LAYING THE FOUNDATIONS FOR A METHODOLOGY TO INTEGRATE AND MANAGE THE CORPORATE SOCIAL RESPONSIBILITY ISSUES OF A COMPANY IN THE PRODUCT DEVELOPMENT PROCESS

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ABSTRACT

Manufacturing companies are urged to take responsibility for their impacts on the environment and on society, to contribute to a more sustainable development. The concept of Corporate Social Responsibility (CSR) has therefore gained a lot of interest in the last decades. The Product Development Process (PDP) is a key activity in the operationalization of CSR in a company. However, little is known about the capabilities needed for companies to integrate and manage their CSR issues in their PDP. Therefore, this article aims at contributing to (1) identifying the capabilities to integrate and manage the CSR issues during the PDP, and (2) providing a maturity model to assess the level of capabilities for the integration of the CSR issues in the PDP. Insofar as CSR aims at contributing to sustainable development, the existing literature on capabilities for integrating sustainability in the PDP has been studied and taken as a basis to identify the capabilities for integrating and managing CSR in the PDP. A maturity model has then been built based on these capabilities. This contribution lays the foundation for a methodology to support companies in the improvement of their maturity level in terms of CSR-PDP interaction.

Keywords: Social responsibility, New product development, Sustainability, Maturity model, Capabilities

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1   INTRODUCTION

Manufacturing companies are facing increasing pressures to make the necessary changes to engage in the transition towards a more sustainable development. They are both major contributors to the negative impacts on the environment and on society, but also major actors who can contribute to the sustainable development project (Aggeri and Godard, 2006; Moon, 2007). Today, there are many regulations and laws asking companies to integrate sustainability aspects in their activities and to report on their actions, and the expectations of companies' stakeholders are increasing as the global situation evolves and gets worse. Given this urge for companies to take responsibility for their impacts on the environment and on society, the concept of Corporate Social Responsibility (CSR) has gained a lot of interest in the last decades. CSR is defined as the "responsibility of an organization regarding the impacts of its decisions and activities on society and the environment, through a transparent and ethical behaviour which contributes to sustainable development, health and well-being of the society; takes into account the expectations of the stakeholders; complies to the laws and the international behaviour standards; and is integrated in all the organisation and applied within its relations" (AFNOR, 2010).

Among the activities of manufacturing companies, the Product Development Process (PDP) is considered as key for the operationalisation of CSR. Several authors have highlighted the strong relationship between CSR and the PDP (Koo and Cooper, 2011; Yang et al., 2016; Rocha and Schmidt, 2014) and the potential of the PDP to contribute to the CSR performance of companies. However, little is known about the capabilities needed for manufacturing companies to integrate and manage their CSR issues in their PDP.

The contribution of this article is twofold. First, this article aims at contributing to the identification of the capabilities to integrate and manage CSR in the PDP. Insofar as CSR aims at contributing to sustainable development, the existing literature on the preconditions, requirements, and capabilities for integrating sustainability in the PDP has been studied and taken as a basis to identify the capabilities for integrating and managing CSR in the PDP. Second, this article aims at contributing to the assessment of the level of capabilities for the integration and management of CSR in the PDP of companies, through the development of a maturity model. These two contributions lead to further research perspectives regarding the way to improve the level of integration and management of CSR in the PDP of companies. Section 2 presents a state-of-the-art leading to the formulation of the research gaps, questions, and hypothesis. Section 3 presents the methodology used in this study, and Section 4 presents the results and discussions. Section 5 concludes this study and outlines future research directions.

2   STATE-OF-THE-ART AND RESEARCH PROBLEM

Corporate Social Responsibility (CSR) and Corporate Sustainability (CS) are often used to talk about the same thing, even if in theory there are both common points and differences between the two concepts. Montiel (2008) reveals that "from a practical perspective, companies use both CSR and CS as interexchangeable". Therefore, to better understand the barriers to integrate and manage CSR in the PDP, we have established a parallel between CSR and sustainability: we have studied the barriers to the integration of sustainability in the PDP, as well as the capabilities to integrate sustainability in the PDP.

2.1 Barriers to the integration of sustainability in the PDP

Brockhaus et al. (2019) relate that "work by Claudy et al. (2016) and Alblas et al. (2014) highlights the missing link between sustainability strategy and NPD" where NPD stands for New Product Development. They also relate that "empirical studies show that companies face huge difficulties breaking down high-level sustainability commitments into operational targets". They observe that many companies "seem to await a trickle-down effect from vision to operations that remains elusive". To integrate sustainability in their PDP, companies "need to build capabilities which they can leverage". There is "an extensive body of literature [that] deals with integrating different aspects of sustainability into product development processes" (Brockhaus et al., 2019). Vallet et al. (2009) relate different classifications of environmental approaches in design, ranging from approaches "focused on modifying a single criterion of the product" to larger approaches such as "Innovative eco-design" or "Sustainable Design", extending the "scope of environmental issues". Ceschin and Gaziulusoy (2019) trace the history of Design for Sustainability (DfS) and all the DfS approaches - and associated principles, methods, and tools - that have been developed especially since the 1990s. Their book "shows how DfS approaches

have broadened in scope over the years, from having a focus on environmental impact improvement to the current cutting edge that deals with long-term and large-scale transformations". Some DfS approaches are more advanced and largely used by companies than others. For instance, ecodesign and associated tools such as Life Cycle Assessment (LCA) are widely spread and used by manufacturing companies to continuously reduce the environmental impacts of their products all along their life cycle. However, DfS approaches in general still lack operationalization for several reasons. There are so many different approaches, methods, and tools that there is a "high degree of effort required for their selection and application" (Buchert et al., 2017). Companies therefore struggle to identify the adequate approaches and to effectively implement them, especially as they often lack the global strategic sustainability perspective to guide them in the choice of approaches. In addition, this abundance of approaches reveals a "lack of consensus on how to operationalize sustainable development" (Rocha et al., 2019). Designers "often complain about lacking visibility of the right tool to be chosen at the right time, as well as in a clear a clear vision of the expected outcomes" (Vallet et al., 2009) when it comes to ecodesign. DfS approaches also poorly address social issues: "environmental criteria tend to be more emphasized than the social and the economic ones, either in the sense they are more numerous and detailed or because they are more directly related to product or service performance" (Rocha et al., 2019). De los Rios and Charnley (2017) highlight that "the majority of design for sustainability tools and guidelines only concern themselves with the technical design criteria, disregarding the bigger picture related to corporate strategies for sustainability".

Therefore, when integrating sustainability in the PDP, several difficulties must be faced by companies. Companies struggle to translate high-level strategic sustainability issues in the PDP and lack the appropriate capabilities to do so. Without these capabilities, there is a lack of connexion between the strategic sustainability vision and what is done in the PDP to integrate sustainability aspects. This lack of alignment between the sustainability strategy and the PDP prevents companies to leverage all the potential of the PDP to improve their sustainability performance.

2.2 Literature review on capabilities for sustainability integration in the PDP

In the existing literature, the capabilities to integrate sustainability in the PDP have been explored and addressed in different ways. Some studies investigate the preconditions, requirements, capabilities, and other key elements or recommendations to integrate sustainability in the PDP. Other studies develop maturity models to evaluate the level of integration of sustainability - or aspects or sustainability - in the PDP or in the company in general.

2.2.1 Preconditions, requirements, and capabilities to integrate sustainability in the PDP

Hallstedt et al. (2013) study the "key elements for implementing a strategic sustainability perspective in the product innovation process". They identify eight key elements for a successful implementation. Poulikidou et al. (2014) conduct an empirical study on the "integration of environmental aspects and requirements into four vehicle manufacturing companies in Sweden". They particularly study the barriers to the "diffusion and efficient implementation of the DfE approach among industries", where DfE stands for Design for Environment, and provide some recommendations to overcome these barriers. Kalish et al. (2018) conduct a study that provides "some insight into how companies are moving forward, suggesting practices, tools, and processes that can facilitate the inclusion of sustainability in product development". In their article, they mention several conditions that are required for a successful implementation of sustainability in product development. Hallstedt et al. (2020) provide insights on new product development capabilities needed from digitalization, sustainability and servitization. They propose a framework to support the development of such capabilities, which relies on four complementary resources. Da Cunha Bezerra et al. (2020) identify seven categories of strategic organizational capabilities for sustainability, associated with ten expected benefits in terms of sustainability. Li et al. (2021) develop a framework in which they present three types of sustainability-oriented capabilities interacting together to create sustainable value in the product development process. Brockhaus et al. (2019) provide "an actionable guide to executives and product developers with respect to bridging the gap between often elusive sustainability aspirations and tangible product improvements via the process of rigorous codification". Based on empirical observations, they suggest best practices to effectively translate "strategic sustainability goals into tangible products".

To sum up, all these studies provide insights on the requirements, preconditions, and capabilities to integrate sustainability aspects in the PDP - or at the operational level.

2.2.2 *Maturity models to assess the level of integration of sustainability in the PDP*

Pigosso et al. (2013) present the Ecodesign Maturity Model which aims at "support[ing] companies in the continuous process of ecodesign implementation by providing a management framework that enables the assessment of their current ecodesign maturity profile, the understanding of improvement opportunities, the selection and prioritization of ecodesign practices and the deployment of roadmaps for implementation, considering the companies' strategic objectives and drivers". The maturity level depends on which ecodesign management practices are applied by the company, and how well these practices are applied. Hynds et al. (2014) present a "maturity assessment tool that allows companies to measure their sustainability efforts with regard to various aspects of NPD", where NPD stands for New Product Development. The dimensions assessed in their tool are grouped into two categories: strategy dimensions and design tools dimensions. The authors developed an Excel tool with a list of questions for each dimension and the maturity level depends on the answers to these questions. Michelin (2015) develops an internal maturity module, aiming at helping companies identifying their ability to deal with potential environmental specifications. This maturity module is built based on the Ecodesign Maturity Model from Pigosso et al. (2013), which means that the ecodesign management practices used for the maturity evaluation are the same, except that they are simplified. Gouvinhas et al. (2016) present a "self-evaluation framework to rank companies into different classes according to their level of maturity in terms of sustainability". The goal is to "help companies to better understand which strategic and managerial actions they need to take before implementing any ecodesign". To evaluate the maturity level of companies, a questionnaire is used which relies on twelve different categories of indicators. Machado et al. (2017) present a maturity framework for sustainability integration guided by sustainable operations capabilities evolution. The maturity levels are described based on the sustainable operations management (SOM) capabilities that companies need to have to reach each maturity level. Ormazabal et al. (2017) present an "environmental management maturity model for industrial companies". The model is divided into six maturity stages, and seven aspects are detailed for each stage: a "description" of the stage, the "agents involved" at that stage, the "actions that companies should take to complete each stage", the "tools" that can help companies at that stage, the "indicators" to measure progress at that stage, the "behavior-over-time (BOT) graphs" representing the evolution of indicators depending of the implemented actions, and a "causal-loop diagram" showing the interactions between the indicators. Schulte and Hallstedt (2018) present a "self-assessment method for sustainability implementation in product innovation", where product innovation includes product development. Their method is based on the work from Hallstedt et al. (2013) who identified eight key elements for a successful implementation of sustainability in the product innovation process. Schulte and Hallstedt (2018) provided a more detailed description of these eight key elements and developed a maturity model to enable companies to "assess and visualize their current capabilities in relation to [these] key elements". Watz and Hallstedt (2019) identify "key elements of requirements management in early product development for sustainability integration" and develop a "model of requirements management and organisational sustainability maturity in product innovation processes". They identify five key elements to support organisational sustainability maturity. Xavier et al. (2020) develop the eco-innovation maturity model, "a framework to support eco-innovation integration and evolution of organizational maturity". The maturity level depends on which eco-innovation practices are applied by the company, and how well these practices are applied. To sum up, all these studies focus on the development of a maturity model to assess the integration of sustainability - or aspects of sustainability - in the PDP or in the company in general. The maturity criteria used in the different maturity models provide insights on the preconditions, requirements, and capabilities to integrate sustainability in the PDP.

2.3 Research gap, questions, and hypothesis

The literature review reveals that companies face difficulties when integrating sustainability in their PDP. Several authors have studied the preconditions, requirements, capabilities, and other key elements for a successful integration of sustainability - or aspects of sustainability - in the PDP or in the company in general. Maturity models have been developed to assess the level of integration of sustainability - or aspects of sustainability - in the PDP or in the company in general. As a parallel has been established between CSR and sustainability, we assume that companies face the same difficulties when integrating CSR in their PDP. Therefore, we need to verify whether the development and application of capabilities enables the integration of CSR in the PDP, and to provide guidance to companies as to which capabilities they need to build and apply, as well as how to assess their level of capabilities.

Accordingly, this article aims at answering the two following research questions (RQ):

RQ1: What are the capabilities needed by manufacturing companies to integrate CSR in the PDP?

RQ2: How to assess the level of capabilities for the integration of CSR in the PDP?

Regarding RQ1, we make the hypothesis that building and applying capabilities enables the integration of CSR issues in the PDP. We rely on the capabilities identified in the literature to test this hypothesis. Regarding RQ2, we make the hypothesis that the use of a maturity model enables to distinguish between the CSR issues already well integrated in the PDP, and those that fall behind. Next section presents the methodology used to answer the two research questions, and to test the associated hypothesis.
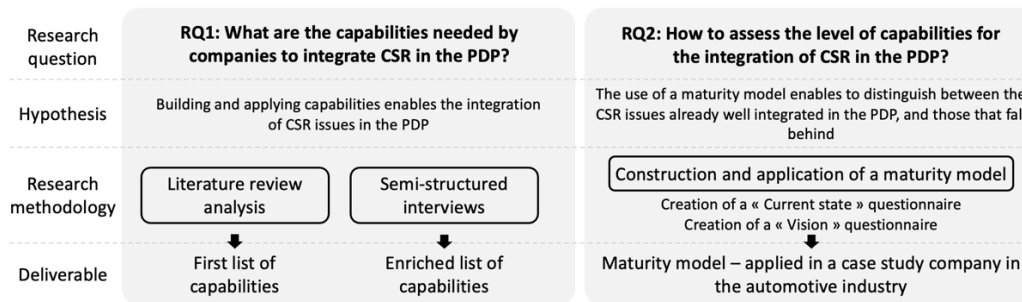
3 METHODOLOGY

Figure 1. Research methodology used to answer the research questions

Figure 1 summarizes the research questions, hypothesis, methodology, and deliverables. For **RQ1**, we analysed the literature review conducted before to obtain a first list of capabilities. Then we confronted this list through semi-structured interviews in a case study company to test our hypothesis. We chose the interviewees based on the way CSR is operationalised in our case study company. They have a CSR global office which oversees a CSR network composed of subject matter experts: the CSR champions and CSR correspondents. The CSR correspondents were deemed relevant to interview as they work with a network of contributors and have a global perspective on the operationalisation of the CSR issues they are responsible of. We interviewed two CSR correspondents in charge of two very strategic CSR issues, as we assumed that the most strategic CSR issues would be the most likely to be already well integrated in the PDP. The interviews aimed at understanding how the CSR issues had been integrated in the PDP, which capabilities had been needed for this integration, and whether these capabilities were coherent with the ones identified in the literature. We also verified if new capabilities emerged from this empirical observation - new meaning not identified in the literature. At the end of these two steps, we obtained an enriched list of capabilities. For **RQ2**, we built a maturity model to assess the level of capabilities for the integration of CSR in the PDP. We created two questionnaires based on the capabilities: a "Current state" questionnaire aimed at understanding the current level of capabilities, and a "Vision" questionnaire aimed at understanding the desired level of capabilities. Then we applied this maturity model in our case study company on the two CSR issues mentioned before for RQ1. The aim was to see if we could distinguish these CSR issues in terms of level of integration in the PDP. Next section presents the results of the application of our research methodology and the discussions.

4 RESULTS AND DISCUSSIONS

4.1 Literature review analysis

We analysed the existing literature on the integration of sustainability in the PDP to obtain a list of capabilities to integrate sustainability in the PDP. We decided to classify these capabilities into five categories based on the work from Da Cunha Bezerra et al. (2020). Inside each category of capabilities we defined what we called "enablers", meaning elements that enable to build the different capabilities. The categories and enablers are described below.

Capabilities related to collaborative relationships for sustainability refer to all the relationships that the company needs to establish, maintain, and enhance with both internal and external stakeholders in the process of integration of sustainability in the PDP. Different enablers have been identified: the whole value chain needs to be involved - suppliers, after-sales, recyclers etc. -, meaning that they need to be

educated to the sustainability issues, that their knowledge and skills regarding sustainability aspects need to be mobilized all along the PDP, and that a continuous dialogue should be implemented with them to keep exchanging good practices and finding solutions. Suppliers should be regularly assessed and audited regarding sustainability aspects, and they should be selected based on sustainability criteria. Cooperation programs should also be implemented, both with internal and external partners - suppliers, universities, consulting firms, etc. - to improve the sustainable performance of products. **Capabilities related to the absorption of knowledge and learning about sustainability** refer to the acquisition, dissemination, sharing and management of knowledge about sustainability. Enablers are the acquisition and dissemination of knowledge about the different sustainability aspects and the existing approaches and tools to integrate them in the PDP, and the implementation of a knowledge management system enabling the documentation, storage, share and application of knowledge about the sustainability aspects all along the PDP. **Capabilities related to alignment and motivation for sustainability** refer to internal conditions created by the company to enable a successful integration of sustainability in the PDP. Different enablers have been identified: the employees involved in the integration of sustainability in the PDP need to be aware and trained regarding sustainability aspects and the existing approaches, methods, and tools to take them into account during the PDP. The company needs to ensure internal communication among and between the different departments, especially regarding the sustainability metrics and goals used in the PDP as well as the associated benefits and risks. The company also needs to ensure a support of the senior management at all levels, both top-down and bottom-up. Top-down means that the senior management needs to communicate the sustainability vision, strategy, and goals to the PDP, and to provide the required resources to integrate sustainability in the PDP - whether it be training for the employees, allocation of financial resources, or promotion of a sustainability culture to keep the employees motivated and involved. Bottom-up means that the senior management also needs to recognize the value of the ideas emerging from the operational level, and to relay them and take them into account. **Capabilities related to flexibility and adaptation on sustainability issues** refer to the ability to respond adequately and quickly to sustainability challenges, especially by making the organisational changes required to integrate sustainability in the PDP. The main enabler is the assignment of roles and responsibilities at different levels to integrate sustainability in the PDP. **Capabilities related to the management of sustainable operations** refer to the implementation and use of sustainability indicators and tools to integrate sustainability aspects in the PDP. Different enablers have been identified: internal benchmarks need to be conducted to assess the current performance regarding sustainability aspects and to set goals for the products; sustainability indicators and tools need to be selected, customized and implemented to evaluate the sustainability impacts of the products; specifications need to be set, and sustainability criteria need to be considered when decisions are made during the PDP along with traditional design aspects - such as cost, quality or aesthetics; a follow-up of projects needs to be done regarding sustainability aspects to ensure information storage and good practices identification and implementation in future projects.

4.2 Semi-structured interviews in the case study company

After our literature review analysis, we conducted semi-structured interviews in a case study company in the automotive industry with two CSR correspondents in charge of two strategic CSR issues. The first CSR issue dealt with the integration of green materials in the vehicles of the company. The strategic goal for this CSR issue was to integrate at least 30% of green materials in average in all the vehicles produced by the company. The second CSR issue dealt with the responsible purchasing practices. All the suppliers of the company were evaluated by an independent third-party who gave them a score reflecting their CSR performance. The strategic goal for this CSR issue was to select suppliers to ensure an average score of the suppliers above a certain threshold. Only the first interview is described here.

The CSR correspondent in charge of the issue of green materials described the process that had been used to integrate this issue in the PDP. The company started by acquiring knowledge on green materials and training the employees in the PDP. Then an internal benchmark was performed on existing vehicles to measure the percentage of green materials integrated in the vehicles and in the different parts composing the vehicles. To perform this benchmark, an indicator was implemented - the percentage of green materials per vehicle component - as well as a data collection to acquire the required data to calculate this indicator. Once the company knew what quantity of green materials was already integrated in the components - and in the vehicles in average - some goals started to be set for all the new vehicle projects. These goals were set both at vehicle and at component level and were expressed in terms of

percentage of green materials that the vehicles - or components - needed to contain. These goals were also integrated in the specifications for the components, which implies that the company had to educate the suppliers on green materials as well. A strong relationship was established with the suppliers to increase the performance in terms of green materials integration. The knowledge of the suppliers on green materials started to be systematically mobilized during the PDP, and a dialogue was implemented with them to look for solutions together. The company also got involved in scientific partnerships to extend the knowledge on green materials and boost the extension of the portfolio of components containing green materials. All these initiatives were always pushed by a strong commitment of the senior management who, for example, systematically remind the members of the PDP of the green materials goals at the beginning of each vehicle project. All the knowledge on green materials is communicated, managed, and shared as much as possible during the PDP. Roles and responsibilities have been assigned to manage the green materials issues during the PDP, and this organisation is largely known and communicated even if not properly formalised.

Through this interview and the second interview not described here, we were able to confirm that the construction and application of the capabilities identified in the literature enabled the company to integrate the CSR issues in the PDP. A global comment that could be made however was that for many capabilities, the relevant level of capability depends on the CSR issue. For instance, not all the employees need to be trained but only those who are deemed relevant - which strongly depends on the CSR issue. In the same way, the indicators and goals need to be implemented at the relevant level of granularity - which sometimes in our case study company was the component level, sometimes the vehicle level for instance. Several elements were mentioned by the interviewees that added or completed the capabilities identified in the literature. For instance, to implement the indicators, a data collection needs to be implemented both in the company and among the suppliers if needed. Also, the evolution scenarios regarding the CSR issue need to be known and used during the PDP.

To sum up, these interviews enabled us to initiate the validation of our first hypothesis and to obtain a refined list of capabilities and enablers. This list is available in the first page of the supplementary material. However, to further validate our hypothesis, other interviews should be made with other people in the company - whether other CSR experts or other functions such as project leaders - to have a broader perspective on capabilities. Other companies could also be studied for a generalisation of results. In addition, the capabilities to translate high-level strategic issues at the operational level - whether sustainability issues or other - should be investigated to see if our list of capabilities could be extended.

4.3 Construction of a maturity model

Based on the capabilities to integrate CSR in the PDP, we built a maturity model to assess the level of capabilities for the integration of the CSR issues in the PDP. The aim was to support companies to distinguish between the CSR issues already well integrated in the PDP, and those that fall behind. Thanks to the interviews we conducted, we realized that depending on the CSR issue, the relevant level of integration in the PDP is not the same. Therefore, we had to build a maturity model applicable to one given CSR issue, and able to: (1) make a diagnostic of the current level of capabilities for the integration of this CSR issue in the PDP, and (2) establish a vision of the desired level of capabilities for the integration of this CSR issue in the PDP.

To build our maturity model, we started by transforming the capabilities identified before into a series of questions to create a "Current state" questionnaire. This questionnaire aims at understanding the current level of capabilities for the integration of a given CSR issue in the PDP. Then we transformed the capabilities into another series of questions to create a "Vision" questionnaire. This questionnaire aims at understanding the desired level of capabilities for the integration of a given CSR issue in the PDP. Figure 2 illustrates the questionnaires by providing the series of questions for the enabler "CSR indicators and tools", both for the "Current state" questionnaire and for the "Vision" questionnaire.

The questionnaires are available in the second and third pages of the supplementary material. They are meant to be filled by the CSR experts of the investigated CSR issues. The maturity level therefore depends on the gap between the current state and the vision. This maturity evaluation is dynamic, which means that the current situation and the vision correspond to a given point in time. Every time the evaluation is made, the current situation evolves as well as the vision. Indeed, depending on the moment of the evaluation, the diagnostic will evolve depending on the improvements made to integrate the CSR issues in the PDP, and the vision will evolve depending on the expertise of the CSR correspondents and on all the internal and external factors influencing the vision of the correspondents.
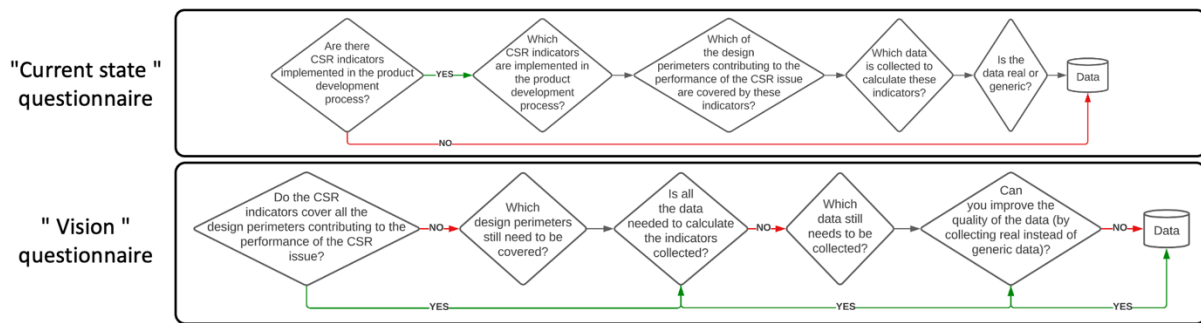
Figure 2. Illustration of the questionnaires for the enabler "CSR indicators and tools"

This maturity model has some limitations: it is based on the capabilities to integrate CSR in the PDP identified before, which means that it might be incomplete and not applicable to other companies than our case study company. It relies on the knowledge and expertise of the CSR correspondents who answer the questions, meaning that depending on their level of knowledge and expertise, the maturity evaluation might differ. There is a subjectivity bias in the evaluation. Yet, the use of specific questions reduces the space for subjectivity in the answers and thus in the maturity evaluation. Another limit is the lack of maturity levels for the capabilities, making it difficult to quantify the gap between the current state and the vision and preventing companies from being challenged to go further than their vision. Creating a maturity grid could address this limit and reduce the bias linked to the self-assessment method.

4.4 Application of the maturity model in the case study company

We applied our maturity model in our case study company on the two CSR issues described before - the integration of green materials in the vehicles, and the responsible purchasing practices with the supplier scores. Our two interlocutors - the CSR correspondents in charge of these two CSR issues - filled in the two questionnaires and we analysed the gap between the current state and the vision.

Regarding the **CSR issue of green materials**, the answers to the "Current state" questionnaire reflect the description that has been made during the interview described in the previous section. The answers to the "Vision" questionnaire show a very small gap between the current state and the vision: according to the expertise of the interviewed CSR correspondent, all the capabilities and enablers have been built and applied almost at their maximum level to integrate the CSR issue in the PDP. Only small incremental improvements could be envisioned such as the reinforcement of the relationship with the suppliers, or the extension of the data collection to other components which are not monitored today in terms of percentage of green materials.

Regarding the **CSR issue of responsible purchasing practices**, the answers to the "Current state" questionnaire are described here. All the suppliers of the company are assessed by a third-party in terms of CSR performance. The suppliers have therefore been educated regarding the CSR issues that are considered to evaluate them. The employees in the company have also been trained on this CSR issue, and on the tool used to evaluate the suppliers by the third-party. An internal benchmark has been conducted to calculate the average CSR score of all the suppliers of the company. This has led to the definition of goals at the strategic level - a minimum threshold has been set in terms of average CSR score of the suppliers. This threshold is used during the PDP as a decision criterion to select the suppliers, component by component. There is a strong senior management commitment to integrate this CSR issue in the PDP as most of the components of the vehicles are purchased components. Roles and responsibilities have been assigned to manage the responsible purchasing practices issue during the PDP, even if not properly formalised. The answers to the "Vision" questionnaire show a bigger gap between the current state and the vision than for the CSR issue of green materials. Indeed, the CSR correspondent has notified that a new CSR indicator could be implemented at the vehicle level, calculating the average CSR score of the suppliers of one given vehicle. This would enable the company to have more visibility on the impact of the different vehicle segments, motorisations - whether electrified or not for instance-, range and characteristics, and to set goals at the vehicle level. The data needed to calculate this indicator is already collected, but a new tool would need to be created to manage this indicator and enable follow-up.

Through these examples, we have seen that our maturity model enables a better understanding of the current level of capabilities for the integration of the CSR issues in the PDP, as well as more visibility on

the desired level of integration of the CSR issues in the PDP. It also enables to distinguish the CSR issues depending on the level of capabilities, and to identify where the lacking capabilities are. However, we have only tested our maturity model on two CSR issues, and in a single case study company. This means that the model might not be applicable in other companies, and that other case studies would be required to further validate our hypothesis. In addition, we have no point of comparison to verify our results and see if the maturity levels we evaluate are relevant and coherent.

5 CONCLUSION AND FUTURE RESEARCH

Companies are urged to take responsibility for their impacts on the environment and on society and the concept of CSR has progressively gained interest in the last decades. The PDP is a key activity to enable companies to contribute to sustainable development, and many approaches have been developed to take sustainability aspects into account during the PDP. However, there is a lack of alignment between CSR and the PDP which prevents companies to leverage all the potential of the PDP to contribute to their CSR performance. Therefore, this article provided two contributions: (1) the identification of the capabilities to integrate CSR issues in the PDP, and (2) the construction of a maturity model to evaluate the maturity in terms of capabilities for the integration of a given CSR issue in the PDP. This maturity model consists in two questionnaires which respectively aim at making a diagnostic of the current level of capabilities for the integration of the CSR issue in the PDP and establishing a vision of the desired level of capabilities for the integration of the CSR issue in the PDP. These questionnaires were designed to be answered by the CSR correspondent in charge of the studied CSR issue, and to be frequently updated to reflect the evolution of both the current situation and the vision. This maturity model aims at providing companies more visibility on the capabilities they lack to integrate their CSR issues in their PDP. It is a first step towards the development of a methodology to support companies in the improvement of their maturity in terms of CSR-PDP interaction. Further research direction would be to provide companies with guidelines to improve their capabilities and therefore their level of maturity in terms of integration of their CSR issues in their PDP. Improvement levers should be identified and suggested to the companies, based on the capabilities. These improvement levers could be characterised based on the efforts required to implement them - for instance in terms of human resources, financial cost, required time - so that improvement trajectories could be formulated. Companies could then choose the trajectories to implement based on internal factors - such as their resources, capabilities, willingness to invest - and external factors - such as the regulation.

APPENDIX

Link to the supplementary material:
https://www.dropbox.com/s/64wvkpz4lrltc2d/Supplementary%20material.pdf?dl=0

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