 2000). Thus, a single case study approach is effective to have in-depth thoughts and multiple views from the different positions at the company. Considering the short timeframe of three months for conducting interviews, the research focuses only on the designing and implementation phases of the SPI project. The details are explained in the following subchapters and are summarized in **APPENDIX C**.

Data collection

For the case selection, criteria are set as 1) a business sector organization 2) located in the Netherlands 3) who tried or is trying to establish SPIs. The selected company (called "Company A" for protecting anonymity) is conducting the SPIs implementation project so it is the best fit for the research purpose. Company A's business is to produce one of the most important raw materials for current technologies such as semiconductors. They aim to have an environmentally friendly and energy-efficient way of production, so there is a huge potential to reduce the environmental burdens of industrial development.

For collecting data from Company A, an in-depth search of the extant research and two-phase semi-structured interviews are conducted. A semi-structured interview is a special set of data collection where interviewers follow an interview guide with some flexibility in the wording or order of the questions (Bell, Bryman & Harley, 2019). This is chosen over an unstructured interview because the data needs to be comparable across the interview results to find commonalities and uniqueness effectively (Eriksson & Kovalainen, 2008). In the first phase of the interview, in-depth semi-structured interviews with the sustainability team are conducted for understanding the real ongoing experiences at Company A. In the second phase, for the purpose of identifying the barriers and the motivations throughout the process, semi-structured interviews with all the division heads and the people in charge of SPI project are conducted. The interviewee selection is according to the research objective to get observations comprehensively from various roles within Company A. With ten interviewees in total, each interview is around 30-minute, with a maximum of one hour (see **APPENDIX D**). Finally, a group review session with those in charge of the SPI project is conducted in order to share the interview results and receive additional insights from them. By taking several steps of the data collection, this research

can contribute to Company A by promoting the importance of SPIs and sustainability in general. Consequently, I could collect the data from twelve interviews/session in total.

To realize effective data collection, the following considerations are taken into account. First, it is important to ensure a similar setting for all interviews as much as possible. In semi-structured interviews, interview quality is highly dependent on the skill set of the interviewer (Leech, 2002). To improve the quality, interview guides with questions for each interview phase are prepared in advance (see **APPENDIX E&F**). In addition, all the interviews are conducted online for consistency. However, as online settings may degrade the quality of the research, assertive communication during the online interviews is required for improving the quality (Bell et al., 2019).

Second, the interviewer needs to be objective in order to induce honest opinions from the respondents. This means that the interviewer keeps a position as an observer and should not overly side with the sustainability team nor be too critical of their initiatives. There may be a limitation in the data obtained through the interviews because of a bias called an insider-outsider effect in the research setting (Mullings, 1999). The interviewer's positionality as an "outsider" of the company, namely as a master's student or as a non-Dutch speaker, may also impact the results. To mitigate the bias, face-to-face communication was conducted with the interviewees to get to know each other when visiting the company prior to the actual interviews. Also, asking a sustainability manager to legitimize the student research is helpful. On the other hand, the members of the sustainability team are considered as "sponsors" in this research setting because they supervise the research and are keen to know the interview results in detail. Thus, this may bias the answers of the interviewees due to the possibility of them not being willing to share their honest opinion with the sustainability team and due to their position at the company and their political concerns. To mitigate the sponsor bias, it is important to maintain a neutral stance and avoid reinforcing positive responses from the interviewees (Sarniak, 2015).

Third, it is essential to protect the anonymity of the interviewees. To do that, the research does not show the name of the interviewees on the report and hide private information on the quotations or findings on the report (Bell et al., 2019). The research ethics are considered

throughout the interview process; therefore, informed consent is provided to all the interviewees and signed by them prior to the interviews (Eriksson & Kovalainen, 2008).

Finally, to make sure that this research does not violate any ethical conduct, I abide by the code of conduct from the University of Groningen.

Data analysis

After the data collection, there are two phases of the data analysis. Firstly, after the first interview phase for the framework establishment, the information derived from both the literature review and the interviews are analyzed and integrated into one framework. After that, the second interview phase for the barriers' and motivations' identification along with the designing and implementation process of SPIs proceeds. Then, coding and analysis of the results of the second phase interviews are conducted in order to find commonalities and uniqueness, specifically the barriers and the motivations for each process of the SPIs implementation. For the coding, Atlas ti., a widely-used computer-assisted qualitative data analysis software (CAQDAS) package, is utilized. It is an efficient software to deal with the large volume of data for both open coding and axial coding (Bell et al., 2019). Considering the volume of the data from eleven interviews and one review session, this systematic approach by using Atlas ti. is a reasonable way to conduct proper coding. The Gioia method is used to aggregate the coding of the barriers and the motivations (Gioia, Corley & Hamilton, 2012). At the final stage of the data analysis, the barriers and the motivations are mapped into the process framework to figure out the connections among each finding.

FINDINGS

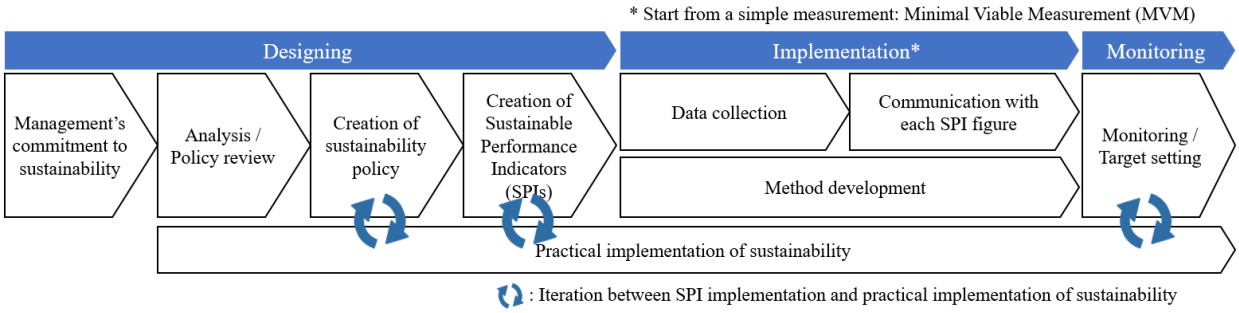
Framework of the SPIs implementation processes

In order to answer the first part of the research question: the process of designing and implementation of SPIs, I have interviewed the people in charge of the SPI project (sustainability officer and quality manager) and the head of sustainability at Company A. Based on the comments from the sustainability officer, the SPI project started from conducting gap analysis between the existing corporate policy/procedures and their sustainability goal of the 70% reduction of CO2 emissions by 2030. Then, they created a sustainability policy which indicates their mission and vision of sustainability, and the objectives based on the TBL of Planet, People, and Profit. After having an agreement on the policy, they defined SPIs according to the TBL dimensions. For implementing the SPIs, they collected the data to measure each SPI and communicated the figures to the employees in their quarterly reports. For the coming phase, they will set a target for each SPI and monitor how they improve. Besides the SPIs, they have several practical sustainability initiatives such as the development of green production or sustainable energy procurement to reach the goal. In addition to the comments from the sustainability officer, the head of sustainability indicated two additional perspectives. First, he noted that the first step of the SPI project was getting acknowledgement of sustainability from the management team. He iterated the importance of mindset change from “nice to have” to “need to have” of sustainability in order to instill a sense of urgency. Second, he also pointed out that they started the implementation from a simple and easy-understanding measure such as waste in order to promote understanding of sustainability at the company. I named this approach “Minimal Viable Measurement (MVM)” by getting inspiration from “Minimal Viable Product”, a concept to verify business assumptions with a small amount of effort in lean startup (Ries, 2011 as cited by Bocken, Schuit & Kraaijenhagen, 2018: 82). This also helps the people in charge to recognize better ways of implementation in the early stage. For the sake of supplementing the interview results, I compared the steps taken in the SPI project in the case company with the existing knowledge on KPI implementation. According to Parmenter (2015), a management’s commitment to the change and method development are important steps in KPIs implementation (see **APPENDIX B**). Those steps are applicable to the SPI project at Company A. In fact, the CEO decided on the sustainability goal before getting an idea of the SPIs. Also, the quality

manager develops the method of how to make an effective dashboard of the SPIs. Based on the initial interviews and the literature, I identified the process framework of the SPIs as in **FIGURE 2**.

FIGURE 2

The framework of the SPIs implementation process



Barriers to implementing SPIs

The following findings about the barriers and the motivations are based on the second phase interviews with the division heads and the people in charge of the SPI project.

Changing corporate culture is the first dimension of the barriers. Considering the company's history of manufacturing a single product for over 100 years, changing its culture is the biggest challenge. One barrier exists in changing the way of thinking about sustainability. For most of the employees, the term "sustainability" is new. Their focus was compliance and safety for a long time, and sustainability was considered something not relevant to their business. Moreover, several interviewees indicated the obstacle to instilling the SPIs in all employees. Even though everyone at the management level is aware of the importance of sustainability, this is still not the case for the employees at the non-management level. One respondent said:

> "So, there is, according to my opinion, gaps between the management and the workforce. (. . .) it's important that they (the workforce) feel and they see that they have an important role in this whole project to realize our goals because the continuity of the

> company depends on this, and it's really, really important. So we need to create a kind of sense of urgency.” (Head of HR)

Not limited to the mindset about sustainability, changing the employees’ way of thinking about performance management to realize transparent communication across departments with SPIs is a barrier to implementing the SPIs. As their current way of working is not based on a centralized management system, some departments have their own performance dashboard on an Excel spreadsheet basis, while the other departments do not have any dashboard. Thus, they do not have any working habits to share and check the performance of other departments which is the essential point of the performance management with SPIs: to have collaboration across departments.

Developing new data management system is the second dimension of the barriers. Developing a centralized management system scheme is one of the significant barriers in the dimension. As Company A is not at the stage of managing its performance with centralized KPIs, they need to implement a new system to manage their performance. The majority of the interviewees mentioned the challenge of making a new system. On the contrary, two interviewees did not consider the system development as a barrier. This duality of the recognition probably occurs because of its ambiguous output image. One interviewee mentioned:

> “In terms of implementations, specifically of indicators, I think a big challenge here is know-how. There's simply not the person with experience of managing indicators and dashboards we don't have a centralized management system for, for KPIs, even each department does their own thing with their own Excel sheets.” (Sustainability officer)

In terms of SPIs design, it is quite challenging to position the SPIs as a core strategy of the company. To set the sustainability goal as its central goal company-wide, the SPIs should not be just a part of performance indicators, but be an overarching concept of all the performance management. However, as the company aligns to the official quality management scheme such as ISO 9000 issued by the International Organization for Standardization, and reports to the

auditing body, it is not easy to customize their management scheme in an effective way. The quality manager who is in charge of the SPI project stated:

> "There's the SPIs include the risk of being treated like only environmental indicators." (Quality manager)

Moreover, there is a barrier to collecting relevant data to measure each indicator smoothly. As they have no dashboard or data management system where they gather the data, they need to find the required data by identifying who has it and asking several employees to provide it every time. This inefficient way of collecting data should be changed in order to regularly generate the figures of the SPIs and monitor them.

Achieving fundamental changes for sustainability is the third dimension of the barriers. Some of the interviewees mentioned that there is no huge barrier to implementing the SPIs, but making actual changes for sustainability is quite difficult. Even though they can come up with ideas to reduce negative externalities which are clearly indicated in the SPIs, it is hard to make fundamental changes which require innovative technology development. Thus, I find a duality in understanding the sustainability goal and the SPIs at Company A. One aspect disturbing the changes is the cost and the investment decision. In reality, they should see the balance of cost and benefit. In many cases, unfortunately, sustainability procurement or production cost more than the traditional ways. One interviewee described:

> "There is so much possibilities for us to become green, but a lot of them are in a complex mode. If I choose one of them, I directly exclude another, (. . .) Because both need our process costs. So there we have to make a choice." (Head of sustainability)

In addition to the cost problem, research and development challenges for sustainable production are considered as a huge barrier to making actual changes. As previously mentioned, they keep producing the same product by taking the same process for over 100 years. Although they put a lot of efforts to finding a way to produce the product in a more sustainable way, it is not easy to

develop a new way of production. As SPIs are supporting tools to reach the sustainability goal, these barriers to the practical implementation of sustainability are worth considering.

FIGURE 3

Data structure: barriers to implementing SPIs

Concepts (quotes)	Themes	Aggregated dimensions
• "I believe today the most challenging thing here is changing the way of thinking." (Quality manager) • "The one of the tougher things is that you constantly need to persuade people, for buying into think green." (Head of sustainability)	Changing way of thinking about sustainability	Changing corporate culture
• "So, there is, according to my opinion, gaps between the management and the workforce. (. . .) it's important that they (the workforce) feel and they see that they have an important role in this whole project to realize our goals because the continuity of the company depends on this, and it's really, really important. So we need to create a kind of sense of urgency." (Head of HR) • "Communication and define clear tasks, and delegate some specific tasks in this project over a broader group. That's important." (Head of HR) • "I believe (. . .) some problems on scaling down the information and getting the commitment of our level. Let's say in the company and not commitment, but even understanding of what is happening, in these changing in the way of showing the numbers and targets that we are sending or that we are showing." (Quality manager)	Instilling SPIs to all employees	
• "I think the reason we don't have a dashboard is a mindset." (Sustainability officer) • "The biggest obstacle I see inside this company is the communication about it. To have SPIs is very good. But when you put SPIs on paper and you keep it inside one or two departments, then the whole company, cannot work with it" (Head of procurement)	Realizing transparent communication across departments with SPIs	
• "In terms of implementations, specifically of indicators, I think a big challenge here is, know-how. There's simply not the person with experience of managing indicators and dashboards we don't have a centralized management system for, for KPIs, even each department does their own thing with their own Excel sheets." (Sustainability officer) • "I don't think we have a decent dashboard. But everybody controls the KPIs as production KPI, sales KPIs, we've presented this to the management team and also to the employees. But also, I think we should improve. I think it would be the same consideration to the actual KPIs to be the new SPIs." (Head of sales)	Developing a centralized management system scheme	Developing new data management system
• "Because we integrate and we have to do like indicators' tree which the SPIs are the top level, and everything that we do under these, (. . .) The problem is show and change the status of the SPIs to instead of being just okay." (Quality manager) • "There's the SPIs include the risk of being treated like only environmental indicators." (Quality manager) • "We will have a very difficult decision concerning our management system as all. Because now we are based on ISO 9000 management then everything's quality procedures and so on. (. . .) And with the sustainability policy and the sustainability management, we have a huge, a huge change to do. But they must decide." (Quality manager)	Positioning of SPIs as a core strategy	
• "The data is very difficult because we have to mine the data from several different places for collecting data we practically don't have automation, and we have a lot of Excel sheets and a lot of spread data and things just one or two people know, I believe it's one problem for us here." (Quality manager) • "Finding that information was difficult because we, there's not a dashboard where we can access the information." (Sustainability officer)	Collecting relevant data smoothly	
• "I'm looking, I think, five, six possibilities, but I'm working on better big, big motors and the kinds of things. But it's all a matter of money. Not only money, also time and development getting the guide to the right engines." (Head of energy) • "The biggest problem I expect is during the process, and it is the biggest challenge will be the financial one. Because you have to pay for a mission that gets more expensive and more expensive." (Head of finance) • "So either you have to pay money for the emissions in Europe, what a country like Brazil doesn't have to do. So in the world market, you cannot compete with your competitors anymore. Which sustainability as we have in Europe. It makes it difficult." (Head of finance) • "There is so much possibilities for us to become green, but a lot of them are in a complex mode. If I choose one of them, I directly exclude another, (. . .) Because both need our process costs. So there we have to make a choice." (Head of sustainability)	Cost / investment decision	Achieving fundamental changes for sustainability
• "I think the big obstacle is not implementing the SPIs but achieve the targets, that we are expecting. Issues and the process that you use to produce [product], production process. It's a kind of a process that is settled down for a long time, is the same process for more than 100 years. And that is no more, there is no much research concerning this process that we didn't face on big change on this process in the last 100 years." (Head of industrial) • "The most important part is to try to reduce our emissions of CO2 emissions. But there is no specific goal besides the legal part (. . .) I think, difficult enough, because in our process, it is normal that you have CO2 emissions. (Head of finance) • "We have to go green as soon as possible. People are looking into it, in the sense that, the companies I don't think this is available yet." (Head of sales)	R&D efforts for sustainable production	

Motivations to having SPIs

External communication about sustainability is the first dimension of the motivations. The SPIs dashboard contributes to the company showing its goals and the actual performance of sustainability externally. Thus, it helps to appeal to their sustainability efforts to the community. Also, it supports the company to disclose and report their performance for fulfilling their accountability. The sustainability officer believes that one of the benefits of having the SPIs is to prepare for future reporting requirements as follows:

> "I think that at some point in time in the future Company A will have to report externally on sustainability. (. . .) if they request some sort of reporting, that is a related to the GRI standard or ESG reporting. . (. . .) the company to be ready to report externally, when the time comes because it will come, and so this process doesn't happen when the government knocks on the door, (. . .) then the company would be ready to show what the data is" (Sustainability officer)

Internal understanding of the sustainability goals is the second dimension of the motivations. In the middle of the SPIs implementation phase, all ten interviewees acknowledge the importance of sustainability, despite the different levels of involvement in sustainability initiatives. According to their comments, one of the great benefits of SPIs is to show the employees why sustainability is important. Also, this makes an opportunity to think of practical solutions to achieve the sustainability goals. Understanding the goals is the first step toward sustainability as one of the respondents commented below:

> "CO2 is bad for the climate. So we must reduce the CO2 also for our children. (. . .) We must do something. And, but how we should do it, we should to do, I don't know. Think it's necessary to be aware of the situation at various levels." (Head of process control)

Effective management system for better sustainability performance is the third dimension of the motivations. Because the SPIs enable the company to clarify costs and benefits of each

sustainability initiative, they can make more clear decision-making with numbers. In addition, performance management with the SPIs helps to show the financial benefits of sustainability. Thus, having SPIs promotes the investment for practical implementation of sustainability at the company. A sustainability officer elaborated the motivation as:

> "Controlling your cost, avoidance of costs, whatever. (. . .) I believe it can be a good motivation." (Sustainability officer)

Lastly, realizing a professional way of management with the SPIs is great motivation for them. As previously mentioned, they do not have a centralized management system which visualizes their goals and the actual performance in a transparent way. Thus, by implementing the SPIs, they are able to change their management system to clarify the distance to reach their goals.

FIGURE 4

Data structure: motivations to having SPIs

Concepts (quotes)	Themes	Aggregated dimensions
• "This is related to people or HR. I think that would be also good to be more active in showing what we are doing because people they only know that some time is there is a not so good smell from the process. (. . .) But the community probably doesn't know in details what we do, also the use of our of, our product is very related to new technologies, new solar panels, electric cars are using also [product]. So the [product] can provide this several benefits to the environment." (Head of sales) • "A good communication is important in that. Yeah, I said always provide a clear story involve the right people and clearly state goals." (Head of process control)	Appealing to the community	External communication about sustainability
• "I think that at some point in time in the future [company name] will have to report externally on sustainability. (. . .) if they request some sort of reporting, that is a related to the GRI standard or ESG reporting. . (. . .) the company to be ready to report externally, when the time comes because it will come, and so this process doesn't happen when the government knocks on the door, . (. . .) then the company would be ready to show what the data is" (Sustainability officer) • "It is a really hot item right now so then it gets really important to show to the, to the province but also to the country or Europe. What we are doing with the emissions now that we try to make it lower, make it better, make it more efficient. So then, the SPIs are getting really important, but with the data you can show where you are and what you have achieved in a certain periods" (Head of finance)	Support for disclosure / reporting	
• "So it's integrated part of getting [company name] to higher level. And in depth, the SPI are taken in back again on my saying from "nice to have" to "need to have", to put it in the new long term dashboard so it's secured and sustainable as a dashboard for the long term that this business is going to be run on figures where sustainability is a very strong part of the decision making." (Head of sustainability) • "For me the SPIs is important to show the company why sustainability is important? What our goals are, and how can we use sustainability to future proof the company." (Sustainability officer) • "I am very pleasant to working in a company here who looks also for environmental sustainability and this kind of thing so for me, this is my motivation. It's producing [product], looking for all this kind of thing, because we need to think about that." (Head of industrial) • "And we if possible can also make some profit on this. So this is regarding my position and then the orders are related also because I'm part of [company name] that is the community everything related to the people and also to the planet." (Head of sales) • "CO2 is bad for the climate. So we must reduce the CO2 also for our children. (. . .) We must do something. And, but how we should do it, we should to do, I don't know. Think it's necessary to be aware of the situation at various levels." (Head of process control)	Understanding the importance of sustainability	Internal understanding of the sustainability goals
• "We have to be clean our products we sell (. . .). I think we have to work very hard on it and you have to find resources to help us and from that kind of things." (Head of energy) • "I think the waste, I think we can find new solutions for the waste, and I can imagine using the waste to help our process." (Head of industrial)	Opportunity for thinking of technical solutions to achieve the goals	

• "For us, purchasing it's very important to have the right SPIs if you do not have the right SPIs, as we on purchase you do not know if we are buying the right products or the right materials for our production, for example." (Head of procurement) • "Can you lower [waste] in your basis material? Yes, we can do. But that means that the, the purchase price of [raw material] directly is going up. And that's of course, you come on the cost per tonnage [product], that you have to wait with each other. (. . .) It's good to have the SPIs, and yes, we work a lot with it already with purchasing, but again, the project now, yeah, is that something what important for us." (Head of procurement) • "I think for a long time, the environmental department, which has to do a lot with compliance, so compliance you naturally have a lot of costs. (. . .) sustainability costs money, but the idea is to show that actually, it's going to be the future of the company. So the SPIs is, will play a huge role in showing that sustainability helps. And without sustainability, there is no future so that is the main goal." (Sustainability officer)	Support for decision making	Effective management system for better sustainability performance
• "I feel very motivated as everybody should be. I think it's very important the implementation of this SPIs. For my position would be more the real the points related to profit of course. So for me, I'm responsible for selling any byproducts." (Head of sales) • "There's also a huge cost reduction there of from 2020 to 2021 was around 130,000 euros, 50% of our solid waste costs. For me a main one also is, the financial aspect. (. . .) Maybe even the for better sustainability performance. It has to do with the economic aspect as well but maybe having a known segment there would be interesting. Also to share with the company internally so they see out." (Sustainability officer) • "Controlling your cost, avoidance of costs, whatever. (. . .) I believe it can be a good motivation." (Sustainability officer)	Showing financial benefits of sustainability	
• "I think it's a good idea. I was not familiar with the term SPI until now. But of course I'm very familiar to KPIs so, it's the KPIs for sustainability. (. . .) They make a lot of sense. In order to us to measure our performance in that sense." (Head of sales) • "That's an important KPI to have that will help us reach our goal. But also we have a lot of you know, we're looking at the sale of byproducts, reduction of costs for waste, but the idea with waste is also which is scope three emissions, look more into transport and waste." (Sustainability officer) • "The way of managing the business and the system using the SPIs is quite modern, let's say. In line with the what we need to reach our objectives. Then for me this is the motivation the most." (Quality manager)	Professional way of management	

Mapping of the barriers and the motivations into the SPIs process

In order to answer the research question: 'what does the process of design and implementation of SPIs look like and what are the main barriers and the motivations linked to the process?', I mapped the barriers and the motivations into the whole process of the SPIs (see **FIGURE 5**). Overall, the barriers exist in particular steps of SPIs processes. In fact, most of the barriers exist in the implementation process and only one barrier exists in the designing phase. Sustainability officer who is in charge of the SPI project commented:

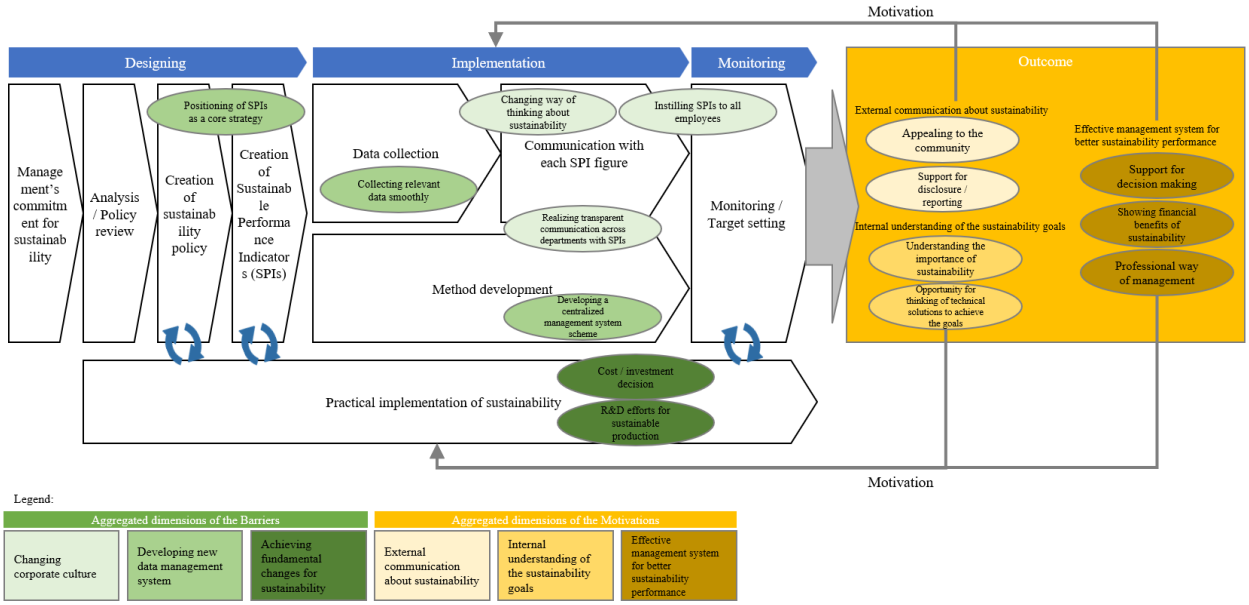
> I think that(the designing phase)'s the easiest part. (. . .) I think choosing SPIs or creating them is the most challenging there but, comparing that to the challenges of collecting data is the, is not so huge. I think the most challenging things there is data collection. And then later on, which we haven't done yet is target setting." (Sustainability officer)

With regards to the motivations, I interpret these factors as the outcomes, or the perceived benefits of the SPIs, because the interviewees are motivated to implement the SPIs in order to realize these factors after the implementation. The benefits related to external communication would be motivations for improving SPIs, the benefits related to internal understanding are for

the practical implementation, and the benefits regarding effective management system would motivate both sides. As the company should continuously try to improve the SPIs and the sustainable practices towards better performance, these benefits are driving factors of sustainability in this ongoing journey.

FIGURE 5

Mapping of Barriers & Motivations to the process of SPIs



DISCUSSION AND CONCLUSION

Reflection on the findings

Cultural change in organizations through the process of SPIs implementation.

As I mentioned in the Introduction, the process of doing something is more important than the output itself for making lasting changes (Harvard Business School Online, 2020). In the research finding, even though the interviewees consider changing corporate culture as a barrier, they are also motivated by promoting an internal understanding of sustainability goals which is directly related to corporate culture. This seemingly contradictory result indicates the significance of the cultural change. By definition, organizational culture means a shared pattern of mindsets, beliefs,

and behaviours of a wider group of employees in an organization (Ha, 2014). It is difficult to instill the SPIs and to change the mindset of all the employees at the non-management level who are not involved with certain sustainability initiatives, especially in the case of Company A having a long history of producing a single product with the same operation. One of the reasons is that employees persist in the status quo and are resistant to changing the routine (Ha, 2014). In order to overcome it, selling the change by generating quick wins is one effective strategy (Parmenter, 2015). At Company A, the sustainability team also took an approach of MVM, starting from a simple SPI measurement of waste to promote the change. Another way is to involve employees in the change process and explain their own benefits of the change to them (Ha, 2014). In that sense, one respondent also elaborated on the importance of explaining the employees' benefits and responsibilities in their own language, namely Dutch. Overall, I emphasize the importance because cultural change through implementing the SPIs is an effective bottom-up approach to promote actual changes in corporate sustainability.

The necessity of dialogue with key stakeholders during the process.

By comparing the research results and the extant theories, the main missing process in the results is a dialogue with key stakeholders. As represented by Nicholls (2018), stakeholder involvement is a crucial step in SPM implementation to establishing materiality: an important value that matters to key stakeholders. In the case of Company A, this step of dialogue was not recognized in the Designing phase of the SPIs, at least with the information obtained from the interviews. They started to communicate with them only after identifying the SPIs and only with internal stakeholders, not external. Linked to the motivation of appealing to the community, this kind of stakeholder involvement can be a good opportunity to appeal their sustainability initiatives to the community. However, do all companies really need to discuss their sustainability targets with others? To answer the question, it is important to distinguish between internal and external stakeholders. I raise the proposition that the involvement of internal stakeholders is essential as argued by Ha (2014), but the necessity of the external stakeholders' involvement depends on the business model and the approach toward sustainability. For Company A, for instance, it is quite simple to set the indicators based on the TBL because they have only a single product; thus, the points to improve and the materiality are obvious. Unless they aim to radically change their

business model towards sustainability, there is no necessity for having a dialogue with external stakeholders during the designing or implementation phase.

SPIs' contribution to the practical implementation of sustainability.

One significant added value of this research is to clarify the contribution of SPIs to the practical implementation of sustainability by connecting the process of SPIs, the barriers, and the motivations. The first contribution is through the process itself. It gives opportunities for the employees to reflect on their actions towards sustainability when creating sustainability policy, creating the SPIs, and monitoring the SPIs figures. The second contribution is encouraging the understanding of sustainability within the organization, as many interviewees mentioned. According to Kotter's theory (1995 as cited by Armenakis & Bedeian, 1999: 301), a sense of urgency, normally raised from the acknowledgement of facing the risk of business continuity in the case they do not promote sustainability, is the very first step of making change, which is followed by thinking of solutions to achieve the target and implementing new practices. The third contribution is realizing an effective management system to visualize the performance and motivate the employees. Performance visualization supports both managers and employees to understand the distance from the current status to the targets and where to improve (Parmenter, 2015). It also supports the decision-making processes of managers by identifying the benefit compared to the investment (Taticchi et al., 2015). Thus, this becomes a driving engine of practical sustainability implementation at a company.

As a concluding argument of the research, SPIs implementation is an effective way of making fundamental changes to corporate sustainability, and I recommend practices to emphasize the involvement of internal stakeholders throughout the implementation process in order to make a culture embracing sustainability within organizations.

Theoretical contributions

I make three main theoretical contributions through the research. First, this research addresses the gap in the research fields by focusing on the "how" question, namely the process view of SPM implementation, while most of the existing research focused on the "what" and the "why".

The research with the “how” question goes beyond purely conceptual discussion and suggests ways to realize intended impacts (what) and/or satisfy the motives of doing something (why) (Zollo, Cennamo & Neumann, 2013). More specifically, even if a researcher identifies a perfect form of SPM with a research of “what”, there is no way to realize it without answering “how” to achieve it.

Second, this research provides deep insights from qualitative research on SPM, while the majority of the existing research was conducted in a quantitative way. According to Alasuutari (2000), a case study in qualitative research contributes to unveiling rich insights related to existing theories. Hence, in order to understand a dynamism in the field of SPM, narrative comments about the barriers and the motivations from a diverse group of stakeholders, not only from sustainability experts but from multiple roles at a company, are meaningful perspective insights about organizational cultural change through SPIs implementation. This research also adds value to the relevant theory by categorizing the dimensions of the barriers and the motivations by using the Gioia method (Gioia et al., 2012).

Third, this research provides a theoretical framework of an implementation process of SPM and underlying barriers and motivations. Even though past researchers identified each element of the research such as barriers or motivations themselves (Andersson & Thollander, 2019), interpretation of these elements from the perspective of process view has a great novelty.

Practical implications

Apart from the aforementioned theoretical contributions, this research provides three main practical implications that help practitioners implement SPM. First, the research results, specifically the process framework, provide a guideline which can be a basis of the implementation project, though some adjustment is needed according to each situation. While this research focused on a manufacturing company and SPIs, the practical implication is not exclusive to the industry or the methodology.

Second, the identification of barriers in each process of SPIs implementation helps practitioners to prepare the countermeasures and enables them to realize a smooth implementation. Although a deep investigation of each barrier and identification of the countermeasure fall outside of the scope of this research, unfortunately, knowing the barriers is still meaningful for the practice.

Third, this research justifies the implementation of SPM by unveiling the contribution of SPIs to the actual sustainability changes. This insight supports practitioners, especially people in charge of the project, selling the idea of the implementation within their organizations. All in all, this research contributes to organizations being more sustainable by promoting SPM and to eventually make a more sustainable society in macro view.

In addition to the general practical implications, I suggest Company A conducts three actions related to each dimension of the barriers, because I understood the situation deeply through the single case study. First, in order to overcome the barrier of changing corporate culture, Company A should try to engage a large number of employees as much as possible for instilling the SPIs throughout the company. As discussed before, a benefit of encouraging engagement to change organizational culture is verified by multiple researchers in the field of change management (Ha, 2014). Moreover, it is better to reiterate the employees' benefits when they involve in the initiative. By doing so, the employees will gradually embrace the importance of sustainability and the SPIs. Second, with regard to the barrier of developing new data management system, Company A should try to design the management system with the SPIs as a comprehensive evaluation mechanism, from the overarching goal at management level (i.e. 70% of CO2 reduction by 2030) to subdivided goals for each department (e.g. percentage of reusing raw material) and, eventually, to clear and tangible targets of the individual employees (e.g. percentage of saving energy per tonne of product compared to the previous year). This is a difficult task which requires technical knowledge about the performance management system; however, existing knowledge sources and consultation with the professionals will help to design the system. Third, for confronting the barrier in achieving fundamental changes for sustainability, Company A should try to use the SPIs as tools to encourage the employees' efforts in the practical implementation of sustainability. When setting the target of each indicator, the decision-maker(s) carefully see(s) the actual performance and the situation. The indicators

should not be too demanding, but not too easy to achieve in order to stimulate the employees' motivations. Also, it is better to discuss thoroughly with each department head when setting the target because they are more knowledgeable in specific business operations and the performance of each team member. These actions will be keys to promote fundamental changes for sustainability.

Limitations and recommendations for future research

Although this research has a number of contributions, some limitations exist in terms of the generalizability, the coverage, and the focus of the research. I conclude the paper by explaining the limitations and the relevant recommendations for future research.

First, it is difficult to generalize the findings due to not enough cases. This research focuses on a single case, and this is definitely a good starting point for further research in these research fields. However, SPIs implementation process may vary among companies, even though we may see some similarities in the steps to be taken. Hence, I recommend investigating a variety of cases for future research. Taking a quantitative approach is also an effective method to improve the generalizability of the barriers and the motivations identified throughout the research. Also, future research can shed light on other frameworks such as SROI or IRIS in order to standardize the process around SPM in general.

Second, this research does not cover the longitudinal aspect and is limited to certain phases of the whole process: design and implementation. Considering the current situation of the SPI project is only in the middle of the implementation process at Company A, there are limited thoughts of the stakeholders about the topic. Hence, in future research, I recommend seeing the following journey toward the end of the implementation and further process of monitoring & evaluation, and how these processes are iterated in the practice.

Third, future research can focus on investigating a specific element in the research findings. For example, focusing on one of the barriers such as the link between strategy and SPIs, or instillation of SPIs to all employees, can be a good theme for future research. In addition, future

researchers can focus on the linkage between the process and the motivation such as the change mechanism of corporate culture through SPIs implementation. These studies will identify the rationale of the findings and give deep insights into both academic and practice.

REFERENCES

Alasuutari, P. 2000. Review essay: globalization and the nation-state: an appraisal of the discussion. ***Acta Sociologica***, 43(3), 259–269.

Andersson, E., & Thollander, P. 2019. Key performance indicators for energy management in the Swedish pulp and paper industry. ***Energy Strategy Reviews***, 24: 229–235.

André, K., & Pache, A. 2016. From caring entrepreneur to caring enterprise: Addressing the ethical challenges of scaling up social enterprises. ***Journal of business ethics***, 133(4): 659-675.

Armenakis, A. A. 1999. Organizational Change: A Review of Theory and Research in the 1990s. ***ORGANIZATIONAL CHANGE***, 25(3): 23.

Bai, C., Sarkis, J., Wei, X., & Koh, L. 2012. Evaluating ecological sustainable performance measures for supply chain management. (Assistant, Ed.)***Supply Chain Management: An International Journal***, 17(1): 78–92.

Banu, G. S. 2018. Measuring innovation using key performance indicators. ***Procedia Manufacturing***, 22: 906–911.

Bell, E., Bryman, A., & Harley, B. 2019. ***Business research methods (Fifth)***. Oxford University Press.

Beske-Janssen, P., Johnson, M. P., & Schaltegger, S. 2015. 20 years of performance measurement in sustainable supply chain management – what has been achieved? ***Supply chain management***, 20(6): 664-680.

Blome, C., Foerstl, K., & Schleper, M. C. 2017. Antecedents of green supplier championing and greenwashing: An empirical study on leadership and ethical incentives. ***Journal of Cleaner Production***, 152: 339–350.

Bocken, N. M. P., Schuit, C. S. C., & Kraaijenhagen, C. 2018. Experimenting with a circular business model: Lessons from eight cases. ***Environmental Innovation and Societal Transitions***, 28: 79–95.

BSC Designer. 2012. ***Example of Sustainability Balanced Scorecard with KPIs.*** Retrieved from https://bscdesigner.com/sustainability-scorecard.htm

Chardine-Baumann, E., & Botta-Genoulaz, V. 2014. A framework for sustainable performance assessment of supply chain management practices. ***Computers & Industrial Engineering***, 76: 138–147.

Ciemleja, G., & Lace, N. 2011. The Model of Sustainable Performance of Small and Medium-sized Enterprise. ***Engineering Economics***, 22(5): 501–509.

Ding, G. K. C. 2005. Developing a multicriteria approach for the measurement of sustainable performance. ***Building Research & Information***, 33(1): 3–16.

Dwyer, S. C., & Buckle, J. L. 2009. The Space Between: On Being an Insider-Outsider in Qualitative Research. ***International Journal of Qualitative Methods***, 8(1): 54–63.

Ebrahim, A., & Rangan, V. K. 2014. What impact? ***California management review***, 56(3): 118-141.

Fiksel, J., Eason, T., & Frederickson, H. 2012. ***A Framework for Sustainability Indicators at EPA***, 59.

Fuel Cycle. 2021. A Quick Guide to Semi-Structured Interviews. ***Fuel Cycle Blog***. Retrieved from https://fuelcycle.com/blog/a-quick-guide-to-semi-structured-interviews/

Gioia, D. A., Corley, K. G., & Hamilton, A. L. 2013. Seeking Qualitative Rigor in Inductive Research: Notes on the Gioia Methodology. ***Organizational Research Methods***, 16(1): 15–31.

Global Impact Investing Network. 2022. ***Iris+***. Retrieved from https://iris.thegiin.org/

Grace K. C. Ding. 2005. Developing a multicriteria approach for the measurement of sustainable performance. ***Building Research and Information***, 33(1):3

Ha. 2014. ***Change management for sustainability***. Business Expert Press.

Harvard Business School Online. 2020. ***5 Critical Steps in the Change Management Process***. Retrieved from https://online.hbs.edu/blog/post/change-management-process

Hockerts, K. 2015. How hybrid organizations turn antagonistic assets into complementarities. ***California management review***, 57(3): 83-106.

Hristov, I., & Chirico, A. 2019. The Role of Sustainability Key Performance Indicators (KPIs) in Implementing Sustainable Strategies. ***Sustainability***, 11(20): 5742.

Impact Economy Foundation. 2022. ***Impact-weighted accounts framework***. Retrieved from https://impacteconomyfoundation.org/impactweightedaccountsframework/

Isaac Mwita, J. 2000. Performance management model: A systems‐based approach to public service quality. ***International Journal of Public Sector Management***, 13(1): 19–37.

Islam, S. M. 2020. Towards an integrative definition of scaling social impact in social enterprises. ***Journal of Business Venturing Insights***, 13: e00164.

Kendall, G., & Rich, M. 2019. The Future-Fit Business Benchmark. In Julia Walker, Alma Pekmezovic & Gordon Walker (Eds.), ***Sustainable Development Goals: Harnessing Business to Achieve the SDGs through Finance, Technology, and Law Reform***: 245-252. John Wiley & Sons Ltd.

Ki-moon, B. 2010. ***The United Nations Global Compact: Achievements, Trends and Challenges*** (A. Rasche & G. Kell, Eds.). Cambridge: Cambridge University Press.

KPI.org. 2022. ***What is a Key Performance Indicator (KPI)?***. Retrieved from https://kpi.org/KPI-Basics

Leech, B. L. 2002. Asking questions: techniques for semistructured interviews. ***Political Science and Politics***, 35(4), 665–668.

Mayer, F. D., Brondani, M., Vasquez Carrillo, M. C., Hoffmann, R., & Silva Lora, E. E. 2020. Revisiting energy efficiency, renewability, and sustainability indicators in biofuels life cycle: Analysis and standardization proposal. ***Journal of Cleaner Production***, 252: 119850.

Meckenstock, J., Barbosa-Póvoa, A. P., & Carvalho, A. 2016. The Wicked Character of Sustainable Supply Chain Management: Evidence from Sustainability Reports: The Wicked Character of Sustainable Supply Chain Management. ***Business Strategy and the Environment***, 25(7): 449–477.

Moktadir, M. A., Dwivedi, A., Rahman, A., Chiappetta Jabbour, C. J., Paul, S. K., Sultana, R., & Madaan, J. 2020. An investigation of key performance indicators for operational excellence towards sustainability in the leather products industry. ***Business Strategy and the Environment***, 29(8), 3331–3351.

Molecke, G., & Pinkse, J. 2017. Accountability for social impact: A bricolage perspective on impact measurement in social enterprises. ***Journal of business venturing***, 32(5): 550-568.

Mullings, B. 1999. Insider or outsider, both or neither: Some dilemmas of interviewing in a cross-cultural setting. ***Geoforum***, 30(4): 337–350.

Nicholls, A. 2018. A general theory of social impact accounting: Materiality, uncertainty and empowerment. ***Journal of social entrepreneurship***, 9(2): 132-153.

Oertwig, N., Galeitzke, M., Schmieg, H. G., Kohl, H., Jochem, R., Orth, R., & Knothe, T. 2017. Integration of sustainability into the corporate strategy. In Stark, R., Seliger, G. & Bonvoisin, J. (Eds.), ***Sustainable manufacturing*** :175-200. Springer, Cham.

O'Neil, I., & Ucbasaran, D. 2016. Balancing "what matters to me" with "what matters to them": Exploring the legitimation process of environmental entrepreneurs. ***Journal of Business Venturing***, 31(2): 133.

Parker, M. 2017. Alternative enterprises, local economies, and social justice: Why smaller is still more beautiful. ***Management (Paris, France : 1998)***, 20(4): 418.

Parmenter, D. 2015. ***Key performance indicators: Developing, implementing, and using winning KPIs*** (Third edition). Hoboken: Wiley.

Perroni, M. G., Gouvea da Costa, S. E., Pinheiro de Lima, E., Vieira da Silva, W., & Tortato, U. 2018. Measuring energy performance: A process based approach. ***Applied Energy***, 222: 540–553.

Rao, P., & Holt, D. 2005. Do green supply chains lead to competitiveness and economic performance? ***International Journal of Operations & Production Management***, 25(9): 898–916.

Rodolphe Durand. 2014. ***Organizations, strategy and society.*** Taylor and Francis.

Sarniak, R. 2015. ***9 types of research bias and how to avoid them***. Quirk's Media. Retrieved from https://www.quirks.com/articles/9-types-of-research-bias-and-how-to-avoid-them

Schaltegger, S., & Wagner, M. 2006. Integrative management of sustainability performance, measurement and reporting. ***International Journal of Accounting, Auditing and Performance Evaluation***, 3(1), 1-19.

Searcy, C. 2012. Corporate Sustainability Performance Measurement Systems: A Review and Research Agenda. ***Journal of Business Ethics***, 107(3): 239–253.

Serafeim, G., & Trinh, K. 2020. ***A framework for product impact-weighted accounts. Harvard Business School Accounting & Management Unit.*** Working Paper, 20-076.

Shah, A. M. 2005. The Foundations of Successful Strategy Implementation: Overcoming the Obstacles. ***Global Business Review***, 6(2): 293–302.

Stephan, U., Patterson, M., & Kelly, C. M. Jan 01, 2016. Organizations driving positive social change: A review of mechanisms and an integrative framework. ***Journal of Management,*** 42(5): 1250-1281.

Taticchi, P., Tonelli, F., & Pasqualino, R. 2013. Performance measurement of sustainable supply chains: A literature review and a research agenda. (L. D. Huaccho Huatuco, Jairo Rafael Mo, Ed.)***International Journal of Productivity and Performance Management***, 62(8): 782–804.

Taticchi, P., Garengo, P., Nudurupati, S. S., Tonelli, F., & Pasqualino, R. 2015. A review of decision-support tools and performance measurement and sustainable supply chain management. ***International Journal of Production Research***, 53(21): 6473–6494.

Unilever. 2022. ***Unilever sustainable reporting centre***. Retrieved from https://www.unilever.com/planet-and-society/sustainability-reporting-centre/.

Uysal, F. 2012. An Integrated Model for Sustainable Performance Measurement in Supply Chain. ***Procedia - Social and Behavioral Sciences***, 62: 689–694.

Whetten, D. A. 2022. ***What Constitutes a Theoretical Contribution?***, 7.

Yin, R. K. 2018. Case Study Research and Applications: ***Design and Methods (6th edn)***. London: Sage.

Zarte, M., Pechmann, A., & Nunes, I. L. 2019. Indicator framework for sustainable production planning and controlling. ***International Journal of Sustainable Engineering***, 12(3): 149–158.

Zollo, M., Cennamo, C., & Neumann, K. 2013. Beyond What and Why: Understanding Organizational Evolution Towards Sustainable Enterprise Models. ***Organization & Environment***, 26(3): 241–259.

APPENDICES

APPENDIX A

Examples of SPIs

Economic dimension	
Goal	SPI
Increasing return on investment	• Cost of ownership linked to energy, environmental tax • Total costs / investments for environmental protection • Environmental cost saving
Increasing the revenues associated to sustainability dimensions	• % of additional revenue / price premium brand differentiation • % of income from recycling • Sustainable innovations rate
Enhancement of technology process	• Investments in environmental technology rate • % of new environmental-friendly product development • Response to environmental programs rate (for suppliers) • Amount of environmentally safe alternatives
Guaranteeing quality of the process	• % of production sites with environmental certification (e.g. ISO9001, ISO 14001) • Environmental information availability rate • Supplier rejection rate
Enhancing reliability	• Customer / supplier service • Reliability of stocks / forecasts
Enhancing responsiveness	• Supply chain responsiveness • Responsiveness through business operation (design, purchase, sourcing, production, delivery, sell, return)

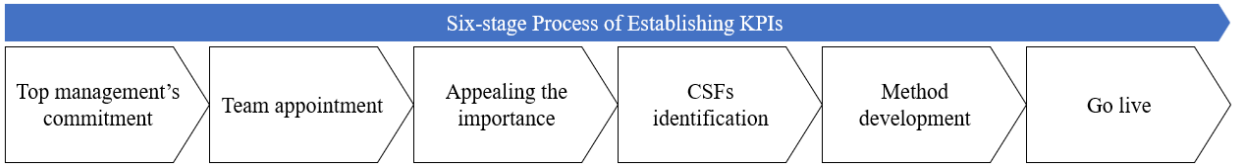
Environmental dimension	
Goal	SPI
Reducing gas emissions	• Emission of ozone-depleting substance rate • Emission of GHG rate • Carbon footprint rate • Sulphur dioxides (SOx emissions) • Nitrogen dioxides (NOx emissions)
Improving the use of renewable energy/source	• Renewable energy rate • Sustainable water use rate
Reducing natural resources consumption	• Energy used per product units • Electricity/gas consumption • Soil/water use rate
Reducing waste and improving the efforts to address “green-ness”	• % of waste generated per product units • % of reusable/recycled material/source • % of waste recycled/reused off-/on-site • Dangerous waste generated rate • % of hazardous material over total waste
Reducing pollution and protecting natural environment	• % of pollution (air/water/land/others) • Land use rate • Action rate with respect of biodiversity

Social dimension	
Goal	SPI
Employees' acceptance of organizational change	• Employee satisfaction rate • Employee turnover rate • Number of training hours per employee • Support employee rate (e.g. physical activity, health care)
Guaranteeing the quality of environmental and work condition	• Employment rate • Health and safety rate • Diversity/equality rate
Guaranteeing the respect of the human rights	• Child/forced labour rate • Number of disciplinary actions • Social security rate
Participating at the social initiative and maintaining a high level of responsibility	• Charity donations rate • Number/expenses of social initiatives at national and local level • % of participants in social initiatives • Number/expenses of culture/technological development • Consumer, supplier and employees' safety rate • Number of job creation

(Chardine-Baumann & Botta-Genoulaz, 2014, 141; Hristov & Chirico, 2019, 8)

APPENDIX B

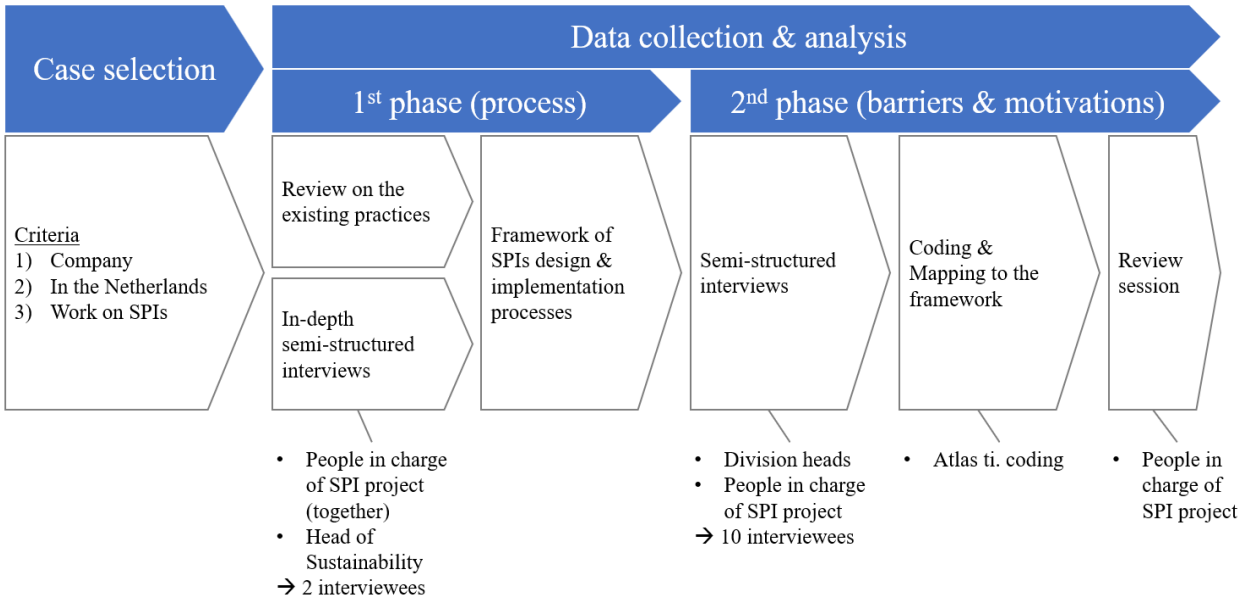
The Six-Stage Process of establishing KPIs



(Parmenter, 2015, 108)

APPENDIX C

Summary of the Research Process



APPENDIX D

List of Interviewees

Interviewees			
1	Head of QESH*/Sustainability	6	Head of Energy
2	Head of HR/Payroll	7	Head of Procurement
3	Head of Finance	8	Head of ProcesControl
4	Head of Sales	9	Sustainability Officer
5	Head of Industrial	10	Quality Manager

*Quality, Environmental, Safety and Health

APPENDIX E. Interview Questions for the first phase interview

Purpose: to get information around the SPI project and to establish the SPIs framework

Interviewees

- Manager of Sustainability Team
- Sustainability Officer
- Quality Manager

Date: TBD

Introduction: Background of the research project

This research project is a master thesis called Sustainable Entrepreneurship Project at the University of Groningen. The research topic is sustainable performance measurement, specifically, focusing on the process of designing and implementation phases of Sustainable Performance Indicators (SPIs) at a manufacturing company. In this specific research project, we aim to illustrate the process of SPIs and identify the barriers, the driving factors and the opportunities through the process. The research question is "what does the process of design and implementation of Sustainable Performance Indicators (SPIs) look like at a manufacturing company?" The goal of this interview is to gather information about the process of SPIs by listening to the real voice of key stakeholders at the company.

Questions

1. Would you like to introduce yourself?
    1.1. Can you explain briefly about your function within the organization?
    1.2. What is your role in the SPI project?

2. Would you like to share the overview of the SPI project?
    2.1. What is the purpose of the project?
    2.2. What is the timeframe of the project?
    2.3. What is the resource allocation for the project?

3. Would you like to explain the steps to be made during the project?
    3.1. What was the first step of the project?
    3.2. What kind of project tasks and timeline have you planned for?
    3.3. How did you experience the project so far?
    3.4. What obstacles did you experience and what kind of obstacles are you expected for the future process?
    3.5. How do you treat the existing KPIs and the new SPIs? Are you planning to merge these into one package of indicators? How do you see the difference between the

two indicators?

4. Ending
    4.1. Do you have any additional information to address?
    4.2. Would it be okay if I contacted you again for a quick follow-up if any more questions come up?
    4.3. Always please feel free to contact me if you have any questions.

APPENDIX F. Interview Questions for the second phase interview

Purpose: to get information about the SPI project and to establish the SPIs framework

Interviewees
- Manager/Head of each department
- Sustainability Officer
- Quality Manager

Date: TBD (April, 2022)

Introduction: Background of the research project
This research project is a master thesis called Sustainable Entrepreneurship Project at the University of Groningen. The research topic is sustainable performance measurement, specifically, focusing on the process of designing and implementation phases of Sustainable Performance Indicators (SPIs) at a manufacturing company. In this specific research project, we aim to illustrate the process of SPIs and identify the barriers, the driving factors and the opportunities through the process. The research question is "what does the process of design and implementation of Sustainable Performance Indicators (SPIs) look like at a manufacturing company?" The goal of this interview is to gather information about the process of SPIs by listening to the real voice of key stakeholders at the company.

Questions
1. Would you like to introduce yourself?
    1.1. Can you explain briefly your function within the organization?
    1.2. What is your role in the SPI project?
        1.2.1. How are you involved with Sustainability?
        1.2.2. Do you work currently with indicators on Sustainability?

2. Would you like to share your thoughts about the SPIs?

2.1. What do you think about the SPIs **in general**?
   2.1.1. What do you know about the SPIs? What about Sustainability Targets?

2.2. What **obstacles** are you expected for the designing and implementation of the SPIs?
   2.2.1. Which aspects of the SPIs do you see as the challenges for your position/team and the company as a whole?
   2.2.2. What are the challenges to building a centralized SPI/KPI management system?
   2.2.3. Is there data available? Is there an established (centralized) dashboard?
   2.2.4. Do teams have their own individual dashboards?

2.3. What is your **motivation** for the SPIs?
   2.3.1. How important is it to have indicators for Sustainability?
   2.3.2. Which aspects of the SPIs do you see the opportunities for your position/team and the company as a whole?

3. Ending
   3.1. Do you have any additional information to address?
   3.2. Would it be okay if I contacted you again for a quick follow-up if any more questions come up?
   3.3. Always please feel free to contact me if you have any questions.

APPENDIX G. Informed Consent Form

RESEARCH-INFORMED CONSENT

Title of study: Sustainable Entrepreneurship Project (SEP)

Researcher:
Ryoko Yatomi (Master student of MSc in Sustainable Entrepreneurship)
e-mail: r.yatomi@student.rug.nl

Supervisor:
Emma Folmer (Academic supervisor) e-mail: e.c.folmer@rug.nl

Description of the research project and its purpose
This research project is a master thesis called SEP. The research topic is sustainable performance

measurement, specifically, focusing on the process of designing and implementation phases of Sustainable Performance Indicators (SPIs) at a manufacturing company. In this specific research project, we aim to illustrate the process of SPIs and identify the barriers, the driving factors and the opportunities through the process.

Why am I being asked to review this form?
You are being asked to take part in a research study. This form is provided so that you may read and understand the reasons why you might or might not want to participate in the research. Your participation is voluntary.

What is the goal of this interview?
The goal of this interview is to gather information about the process of SPIs itself, the barriers, the driving factors and the opportunities through the process by listening to the real voice of key stakeholders at the company.

What will happen before the interview?

- You are allowed to withdraw from the study without justification and without negative consequences until a day before the meeting;
- We will review this form before the beginning of the interview;
- You can contact us and our supervisors if you have any additional questions.

What will happen during the interview?

- You will be asked multiple questions;
- The interview will be recorded;
- You have the right to decline to answer particular questions.

What will happen after the interview?

- The recordings of the interview will be transcribed and analysed by the researcher;
- This reviewed transcription will be integrated into the final report;
- Quotes from the transcription will be used as verbatim in the report;
- You will have access to this final report and the transcription;
- For confidentiality purposes, your name is to be anonymized.

Contact Information
If you have questions at any time about this study, you may contact the researcher whose contact information is provided on the first page. If you have questions regarding your rights as a research participant, or if problems arise that you do not feel you can discuss with the researcher directly, you may contact the supervisor.

Voluntary Participation
Your participation in this study is voluntary. It is up to you to decide whether or not to take part in this study. If you decide to take part in this study, you will be asked to sign this consent form. After you sign the consent form, you are still free to withdraw at any time and without giving a reason. Withdrawing from this study will not affect the relationship you have, if any, with the researcher.

Consent
I have read and understand the provided information and I have had the opportunity to ask questions. I understand that I will be given a copy of this consent form. I understand that my participation is voluntary and I voluntarily agree to take part in this study.

Participant's name: _____ Date _____

Participant's signature _____

Researcher's name: Ryoko Yatomi Date _____

Researcher's signature _____