Developing insights in the environmental performance of organizations

Testing a tool that provides insights in the results of environmental management systems of companies with the ISO 14001:2015-certificate.

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Abstract

This study focuses on the environmental performances of organizations with the ISO 14001:2015-certificate. Where the standard demands a continuous improvement of environmental management systems it does not clearly state how and to what extent environmental performances have to improve, resulting in the debate among scholars of the effect of the implementation of the ISO-standard on environmental performances. To gain more insights in the effect of the ISO-standard on environmental performances the Environmental Performance Scale (EPS) has been developed. The EPS is a tool that provides business with an ISO 14001:2015 certificate with more insights in their environmental management systems with the aim to improve environmental performances. The aim of this study is to identify the key characteristics of environmental performance instruments. Identifying the most relevant qualifications of a good functioning environmental performance instrument, this study enables to determine how the EPS meet these criteria. Furthermore, this study identifies the demand for a tool to measure the environmental performances of organizations with the ISO 14001:2015-certificate, determines the EPS' applicability, added value for both organizations and the ISO-standard, and will validate the instrument via a test-pilot. Validating the instrument in the test-pilot revolves around comparing the results from the instrument with the real-world situation. When the results correspond with the current state of affairs of the organization, the instrument can be qualified as valid. This study is relevant for organizations with an ISO 14001:2015 certificate, not only to gain more insight in their environmental management systems but also to truly contribute to the improvement of environmental performances.

Keywords: 'Environmental Performance Scale', ISO 14001:2015, Environmental Management Systems, Environmental performance, Environmental performance indicators

1. Introduction

“The accelerating environmental consciousness of individuals, companies, and government entities serve as a driver for manufactures to focus attention on the environmental performance of their operations” (Jiang et al., 2015, p. 783). Within that sustainable transition, companies should take into account the effect their business models have on climate, bio-diversity, raw materials, water and air pollution and should be responsible for their own waste streams. Governments have to adjust legislation and formulate nation-wide targets, people have to change their behavior and adjust their consumption patterns, and businesses have to develop new strategies in order to reach lawfully set targets and to keep shareholders and stakeholders satisfied in the transition towards a sustainable economy. This research focuses on the private sector and especially on the environmental performances of businesses in the private sector. The private sector has the opportunity to impact climate change in a positive way since they can lead by example for their customers, their competition or for governments. The private sector has capital, expertise, innovation incentives and economic incentives to improve environmental performance by adapting new business strategies in order to remain future resistant.

The vigor of the private sector can potentially have the largest impact on climate mitigation. However, having a positive environmental impact is generally not the core motivation to start a business. In most cases the financial revenue is the main objective, societal and environmental contributions are often considered secondary objectives. Nevertheless, the environmental performances of businesses are becoming increasingly important. Businesses are increasingly confronted with the demand from their clients to increase environmental involvement and improvement of their business activities. To accommodate the needs of their clients businesses need to be able to communicate their environmental performances. These environmental performances can differ among industries or between companies in the same sector. There are several reasons why the environmental performances of companies are measured differently, but relevant in this research are the intrinsic motivations of organizations. At a minimum companies should comply with legal requirements, but there is a difference between what the law requires and what ethics require (Norman, 2011).

Formulating business ethics is a matter of values and the intrinsic believe that the organization should contribute to social and corporate responsibility or citizenship (Demirel et al., 2017; Norman, 2011). The realization of these values is outside the legal arena, where states dictate minimum standards, the responsibility to improve for example corporate responsibility,

environmental performance, corporate citizenship or animal welfare, is the responsibility of the companies themselves or as a shared objective in their sector. Improving business ethics or developing standards within a sector is an example of self-regulation. "Self-regulation happens when a number of firms, typically within a common sector, work out a voluntary regulatory regime through some kind of industry or professional association" (Norman, 2011, p. 49). An important example of a self-regulatory body, and relevant for this study, is the International Organization for Standardization. The International Organization of Standardization is a global actor which develops International Standards which are instrumental in facilitating international trade to support innovation and provide solutions to global challenges.[1] The International Organization of Standardization has developed numerous standards on many different subjects. A divide between the standards can be made regarding certification and/or inspection, some of the standards are not subject to certification, while others do. Where there are some standards for technical issues, certification of an ISO management system standard is common. The focus of this study will be on the management systems where certification is customary. The certification of management system standards is done by independent third parties, the certification bodies, which provide businesses with certificates if they meet the criteria set out in the ISO management system standards.

ISO-certificates of management systems provide companies with handles to develop and implement environmental policies which go beyond legal requirements. Simultaneously these standards demand the commitment of companies to continuously improve their environmental policy performances. Reaching for the improvement of the companies' performance on for example energy, environment or labor conditions which go beyond legal requirements suggest intrinsic motivations of a company to improve. According to Demirel (et al., 2017) companies decide to seek certification as a result from intrinsic motivations, but the motivations of organizations differ, varying from increased access to (international) markets to symbolic adaption of a standard. The variation of motivations to adapt ISO standards will be elaborated on in chapter two.

This research focuses on the environmental management system certificate, the ISO 14001:2015 standard. The International Organization of Standardization has developed an International Standard on Environmental Management Systems (EMS) which are included in the ISO 14001:2015 standard. The ISO 14001:2015 standard is an environmental management standard that has the objective to improve environmental performances by systematically

[1] ISO.org (2018) 'About ISO', https://www.iso.org/about-us.html, (last conducted on 15-04-2018).

developing environmental policy. Organizations who commit themselves to the ISO-certificate have the obligation to continuously improve their environmental management systems. The certificate does not specify to what extent environmental performances have to improve or how an organization should accomplish the improvement of their environmental performances.

The *Stichting Coördinatie Certificatie Milieu- en Arbomanagementsystemen* (SCCM) is a foundation which cooperates with business, governments, certification institutions and other interested parties in the Netherlands for an unambiguous and valued certificate for ISO 14001 (environment), EMAS (environment), ISO 50001 (energy) and OHSAS 18001 (since 2018 ISO 45001 Factory Act).[2] Although SCCM identifies the importance of unambiguous certificates, in practice, and for this study relevant, the ISO 14001 standard has problems with harmonizing the implementation of the standard, the effects of implementing the standard vary and, as mention previously, the motivations to adapt the standard vary as well. This led to the ambition of SCCM to develop an instrument to gain more insights in the environmental performances of business in order to control, reduce or explain the differences in motivation, effect and implementation of the ISO 14001 standard. In order to provide these insights SCCM has developed the 'Milieuprestatiemeting' – the Environmental Performance Scale (EPS) – which show businesses a detailed analysis of their environmental performances. The EPS is in line with the ISO 14001 standard and utilizes the information which comes from the EMS, so that specified improvement in their management systems can be realized.

The Environmental Performance Scale

The environmental performances of businesses differ between a broad variety of industries. Where some environmental performances are directly clear in the industry, for example using green electricity rather than electricity that originates from a coal plant, other environmental performances are not particularly clear. The EPS is developed to help organizations to improve their environmental performances by clarifying what environmental performances exactly entail for a particularly organization, which environmental performances an organization should focus on, how quickly the environmental performances can improve and how an organizations determine which environmental performances should be improved. The answers to these question can help understand why it is possible that organizations with an ISO 14001-certificate have different environmental performances.

The Environmental /Performance Scale systematics

[2] SCCM.nl, 'Over SCCM', https://www.SCCM.nl/over-sccm, (last conducted on 15-04-2018).

The instrument consists of 26 questions divided over four themes: environmental performances of: (1) the products/services up along the chain; (2) supply chain/materials purchasing (the influence on the environmental performance of parties supplying products/services to the organization); (3) the production equipment and facilities (environmental performance of e.g. the machines used, buildings, processes used to make or supply products/services, if applicable including transport); and (4) process control and safety.

Organizations answer the 26 questions (see Appendix F) by indicating a percentage that is applicable to their situation, the higher the percentage the more points an organization receives (see table 1). For their own interest they can also provide an explanation for their answer that can be used as a benchmark for future application of the instrument. For each theme the scores will be added together, which determines the final score for that theme. The end result is determined by what percentage the total scored points are of the maximum score. The score determines whether an organization is a 'straggler', 'follower', 'frontrunner' or a 'leader'. This enables companies to compare themselves with companies within their industry.

The highest level (86-100%), the leader qualification, must be understood as an organization which has a leading role in its sector. Its operations regarding environmental management are an example for others in the same sector. The second level (61-85%), the level of frontrunner, is ahead of the sector with a number of others, the organization has therefore no leading role. A follower (36-60%) has an average environmental performance in its sector. An organization has some environmental policies in place but does not take extra initiatives to further improve its environmental performances. The lowest level in the EPS is the straggler (0-35%). The organization is behind on the most recent developments within its sector.

Share	**Percentage**	**Points**
Not	0%	0
Very small share	<10%	1
Small share	11-30%	2
Reasonable share	31-59%	4
Large share	60-84%	7
Very large share	85-99%	8
Complete	100%	10

Table 1: Answer possibility example. The points can differ for different questions.

Besides its distinctive function, the instrument can also be used as a communication tool, primarily for internal use. The communicative advantage which the instrument provides organizations helps them to better understand the broad concept of environmental performances. The four themes and 26 questions can be used as a checklist for developing an

image of the developments and wishes of stakeholders. Applying the EPS will visualize the strengths and weaknesses of the organizations' environmental performances. The answers form an overview that can directly be developed into environmental performance objectives on a management level.

When discussing the environmental performance, the EPS also enables the organization to better shape a framework of how environmental performance should be understood, which will result in a more harmonious understanding on how to improve the environmental performances. When discussing the environmental performance on the basis of the EPS, the awareness, regarding the company's objectives, within the organization will increase the most when sufficient employees from different departments come together. In these discussions it is relevant that both employees and managers are included in the debate. The results from the EPS can be used as input during the management review and in the process of continuous improvement. It enables management to evaluate current policy and to adjust or develop policies.

When an organization decides to use the EPS to communicate externally, an independent third party, the certification body, has to audit the application of the instrument. A demand in the ISO 14001 standard is that communicated information must be valid and reliable. However, in the current state of the development process of the EPS, the primary focus is on the internal application of the instrument.

Problem statement

Improving corporate sustainability within an organization is a challenging tasks for any organization since the three P's – Planet, People, Profit – should improve simultaneously. This is however difficult since short-term profits conflict with long-term environmental performance objectives.

EMSs are useful, but using an EMS as the only tool to improve corporate sustainability will not be sufficient from an environmental perspective. EMS, Life Cycle Assessments (LCA) and Sustainability Reporting (SR) are independent of each other and do not cover the entire field of corporate sustainability, but combining these measurement tools can encompass the entire scope (Witjes, 2017). The purpose of this study is however not to include EMS, LCA and SR in one all-encompassing tool, but rather to improve the use of EMSs by increasing insights in, and extracting more information from, the ISO 14001:2015 standard. These insights in the ISO standard are useful since organizations struggle with the exact meaning, purpose and effect of the ISO standard.

Since the ISO standard states that companies have to continuously improve their environmental performances, it is relevant that the environmental performances of organizations are clear. This is the second problem with the ISO standard: the influence the standard has on the environmental performance. Within the ISO standard improving the performances depends on the use of EMSs too (NEN, 2015). However, this demand of the ISO standard does not state how EMSs or environmental policy should be developed, and, perhaps more relevant, it does not state what qualifies as an environmental performance improvement. It is unclear if improvement is measured by the amount of CO_2-reduction or the hours spend on environmental meetings or reducing waste streams. Although continual improvement is defined as "recurring activity to enhance performance" (NEN, 2015, p. 5), the enhancement of the performance is not given a precise objective and is dependent of the ambitions of the organization itself. Therefore, by increasing insights in the environmental performances of organizations with an ISO 14001:2015-certificate via the EPS, this study focuses on the matter of EMSs with the aim to support organization in enhancing their environmental performances via their EMSs.

Additionally, the ISO 14001:2015 standard does not have a nominal or ordinal scale to state to what extent the environmental performances are developed compared to other actors in the same sector. A lack of scaling brings uncertainties for both customers and businesses. If a customer demands an ISO 14001:2015 standard it would be beneficial for the customer to know how well implemented the management systems are and to what extent the EMSs contribute to the improvement of environmental performance. So in the interest of the customer it would be beneficial to have a scale which enables a comparison between companies in the same sector.

In the interest of businesses it is relevant that they have sufficient insight in their environmental performances. Organizations might have the right intension to improve their environmental performances, but without an instrument that provides a detailed overview of their performances, they lack insights in whether their intensions are too ambitious or that they have the potential to further sharpen their environmental goals. This lack of an objective, unambiguous sketch of current environmental performances slows organizations down in improving their performances. A second advantage of improved insight in their EMS is that organizations can use the result from the EPS as a competitive advantage. Where a scale offers customers an increased insight in their choices, that same scale can be utilized by companies to outsmart their competition.

So, while EMSs can be useful for improving sustainability objectives of organizations, there are some difficulties with the management system standard: organizations have limited

insight in their environmental performances; the direct influence of the EMS on the environmental performance of an organization is unclear; and the ISO 14001:2015 standard lacks an ordinal or nominal scale, which is detrimental for both customers and organizations.

Research aim

As discussed this study will test the EPS, however before the EPS's use can be valued, it is important to identify the most relevant characteristics or qualification of a well-operating instrument for environmental performance measurement. An overview of key characteristics or a framework with relevant qualifications is developed in this study that will serve as a benchmark. Placing the EPS side by side with the overview developed in this study enables to determine how the EPS meets these criteria and help to justify the inclusion of environmental performance indicators in the EPS. Furthermore, a comparison sheds light on what the distinguishing characteristics of the EPS are. Secondly, the aim of this study is to test the EPS in real-world situation.

The EPS will be tested via a pilot. One of the aims of the pilot to provide insights in the manageability and applicability of the instrument in order to evaluate how the instrument operates in practice. A second aim is to determine the added value of the EPS: the added value for businesses and the added value to the ISO 14001-certificate. The third objective of the pilot regards the validation of the instrument. The validation of the EPS revolves around comparing the results from the instrument with the real-world situation of the environmental performances of the organizations. When the results from the EPS correspond with the state of affairs of the organizations, the instrument is qualified as valid. This validation process is independent of the validation regarding the methodology of this study which will be discussed in chapter four.

These aims are translated into a two-folded research objective: The first objective of this research is to identify key characteristics of environmental performances measurement tools in order to compare the EPS to these criteria and to justify the inclusion of certain performance indicators. The second objective is to test the EPS via a pilot. The pilot consist of two surveys and the EPS itself. One survey is conducted before participants receive the instrument and one survey is conducted after companies applied the EPS. This process is described in detail in chapter four. With a well-operating instrument businesses can overcome the difficulties as described in the problem statement. The objective of the instrument is to provide businesses with more knowledge about their EMSs and their environmental performances, which simultaneously benefits people, planet and profit.

Research questions

Corresponding with the two objectives the main research question consists of two components, both identifying the relevant characteristics and the application of the EPS in the real-world. These objectives are included in the following research question: "*What are key characteristics of a well-operating environmental performance measurement instrument and to what extent does the EPS meet those criteria?*" In the conclusion of this study – in chapter seven – an answer to these question is formulated.

Corresponding with the two-folded objective of this study a divide is made to organize the sub-questions. The explorative objective of identifying the key characteristics of a well-operating environmental performance measurement instrument is supported by two sub-questions:

- To what extent can the development of the EPS add insights to the academic debate on environmental performance measurements?
- What are the distinguishing characteristics of the EPS compared to other environmental performance measurement instruments?

The answers to these questions contribute to the academic debate on environmental performance instruments. It will especially be valuably for the debate regarding the effect of implementing the ISO 140001 standard on environmental performances since scholars disagree on the effect of ISO standard on environmental performances rather than only influencing the EMSs.

The second objective of this study is to test the EPS in the real-world. Testing the EPS revolves around the validation of the outcome of the instrument, its applicability, and identifying the demand for a tool that improves the understanding of the EMSs from the ISO 14001:2015 standard. These objectives correspond with the following sub-questions, which enable to determine to what extent the EPS can be considered a useful measurement instrument:

- How does the EPS operates in practice?
- How is the applicability of the EPS perceived by organizations?
- What are the added values of the instrument for organizations?
- To what extent can the EPS increase the value of the ISO 14001-certificate?

The value of the instrument will partially be determined by the applicability of the instrument. If businesses struggle with assessing the instrument it can influence the outcome, which can result in a misrepresentation of their environmental performances. Furthermore, the added value

of the tool will be determined by the demand for a measurement instrument. Representative results and a clear instrument are relevant, but without a clear added value for the companies an instrument cannot be considered desirable. So, the added value of the EPS will be determined by the applicability of the instrument and by the positive effect on the understanding of the ISO 14001:2015 standard.

Societal and scientific relevance

Although the presence of an ISO 14001-certificate entails that organizations have to constantly improve their environmental performances, the standard does not specify certain guidelines with improvement measures which organisations have to fulfil or follow. “Except for such mandatory reporting requirements as pollutant emissions, most firms are still in the dark about the environmental performance of their business activities. This makes the firms vulnerable to changing regulations, stakeholder expectations and customer demand. Excellence in environmental performance will become an integral part of business economic viability.” (Ditz & Ranganathan, 2000, p. 240) The EPS provides insights in the EMS making it relevant for organisations since they will have a better understanding of their environmental performances. Additionally, the EPS will create an ordinal scale for companies which they can use in their advantage. Having an ordinal scale has been proven to be effective in improving performances. Chapter five elaborates on the CO2-Performance Ladder and the Safety Culture Ladder, these instrument have proven to increase the commitment of organizations when they could work towards a desired level. An ordinal scale helps organizations to distinguish themselves from their competition. With the development of the EPS a similar development can be realized, aiming at simultaneously improving the competitive advantage of businesses and increasing their environmental performances. Kees Huizinga, who was involved with the development process of the EPS and who is familiar with the CO2-Performance Ladder in his professional field, stated that by developing the EPS Dutch organizations have the opportunity to lead the way on the international field (Huizinga, 11-07-2018). Re-inventing or developing the certificate might contribute to an increase in the environmental performances of organizations, since organizations will have a better understanding of the management systems which enables them to create, adjust or stop (environmental) policies.

There is no academic consensus on the direct positive impact of the ISO 14001:2015 management systems on environmental performances, leaving the efficiency of the ISO 14001 standard controversial (Boiral & Henri, 2012). Primarily because the environmental performance of the organizations with an ISO-certificate has limited insights in the outcome of

their environmental policies. By testing the EPS, insights in the environmental performances of organizations can increase. This contributes to the debate regarding the impact of the ISO 14001:2015 standard. If, with the help of the EPS, organizations can enable themselves to pinpoint precisely where their environmental policies miss their effect, they can adjust more precisely their EMSs from the ISO 14001 standard. When it becomes clear how and why organizations experience limiting factors in (implementing) the ISO 14001 standard, the academic debate regarding the value and the effect of the standard can built on those insights.

Ideally the insights gained from the EPS do not only provide better insights in the environmental performances but will, as a result, increase the value of the ISO 14001-certificate. There is some academic controversy on the value of the instrument due to the lack of insight in environmental performances or regarding the motivations to adapt the standard. The pilot to test the EPS can counter or support these assumptions, since it provides information from organizations which can be used in the debate. This is relevant for further research since differences between industries, branches or companies can better be researched if the variable of EMS is a more constant factor in the comparison. The insights provided by this study will add a chapter to the body of knowledge on environmental performance instruments and further research can be built on the findings of this study.

Readers guide

Chapter two will discuss the ISO 14001:2015-certificate, this chapter will elaborate on the objectives and the content of the standard, and discuss the management systems of the ISO 14001 standard compared to other management systems, including the High Level Structure and the Environmental Management Systems, and discuss why it is relevant to elaborate on these issues in this study. Chapter three is devoted to the literature study. Key concepts, including environmental performance, environmental performance instruments, and environmental performance indicators will be reviewed. Chapter four provides justification for the methodology of this study and discusses both the research strategy for the validation and the research strategy in academic context. Additionally, the research philosophy, validity and reliability and operationalization of relevant concepts will be discussed. Chapter five will discuss other performance tools to place the EPS' development in context and to compare validation, objective and added value. Followed by chapter six where the results of the survey will be discussed and analyzed in the perspective of the literature provide in chapter three. Chapter seven will conclude this study by summarizing the chapters and answering

corresponding sub-question in order to conclude this research by answering the main research question.

2. Understanding the ISO 14001:2015 Standard

Introduction

The objective of this chapter is to provide understanding of the ISO 14001-certificate. This is relevant for this study since the EPS provides insights in the environmental performances of organizations that are ISO 14001 certified based on their EMS's. When elaborating on the content of the ISO 14001-certificate, it is important to discuss the key aspects of the standard: the High Level Structure, Management Systems, and Environmental Management Systems. Throughout this chapter the content of the ISO 14001-certificate will be discussed in academic context to provide insight in the debate regarding the standard's effectivity, impact on the environment, and the sincerity of the organizations to adapt to the criteria set in the standard. In the context of this study it is relevant to elaborate on the ISO 14001-certificate and its relevant components because it enables to better understand the academic debate and helps to interpret the results from the pilot. The value of this chapter lies in the understanding of the ISO 14001 which enables a better understanding of the results from the pilot. With more knowledge of the certificate it becomes clearer what the weaknesses and strengths are of the standard and how they are experienced by organizations. Without sufficient insight in the ISO standard it would become more difficult to interpret the pilot and the additional interviews.

Relevant to understand throughout this chapter is that the management systems are an addition to what is legally obligated. Where compliance management of organization focuses on visualizing lawfully and regulatory criteria in order to determine what the minimum criteria are that the organization has to comply to, management systems are an addition to those minimum criteria and support an organization to develop more ambitious policies.

The ISO 14001-certificate is not the only recognized standard that is often applied by organizations. The European Commission has also developed an audit scheme which organizations can use in combination with or separately from the ISO standard. "The Eco-Management and Audit Scheme (EMAS) is a premium management instrument developed by the European Commission to evaluate, report and improve their environmental performance"[3]. The EMAS is a similar tool like the ISO standard, therefore companies have similar motivations to adopt to EMAS. However, since this study revolves around testing and evaluating the EPS, the focus of this research is on the ISO 14001:2015 standard. As with the EMAS standard the ISO standard dictates continuous improvement of EMSs, therefore the standard "requires that organizations conduct periodic EMS audits to determine whether the EMS has been properly

[3] European Commission (2018), *Environment,* http://ec.europa.eu/environment/emas/index_en.htm (last conducted on 15-04-2018).

implemented, and the results of the audit are then reported to the management" (Epstein, 2008, p. 236).

High Level Structure

The High Level Structure (HLS) was initiated by International Organization for Standardization in 2008 to develop a common structure for management system standards and was included in 2012 when it became the starting point for new and revised ISO standards for management systems.[4] It was however until 2015, when the new ISO 14001 standard and ISO 9001 standard were published, that the HLS was incorporated within the new ISO standards and therefore put into practice. "The HLS provides identical structure, text and common terms and definitions for all future ISO management system standards. Now, all the ISO management system standards can be aligned, facilitating full integration of several standards into one management system in a single organization" (ISO, 2017, p. 38).

The management systems can be integrated together since the HLS is the heart of the *plug-in model* for ISO-management system standards. The plug-in model has been developed by the International Organization for Standardization after businesses formulated their wish for a system which aligns and connects different management systems.[5] "With this model the standards will have the same structure, the same text elements and the same core values" (NEN, 2014, p. 7). The International Organization of Standardization provides guidance on the general principles for conducting a social and environmental audit criteria, for selection and composition of audit themes and the qualifications of internal and external auditors (Epstein, 2008, p. 236). Especially for larger companies, that often combine different ISO standards – regarding for example quality, the Factory Act or environmental performances – it is important that these standards connect in the management systems.

The plug-in model consist of four core elements and requirements: industry norms, specific guidelines, generic guidelines and generic norms. The harmonization of systems as a result of the plug-in models based on the HLS, enables organizations to adapt more standards without changing management systems themselves. The HLS is primarily about new or changed requirements in the standards.[6] The HLS also leaves the opportunity to include additions for a specific industry as long as the addition does not conflict with the statements in

[4] NEN, https://www.nen.nl/NEN-Shop/Vakgebieden/Managementsystemen/De-nieuwe-ISO/De-HLS-als-basis-nieuwe-ISO.htm, (last conducted on 07-09-2018)
[5] Idem.
[6] SCCM, https://www.sccm.nl/HLS, (last conducted on 07-09-2018)

the HLS, undermine its intentions or have a negative impact on the intended harmonization.[7] Although specifications can be added, the HLS consists of seven main components of a management system, which combined give substance to the seven important management themes and make a good connection between the strategic and operational level possible.[8] The seven main components of the HLS and ISO management systems are: 'Context of the organization', 'Leadership', 'Planning', 'Support', 'Operation', 'Performance evaluation', and 'Improvement'. Not surprisingly the content of the HLS is shared among the ISO management systems. Throughout these chapters it is relevant to state that the continuous improvement cycle is included. Continuously improving environmental performances is at the core of the ISO 14001 standard.

Management systems

It is justified to assume that organizations that are founded in different countries have different modus operandi. In a globalized economy these differences are not beneficial and can harm international trade. In a global economy management system standards, or meta-standards (Heras-Saizarbitoria, 2013; Uzumeri, 1997), can stimulate international trade by avoiding obstacles arising from national practices (Heras-Saizarbitoria, 2013). The harmonization of international standards can help overcome problems such as information asymmetry, increase accessibility of foreign markets and can legitimise business strategies (Ferron Vílchez, 2017). In essence a management system standard reduces information transaction cost. These are costs that are related to translating the understanding of one organization into an understandable language for another organization with a different country of origin.

Since the management system does not formulate how organizations should operate but merely lay down a basic understanding there is consensus about understanding the management system standard as an administrative standard. However, management systems can also be understood in different frameworks making it a complex and multi-faceted concept such as the perspectives which includes operations management, strategic management, international economics, economic geography and organizational sociology" (Heras-Saizarbitoria, 2013, p. 57). Because this research focuses on the ISO 14001 standard it is relevant to include the understanding of the International Organization for Standardization of a management system

[7] NEN, https://www.nen.nl/NEN-Shop/Vakgebieden/Managementsystemen/De-nieuwe-ISO/De-HLS-als-basis-nieuwe-ISO.htm, (last conducted on 07-09-2018)
[8] NEN, https://www.nen.nl/NEN-Shop/Vakgebieden/Managementsystemen/De-nieuwe-ISO/De-HLS-als-basis-nieuwe-ISO.htm, (last conducted on 07-09-2018)

standard. A management system is “a set of interrelated or interacting elements of an organization to establish policies and objectives and processes to achieve those objectives” (NEN, 2014, p. 46). This definition is supported by further specifications: “a management system can address a single discipline or several disciplines (e.g. quality, environment, occupational health and safety, energy, financial management)” (NEN, 2014, p. 46). The second specification regards the elements: “the system elements include the organization’s structure, roles and responsibilities, planning and operation, performance evaluation and improvement” (NEN, 2014, p. 46). The third remark is about the scope of the management system: “the scope of a management system can include the whole organization, specific and identified functions of the organization, specific and identified sections of the organization, or one or more functions across a group of organizations” (NEN, 2014, p. 46). So a management system can be about one or more disciplines, describes the basis of modus operandi for an organization and can help to define the scope of the organization.

With a management system in place companies can improve their performance “by specifying repeatable steps that organizations consciously implement to achieve their goals and objectives, and to create an organizational culture that reflexively engages in a continuous cycle of self-evaluation, correction and improvement of operations and processes through heightened employee awareness and management leadership and commitment.”[9]

Environmental management system

“Environmental management can be defined as the process of allocating natural resources so as to make optimum use of the environment in satisfying basic human needs, if possible, for an indefinite period and with minimal adverse effects to the environment” (De Beer & Friend, 2006, p. 549). Since this study revolves around the ISO 14001 standard, the definition of an EMS in the certificate will be applied in this research. An EMS is “part of the management system used to manage environmental aspects, fulfil compliance obligations, and address risk and opportunities” (NEN, 2015, p. 13). It is also relevant to distinguish the difference between ‘normal’ policy and environmental policy. Compared to the understanding of policy the distinction is made by adding: related to environmental performance. Environmental policy is defined as “intentions and direction of an organization, related to environmental performance, as formally expressed by its top management” (NEN, 2015, p. 13). The environmental policies influence the environment, which should be understood as the surroundings in which an

[9] International Organization of Standardization, https://www.iso.org/management-system-standards.html, (last conducted on 07-09-2018).

organization operates, including air, water, land, natural resources, flora, fauna, humans and their interrelationships (NEN, 2015, p. 13).

Other relevant parts from the EMS are ‘environmental aspects’. The environmental aspects also relate to ‘environmental impact’ and ‘environmental performance’. An environmental aspects is an “element of an organization’s activities or products that interacts or can interact with the environment” (NEN, 2015, p. 13). The environmental aspects can influence the environment, so the environmental impact is defined as “change to the environment, whether adverse or beneficial, wholly or partially resulting from environmental aspects” (NEN, 2015, p. 14). How the environmental aspects (and their impacts) are managed determines the environmental performance (NEN, 2015). The concept of environmental performance will be further elaborated in chapter five.

ISO 14001:2015

Based on the HLS, the ISO 14001:2015 standard has the same core subjects. But as stated, although the structure of the standard is similar it does not entail that the content of the standard is the same. This also applies for the environmental performance. “Application of this International Standard, however, will not in itself guarantee optimal environmental outcomes. Application of this International Standard can differ from one organization to another due to the context of the organization” (NEN, 2015, p. 9).

The application of the ISO 14001:2015 standard is based on the Plan-Do-Check-Act model (PCDA-model). The PCDA-model was developed by W.E. Deming in 2000 and is applied in the ISO 14001:2015 certificate. In the certificate the stages are defined as follows (NEN, 2015, p. 9):

- Plan: Establish environmental objectives and processes necessary to deliver results in accordance with the organizations environmental policy;
- Do: Implement the processes as planned;
- Check: Monitor and measure processing against the environmental policy, including its commitments environmental objectives and operating criteria, and report the results;
- Act: Take actions to continually improve.

This model supports and includes the main objective of the standard: systematic continuous environmental performance improvement which contributes to the broader sustainability

development. “The organization shall continually improve the suitability, adequacy and effectiveness of the EMS to enhance environmental performance” (NEN, 2015, p. 29).

Although the improvement of the EMS is the objective of the ISO 14001 standard the motivations of organizations to work towards certification are diverse. Epstein (2008, p. 74-75) identifies seven motivations for companies to pursue ISO 14000 and EMAS certification and benefit their management systems:

- Strategic framework, the standards provide a structured methodology for developing EMSs;
- Supply chain pressure, organizations compel their suppliers to adopt better environmental practices;
- Expansion of foreign trade, the ISO 14000 is becoming the *de facto* requirement for companies conducting international business;
- Reduction of regulatory burdens, companies can decrease the cost and time requirements of the regulatory process, improving effectiveness and efficiency;
- Cost reduction, the improvement of corporate environmental performance has been linked with process and product cost improvement, as well as lower risk factor and lower cost of capital;
- Stakeholder interest, certification is used to satisfy investors and environmental groups;
- Reputation, certification is used to communicate the commitment of an organization to improve their environmental performance.

Although these motivations are also identified in other studies and form a good starting point to better understand the motivations of businesses to implement the ISO 14001 standard, some nuances should be made. In a study conducted by Summers Raines (2002) came forward that businesses that had implemented the ISO 14001-certificate had substantial cost savings, but that was not the core motivation to implement the standard. “The strongest motivation came from a desire to provide environmental leadership and to be a good neighbour” (Summer Raines, 2002, p. 423). Ferrón Vílchez (2017) describes a transition in motivation which questions solely the intrinsic motivations. Where the primary motivation of business initially was to improve production efficiency or to comply with legal obligations, business nowadays adopt to the ISO 14001 standard to increase institutional legitimacy. And this search by companies for legitimacy is one of the pitfalls of the ISO 14001 standard. Since the standard does not focus

on the improvement of environmental performance, but rather on the management systems, the correlation between implementing ISO 14001 and environmental performance is contested. “Firms with symbolic profiles try to gain legitimacy through the adaptation of ISO 14001 standard, but they do not necessarily achieve improvements in environmental performance. Consequently, this symbolic adoption of ISO 14001-certificate results in corporate behaviour that contributes the degradation of confidence in the standard” (Vílchez, 2017, p. 37).

The vagueness over the impact of ISO 14001 certification is another critique which is often mentioned. Since “the implementation of the standard does not automatically result in improved environmental performance; rather, it serves to establish means that should theoretically contribute to improved environmental performance” (Boiral & Henri, 2012, p. 85). This can result in differences in environmental performances among similar businesses (Yin and Schmeidler, 2009). Differences in environmental performances which are not pointed out, either an organization has an ISO 14001:2015 certificate or it does not have a certificate. There are no distinctive characteristics within the certificate. As stated in the introduction this is a problem for both customers and organizations. However, according to Arimuri (2008) it is relevant to state that the ISO 14001 standard does effect environmental impact over time due to the incentives it gives to organizations to make long-term efforts for better performance.

Opportunity to be lead the way

Since there are no distinctive qualities in the certificate there is the potential to create more insights in EMSs, resulting in more insights in environmental performances and the opportunity to introduce an ordinal scale within the ISO-certificate. Without clear differences between companies who have the certificate, but do not work particularly hard on improving their environmental performance, the certificate is regarded the same as an organization who is truly devoted to improving their environmental performances. These underachieving organization are having a piece of the same cake without contributing to the effort (Huizinga, P.C., 10-07-2018).

Developing an instrument like the EPS enables companies to sketch a clear image of their environmental performance which can be used as a communication tool throughout the organization, while at the same time enable organizations to distinguish themselves from other parties based on their environmental performances. The development of an instrument as an addition to the ISO 14001 standard, further specifies the certificate without, in essence, international support. If this tool is implemented throughout the Netherlands, it enables

businesses in the Netherlands to lead the way, but how the international community will respond to this leap forward is unclear (Huizinga, P.C., 10-07-2018).

Concluding Remarks

This chapter described the key characteristics and most relevant aspects of the ISO 14001 standard. The HLS is at the heart of a variety of standards in order to enable organizations to combine different ISO standards. As stated and discussed in this chapter the EMS is at the core of this research. Allocating natural resources and managing the environmental impact are relevant characteristics of the environmental aspects in the management systems. The continuous improvement cycle which is included via the PDCA-model will be relevant in this study because this study sheds light on the improvement of environmental performance rather than the improvement of environmental policies. This change of perspective in the improvement cycle contributes to the debate on the value of the ISO 14001-certificate since the approach differs from the approach used by the variety of authors discussed in this chapter.

3. Theoretical Framework

Introduction

As stated in the introduction, this research revolves around testing the EPS in order to gain insights in the environmental performances of companies with an ISO 14001:2015-certificate. Where the previous chapter provided insights and discussed the ISO-certificate itself and the systems incorporated in the standard, this chapter provides an overview of existing literature on more the abstract concepts that are relevant for this study. The objective of this chapter is to identify and discuss relevant concepts in order to develop a general understanding for this study. A broad understanding of the concepts can help the development of the instrument on the one hand, and contributes to the academic debate on the other hand.

Since environmental performance is a relevant concept in this study it is important to provide an understanding of what environmental performance exactly entails. Another aspect in this chapter are the environmental performance indicators. Since environmental performances should be measurable it is relevant to identify what indicators are used to measure the environmental performances. Completing the environmental performance debate this chapter will provide an overview of relevant characteristics of instruments that measure environmental performances and what indicators are included in these instruments. Finalizing this chapter, insights will be provide in the strengths and weaknesses of current available instrument, in order to identify the need for an instrument that measures the environmental performances of organizations with an ISO 14001-certificate.

Although this research focuses on testing a new developed instrument that measures environmental performances and has environmental performances indicators incorporated, it remains relevant to provide a broader overview of environmental performance indicators in order to justify the indicators included in the instrument. Furthermore, identifying which indicators are missing in the instrument might help to improve the applicability of the instrument. The same argument applies for the concept of environmental performance: the EPS bases the environmental performance of an organization on the indicators within the instrument, however, it remains relevant to identify further understandings of environmental performances. So starting this chapter the concept of *environmental performance* will be discussed, followed by an inquiry in existing literature on *environmental performance indicators*. As stated the chapter will lastly discuss a variety of environmental performance measurement instruments to formulate an overview of the most relevant characteristics. In the conclusion of this chapter the theoretical framework in which this study should be understood will be outlined.

The concept of environmental performance

Environmental performances are difficult to measure, primarily because the broadness of the concept makes it difficult to operationalize the concept. A concept which is too all-encompassing, making it difficult to operationalize, loses scientific value (Floyd, 2008), it is therefore relevant to define the concept of environmental performance so that a workable understanding can be developed for the benefit of this study and for further (academic) research. "Without a common definition and measure of environmental performance, our understanding of its antecedents and consequences will be hindered." (Trumpp et al., 2015, p. 186) However, a complete overview of the existing debates on the concept of environmental performance is not the objective of this study nor is it a necessity as long as a good understanding is provided. Yet it remains relevant to discuss these concepts in order to formulate a conceptual framework for this study. When developing a measurement instrument for an organization's performance, one of the first objectives is to define relevant constructs or concepts (Paliszkiewics, 2015).

Where economic growth is in general measured in Growth Domestic Product (GDP) environmental quality is commonly measured in individual pollutant emission levels, ambient air quality or water quality (Hanley et al., 2013). Whereas the economic growth is accommodated in one measurement unit, the GDP, environmental quality has a variety of different measurable components. The variety of different components needs to be identified to develop an understanding of the scope of the environmental performances. It is therefore relevant to discuss what in this research is understood as environment. Which components fall under the umbrella concept of environment and whether environmental performance are the same as sustainable development and how the concepts relate to the concept of (Environmental) Corporate Social Responsibility (CSR or ECSR). " ECSR focuses on firm-specific activities, both compliant and preventative, that limit the adverse environmental impact of these firms" (Rahman, 2011, p. 307).

"One of the key challenges of the ongoing research on CSR practices enables corporations to take account of their dependence of their social and ecological environment. Meeting this challenge calls for moving beyond the narrow economic perspective seeing corporation merely as economic actors dependent on their business environment" (Valentinov, 2013, p.). This entails that businesses have to adjust their mindset and their business strategy. But implementing sustainable strategies effectively demands the implementation of both formal (hard) and informal (soft) systems (Epstein & Buhovac, 2010).

CSR and/or ECSR are often considered within the context of sustainable development on how businesses can support the sustainable transition. The environmental aspects are

included in both the concepts of sustainable development and CSR. “Sustainable development has emerged as an organizing principle for addressing economic, environmental, and social issues. However, at a corporate level there is a weak understanding of how to operationalize sustainable development” (Bansal, 2005, in Macagno, 2013). For this study it is relevant to discuss the concept of environmental development as a separate and independent concept. By focusing on the environment, operationalizing the concept of environmental performance will benefit the development of understanding on how to improve an organization’s environmental responsible business strategy.

Environmental performance measurement and control systems are important: identifying emerging threats and opportunities, facilitate environmental decision-making and coordination by managers, promote goal and value congruence between the individual and the organization, and facilitate learning (Lisi, 2015). The reasons for implementing an EMS vary. Most motivations are related to external factors, such as the organization’s image, market-related advantages, the demands for the market and/or customer, or seeking improved stakeholder communication (Campos, 2015). Internal factors, such as the emergence of response, improved information flows, employee motivations, waste reduction, increased operational efficiency as well as financial and organizational benefits are also grounds to implement an EMS (Campos, 2015). Corporate environmental proactivity is claimed to be associated with favorable internal outcomes such as reduced waste and dischargers, increased efficiency, reduced energy and resource cost, lower risk and better reputation, and reduced compliance cost (Lisi, 2015). Environmental performance measurement systems are also fraught with commensuration problems, which may hamper their effectiveness. “If environmental performance measurements are perceived to have low controllability or technical validity, their use – particularly when linked with rewarding, can have dysfunctional effects” (Virtanen et al., 2013, in Lisi, 2015, p. 28) Second, the environmental domain represents a particularly challenging decision-making setting in which ethical motivation play a crucial role, but they may sometimes conflict with economic considerations.

Environmental performance indicators

“Environmental performance indicators have a powerful appeal to business managers and outside parties, but, to be most useful, this information must adhere to basic guidelines of what gets measured and how.” (Ditz & Ranganathan, 2000, p. 244). Environmental indicators are considered instrumental concepts that must be added to the objectives of society (Campos, 2015). The indicator of an environmental system responds to a generic and entirely social

interest – the sustainability development. “Environmental performance indicators provide data and information about the organization’s environmental performance and are classified in two types: (i) managerial, which provides information about the management efforts that positively influence the environmental performance of the organization as a whole and, (ii) operational, which provides information related to the environmental performance on the operation of the production process” (Campos, 2015, p. 288). Yet, these indicators can only be effective when a common set of metrics emerge that is universally adopted and understood by all (Ditz & Ranganathan, 2000). The ISO 14001 standard has these metrics included in its design, enabling organizations to apply the standard to their own organizational structure, but also have enough freedom to adjust the standard to their organizational demands. The possibility to adjust the standard to personal demands, should also be an added value of the EPS. Since the EPS strives to be a generally applicable instrument, it is relevant that the indicators in the instrument are broad, and if necessary easily translatable to a certain sector. “Companies most frequently use performance indicators that are directly associated with legal requirements, possibly because companies are forced to meet the environmental regulations” (Campos, 2015, p. 293). Yet, compliance does not guarantee that their behavior changes towards a more environmental conscious behavior (Ditz & Ranganathan, 2000). It is the intrinsic motivations that truly improve environmental performances.

DEFRA (UK) identifies 22 indicators and divides them into different categories: Emissions to air, water and land and resource use, but does not include biodiversity since “there is no single, universally accepted method for measuring the impacts of company activity on biodiversity” (DEFRA, 2006, p. 20). The air category includes: greenhouse gases, acid rain, eutrophication and smog precursors, dust and particles, ozone depleting substances, volatile organic compounds, and metal emissions in to air. The water category consist of: nutrients and organic pollutants and metal emissions into water. The land category included: pesticides and fertilizers, metal emission to land, acids and organic pollutants, waste (landfill, incinerated and recycled), and radioactive waste. The last category, resource use, included: water use and abstraction, natural gases, oil, metals, coal, minerals, aggregates, forestry and agriculture (DEFRA, 2006). Although the list of indicators by the DEFRA is rather elaborate, the four main categories are in general included as environmental indicators. The environmental dimension of sustainability concerns an organization’s impact on living and non-living natural systems, including land, air, water and ecosystems (GRI, 2016). “Environmental performance indicators that focus on manufactures, customers and others on products, processes and services that

prevent pollution and boost efficiency" (Ditz & Ranganathan, 2000, p. 214). These indicators include:

- Materials use (quantities and types of materials used): this EPI tracks resources inputs, distinguishing their composition and source;
- Energy consumption (quantities and types of energy used or generated): this EPI, the energy analogue to materials use, also differentiates fuel types;
- Non-products output (quantities and types of waste created before recycling, treatment or disposal): this EPI distinguishes production efficiency from end-of-pipe pollution control;
- Pollutant releases (quantities and types of pollutant released to air, water and land): this EPI includes toxic, chemicals, as well as greenhouse gases, solid wastes and other pollutants;

These indicators are relatively clear for production companies, however, it might be difficult for organizations who provide services to translate these indicators to their sector. This matter is relevant for this study since the EPS aims to be an instrument that can broadly be applied and it is therefore interesting to see whether the instrument has the qualities to indeed be applied into different industries or that the instrument lacks the capability to be applied in a broad field.

Environmental performance instruments

With an understanding of environmental performances and with insights in what environmental indicators entail, it is relevant to incorporate these concepts in discussing the characteristics of environmental performance measurement instruments. This is important since the objective of this study is to determine whether the EPS is an instrument that can be useful for organizations throughout different industries to measure their environmental performances. Therefore this paragraph will elaborate on performance instruments and will narrow the scope by focusing on environmental performance instruments. An overview of qualifications of environmental performance instruments will be used as a benchmark for the EPS in the analysis of this study.

Nor the objective nor the ambition of this paragraph is to formulate or describe a complete overview of existing environmental performance measurement instruments, the objective is rather to provide insights in the ground principles of environmental performance instruments. This approach is justified because of the multitude of environmental performance instrument which are developed for industry specific or even companies specific situations. The EPS in an instrument which has been developed to be applied throughout different sectors thus,

in this study it is more suitable to focus on the broader key characteristics of environmental performance instruments.

The objective of any measurement instrument as a sustainability initiative requires a basis of a corporate environmental management framework to relieve pressure on ecological and social integrity" (De Beer & Friend, 2006, p. 549). Neely (2005) defines performance measurement as the process of quantifying the efficiency and effectiveness of action. Efficiency and effectivity are common concepts in economics or business administration, but in the context of environmental performance the concepts are specifically linked to the environment in which the organization operates in. In economic terms efficiency and effectivity reduce cost and increase therefore revenue. Environmental effectivity or efficiency on the other hand should be understood in a broader sense. It no longer solely revolves around reducing cost, but as the environmental performance indicators show, it regards reducing the impact on the (ecological) environment. Environmental accounting combines the financial aspect with the environmental perspective. Environmental accounting can best be understood as the identification, allocation and analysis of material streams and their related money flows by using environmental accounting systems to provide insight in environmental impacts and associated financial effects" (De Beer & Friend, 2006, p. 549).

In this study environmental performance measurement regards the quantification of the management systems from the ISO 14001 standard via the EPS into measurable metrics. The financial aspect which in included in the economic evaluation and environmental accounting is of limited relevance in this study. A set of metrics can be used to quantify the efficiency and effectiveness of actions which can be defined as a performance measurement system (Neely, 2005). Paliszkiewics (2005) sees the performance of an organization as an analysis of a company's performance as compared to goals and objectives. "A well-defined system of organizational performance measurement can be a powerful mean for prioritizing organizational goals and achieving them." (Paliszkiewics, 2005, p. 22). Within the ISO standard, as discussed in chapter two, the management systems within the standard revolve around describing the modus operandi and continuously improving the outcome. The metrics used in the standard have the objective to implement improved policies and to achieve the organization's goals and objectives. The EPS enables to measure these characteristics of the certificate since it enable organizations to quantify their performances.

"Evaluation is a key step to continuous environmental improvement" (Jiang, et al., 2012, p. 789). When the policy has been quantified, it is relevant for a decision-maker to identify what actions should be taken based on their environmental performances. The PDCA-model

within the ISO standard revolves around evaluation, but also emphasizes the importance to act upon insights regarding potential improvement.

Concluding remarks

This chapter finalizes the (theoretical) background information necessary to develop, to test, and to analyze the EPS and its academic context. Where the previous chapter discussed the relevant information and debate regarding the ISO 14001 standard, this chapter stood still with the more abstract concepts of this study. Discussing the concepts environmental performance and environmental performance indicators and elaborating on environmental performance measurement instruments enables this study to place the EPS in an academic context and to define the key characteristics of the EPS. Thus, the strengths and weaknesses of the EPS can be analyzed and the data from the pilot can be interpreted in this context which is relevant for determining the added value of the instrument and its applicability.

In this study the concept of environmental performance is understood as an independent concept of sustainable development. Whereas the sustainable development includes economic, social and environmental aspects, environmental performance revolves around the impact of human activity on the environment – both corresponding with the definition provided in chapter two and as discussed in this chapter. Reasons to improve environmental performance can differ due to the differences in motivations, either for internal or external benefits, and where long-term and short-term objectives might conflict.

The variety of different indicators can be narrowed down to four shared categories: water, land, air and resource use. These indicators need to be translated into quantifiable measurable metrics. In this study the metrics in the EPS will be analyzed in order to determine if the most relevant indicators are included in the instrument.

These categories need to be include in the instrument. This however leaves a challenge to be broad enough to include a variety of organizations from different sectors, and at the same time can provide business specific information. Trying to find that balance is a relevant objective for the development of the EPS.

4. Methodology

Introduction

In the first chapter of this study the research objectives were formulated, in the following chapters insights have been provided on the ISO 14001:2015 standard, environmental performance, environmental performance indicators, and environmental performance instruments have been discussed in the academic context. Corresponding with the two-fold objective of this study, the research design has a similar setup. The placement of the EPS in an academic context has to a significant extent been discussed in the previous chapter. However, there are still voids that need to been filled with insights that arise from the pilot. The added value of the EPS in not only determined by the usefulness of the instrument for businesses, the EPS should also add insights to the perception on environmental performances of organizations with an ISO 14001-certificate. These should come forward form both the surveys prior to and after the application of the EPS by organizations and from the interviews conducted with participants of the pilot. Testing and evaluating the EPS revolves primarily around two surveys which are part of the test-pilot, additionally further understanding behind the reasoning of the participants come forward from follow-up interviews.

This chapter further elaborates on the research design of this study and focuses on the research strategy where the research philosophy and ethics will be discussed. Followed by the research methods where the choice will be justified to use surveys and interviews in this research, and attention will be given to the unit of observation and unit of analysis. Next the data collection and analysis and the operationalization of key concepts will be discussed. This chapter ends after discussing the validity and reliability of this research. By elaborating on these issues, justification for this research design will be granted.

Research strategy

Nor the objective nor the ambition of this research was to provide a complete and broad understanding of the different research philosophies. It remains however relevant to elaborate on the paradigm in which this study is conducted, since it provides a framework in which the outcome of this study should be understood. Different philosophies bring different perspectives on how reality is perceived, the frameworks provide logic and references to organize observations and reasoning (Babbie, 2010). Understanding the research paradigm in which a research is conducted steers the research in how the study should be conducted. Furthermore it supports the used methods and enables the evaluation of the quality of the research. Finally, the research philosophy can support the strengths of the research design and simultaneously counter

the weaknesses of the design (Rubin & Rubin, 2012). It is therefore relevant to elaborate on the research philosophies that apply on this study.

Since the objective of this research is two-fold it is relevant to discuss the research philosophy for each of the objectives. But to get to the conclusion which philosophy applies to this study, a brief overview of different philosophies is provided from where the discussion builds. In general research can be divided along the line of qualitative and quantitative research and inductive and deductive research. Along these lines different philosophies or paradigms can be distinguished: positivism and interpretivism, and objectivism and constructivism (Becker, 2012).

Positivism and interpretivism

Positivism describes the scientific approach that is based on the rational proof or disproof of scientific assertions, there is an objective observable reality (Babbie, 2010). This reality is independent of human behavior and is therefore not a creation of the human mind (Crossan, 2003). This philosophy is based on a very structured methodology to enable generalization and quantifiable observations based on statistical methods. However, although positivistic research is often conducted via statistical methods it does not exclude other research strategies. So a positivistic approach is not necessarily a statistical approach. Since this paradigm focuses objective observations, "the exploration and examination of human behavior such as feelings, are beyond the scope positivism" (Crossan, 2003).

Testing the EPS via a pilot where organizations from every sector can be involved, entails that the setting of this study is rather unpredictable. Prior to the pilot it was unknown which organizations, with unknown characteristics, would participate. Therefore an inductive research approach is more in place rather than a deductive research approach. Although it is not an absolute reality, inductive research is often conducted within the interpretivism framework rather than in the positivism framework were deductive research is more common. Since testing the EPS was intended to increase insight in the perception of value of such a measurement tool, this is an inductive studies which lies more in line with the interpretivism paradigm. The evaluation of the EPS formulated by the participants of the pilot gave insight in their perception.

Yet, discussing the perception of people does not necessarily and exclusively entail that the research is conducted on the believes of the interpretivists or that it can exclusively be qualitative research. In this research a mixed method is applied. Where the data is collected via survey and provides a mere quantitative data set, the open-ended questions and additional interviews lead to a rather more qualitative dataset. Furthermore, that data-analysis, which will

be elaborated on later in this chapter, is also a combination of a qualitative and quantitative analysis. So both the positivistic approach and the interpretivist approach come forward in this study. A mixed method research framework has the benefit of including the best of both worlds and realizing a research design which corresponds with the real-world. So where the theoretical distinction between the two frameworks rather distinctive, in practice it is more difficult to distinct the two frameworks and combining the two is common (Crossan, 2003; Babbie, 2010).

Since this study uses a mixed method approach it is relevant to briefly elaborate on the perception of reality. This study assumes that there is an observable reality, which is in line with the positivistic philosophy. However, the presence of an observable reality does not entail that the entire scope of an observable reality is known. The recognition of unfamiliarity's in the observable reality is recognized by the post positivism philosophy endorse the assumption that reality and the perception on reality can differ.

A multitude of interpretations of the observable reality is more in line with the interpretivist philosophy, where the assumption is that reality is constructed by a set of social categories, rather than a fixed reality. However, this entails that reality can only exist when it is (socially) constructed and that there is not one objective reality but only a variety of perceptions of reality. Both of the streams in its pure form do not apply to this study. As stated this research assumes that there is a reality, but with the recognition that that reality is multi-interpretable and that reality in its totality cannot be grasped completely.

Quantitative and qualitative research

This overlapping reality of the paradigms is also present in this research design, especially when taking the quantitative and qualitative approaches of research in consideration. Where positivistic research is often quantitative research and interpretivism is in general more qualitative research, hybrid forms are no exception. This research has both quantitative as qualitative characteristics. From the surveys that have been conducted both quantitative and qualitative data is collected. The follow-up interviews with participants were used to provide a more elaborate understanding on the data provided from the survey. Especially with the closed questions, the interviews provided useful support for this study. Furthermore, the open-ended questions in the survey provided qualitative data.

Since the objective of this study was to test the EPS on a broad variety of organizations, it is relevant that a broad variety of organizations is included from different industries, of different sizes, and different durations of being certified. Additionally, the quantitative data

provided insight in the necessity of the development of an environmental performance tool and how the application of the EPS was experienced by the participants.

Inductive and deductive approach

An inductive or deductive research design depends on the knowledge available prior to study. Where a deductive approach is most appropriate for a research where sufficient knowledge is available, inductive research is preferred for studies with a more explorative character (Lauri & Kyngäs, 2005). Since this research revolves around collecting data on the perception of organizations on the EPS, so little knowledge on that matter is present, this research has an inductive approach. From the observations made in this study a set of patterns can be established (Babbie, 2010), which enables to answer the sub-research questions.

Research Ethics

In the pilot participants were asked to provide insight in company specific information. It was therefore important to communicate prior to the pilot that the information gathered in this study would be used confidential. Due to the set-up of the survey – it was obligatory to provide contact information – total anonymity could not be realized. Nevertheless, from the data that is used in this research it is unverifiable which organization provide the corresponding information. The confidential data from the survey has been made anonymous to protect the companies. Furthermore, this study did not revolve around gathering the information from the EPS itself, but rather on the perception of the participants of the EPS. By only providing the end-result of the EPS, the quantity of sensitive information was limited. Further elaboration on the scores contained to some extent company information, but as stated, it will not be communicated which organization provide the answers. “Confidentiality is particularly important in survey research” (Babbie, 2010, p. 292), and keeping the data confidential has been important throughout this study.

For the conducted interviews the same approach has been applied. Participants were informed at the beginning of the interviews that the insights would be used in the context of this research, but that the data would be confidentially handled. After the interviews participants received the transcript of the interview to adjust their answers or to indicate if certain issues were misinterpreted. The interviews with Kees Huizinga and Dieter van Delft were an exception, these interviews had a more open approach. However, they also had the opportunity to comment on the transcripts to filter out misperceptions and to adjust answers. No participant had any comments after they had read the transcript.

Research methods

As mentioned a pilot has been developed to test the EPS. The pilot consisted of three parts, a survey before participants applied the EPS, applying the EPS, and a survey after they applied the EPS. Additionally follow-up interviews have been conducted with several participants to gain more detailed information from the answers that participants provided in the survey. Furthermore, interviews have been conducted to gain insights in the development process of the Safety Culture Ladder and the CO_2-Performance Ladder. The objective of this paragraph is to justify the choices that have been made regarding the selection of research methods and the unit of analysis and unit of observation.

Survey

Validating the EPS, determining its added value, and evaluating its applicability are the main points of interest when testing the instrument. The objective of part 1 is to provide general data about the participant, what the motivations are of the participant to participate in this pilot, and participants are asked to estimate their environmental performances before using the EPS.

In part 2 participants received the EPS. The EPS consists of 26 questions divided into four themes: products/services, supply chain/material purchasing, production equipment/facilities, and process control and safety. Between 0 and 10 points are rewarded for each question which will result in for potential outcomes in relation to their own sector. A company can be a leader, frontrunner, follower or straggler, depending on the outcome of the EPS.

In part 3 of the pilot participants had to fill in a second survey. This survey collects general information about the instrument (how long it took to fill it in, how many people were involved and what their positions in the company are), information about the applicability and clarity of the instrument, a summary of the outcome, and information on what the participant experienced as the added value of the instrument. With the insights from the surveys the research question regarding added value, validation and applicability can be answered. Survey are common in exploratory, explanatory and descriptive studies (Babbie, 2010) and because this study revolves around creating new insights in the perceptions of organization on the EPS, surveys are an appropriate research technique in this study.

Interview

To better understand the outcome of the instrument it is relevant to conduct follow-up interviews with participants to specify their experiences with the tool and what they considered

to be the most important added value of the instrument. Determining the impact of the EPS on environmental performances can be deducted from the perception of the added value of the instrument by participants. However, the main objective of the EPS is not to directly improve environmental performance, but rather indirectly by providing organizations with a detailed description of the current state of their environmental performances. With improved insight in the environmental performance, environmental policy can be adjusted, developed and implemented.

Additionally, and separate from the pilot two other performance instruments, the Safety Culture Ladder and the CO_2-Performance Ladders will be studied. The objective of the analysis of these two performance instrument is to compare the development process, the characteristics, the objectives and the limitations of the tools, with the EPS. By comparing the development process relevant insights in the validation process, process of concept inclusion and demand from the market, can be analyzed. As well as the systematics of the tools and how their objectives are constructed.

Literature study

The environmental performance indicators that are included in the EPS are based on the ISO 14001 standard. However, to put the value of the instrument in academic context it is relevant to gain insight in which factors are used in previous studies to determine environmental performance. Therefore a literature study has been conducted that provides insight in how other tools or instruments function and which criteria are taken into account. The combination with the outcome of the instrument and the response of participants on the outcome of the EPS, the literature study should shed light on whether the instrument has sufficient relevant factors included which determine environmental performance or that the instrument lacks crucial aspects, therefore representing an unrealistic perspective of the environmental performances..

Unit of analysis and unit of observation

This study conducted two surveys and interviews with participants of the pilot to test the EPS and two interviews with experts of other performance instruments. The unit of analysis are therefore the participants who participated in the (complete) pilot. From the unit of analysis data can be withdrawn to study the unit of observation. The unit of observation corresponds with the research questions of this study: the added value of the instrument, the applicability of the instrument, the validation of the scores, the academic context and the characteristics of

environmental indicators within the instrument. Thus, the surveys and interviews were used to analyze the perception of the participants on the EPS.

Data collection

The survey was openly available on the website of SCCM and was brought to the attention of participants via the SCCM newsletter. By filling in the survey prior to the EPS participants gained access to the instrument. It is relevant to state that participants could only participate if they stated that they had the ISO 14001-certificate. After participants had digitally send in the first survey they gained access to the EPS and the second survey.

This approach has been chosen to include more participants, by not directly giving them the instrument data has been collected on the grounds to participate and whether there is a demand for an environmental performance instrument. Information that might have been lost if participants had direct access to the EPS. Furthermore it was relevant that participants provide an unbiased estimation of their environmental performances over the four themes included in the instrument.

In the survey after the EPS participants were asked to evaluate the instrument to gain data on its applicability, inclusion of relevant performance indicators, and added value. It also gave the participants the opportunity to reflect on the outcome of the instrument and to debate whether or not they agreed with the outcome of the EPS. The interviews that have been conducted provided additional insights behind the reasoning of the participants. Participants were asked to provide more context on their organization´s situation and were asked to elaborate on their choices made in the surveys.

Data analysis

The collected data is analysed corresponding with the three parts of the pilot. The organisation's perspective of their environmental performances – prior to the measurement via the instrument – will be compared with the outcome of the instrument. Differences between perspective and outcome need clarification in order to determine whether the perspective was either too ambitious or too modest, or whether the instrument did not measure the real situation accordingly. Regarding the validation of the instrument, participants were also asked whether or not the results represent the real-world situation. And third, in the follow-up interviews participants were asked why they indicated whether or not they agreed with the outcome of the EPS. This triangulation of methods to validate the instrument, is further supported by comparing the validation process of the Safety Culture Ladder and the CO_2-Performance

Ladder. Additionally, the literature study explores which other indicators have been taken into account in previous studies and should determine whether or not certain indicators should be included in the instrument or why it is justified to leave those indicators out of the equation. The combination of the literature study and the indicators in the instrument contribute to sketching a complete picture of relevant aspects which should be taken in consideration when comparing the outcome of the EPS to the real-world situation.

The feedback on the instrument will determine the added value. Positive responses and outcomes which increase insight and improve strategic development – long term or short term – are indicators of a useful and valuable instrument. The aim of this study is also to determine the difference in the added value of the instrument between organizations. The value of the EPS can for example differ among organizations due to their differences in size, sector or how long they have the ISO 14001-certificate. The analysis of the perceptions of value of the EPS can steer the development direction of the instrument. If the pilot shows that especially larger companies experience benefits from the instrument, choices occur whether the instrument should broaden its scope to include the demands of smaller organization or that it should further specify to fit the needs of larger organizations even better

In comparison, the data on the applicability of the instrument is analysed from a more quantitative angle. Statements have been formulated and participants had to indicate to what extent they agreed with the statements. Combining the results from the statements gave insight in the appreciation of the participants of the instrument, and provided insight in the clarity and understanding of the systematics of the EPS.

Reliability and validity

Validity revolves around the description of the measure that reflects the concepts which is measured (Babbie, 2010). Whereas reliability revolves around demonstrating the research operation in order to make it possible to repeat the study and develop the same results (Yin, 2009). In every research where one researcher conducts the study validity and reliability might be contested by biases from the researcher (Babbie, 2010). However, this can be overcome by standardized data formats and clear documentation of the choices that have been made in this study. The documentation of data and made choices are of key importance, otherwise the validation of the instrument will be in jeopardy. As this study used a fixed questionnaire prior and after the EPS, the data is collected in an organized and controlled manner. The additional interviews have a more fluid approach but overall similar questions were raised. Thereby, the flexibility of the interviews contributed to a deeper and more specified understanding of the

experiences and recommendations made by the participant of the pilot without harming the reliability.

Constructing a valid research can be granted by doing three validity tests: on the construct validity, the internal validity and the external validity. Validity issues occur throughout the entire process of research (Yin, 2009), external validity should be granted during the development of the research design and a research design should enable the generalization of the results from the study. The objective of this study is however not to generalize the outcome. The outcome can be used in further research with a broader set of participants.

Internal validity should be considered in the data analysis, whereas reliability is especially important during the data collection process. During the data collection attention should also be on the construct validity.

The construct validity revolves around identifying the correct operational measures for the concepts being studied (Yin, 2009). Construct validity is accomplished when there are logical relationships between the variables being studied (Babbie, 2010). In this study the construct validity is realized by the structured data collection. Via the surveys participants provide direct data on the variable being studied for example the applicability of the instrument.

The internal validity of a research is realized when the conclusions drawn from the study reflects what the data of the study represents (Babbie, 2010). The objective for the researcher is to seek causal relationships between certain conditions (Yin, 2009). The data analysis in this study is structured, due to the direct questions in the survey. Since the questions are formulated strictly and have most often closed-end answer possibilities, the internal validity is realized due to the limited space that is left for different interpretations. Only with the open-ended questions the interpretation of the answers can harm the internal validity. However, this can be overcome with the follow-up interviews.

The external validity revolves around generalizing the results of a research. Prior to this research SCCM tested the tool on a smaller sample of four companies. This research is in that sense the second test, but on a larger scale. So, with a sample of 25 participants this research cannot generalize the results one on one, but should rather focus on the contribution as a part of the large generalization. This research applies an analytical generalization: the investigator is striving to generalize a particular set of results to some broad theory (Yin, 2009) “The generalization is not automatic. A theory must be tested by replicating the findings in a second or third neighbourhood, where the theory has specified that the same results should occur” (Yin, 2009, p. 44). The entire set-up of this research design contributes to provide insight in the

perception of a large scale test-case, which enables to, to some extent, generalize the findings of this study in the broader understanding of analysing environmental performances.

Concluding remarks

This chapter discussed the mixed method approach in this study, it elaborated on the research design, the set-up of the pilot, the various data collection methods and the data analysis. This design has been chosen to successfully meet the two-folded objective of the study in a valid and reliable manner. By including aspects of the positivism and interpretivism frameworks this research benefits from the strengths of both paradigms and enables a research design that can meet the objectives of combining quantitative and qualitative data collection and analysis to formulate a well-founded answer to the main research question to conclude this study. Regarding the external validity and generalization of this study there are two things that are relevant to conclude: (1) in general qualitative research is not per se suitable to generalize the outcome of a research, quantitative research is more often used in studies with the intention to represent a larger group than the research group; (2) the objective of this study is to add a relatively small test-case to the body of knowledge by using the qualitative data of this research as an elaborative and supportive advantage to the quantitative data from the pilot. It is not the objective of this study to draw a conclusion over a larger group based on the outcome of this research.

5. Comparing performance instruments

Introduction

This chapter is devoted to two performance tools: the CO_2-Performance Ladder and the Safety Culture Ladder. These instruments have to some degree a connection to sustainability. However these instruments are studied to compare the development, characteristics, objectives and strengths and limitations of the tools in order to compare them with the EPS. First the Safety Culture Ladder will be discussed, followed by the description of CO_2-Performance Ladder, and this chapter will conclude by comparing the EPS's processes and characteristics with the features of the two instruments.

It is relevant to take the development process of the instruments in consideration because these instrument were faced with similar issues as the EPS, regarding validation, inclusion of certain indicators and acceptance by the market. Although the different features of the instrument will be described, the characteristics of the instruments are primarily compared regarding their systematics. Comparing objectives is also relevant in this study. Both the objectives of the instrument – why the instrument should have been developed – and the objectives of those who use the instrument. This structure also applies throughout the coming three paragraphs: the Safety Culture Ladder, the CO_2-Performance Ladder and EPS in perspective.

Prior to discussing these two performance instruments in comparison to the EPS it is relevant to discuss a shared characteristic of the Safety Culture Ladder and the CO_2-Performance Ladder. These instruments are both used in the tender process of projects. For interested project developers these instruments are interesting because they provide them with a fictional discounts. These fictional discounts increase when organizations score higher on these ladders. So in the tender process organizations can increase their competitive advantage, since a bigger fictional discount enables them to lower their absolute offer. For example: project developer A offers 10 million to build a new bridge without a being certified. His competition, project developer B, has a certificate on level three and therefore realizes a 10% fictional discount. This entails that his absolute offer only has to be 9 million to match the offer of project developer A. So project developers have a financial incentive to be certified since it enhances their competitive advantage. Such a financial incentive is not included in the EPS.

Safety Culture Ladder

The insights in the development process, characteristics, objectives and strengths and limitations of the Safety Culture Ladders came forward from an interview with Dieter van Delft,

who has more than 30 years of experience at ProRail and is currently Advisor External Quality and Procurement at ProRail. He began at procurement in 2011, simultaneously the idea arose of the development of an instrument to improve safety. Although ProRail did work safely at the time, there was consensus that safety could be improved, especially when they compared themselves to the best practices regarding work safety. Because Van Delft was so closely involved in the development and initial implementation of the Safety Culture Ladder this paragraph will primarily focus on the development process of the instrument.

Development

Van Delft describes ProRail as a contract factory since they outsource most of their activities to contractors, engineers and other parties. So the challenge was to use that tender power to increase safety, by including these parties in the process. From that starting point onwards several meetings were held in order to establish the objectives, content and scope of the instrument. One of the first conclusion was that the Safety Culture Ladder should have a people-orientated approach rather than a systematic approach. Van Delft states that this approach was chosen because they were convinced that when you can change human behavior and actions, safety can truly be improved (Van Delft, P.C., 14-07-2018). Another relevant argument was that there are already several safety instrument focused on the systems in place like the OHSAS and VCA. In order to develop an instrument that has added value, improving safety had to be approach differently.

With a people focused mindset as basis of the instrument the content of the instrument and its systematics had to be filled in. Since ProRail was familiar with the organizations that had high safety scores, they approach them to observe what they did to reach a high safety level. Although each organization had its own safety systems and instruments in place the common denominator was the principle of Hearts and Minds. Hearts and Minds is a tool developed to gain insight in or to adjust the behavior of people within an organization, in order to establish a safe working environment.[10] The Hearts and Minds tool is a self-assessment tool and according to Van Delft a self-assessment tool does provide a sense of improvement but over time it is difficult to pin-point hard evidence of improvement. Therefore the developers of the tool concluded that the Safety Culture Ladder had to be an objective instrument. But since contractors, engineers and several other parties were already familiar with the concepts of Hearts and Minds they decided to take over the five development stages – also the case with

[10] Werk en Veiligheid, https://www.werkenveiligheid.nl/werken-met-hearts-and-minds (last conducted on 25-7-2018).

the CO_2-Performance Ladder – and the fourteen business aspects and included them in the Safety Culture Ladder.

Now that the structure of the instrument was set, the next objective was to work out which requirements should be included in the instrument and what qualifications each step of the instrument should have. In order to establish the requirements they tried to visualize the five stages of safety development, based on the expected observations which corresponds with an organization on a certain step. For the first three steps of the instrument – Pathological, Reactive and Calculating – expectations of requirements could be visualized. However, for the last two steps – Proactive and Progressive – it was more difficult since there were little to no organizations that could be regarded as an example at these steps. Especially visualizing the Progressive step was difficult (Van Delft, P.C., 14-07-2018).

To validate the requirements and corresponding end results, ProRail conducted test audits in the railway sector and in the petro chemistry industry. Before the audits ProRail estimated themselves to be at the second step, Reactive, and the petro chemistry industry was estimated at step four, Progressive. When the results of the audits confirmed the expectations the next step was to enroll the instrument on a larger scale.

ProRail has its own recognition schemes which operates as a pre-qualification for contactors which want to cooperate with ProRail. ProRail approached these organizations, but also approached specific companies who are working primarily with safety, to include them in the development process of the instrument. With these parties the progress of the development was discussed, but the organizations were also asked to provide feedback which was included in the test-audits. This led to a broad support for the Safety Ladder among the organizations, which benefits one objective of the instrument, improving working safety together.

The development process was completed in 2012 and in January 2013 the Safety Ladder made its formal introduction. Since the instrument had a financial stimulus, the fictive discount for contractors, Van Delft states that in the beginning the fear of the developers was that organizations only would implement the Safety Ladder for the financial benefits. Luckily, as it turns out, those fears were ungrounded, and organizations implemented the tool to increase the safety culture of their organization.

An important turning point for the instrument was in 2016 when ProRail decided that it could no longer be responsible for the instrument. Due to the success of the instrument and its broad application throughout different industries, ProRail felt that the instrument was becoming more a public instrument and that it should be given to the “B.V. Nederland”. This meant handing over the responsibility, development and certification over to NEN.

Characteristics

Some characteristics of the instrument have already been touched upon, the integral safety approach, the cooperative approach and the different steps of the instrument. To better understand the instrument, in order to compare (the systematics) with the EPS, it is relevant to briefly elaborate on the characteristics of the Safety Culture Ladder.

A relevant development after the formal introduction of the Safety Culture Ladder was that a burst of energy came free from the companies. Organizations had struggled with operationalizing, visualizing and improving safety, and with the different approach of the instrument organizations started to approach safety differently. According to Van Delft that had to do with the focus on people rather than on systems, but also to a great extent with the integral approach of the tool. Safety was not only about the factory act, but also focused on security, social security, external safety, all in all, a broad scope. The combination of people orientated and the integral safety approach established a new framework where organizations felt comfortable with and had a stimulating effect on the improvement of safety within the organization.

The steps

The Safety Culture Ladder has five different steps where step one has the minimal criteria to get a certificate, and where step five is rather illusive since no organization has reached that level yet.

There are also no certified organizations on the first step. The Pathological step is characterized by "ignorance is bliss". "The company's attitude is: 'we have no mishaps, we deliver good quality, so why should we waste time on preventive activities' and 'what you do not know will not harm you'. The company makes little to no investments in improving safety behavior. This is not the desired attitude and will therefore not be rewarded."[11] This step however does not entail that an organization operates unsafe. Van Delft emphasizes that the instrument is an addition to legal requirements. What the steps on the ladder indicate is the level of intrinsic motivation which, when higher, reduces the possibility of an unsafe situation.

The Reactive step is characterized by ad-hoc and temporary changes. "The company tends to make changes after things have gone wrong. The response is based on deeply ingrained patterns. Employees are inclined to feel themselves the victim of a situation, rather than

[11] Safety Culture Ladder, http://www.veiligheidsladder.org/en/the-safety-culture-ladder/safety-culture-ladder-steps/ (last conducted on 25-7-2018).

personally responsible. ‘But that is not my fault?’ Change behavior is often ad hoc and short lasting. This behavior is moderately valued.”[12]

The first step where the behavior of an organization is valued is the Calculation step and safety rules are considered important. “The company has determined which safety rules are important. It adopt a vulnerable approach, assumes responsibility, but is often driven by self-interest. ‘What is in it for me?’ Involvement in safety and compliance with rules and laws is mainly the task of (senior) management. Attention is given to health and safety, which is valued.”[13]

The fourth step is the most frequently desired step when organization start with the process of certification. On step four safety has a great priority and is continuously improved. “Safety has high priority, is deeply ingrained in the company’s operations. Continuous investments are made in raising awareness and employees are encouraged to confront one another with unsafe behavior. Improvements are structurally implemented and evaluated. The approach is characterized by proactive and initiative. Safety awareness is regarded as an own responsibility: ‘how can I contribute?’ This form of behavior is highly valued.”[14]

The highest step, and a yet to be reached step of the ladder, is the Progressive step. On step five safety has been fully integrated into all business process. “Safety is fully integrated in the operational processes. It is a fixed item on the agenda during feedback and evaluation within the organization and with sector parties. Safety is ingrained in the thinking and behavior of all employees; it is part and parcel of their work. This is very highly valued.”[15]

CO_2-Performance Ladder

As with the previous paragraph the development process, characteristics, objectives and strengths and limitations of the CO_2-Performance Ladder will be discussed. To gain these insights an interview has been conducted with Kees Huizinga, sustainability advisor at Rijkswaterstaat and researcher at the Erasmus University. As member of the Central College of Experts – Environment (CCvD – M) he is also familiar with the development of the EPS. Since Huizinga was, compared to Van Delft, less involved in the development process of the CO_2-Performance Ladder, the focus of this paragraph will be more on the connection between the CO_2-Performance Ladder and the ISO 14001-certificate.

[12] Safety Culture Ladder, http://www.veiligheidsladder.org/en/the-safety-culture-ladder/safety-culture-ladder-steps/ (last conducted on 25-7-2018).
[13] Idem.
[14] Idem.
[15] Idem.

Like the Safety Ladder the CO_2-Performance Ladder is developed and implemented by ProRail. In 2008 the CO_2-Performance Ladder was implemented for the first time. Similar to the development of the Safety Ladder the CO_2-Performance Ladder growth demanded an independent party who was responsible for the certification. In the instance of the CO_2-Performance Ladder the Foundation for Climate Friendly Procurement and Business (SKAO) took that responsibility over in 2011, and manages all the regards of the ladder: its use, its continued development, managing the certification scheme and the expansion of participating industries.[16]

As stated in the previous paragraph ProRail can be described as a contract factory. And as with safety, ProRail felt the responsibility to contribute in reducing CO_2-emissions. The similarity between the two instruments is that they are both developed to provide contractors with a fictional financial advantage. The distinctive character and capabilities of the instrument were important to Rijkswaterstaat and ProRail, since contractors can be distinguished from one another. That capability of the CO_2-Performance Ladder was the most important issue according to Huizinga.

The objective of the instrument is to help organizations to reduce CO_2-emissions in a structural manner. The focus of the instrument is on business management, projects and on the chain (SKAO, 2017). The focus of the instrument depends on the step of the organization on the ladder. The CO_2-Performance Ladder is divided in five steps where the first three steps primarily focus on the organization itself and step four and five concern a broader approach since the focus is on the organization and the chain. Logically organizations can have the CO_2 certificate if they fulfil the requirements of step one. However, in practice it turns out that most organization start at step three, the highest level with a primarily internal focus on CO_2-reduction objectives. From step four the focus of the organizations starts to shift from internal to external. An organization on step four should also contribute to CO_2-reduction in the chain and innovation. On step five, the highest level, an organization shows that it accomplishes ambitious objectives, by cooperating in the sector and by autonomously adjusting purchasing, products and/or services of its own organization (SKAO, 2017). Throughout these levels the organization should comply with general demands, and within the five levels fulfil the demands from four perspectives:

- Insight: Identifying the energy streams and the CO_2-footprint;

[16] SKAO https://www.skao.nl/about-skao (last conducted on 23-7-2018).

- Reduction: Developing and implementing energy and CO_2-reduction measurements;
- Transparency: Internal and external communication about CO_2-policy;
- Participation: Participation on initiatives in the sector on the in the area of CO_2-reduction. (SKAO, 2017).

The general demands support the objective of continuous improvement of CO_2-reduction. As with the ISO 14001:2015 standard, the PCDA-model is included in the CO_2-Performance Ladder as a tool to assist organizations. Within the CO_2-Performance Ladder especially the Check phase is relevant since an annual internal audit operates as the input for the annual management review (SKAO, 2017).

CO_2-Performance Ladder development

From the start the CO_2-Performance Ladder was a success. According to Huizinga the success of the CO_2-Performance Ladder had to do with several components of the instrument. The fact that the instrument was developed to provide contractors with a fictional discount was an incentive that stimulated a lot of organizations to develop policy towards a CO_2-Performance Ladder certificate in order to remain competitive and to sign new projects. Especially the idea of a ladder increased the attractiveness of the instrument because it gave organizations the opportunity to distinguish themselves from others. Another relevant aspects is the simplicity of the subject of the instrument. CO_2-reduction is one of the many sustainability factors, but according to Huizinga, CO_2-reduction is also an aspect of sustainability where people are familiar with and impacts to the most relevant sustainability aspect: the climate. Additionally, by solely focusing on CO2-reduction, it is relatively easy to operationalize the instrument within an organization. For example energy use is something that can be outsourced or companies can change to a green energy provider (Huizinga, P.C., 15-07-2018). The last relevant aspect which can clarify the success of the CO_2-Performance Ladder is that the foundation of the instrument was based on the cooperation between the top of ProRail, Rijkswaterstaat and the private sector. They collectively decided that the CO_2-Performance Ladder was the instrument that they would use in the Netherlands.

The cooperation between (now) SKAO, Rijkswaterstaat and the private sector continuous in order to adjust and improve the instrument. The adjustments and improvements remain relevant, as stated in the previous paragraph time on its own is an incentive to keep reinventing the key components of an instrument, but another incentive to adjust the CO_2-

Performance Ladder is the fact that from the start contractors relatively quickly reached level five. According to Huizinga it is in essence a good sign that contractors are at level five rather than on a lower level, but is also forces SKAO to further specify the instrument to keep its distinctive capabilities. Without the distinctive power the instrument would decrease its value since the most important application is the fictional discount for contractors.

In the early stages of the instrument the application of the tool was only for contractors of ProRail, but as the CO_2-Performance Ladder developed and more organizations got a certificate, the instrument was applied in a broader field. Rijkswaterstaat uses the instrument throughout the organization, but also other governmental bodies like provinces, municipalities and regional water authorities. But the instrument can also be used for business to business (Huizinga, P.C., 15-07-2018). An external effect of applying the instrument is that the tool holds up a mirror for the organizations. Although the primarily objective is to sign new projects, the mirror function is especially useful for the management review, which is included in the Check phase.

Since the main objective of the instrument is to realize fictional discounts, there is an extra incentive to get a certificate or to climb the ladder prior to a major project. When an organization realizes a higher level on the ladder the fictional discount will increase. This has an effect on the application of the instrument. The instrument either be applied on a project or on an organization. So an organization with all its activities is at a certain level or a contractor decides to apply for a project with a certain level. This can result in a conflict of interest between long-term CO_2-reduction objectives and the short-term objective of signing a new project. “Managers working for companies that adopt sustainability policies face continuous pressure as they try to juggle short-term profitability and the responsibilities towards sustainability” (Lee & Hageman, 2016). Huizinga states that these situations have occurred but that in general a developer was aware of this pragmatic and opportunistic behavior. Therefore certain control elements are included, and, especially if an entire organization has a CO_2-certificate it is difficult to keep up appearances without truly adjusting the organization’s business management.

Limitations of the CO_2-Performance Ladder

As discussed, a challenge for SKAO is to create sufficient requirements in the instrument in order to keep its distinctive character. There are also other issues, regarding concrete CO_2-reduction and how the strength of a one-sided focus can also be considered a weakness. Where

the one-sided sustainability approach of the CO_2-Performance Ladder has its benefits for the operationalization of the instrument within an organization, its lack of an integral approach on sustainability is also a pitfall of the instrument. By only focusing on CO_2-reduction a waterbed effect can occur. Huizinga uses the example of diesel engines from ten years ago. Lobby groups promoted diesel engines because diesel engines emit less CO_2. Although that assumption is correct, it increases the emissions of small particular manner and Carbon. Other external effects of a limited scope are different waste streams that can develop. That is where the ISO 14001 standard stands out from the CO_2-Performance Ladder, since it is an all-encompassing instrument.

The CO_2-Performance Ladder revolves around CO_2-reduction however there are no strict CO_2-reduction schemes included in the instrument. The CO_2-reduction is more abstractly formulated. Although the assumption is made that when an organization adapts to a higher level it will be assigned to more sustainable project, and research has been done to confirm the assumption, but the actual CO_2-reduction, both for an organization or a project, remains abstract.

The EPS' development process

The development process of the EPS is discussed with Frans Stuyt, developer of the EPS and director of SCCM and he stated that the Netherlands is unique in the world due to the coordinate approach on certification (Stuyt, P.C. 24-7-2018). Although the International Organization for Standardization has taken the initiative to develop an international database, the Netherlands are as of yet the only country that has a certificate database. This collaboration between different parties is therefore unique. And according to Frans Stuyt (P.C., 24-7-2018), a reason why it is possible that an instrument like the EPS can be developed in the Netherlands. Before the EPS was developed SCCM had conducted several inquiries to gain insight in the perception of both public and private sector of the value of the ISO 14001-certificate.

From these research two main conclusions were drawn that both were an incentive to develop an instrument to overcome the problems. One of the problems that was drawn from the studies was that organizations experienced that the certificate does not clearly informs about the performances, while the improvement of performances are an essential part of the standard. Another issue was that auditors experienced difficulties when examining the standards. They noted that organization only slightly adjusted their management systems so they could state that they had fulfilled their standard obligation. While others only made little adjustments because they feared that if they improved their management systems now, little room for improvement

would be left in the future. These two odd mechanism fed the desire to develop an instrument that could give the certificate more body and more handles to organizations. The development and the success of the CO_2-Performance Ladder led to an increased need of an instrument that was related to the ISO-14001 standard.

These three issues, in combination with the problems regarding the limited scope of the CO_2-Performance Ladder, were the starting point for Stuyt to develop of the EPS. One of the characteristics of the EPS should be that it is easy to apply and has a limited size. Compared to the CO_2-Performance Ladder or the Safety Culture Ladder, the EPS can be filled in within a few hours rather than a day.

After the first development stage some organization were approached to provide feedback. One of the more relevant remarks was that the way of questions differ and that was undesirable. For the clarity of the instrument the way questions were raised were harmonized, but the approach regarding the themes stayed the same. As with the previously discussed performance measurement tools, the EPS is also submissive to the constant of change. With the passing of time new (technological) developments will force the instrument to adjust itself in order to remain valuable. However, the demands set in the instrument do not have to be adjusted (Stuyt, 24-7-2018).

The development of the EPS is as of yet in an early stage, the most relevant objective therefore is to establish that organizations are using the instrument. The next development step would be that organizations are using the instrument to communicate with their surroundings. Followed by the step that organizations are communicating with each other, from then on it is relevant to judge the outcome that organizations communicate (Stuyt, 24-7-2018).

Concluding remarks

The development of the three instruments are rather similar: a desire from the market has been identified, an initial instrument is developed and presented to a small group of organizations, the different levels or steps have been given distinctive characteristics, and the instruments are validated by comparing the outcome of the instrument with the perception of the organizations themselves. However, some distinctive differences have also been established. When comparing the Ladders to the EPS, they both operated, especially at the beginning, as an external financial motivation for companies to apply the instrument. This is different with the EPS where internal motivations to improve environmental performance is the main stimulus. Although, especially with the Safety Culture Ladder, internal motivations to apply for a certificate become increasingly important.

The systematics in the instruments is also similar since all the instruments have a continuous improvement cycle included. Although the EPS does not have the PDCA-model included, the ISO 14001 standard does. This continuous demand for improvement is also discussed in the literature as a relevant characteristic of a well-operating instrument. It remains however relevant, as stated by Stuyt, Van Delft and Huizinga, that the instruments themselves also follow the latest developments in order to remain an important instrument with significant value.

Compared to the CO_2-Performance Ladder the EPS has a broader and more integral approach on environmental policy/issues. Although a broad variety of issues within the CO_2-Performance Ladder CO_2 is connected, the EPS includes more environmental performance indicators, such as water and land quality and how other businesses in the chain can contribute to an integral improvement of environmental performances.

One of the participants in the pilot stated that the ISO 14001-certificate is a dis-selection criteria for their organization. This entails that in their sector organizations need to have an ISO-certificate in order to compete in the tender process, without a certificate they have no real chance to get the tender. (P.C., 30-7-2018) However, with the development of the EPS different levels can develop and can help organizations to distinguish themselves. As of yet, the different levels in the EPS need further specifications on what the key characteristics are of organizations on a certain level. It is therefore relevant that in cooperation with businesses, a clear foundation needs to be developed for each level. With a more distinctive and clear description of the levels, organizations will be able to distinguish themselves from others, but also have a better understanding of their current environmental performance in the context of their sector.

6. Analysis of the Environmental Performance Scale

Introduction

Where the previous chapters focused on the methodology of this study, the theoretical approach on environmental performance, and the development process of a performance instrument, this chapter is devoted to the presentation and analysis of the survey prior and after the application of the EPS. Corresponding to the pilot design this chapter is divided in the presentation and analysis of the questionnaire prior to the application of the EPS and the presentation and analysis of the questionnaire after participants had applied the instrument.

For each question from the survey the answers will be presented and discussed. As stated in the methodology the conducted interviews are used to further elaborate on certain question to provide better understanding of the argumentation behind the answers. Where tables provides a clear overview of the data, the discussion on each question will provide context to the data and discusses the objectives of this research regarding societal relevance, academic relevance, generalization of this study, and with these insights the main objective of this chapter is to answer the following sub-questions:

- How does the EPS operates in practice?
- What are the added values of the instrument?
- To what extent can the EPS increase the value of the ISO 14001-certificate?
- How is the applicability of the instrument perceived by businesses?

The answers to these questions will enable this study to conclude the first objective of this study, namely determining the practical value of the EPS. With the practical value of the EPS analyzed this chapter builds on the conclusions to analyze the instrument from an academic perspective by placing the value of the instrument in the academic debate and by comparing the EPS to the characteristics of well-operating instruments as discussed in chapter four.

This chapter begins with the analysis of the questionnaire prior the application of the EPS, followed by the analysis of the questionnaire after the application of the EPS and will conclude by answering the previously raised questions.

Survey prior to the EPS

The survey that gave organizations access to the EPS and had to be filled in prior to the application of the EPS, primarily focused on general information of the organization's sector, how long the organization is ISO 14001 certified, number of employees, and reasons why they choose to participate in this study. For the validation of the instrument participants were asked to estimate their environmental performances for each of the four themes included in the EPS

– products/services, supply chain/material purchasing, production equipment/facilities, and process control and safety. Since the validation regards the comparison between the estimation of the organizations prior to the application of the EPS and the results from the instrument, it will be included in the analysis of the survey after the application of the EPS.

General information survey prior to the EPS

All the participants that filled in the survey before the application of the EPS have an ISO 14001-certificate. In the questionnaire participants had to declare that their organization had the ISO-certificate, if not, they could not continue the survey. This resulted in the inclusion of 85 organizations with an ISO 14001-certificate. From the 85 participants, 25 completed the pilot, this entails that they had filled in the survey before the EPS, they applied the EPS, and finally they completed the second survey. Prior to this study the instrument has been tested on a small group of four organizations. With the results from that study the objective was to test the instrument on a larger scale. The desire was, from the perspective of SCCM, to include 20-25 participants in the second test of the instrument. Where more participants would have provided more value to the test, the minimum of 20 participants has been easily met. Especially when taking the other 60 participants who did not complete the pilot in consideration, but gave valuable information on the demand for an instrument that measures the environmental performances.

The 85 participants come from a broad variety of sectors. Appendix A provides an overview of the different sectors in which the organizations operate in. The most frequent sector was the construction sector (11), followed by the metal industry (5) and the (technical) installation sector and the business services sector (both 4). The inclusion of many different sectors is relevant for testing the instrument. With a broad variety of industries we can learn more about the capabilities of the instrument to be simultaneously broad enough to include the variety of sectors and can be precise enough to formulate results that both corresponds with the real-world state of affairs and the daily activities of the organizations. This will be elaborated on in the analysis of the survey after the application of the EPS. Furthermore this paragraph discusses to a broader extent the number of employees and the duration of the certificates. The next paragraph goes into detail on the grounds of the organizations to participate in this pilot.

Table 2 provides an overview of the number of employees of the participating organizations, it includes both the participants who completed the pilot and those who did not fill in the second survey, and thus not completed the survey. There is a normal representation

of the different sizes of companies. The extremes are the less frequent and in the middle the most participants are represented.

Number of Employees	Frequency
<10	3
10-30	8
31-50	11
51-100	19
101-250	12
251-500	13
501-2000	12
>2000	7

Table 2: Number of employees and corresponding amount of organizations.

Table 3 gives insights in the variety of 'years of certification', as with the sizes or the organizations, the years of certification has a normal distribution. The difference in how long an organization has the ISO 14001-certificate can influence the grounds on which they participated in this pilot. For example, for organizations which only recently received the certificate, the instrument could be useful as a starting point from which they can develop their environmental policies, whereas for organizations that have the certificate for more than 10 years for example, the instrument might provide new insight on how to approach the continuous improvement process. The information from table 2 will be included in the analysis of the arguments to participate in this pilot later on in this chapter. Further in this chapter the general information of participants who completed the entire pilot will be presented and used in the analysis of the questions from the second survey.

Years of certification	Frequency
Shorter than one year	6
1 year	4
2 years	9
3-5 years	25
6-10 years	26
Longer than 10 years	14
Unknown	1

Table 3: Years of certification and corresponding amount of organizations

Grounds to participate

In the questionnaire prior to the EPS two statements were presented to the participants regarding their grounds to participate in this pilot. Additionally an open-ended question was raised in

order to provide the participants the possibility to formulate other reasons to enter the pilot. Table 4 provides an overview of the answers to the statements – the answers vary from totally disagree with the statement to totally agree with the statement. The other reasons will be discussed in this paragraph, Appendix D provides the complete set of additional grounds of organizations to participate in this study. Furthermore, from the interviews with four participants additional insights will be added and discussed.

As table 4 shows organizations are often orientating themselves on possibilities to improve their business or to keep an eye out for potential new opportunities. 76 out of 85 participants or 89% stated that they had interest in the pilot in order to take new developments into account. Rather more relevant for this study is that 73 out of 85 or 86% indicated that their organization would benefit from an instrument that provides more insights in their environmental performances. This corresponds with the findings with the results from previous studies. As discussed in chapter two and chapter four, there is no consensus on whether the implementation of the ISO 14001 standard results in better environmental performances. The statements clearly show a demand for a tool that provides these insights, considered relevant in the development of the EPS (Stuyt, P.C, 2018).

	Totally disagree	**Disagree**	**Neutral**	**Agree**	**Totally agree**
We participate in this research because we want to follow recent developments	2	0	7	40	36
There is a need for an instrument that provides better insight in the environmental performances of the organization	2	1	9	48	25

Table 4: Statements about reasons to participate in the pilot and the corresponding number of organizations.

Additionally, 29 participants formulated other/additional grounds to participate in this study. Roughly five different alternative reasons can be derived from the given answers. The main argument that organizations formulated as an alternative reason to participate in the pilot was to ‘generate insight’ or ‘new insights’ or ‘more knowledge’ (14 out of 29 answers). But within this set of additional reasons to participate are some relevant nuances. Despite the fact that all these organizations are looking for more information about their environmental performances, their arguments on why they need that information vary. A participant from an organization that only recently got the ISO 14001-certificate, stated that they are still learning and hoped that the EPS could contribute with further improvements. While on the other hand, two participants

which have the standard for more than 10 years, formulated that they are looking for new insights which have not been considered. So throughout the organizations the search for more insight in the environmental performances is clear, however, how the organizations will use the information varies.

Another desire for more insight came forward from an interview with an organization in the service sector, they participated because they feel that due to the characteristics of their organization – primarily operates in an office – they have limited possibilities to improve their environmental performances. So by participating in the pilot they hoped to gain new insights and 'clear examples' (P.C., 25-07-2018). Although new insights were provided by the EPS, concrete examples on where to improve certain environmental performances were not given. This however, is not an objective of the EPS. The instrument has the objective to give an overview of the environmental performances rather than providing organization detailed directions of improvement.

The second biggest cluster of additional reasons is simply because organization are interested or curious. Especially in what the instrument has to offer and to what extent the instrument has a substantive foundation.

Another set of reasons to participate was that organizations want to compare the EPS to other performance tools. Two of the four participants who formulated this additional reason to participate are active in the construction sector. In this sector it is common to have the CO2-certificate from the CO2-Performance Ladder, discussed in the previous chapter. One of the two participants stated that the EPS could potentially improve their performances on the CO2-Ladder. But in general these four participants want to compare the EPS to the instrument they currently apply. Since the CO2-Performance Ladder can be used to include or exclude contractors from a project, by formulating a minimum criteria based on the Ladder, a participant stated that adding different levels in the ISO 14001-certificate would be valuable addition. The organization now perceives the ISO 14001 standard as a 'dis-selection criteria' – you have to have the certificate in order to compete in the process of signing a project. "With more insights in the environmental performances of our suppliers, we can apply more pressure on them to improve their environmental performances" (P.C., 30-07-2018). This corresponds with the general notion that organizations that participated often feel limited in their options to improve their environmental performances because they are dependent of third parties.

Three participants stated that they participated in this pilot because they seek an instrument that could help communicate. With the results from the EPS they hoped to involve more/other stakeholders, provide the management with insights on sustainable development

and to raise awareness on the environmental aspects throughout the organization. A participant stated that the visualization of the results is particularly useful as input for the management review. Due to organizational changes the participant stated that the information from the EPS would be especially useful as a wake-up call in order to give a new impulse to the environmental performances in the transition (P.C., 20-07-2018).

So the participants seek to improve their environmental performances, they formulate a shared desire for more insights and knowledge but vary in the way on how they want to apply these new perspectives. This came also forward in the different ways they intended to use the instrument: as an information tool, communication tool or as an addition to improve other certificates. As discussed in the literature it is relevant for an instrument that it is both precise enough to provide organizations with valuable insights and on the other hand to include a broad variety of organizations with varying interest. From the survey prior to applying the EPS, the demand for such an instrument is identified, which indicates a potential niche that the EPS can benefit from. However, before that conclusion can be drawn it is relevant to discuss the survey after the EPS.

Survey after the EPS

From the 85 participants prior to the EPS, 25 participants remained that completed the pilot. Although in an additional short questionnaire participants were reminded about the second part of the pilot, it remains guessing why participants stopped with the pilot. Only a few participants have indicated that they stopped with the pilot due to a lack of time. But no substantive remarks were made.

The survey after the EPS will be discussed regarding the following aspects: how the instrument was applied by the participants, individually or by multiple people and how the answers were given, a precise calculation of or a (shared) perspective on the environmental performances; the clarity and applicability of the instrument; the evaluation of the results from the EPS as the validation of the instrument; and the average grade and suggestions/remarks will be discussed. As with the previous paragraph the answers the participants provided in the questionnaire will be discussed for each question, based on the general information provided from tables and placed in context with the additional information from the interviews and other relationships regarding size of the organization and/or the grounds to participate in this pilot.

General information survey after the EPS

Similar to the pool of participants prior to the EPS, the construction sector is the biggest sector in the survey after applying the EPS with four participants from that industry. The (technical) installation branch is the second largest group with two participants. The remaining participants come from a variety of sectors, in Appendix E an overview is provided. It is relevant for this study to have insight in the difference on how different industries value the EPS. Depending on the sector the appreciation or applicability or value might differ. This will be further elaborated on in the coming paragraphs.

The pool of participants is divided into two groups; a group that consists of participants who filled in the instrument individually (15) and a group that filled in the instrument with two or more people (10) (table 5). The general information on these participants is provided in table 5 and 6, regarding size and years of certification. In the questionnaire participants were asked to specify how long they took to complete the EPS individually (table 8) and the participants who cooperated were asked with how many people the instrument was applied (table 7). Both of these tables indicated a normal spread of characteristics of the participating organizations.

Number of Employees	**Frequency**
<10	1
10-30	2
31-50	4
51-100	4
101-250	6
251-500	3
501-2000	2
>2000	3

Table 5: Number of employees of participants' organization that completed the pilot

Years of certification	**Frequency**
Shorter than one year	2
1 year	1
2 years	3
3-5 years	7
6-10 years	8
Longer than 10 years	4
Unknown	0

Table 6: Years of certification participants' organization that completed the pilot

In the explanatory note, added to the EPS, participants were advised to apply the instrument within multiple people in order to provide a complete as possible image of the organization. It

is therefore relevant to discuss why the majority of participants chose to fill in the EPS individually and why other chose to cooperate.

From the 25 participants four participants misinterpreted the question or did not answer the question. From those 21 remaining valuable answers 12 were given by participants who filled in the EPS individually. The most common argument to fill in the EPS individually, 6 out of 12, was that those participants were ‘responsible for’ or ‘have complete insight in’ the environmental performance or their organization. Some participants specified their answers by stating that ‘adding more people would cost too much time’ or ‘that for this tool it is not a necessity to include more people’. The second most common answer provided by the individuals was that they filled in the instrument individually because they wanted to test the instrument or get familiar with the instrument before involving more people. Corresponding, a participant applied the EPS individually for a ‘quick scan on the status of the environmental performances’. One participant supported the decision to fill in the instrument individually because he/she wanted to use the instrument as a steering mechanism to the management.

People involved with application EPS	**Frequency**
Individually	15
Two people	3
Three people	2
Four people	3
Five people	1
Seven people	1

Table 7: People involved by applying the EPS.

Duration of applying the EPS	**Frequency**
0,5 hours	1
1 hour	7
2 hours	4
2,5 hours	1
3 hours	2

Table 8: Duration of individually applying EPS

The participants that filled in the EPS in pairs or as a group had several grounds to support their decision. Two participants stated that by filling in the EPS as a group, different perceptions were included and could be discussed, either for indicating differences between understanding and reality, or for nuancing larger differences. Three participants indicated that they filled in

the EPS as a group on ‘practical’ grounds, or formulated that by including more people more ‘knowledge’ would be available, which led to a better ‘representation of the organization’. These grounds correspond with the advice provided in the explanatory note. However, as indicated by one participant, a representation of the entire organization was only partly successful. Other arguments regarding the application of the EPS with a group were: ‘triggering people’ or ‘after remarks from an external audit’.

Additionally, the participants who filled in the EPS as a group were asked how they formulated their answers, either as an average of different answer or as an answer with general consensus. Table 9 provides an overview of the given answers. One participant filled in the instrument differently: rather than discussing the EPS in a group, he conducted different interviews within the organization, and formulated the answers in the EPS based on those interviews. Since the sustainability was not that high on the agenda due to organizational transitions, the interpretations on the environmental performances varied greatly. The EPS was still considered useful however, since it gave insight in where the organization stands at the moment, regardless of whether it is good or bad (P.C., 30-07-2018).

How the instrument was applied by multiple people	**Frequency**
Applied by multiple people individually, then calculated the average score	3
Applied by multiple people individually, then consensus on the answers	4
Applied by multiple people together as a group	2
Differently, namely	1

Table 9: How participants as a group formulated the answers in the EPS.

Since the outcome of the EPS could in this pilot be calculated differently – based on hard numbers or as an interpretation of the environmental performances – the environmental performances of an organization remain dependent on perception. However, since one of the objectives of the pilot was to test the instrument on how it is perceived by a bigger audience, it is not of vital importance how the instrument is applied and what the final score exactly tells the participants about their environmental performance. When the instrument is further developed a specification on how the instrument should be applied becomes more relevant (Stuyt, P.C., 2018).

Clarity and applicability

One of the objectives of the survey after the EPS was to identify how the participants perceived the clarity of the instrument. This is relevant for the added value of the instrument, since an

instrument that is not clear on how to apply it loses value due to potential misinterpretation of the results. In order to gain insights in their perspective four statements were presented about the clarity of the questions, the explanatory note and the systematics. Additionally, a statement was included about the inclusion of all relevant environmental performance subjects. As with the statements in the questionnaire before the application of the EPS, the variety of answers goes from 'totally disagree' to 'totally agree'. In table 10 the results are presented. Since these statements do not provide the complete picture about the clarity, remarks made in the interviews will be included as well as additional suggestions/remarks made at the end of the survey.

The majority (15 out of 25) of the participants did not agree with the statement that the questions in the EPS were clear, although 8 participants were neutral, a minority of 10 participants agreed with the statement. Some critical remarks have been made regarding the clarity of the questions, both in the interviews and in the suggestions/remarks. In Appendix B an overview of the remarks is included. Some remarks have been made about the questions – 'too vague or too broad' or 'more questions' – while others discussed the answer possibilities – add more often the option 'not applicable' or more closed rather than open-ended questions. Regarding the content of the question multiple participants stated that the questions did not completely apply to their sector. 'Environmental performances are truly different for companies who produce products compared to companies who provide services' or 'focus better on service organizations'. Although these remarks are not solely about the clarity of the questions, but rather about the approach of the instrument in general, it still is relevant to discuss this in the context of the clarity of the questions, since it informs about how the daily activities of the organizations are represented in the instrument (P.C., 20-07-2018).

	Totally disagree	**Disagree**	**Neutral**	**Agree**	**Totally agree**
The question in the Environmental Performance Scale are clear	0	7	8	9	1
The explanatory note of the questions in the Environmental Performance Scale is clear	0	3	6	16	0
The systematics (the possibility of exclusion of some questions and the weighting of the questions) is clear	0	2	6	14	3
The 26 questions about the four aspects cover all the relevant environmental performance subjects*	0	5	8	9	1

* Two participants did not answer this question.

Tahle 10: Evaluation on clarity of the EPS.

In this regard the explanatory note got the same critique. The examples presented in the explanatory note were, according to some participants, too much focused on the production sector rather than the sector that provide services. Nevertheless, the explanatory note is perceived considerably clearer than the questions in the EPS. This also goes for the systematics of the instrument, although some remarks have been made about the impact of follow-up questions and the necessity of filling in '0' when 'not applicable' would have been the desired answer. The observation that some questions were not applicable to the (industry of) organization comes also forward when discussing whether the 26 question cover the relevant environmental performance subjects. 10 out of 23 participants stated that the 26 question cover the important subjects, 8 participants perceived it as neutral. In a follow-up interview a participant indicated that it is not necessary to add more question or themes, but that the questions had to be more specific on which sector they apply on (P.C., 25-07-2018). From a participant in the service industry the same argument came forward, that the 26 question did not cover the relevant subjects for organizations that do not produce products but provide a service (P.C., 24-08-2018). A relevant notion has to be added to table 10. The participants who disagreed with one statement also disagreed with (some of) the other statements and were in general less positive about the instrument primarily because the felt that their industry was not represented via the instrument. When taking these negative answers out of the equation because the industry is misrepresented by the instrument, and instead only focus on the organizations that felt that their daily activities are represented in the instrument, the conclusion can be drawn that for production organizations the relevant indicators are included in the EPS. However the inclusion of the service organizations remains relevant since the objective of the EPS was to be applicable throughout industries.

Another objective of this pilot was to identify whether or not the results from the EPS could be put into practice. The applicability of the instrument is about whether or not participants felt that the instrument was easy to use, but also, that the results of the instrument are valuable to them and have an added value to their organization. Table 10 provides an overview of how the results from the EPS are perceived. The first statement will be used in validation of the instrument in the following part of this chapter.

How organizations apply the results in practice depends on the reasons why they participated in this pilot. As indicated some participants want to use the results as a communication tool towards the management, while others see the most valuable aspect of the

instrument that it functions as mirror and indicates the state of current affairs. No comments were directly made by the participants that the results from the EPS could directly be translated in new environmental policies. Nevertheless, opening a discussion, or relighting awareness can indirectly lead to the improvement/development of environmental policy (P.C., 20-07-2018). Similar to the improvement of policy, is the understanding of the continuous improvement objective in the ISO 14001 standard. 12 out of 23 participants stated that their insight in the improvement process has increased. The results from these two statements are an indication on why participants see the application of the EPS as an added value to their organization. In Appendix C an overview is provided of what the participants perceived as most important added value of the instrument. In general, corresponding with the statements made by participants prior to the EPS, the most important added value is insight in 'current state of affairs', 'recognition', 'insight in strengths and weaknesses', and an increase in awareness or providing handles for communication (to management).

	Totally disagree	**Disagree**	**Neutral**	**Agree**	**Totally agree**
The result of the EPS provides a good image of the real situation of our environmental performances	0	2	3	18	2
The result of the EPS can be put into practice*	0	3	10	10	1
The result of the EPS has increased the understanding of the continuous improvement process**	0	5	6	12	0
Applying the EPS has added value for our organization***	0	4	9	10	1
In the future we want to use the EPS more often****	0	4	4	14	1
The process of applying the EPS is more important than the result of the EPS*****	0	5	8	9	2

*One participant answered the question with 'unknown/do not know'
** Two participants answered the question with 'unknown/do not know'
*** One participant answered the question with 'unknown/do not know'
**** Two participants answered the question with 'unknown/do not know'
***** One participant answered the question with 'unknown/do not know'
Table 10: Evaluation on applicability of the EPS.

Validation

A third objective of this pilot was to validate the outcome of EPS. As with the development of the Safety Culture Ladder, the outcome of the instrument is valid if the results correspond with the real-world state of affairs of the environmental performances of the organizations. The validation of the instrument is a subject which has to be further developed and expanded with a larger test case. However, with this research design, comparing the expectations of the participants with the results from the EPS and additionally asking them if they agree with the results from the EPS the initial validation of the results from the EPS will be realized.

Paliszkiewics (2015) states that it is relevant that an instrument is validated by administering it throughout a variety of levels within an organization and throughout various organizations. The design of the pilot used in this study, met this criteria. As indicated in this chapter a broad variety of organizations participated and participants from different departments and levels within an organization were involved in the pilot. This is relevant both for the generalization of this study, as well as an indication of the acceptance of the instrument throughout various branches.

Although in the questionnaire prior to the EPS the themes and the levels were explained, some misunderstandings about the qualifications could influence the expectations of the participants. For example a participant stated that they were a frontrunner in their sector because they are the only ones with an ISO 14001-certificate (P.C., 25-07-2018). However, the expectation should have regarded to what extent they qualify themselves in the implementation and improvement process of the ISO 14001 standard. Nevertheless, 20 out of 25 participants, or 80%, indicated that the results from the EPS corresponded with the real situation. One participant that mentioned that the results did not represent the environmental performances of their organization stated that it had primarily to do with the lack of applicability of the instrument in the education sector (P.C., 24-08-2018). Their activities on environmental performances could not be measured with this tool, therefore a low result came out of the EPS which did not correspond with their own perception on their environmental performances.

Remarkably, despite the fact that 20 participants felt that their current situation was righteously represented by the instrument, the participant very rarely predicted their results correctly (Appendix E). Especially in the theme ‘production/services’ almost every participant estimated their environmental performances higher than the EPS’ results. Only two estimated their level correctly and two participants scored higher than they had anticipated. The remaining 21 participants in this category were at least one level of, and in some cases even three levels of. But even than the participants indicated that the outcome corresponded with the real-world

situation. The same pattern can be identified in the theme ‘supply chain’. Most participants, 18 out of 20 (5 participants did not (correctly) communicated their scores), estimated their performances differently compared to the results in from the EPS. In the theme production means/facilities the differences are smaller, but still only in 5 cases the participants had estimated their performances correctly.

The theme ‘Process control and safety’ is somewhat different from the other themes since this theme has the most positive differences, meaning that the participants had more often estimated their performances lower than the results from the EPS. A remark needs to be made however: in the survey before the EPS the participants had to indicate separately how they perceive themselves on ‘process control’ and on ‘safety’. In the survey after the EPS these two subjects were included as one theme, corresponding with the layout of the EPS.

Placing the EPS in perspective

The surveys show the perspectives of the participants on the EPS, furthermore it is relevant to determine the position of the EPS in the academic debate regarding the criteria of a well-operating environmental performance measurement instrument. It is therefore relevant to link back to the literature discussed in this study in order to place the EPS in the academic debate which enables an analysis on how applying the EPS can overcome some problems with the ISO 14001 standard as discussed in chapter two. To support the academic objective of the research question two supportive sub-questions were formulated:

- What are the distinguishing characteristics of the EPS compared to other environmental performance measurement instruments?
- To what extent can the development of the EPS add insights to the academic debate on environmental performance measurements?

The characteristics of the EPS have been elaborately discussed in the Introduction. The 26 questions divided over four categories provide organizations with an ISO 14001-certiticate insight in their environmental performances. The fact that the EPS measures the environmental performances only of organizations with an ISO 14001-certificate makes it unique and valuable both in practice and in the academic context. Organizations benefit from the instrument because they gain more detailed information on how specific parts of their EMS can be improved in order to improve environmental performances. And from an academic point of view the instrument adds value since it focuses on the niche of measuring the environmental performances of organizations with the ISO 14001 certificate. Studies have been conducted on

how the ISO 14001 standard influence EMSs, but not on the environmental performances of the ISO 14001-certified organizations.

The notion that the EPS is specifically developed for organizations with an ISO 14001-certificate is also important in the context of demarcating the concept of environmental performance. In the ISO standard itself a workable definition has been provided as discussed in chapter two – allocating natural resources and managing the environmental impact via EMSs. Furthermore, the concept of environmental performance in the EPS is limited to the environmental impact, leaving social and economic effects out of the equation. Focusing the scope of the instrument on the environmental performance enables a more specific formulation of the relevant concepts or indicators compared for example of the often used 'sustainable development' objectives/performances, a concept which is difficult to operationalize on a corporate level as referred to in chapter three. So the specific focus of the EPS on the environment enables the operationalization of environmental performance and the indicators.

Via the surveys it came forward that organizations had different motivations to participate and different insights on how they would use the instrument when fully operational. The different motivations to improve environmental performance came also forward in the academic debate where internal and external motivations and long-term and short-term considerations can influence the adaption of environmental policies. The impact of the EPS in its current state is primarily focused on the internal impact since external communication, for example to improve the image of an organization, needs a more developed and more validated instrument. Especially as a means for improved information distribution the EPS can be beneficial for organizations, since, as appears from the surveys, organizations have an unprecise understanding of their environmental performances.

As discussed in chapter three, environmental performance indicators need a common set of metrics in order to provide data that can provide insights on both managerial and operational level. Beneficial to the EPS is that the instrument has been developed with the metrics of the ISO 14001 standard in mind. That is relevant because the EPS can built on the broadly accepted metrics within the ISO standards. As discussed the EPS focuses on the environmental performance of an organizations, so logically, the indicators also revolve around the impacts on land, air, water and resource use. Material use, energy consumption, non-products and pollutant releases are all included in the ISO 14001 standard and therefore also locked-in the EPS questions and categories. The fact that the indicators in ISO standard are included in the EPS makes the instrument valuable since it on the one hand connects to the ISO standard, and on the other hand corresponds with the accepted relevant environmental

performance indicators. Yet, it remains relevant for the instrument itself, but also for the academic world, to further specify the indicators for organizations outside the production industry which demands a deeper understanding of environmental performance indicators of service-providing organizations or for example schools or universities.

Quantifying management systems enables organizations to discuss their environmental efficiency and effectivity, which in turn can assist to develop organizational goals and reaching them. The EPS quantifies the impact of the improvement of the EMS by forcing organizations to numerical formulate their environmental performances via the 26 questions. An organization can use the outcome of the EPS as a benchmark. This enables the organization to compare progress with the previous year(s). But looking forward and perhaps more importantly, an organization is able to compare its performance with their competition.

The fact that the EPS has four different categories further helps organizations in specifying company objectives, since they have a detailed overview of which aspect of their modus operandi requires more attention or on which aspect they can distinguish themselves. This feature of the EPS is an important characteristic. As discussed in chapter five an ordinal scale is beneficial for organizations, especially since an ordinal scale within the ISO 14001 standard has not yet been introduced. This can be relevant for the understanding on why organizations adapt the standard, provide insights in what parts of the standard are difficult to improve, but also sheds lights on the general effectiveness of the ISO 14001 certificate. When the majority of the certified organizations are stragglers and very few are frontrunner or leader, the general effect of the ISO 14001 standard on environmental performances can be debated, but with the help of the EPS can also be described better.

The survey after the implementation of the EPS shows that organizations would use the instrument every few years in order to measure their improvements. As mentioned in chapter two and three evaluation is relevant for the continuous improvement. Since organizations with an ISO-certificate are familiar with the PDCA-model, which revolves around evaluation, the EPS can be an important addition that provide organizations with quantitative data of their performances.

In general the EPS has the unique characteristic that it is a specific instrument since it focuses only on ISO 14001 certified organizations and at the same time is applicable to a broad variety of organizations due to the variety in organizations with an ISO 14001-certificate. The connection with the ISO standard is relevant, but it also has important characteristics of a well-operating measurement included. The EPS has a demarcated concept of environmental performance and environmental indicators and as discussed helps organization define

objectives and provides handles to reach those goals, where evaluation is at the center of the continuous improvement cycle.

7. Conclusion

In this final chapter this research will be summarized using the sub-questions formulated in the Introduction as guidelines. Furthermore this chapter summarizes the methodology and will indicate where difficulties lied during the execution of the design. This chapter, and thereby this research ends by formulating the answer to the research question: "*What are key characteristics of a well-operating environmental performance measurement instrument and to what extent does the EPS meet those criteria?*"

This study revolved around testing the EPS and based on the outcome of the test, determines its added value, its applicability, and to determine to what extent the EPS meet the criteria of a well-operating environmental performance measurement instrument. To come to a conclusion this study elaborately discussed the content of the ISO 14001-certificate and discussed the controversies of the standard regarding the difficulty to pinpoint what the effect is of the standard on the environmental performance of organizations that are ISO 14001 certified. This influences the motivations to adapt to the standard varying from being a good neighbor to gaining access to a(n) (international) market since the certificate is sometimes seen as a dis-selection tool. As seen with the Safety Culture Ladder, a broadly accepted and well-operating instrument can have influence on an organization and can therefore influence internal motivations to change its behavior.

To see whether the EPS could have such an effect on an organization, focusing on the continuously improvement of environmental performance, rather than the continuously improvement of the EMSs, a pilot has been developed to test the EPS. The pilot consisted of three parts: a survey prior to the application of the EPS; the application of the EPS and a survey after the EPS to evaluate the instrument. This set-up has been chosen for the benefit of the research objectives, regarding the validation of the instrument – comparing expectations of environmental performances with the results from the EPS – the added value of an instrument and the applicability of the instrument. Combining surveys – with open-ended and closed questions – and follow-up interviews, this research aimed at benefiting from the strengths of both qualitative and quantitative research. The quantitative data provided this study with a broad perception of how organizations perceived the EPS, and the qualitative data from the interviews provided more detailed data on why participants had formulated their answers in the surveys. As with any survey a weakness lies in the misinterpretation of the questions by participants. Also in this research some data is missing because either participants answered the question incorrectly or did not answer the question at all, effecting the value of the data. Nevertheless, as shown in chapter 6, the data was sufficient to analyze the EPS.

Including the insights via interviews with Kees Huizinga and Dieter van Delft provided this study with in-depth insights in the development process of an instrument – formulating objectives, including relevant indicator and validation process – what the benefits are of developing (ordinal) scales for continuous improvement, and how an instrument is always submissive to time. This elaborate chapter helps to better understand the general process of developing an instrument and thereby helps to understand why the broad set of criteria for an well-operating instrument are important. As concluded at the end of chapter five, the development path of the EPS is rather similar. In close cooperation with organizations the instrument is developed and tested, first on a small scale, and with this study on a larger scale. Additionally, the validation of the results of the EPS went through the same process as the Safety Culture Ladder and the CO_2-Performance Ladder. The outcome is understood as valid when the instrument develops results were the organization can recognize itself in. However, both the Safety Culture Ladder and the CO_2-Performance Ladder have much larger support from different organizations, something the EPS should strive for as well to become truly accepted and to provide a more solid foundation for valid results.

The validation of the instrument is relevant for its added value. Two sub-questions were raised about the added value of the instrument, one regarding the added value for organizations and the second regarding the value for the ISO 14001-certificate. The added value of the instrument is determined by the demand for such an instrument, its applicability (third sub-question), and the benefits as indicated by the participants. A demand for an instrument that provides more insights in the environmental performances of an organization has been established via the first survey, where 86% formulated such a demand.

Although the questions were not considered clear by the majority a relevant factor with the formulation has been identified. Especially organizations outside the production industry had difficulties to translate the questions into their day-to-day activities. In order to improve the added value, the instrument needs to adjust so that modus operandi of organizations outside the production sector are more included. Participants indicated the most important added value of the instrument that they gained more insight in their environmental performance. For the ISO 14001-certificate the EPS adds an ordinal-scale which increases motivation of organizations to improve their EMSs, as indicated with the Safety Culture Ladder and the CO_2-Performance Ladder. The validation process of the EPS, the demand for a tool, its applicability and the new approach to the ISO 14001 standard indicate added value for both organizations and the standard itself.

How the EPS operates was also a sub-questions and from the survey and follow-up interviews the same main conclusion can be drawn as throughout the analysis: the EPS works well for production companies. For organizations that provide services not so much. As discussed, these organizations evaluated the EPS more negatively since they felt misrepresented or because they had difficulties translating the question into their daily activities. But when only taking the production organizations in consideration, the participants understood the questions and had were able to apply the EPS without difficulties.

Key Characteristics

After the analysis of the surveys the characteristics of the EPS have been discussed compared to the general understanding of well-operating environmental performance indicators. Especially the fact that the EPS is only applicable for organizations with the ISO 14001-certificate enables the instrument to be at the same time broad – since it reaches variety of industries – and detailed – since it builds on the criteria in the standard – makes the instrument unique.

So answer the first part of the research question, *"what are key characteristics of a well-operating environmental performance instrument"*: (1) well-defined concepts, such as environmental performance, (2) a set of quantifiable metrics as indicators of environmental performances in order to formulate, steer, reach and (3) evaluate environmental performance objectives.

The EPS builds on the definition of environmental performance as formulated in the ISO 14001-certificate, including the most common set of environmental influence on land, air, water and resource use. The EPS can be used as a part of the PDCA-model, since the results from the instrument can be used as a benchmark or starting-point on which an organization can formulate its objectives. And the EPS can be used as supportive communication tool in the evaluation cycle to harmonize the insights throughout the organization. This benefit, which benefits the evaluation of the environmental performance So the relevant characteristics are included in the EPS, both via the instrument itself and via the supportive criteria set out in the ISO 14001 standard. This answers the second part of the research question, concerning to what extent the EPS meet the criteria of a well-operating environmental performance instrument: well-defined concepts are included, the metrics in the instrument are quantifiable, and in the core the instrument is developed to improve environmental performance based on continuous evaluation.

Additionally, and what distinguishes the EPS from other instrument discussed in this study, is the simple applicability of the instrument. The objective of SCCM was to develop an instrument that was both less time consuming than other instruments and easy to interpret. Although this is not a key characteristic as discussed in the literature, it is a distinctive characteristic of the EPS.

Taking in consideration that the EPS is still in development, it is relevant to discuss the main problem with the instrument in its current state and how it can be revolved. Throughout the evaluation survey similar criteria came forward regarding the applicability of the instrument for organizations outside the production industry. Either the question were not applicable or difficult to translate into their daily activities, so service providers significantly valued the instrument less. Nevertheless they also see the importance of the development of an instrument that measure environmental performances.

Reflecting on the research strategy

The methodology chapter elaborately described the research design, including the research strategy, the data collection, data analysis, validation and reliability and research philosophies. Although the strengths and weaknesses of this research design have been discussed prior to the study, it remains relevant to discuss this after the study has been conducted.

As this study has shown the EPS is primarily useful for organizations that produce a certain good, service providers did not felt that their activities were represented via the EPS. The literature study in this study had the same shortcoming. While in this study an overview is provided of the most relevant concepts, no distinction has been made between the environmental performances of production companies and service providers. With a more in-depth literature study the shortcomings of the EPS could have been more elaborately explained, rather than just the recognition that the environmental performance of service providers are not represented via the instrument.

Although the objective was to include at least 20 participants in this study, and that objective has been accomplished, it is preferable that the number of participants is larger than the current 25. Especially an increase in interviews with participants would have shed more light on the grounds participants judged the EPS, which could have led to an more in-depth analysis of the instrument in academic context. However, the research questions are answered with the data collected from the two surveys. This was most relevant for the practical analysis of the instrument.

In conclusion, the research design fitted the research objectives, primarily the practical aspects of this study, however, a more detailed analysis could have been made with more insight in the environmental performances of service providers and with more insight in the perception of the participants via the interviews.

Recommendations

Finalizing this study it is important to sketch a path for the further development of the instrument, both for the benefit of the instrument but also for organizations using the instrument, and for the ISO 14001-certificate. First, in its current form the EPS cannot be applied by organizations outside the production sector. It is therefore relevant that the instrument should focus on formulating the questions and examples in a manner so that providers of services are more represented. However, in order to change the questions in the instrument itself, further research is necessary to provide more insights in what environmental performance entails for service organizations. It is thereby relevant that such a research focuses on the differences between environmental performance indicators of production companies and service companies. The ISO 14001 standard can still be used as base from which the concepts can be demarcated. A specification in environmental performance (indicators) will support the translation of the current questions in the EPS into questions valuable for service providing organizations.

Second, it is important that the EPS follows the path of the Safety Culture Ladder and CO_2-Performance Ladder regarding the development process. Testing the instrument on a larger scale, involving more organizations in the feed-back loop will increase the validation of the instrument and will also create more value to the instrument itself when a larger number of organizations supports the instrument.

And last, the lay-out of the EPS can be adjusted. In its current form it is a questionnaire of 26 questions in an Excel sheet. When the instrument is tested on a larger scale the lay-out needs to be adjusted in order to better analyze the data but also to make it more user-friendly. An option is to develop an online platform were organizations can answer the questions one by one, and at the same time directly see their improvements and how they perform compared to the competition in their sector.

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Appendix A: Overview of sectors

Branch	Frequency prior EPS	Frequency after EPS
Construction	11	4
Metal	7	1
Industrial (cleaning)	5	1
(Technological) Installation	4	2
Business services	4	1
Chemicals	3	1
Facility management	3	
Waste (processing)	2	
Automotive	2	
Graphics (industry)	2	
Government (and offshore)	2	
Technical services	2	
Transport	2	1
Food supplies	2	
Aerospace	1	
Audio-visual equipment	1	1
Company catering	1	
Defense	1	1
Distribution	1	1
Fleet & Mobility management	1	1
Sodas, waters and juices	1	1
Ground, road, and water construction	1	
Wholesale	1	
GWW	1	
Trade	1	1
Aerial work platforms	1	
ICT	1	1
Logistics	1	1
Maritime	1	1
Media	1	
Furniture	1	
Network	1	1
Research	1	
Railway infrastructure	1	
Recycling	1	
Rotating equipment	1	
Ship-building	1	
Cleaning in medical care	1	
Gas- oil extraction and exploration	1	1
Carpeting	1	
Technic	1	
Telecom	1	

University	1	1
Water treatment	1	1
Water Authority	1	
Business trips	1	1
Solar panels	1	
Health insurance	1	

Appendix B: Suggestions/improvements proposed by the participants

For an internationally operating company it would be very useful to have an English version.

In my case: if I want to discuss this with the rest of the top management and the own responsible for the department, I personally have to translate and explain everything.

Some experience will be necessary to interpret some parts correctly.

The is (too) much attention for compliance aspects. Our needs involve especially the themes product/services and supply chain.

Develop a webpage that can be saved and can be filled in at multiple occasions, in combination with a benchmark report of previous applications.

Following trends and developments and dynamically adding those to the systematics.

Question 4C Compliance status: the first question has (too) much impact on the outcome of the two follow-up questions, and thus on the end result. This exceeds the 'arbitrary messing about in the margin'. For example: 10, 10 (=30), compared to 8, 5, 5 (=18)

Environmental performances are truly different for companies who produce product compared to companies who provide services.

In itself it works good, but the questions does not corresponds well (is to abstract) to our daily activities. It is quite far from the work floor.

Better focus on service organizations.

Try to zoom in a little bit more only on a service providing organization.

We feel that we are often not the ones who can make decisions regarding the environment. The client determines in general the materials. Than the primarily the market choses sub-contractors/suppliers based on market conditions (supply, price).

Add more possibilities for 'not applicable', sometimes we had no idea on the things that were asked, so we answered them with '0', while that potentially provides the wrong state of affairs.

Further detailing

The question are dependent of interpretation. If a year later you interpret things differently the outcome will change. That has to improve.

More examples for service providing organizations. Currently the examples in the instrument are primarily applicable for production companies.

I understand that this is a general setup so that it is applicable for every organization, however it might therefore be too general and some question are difficult to apply on specific companies.

More questions

Preferably more closed questions rather than open-ended question. That costs too much time. The changes of quitting therefore is big. Current version is exhausting to fill in.

The questions are too vague and too broad.

Context and stakeholder analysis is insufficiently included.

Appendix C: Most important added value of the EPS

Conformation of what plays within the organization.

Mindset and awareness

a). Development of support and common understanding of our environmental performances, especially within the chain. Managers of different departments come to shared insights. b) Trigger to develop policy/measurements on specific areas.

It raises questions where we as an organization cannot directly do something with, but there are things where we could focus/adapt to in the future (for example, setting standards for our suppliers).

Different approach/methodology.

Provides the current state of affairs

The process of filling in the instrument by multiple people that additionally together an average resemblance provides of our situation. Furthermore, having a periodic benchmark enables setting priorities and developing insight in the continues improvement process.

Insight in where the strengths and weaknesses are of the organizations' environmental aspects.

It is quite abstract. BBT is not something that is an issue in our company. Especially existing things are generally not brought to BBT, mostly just improvement.

Supply chain

Recognition

It is a list of questions for a production companies, not for service organizations like an university.

You have to think about the correct answer.

Bringing up attention for making/made choices.

Visualizing the current state of affairs with the diagram.

It provides handles to inform the management about the environmental performances.

The results provide a good image of reality, but is quite dependent on how the questions are interpreted.

It is good to gain insight in our environmental performances. From audits, among other things EED, already comes forward that most measurements are taken, within our sphere of influence, to minimize the impact on the environment.

Providing insight in strengths and weaknesses.

Clear measurable image.

If forces to reflect on your own situation.

Clearly mapping the performances of the company.

Appendix D: Alterative grounds to participate in pilot.

Generating insight for the management about how we, as an organization, perform on the area of sustainable development (policy, implementation, execution, improvement).

With this instrument I might can involve more/other stakeholders.

Ongoing search to keep the attention for the environment high within the organization as part of EH&S, with almost always more attention to H&S.

Interest in how this tool works and what it has to offer.

Interest.

Curiosity.

Curiosity.

Curiosity, potential improvement.

I am curious about the outcome and it the instrument can potentially help to continuously improve.

We contribute to these kind of developments and are curious if this instrument is truly applicable, or whether it is just a shot in the dark that can be filled in by everyone but has no true substantive foundation.

Generate insight in where we are.

Gathering general information.

Starting point is where the organization stands related to the new norm.

Because we are only recently ISO 14001 certificated we are still learning and with this research we can further improve.

Further orientation on the changes in the norm.

Creating insight and map where we can make potential improvements.

Potentially offer new insights.

More insight in objectives and improvement measurement

Gain more knowledge and improve awareness.

There is little room for improvement for us, so we have to seas every opportunity.

Maybe new things come up where we have not thought of before.

See whether there is room for improvement on the area of environment.

See if new insights develop, thinks we did not think about ourselves.

As an organization we are always looking for ways to improve environmental performances. Therefore we are looking for ways to accomplish this and via this research we hope to discover new, unfamiliar possibilities to reach that desire.

The organization is ISO 14001 certificated and has used for years the ‘Milieubarometer’ (Stimular Foundation) but wants to change the way it maps its environmental performances.

Compare with other performance tools on this area (CO2 Performance Ladder, CO2-footprint, Ambitieweb)

Environmental performances are (also) the important aspects (planet) of our other important certificates (CO2 and CSR performance ladder).

Next to the ISO 14001 certificate, the organization is also certified on step three of the CO2 Performance Ladder. Potentially this research can contribute to further improvement of the environmental performances.

Benchmark.

Education is technical, eventually grown to quality assurance (ISO 9001/13485). Since a couple of years responsible for environment, I see this as a burden, while quality norms are in our DNA.

Appendix E: Difference between expectations and results of environmental performance

Products and services		
Expectation	**Result**	**Difference**
Straggler	Straggler	0
Follower	Straggler	-1
Follower	Straggler	-1
Frontrunner	Straggler	-2
voorloper	Leader	1
Leader	Follower	-2
Follower	Straggler	-1
Follower	Straggler	-1
Follower	Straggler	-1
voorloper	Straggler	-2
Leader	Unknown	-
Leader	Straggler	-3
Follower	Unknown	-
Frontrunner	Follower	-1
Follower	Straggler	-1
Follower	Straggler	-1
Follower	Straggler	-1
Frontrunner	Straggler	-2
Follower	Frontrunner	1
Follower	Follower	0
Leader	Follower	-2
Follower	straggler	-1
Frontrunner	Follower	-1
Frontrunner	Straggler	-2
Follower	Straggler	-1

Supply Chain		
Expectation	**Result**	**Difference**
Unknown	Straggler	-
Follower	Straggler	-1
Straggler	Straggler	0
Follower	Straggler	-1
Follower	Straggler	-1
Leader	Frontrunner	-1
Frontrunner	Unknown	-
Follower	Straggler	-1
Unknown	Straggler	-
Follower	Straggler	-1

Leader	Unknown	-
Leader	Straggler	-3
Follower	Straggler	-1
Follower	Follower	0
Straggler	Straggler	0
Follower	Straggler	-1
Follower	Follower	0
Unknown	Straggler	-
Follower	Frontrunner	1
Frontrunner	Follower	-1
Follower	Frontrunner	1
Frontrunner	Straggler	-2
Frontrunner	Straggler	-2
Follower	Straggler	-1
Frontrunner	Follower	-1

Production means and facilities		
Expectation	**Result**	**Difference**
Straggler	Straggler	0
Frontrunner	Straggler	-2
Follower	Leader	2
Follower	Straggler	-1
Follower	Leader	2
Leader	Frontrunner	-1
Follower	Unknown	-
Follower	Straggler	-1
Follower	Follower	0
Follower	Follower	0
Frontrunner	Unknown	-
Leader	Frontrunner	-1
Frontrunner	Straggler	-2
Frontrunner	Follower	-1
Frontrunner	Frontrunner	0
Follower	Straggler	-1
Follower	Straggler	-1
Follower	Unknown	-
Frontrunner	Frontrunner	0
Follower	Follower	0
Frontrunner	Follower	-1
Follower	Frontrunner	1
Unknown	Straggler	-
Follower	Unknown	-
Frontrunner	Frontrunner	0

Process control	*Safety*		
Expectation		**Result**	**Difference**
Straggler	Follower	Frontrunner	1,5
Frontrunner	Frontrunner	Frontrunner	0
Follower	Frontrunner	Frontrunner	0,5
Frontrunner	Follower	Leader	1,5
Leader	Leader	Frontrunner	-1
Leader	Leader	Frontrunner	-1
Follower	Follower	Unknown	n.v.t.
Frontrunner	Leader	Frontrunner	-0,5
Follower	Follower	Frontrunner	1
Unknown	Unknown	Follower	n.v.t.
Frontrunner	Frontrunner	Unknown	n.v.t.
Leader	Follower	Leader	-1
Frontrunner	Follower	Follower	-0,5
Frontrunner	Leader	Leader	0,5
Follower	Frontrunner	Follower	-0,5
Follower	Frontrunner	Straggler	-1,5
Follower	Follower	Follower	0
Frontrunner	Frontrunner	Leader	1
Frontrunner	Follower	Frontrunner	0,5
Frontrunner	Follower	Leader	1,5
Frontrunner	Follower	Frontrunner	0,5
Follower	Frontrunner	Frontrunner	0,5
Frontrunner	Unknown	Frontrunner	0
Follower	Follower	Follower	0
Follower	Leader	Leader	2

Appendix F: The 26 questions of the Environmental Performance Instrument

1. Environmental performance associated with the products/services up along the chain

1a. For how much of sales/production is the systematic understanding of all the possible ways to improve the environmental performance of the products/services such that the most important options for improvement of these products/services can be selected and concrete improvement projects can be started? This involves environmental performance of products/services that is tangible for customers, for example because it is easier to recycle, lasts longer, can be returned, etc.

With how many of the most important* customers do you have regular personal contact about their desires and possible ways to improve the environmental aspects of products/services?

1b. For what share of the products and/or services is the development of an 'environmentally friendly' version embedded in plans with concrete objectives, responsibilities, budget and lead times?

Are there similarly sized companies in the same branch that conduct research themselves or have the budget for research in new products/services?
If no: fill in 100 ('not applicable')
If yes: What share of the R&D budget (if more than 3% of sales is invested in R&D) has been spent on improving environmental performance of products/services in the last 2 years?

Is it possible for the organization to use principles of circularity and have products returned after use:
if no: fill in 100 ('not applicable')
if yes: How large is the proportion of sales or production for which returning items is partly or wholly conceivable and for which customers are encouraged to do so?

1c. What percentage of sales/production consists of products/services that from an environmental perspective are an improvement over conventional/prevailing requirements (e.g. uses less energy, lasts longer)?

What percentage of the sales/production consists of products/services which are a substantial improvement, from an environmental perspective, which is attractive for customers (such as a device that consumes much less energy)?

What percentage of the sales/production consists of products/services which are doing well or leading in the market and only are used by ‘early adopters? This includes sales of products the company has agreed to take back after use as part of a circularity strategy.

2. Environmental performance of supply chain/materials purchasing (the influence on the environmental performance of parties supplying products/services to the organization)

2a. For what percentage* of sales of products/services (excluding investments) is the organization familiar enough with the main environmental aspects that it can set requirements for purchasing?

For what percentage* of sales of products/services (excluding investments) does the organization systematically consult with suppliers about reducing pollution?

2b. For what percentage* of sales of products/services (excluding investments) is the producer/service provider (not intermediaries) ISO-14001 certified? If the producer is not known, intermediaries may count for 50%.

2c. For what percentage* of sales of products/services (excluding investments) does the organization demonstrably set detailed requirements for suppliers, in order to improve its environmental aspects?

2d. For what percentage* of sales of products/services (excluding investments) does the organization make agreements beforehand with the supplier about taking back used products (not including packaging)?

3. Environmental performance associated with the production equipment and facilities (environmental performance of e.g. the machines used, buildings, processes used to make or supply products/services, if applicable including transport)

3a. For what percentage of the production equipment/facilities/ buildings* with significant environmental aspects is there a demonstrably complete understanding (including necessary investments) of the measures necessary to meet the best available techniques (BAT) requirements?

3b. For what share of the production equipment/ facilities/ buildings * not at BAT level is there a demonstratable plan to bring them up to BAT level within 5 years ? If the organization is completely at BAT level, then "all" can be filled in.

Are there companies of a comparable size in the same branch that do their own research or have budget for research into new production technologies?
If No: fill in 100 ('not applicable')
If Yes: What share of the R&D budget has been spent in the last two years on improving the production equipment from an environmental perspective? The R&D budget must be at least 3% of sales for points to be awarded.

3c. How large is the share of investments in production equipment/facilities/buildings that is at BAT level?

4. Process Control and Safety

4a. What percentage of products or services delivered for the operationalizing of which there is optimal process control from an environmental perspective (for example, with as little waste as possible from faulty production, minimal waste/consumption of materials due to proper calibration of controls, etc.)?

4b. For what percentage of the operations, buildings and facilities is there an understanding of the requirements in environmental legislation and regulations?

For what percentage of the applicable environmental legislation and regulations is there a current internal evaluation of compliance with the requirements arising from them?

4c. For what percentage of the requirements in environmental legislation and regulations has compliance been demonstrated?

If the first question about compliance status was answered ‘all’ and there are no unusual situations to report: 10 points

In the event of non-compliance or unusual situations being reported: What percent of the non-compliances or unusual situations were reported to government or other authorities, insofar as this is required?

If there is full compliance (see 1st question on compliance status): 10 points
If there is any non-compliance: For what percentage of the non-compliance situations has an action plan been drawn up, coordinated with the competent authority or other parties requiring compliance?

4d. For what part of the organization where hazardous materials* are used is there an up-to-date and demonstrable understanding of both the amounts of materials used and the measures necessary to control the risks?

What part of the measures to control the risks connected with hazardous substances are at the level of BAT (best available techniques)?

Is the organization covered by the BRZO (Hazard of Major Accidents Decree)?
If no: fill in 100 (not applicable here)
If yes: There is a culture measurement instrument for BRZO companies. How large a part of the organization has a 'pro-active' or higher score in the culture measurement?