

From Diagnosis to Melioration of Sustainable Development in SMEs: The SME-Sustainability Compass

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Abstract. The paper presents the Sustainability compass, which aims at supporting small and medium-sized enterprises (SMEs) to improve the performance of their sustainable development; hereafter called the *SME-Sustainable compass* (SME-SC). Firstly, the paper introduces the result of the first step of the project that proposes the Sustainability compass as an online diagnostic tool. Thus, the paper continues with the second step of the project, which uses the data captured in the previous step to develop a recommender system to suggest the models to follow, and specific recommendations of those role models. Accordingly, a general architecture for the SME-SC is presented. Finally, the paper ends with a discussion, conclusion, and further research directions.

1 Introduction

Nowadays, small and medium-sized enterprises (SMEs) are still slow to integrate sustainable development practices into their business model. However, in the aggregate, their impact on climate and biodiversity is major [1]. This delay is caused, among other things, by the difficulty of being inspired by a model that is similar to their own.

While large companies can draw inspiration from several public companies to adopt practices comparable to champions in the field, SMEs do not have access to the same sources of inspiration. For example, a recent survey by [2] shows that 96% of the top 250 companies in the United States have incorporated sustainability reporting into their reporting practices. The isomorphism effect described in institutional theory seems to be at work [3]. Large companies are imitating each other, and this is driving sustainability reporting practices forward.

In order to stimulate such emulation among SMEs, it is important to present them with models that resemble them and that can inspire them with practices adapted to their situation. It is in this spirit that the study develops an online diagnostic tool, called the *SME-Sustainability compass* (SME-SC) [4] and then improves this tool by adding an artificial intelligence (AI)-based process that will guide SMEs towards SMEs that resemble them and that are, moreover, more efficient in terms of sustainable development practices.

The rest of the paper is organized as follows. Section 2 presents the SME-Sustainability compass as a diagnostic tool. Section 3 suggests potential improvements that consist in

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adding an AI-based process to classify SMEs according to a set of relevant variables (size, age, sector, positioning in the value chain) and to identify the "champions" that will serve as models to follow. Accordingly, Section 4 presents a general architecture for the SME-SC. Finally, Section 5 ends the paper with a discussion, conclusion, and further research directions.

2 The SME-Sustainability compass as a diagnostic tool

The SME Sustainability Compass is an online tool that identifies the sustainability profile of SMEs. It is a self-service online tool (available as an open-source system) that is intended for SME managers and is currently available on the Vigie-PME website¹.

The SME-SC tool is, in fact, a matrix that allows to position according to the axis of sustainable orientation and the axis of entrepreneurial orientation. Based on a set of questions about their environmental, social (in relation to employees), and community sustainability practices, it reveals where an SME is headed.

The current system allows SMEs to compare themselves to 400 other SMEs and to position themselves according to the two axes of the Compass. The SME can be assigned to one of four business profiles as follows: a) The traditionalist SME, b) the strategic SME, c) the activist SME, and d) the reactive SME.



Fig. 1. The SME-Sustainability compass.

In general, the SME-SC offers SMEs a way to discover which of their practices contribute to sustainable development. It is also a tool for reflecting on the positioning and overall performance of their organizations.

In the following, the paper provides detailed information about the orientations and profiles.

¹ <http://www.vigiepme.org/>

2.1 The orientations

Sustainable orientation.

Sustainable orientation is defined by social, environmental, human resource management and community relations practices [5]. The degree of commitment to these practices allows to distinguish typical behavioral profiles.

The environmental practices observed in this context are strongly linked to the principles of the circular economy [6]. This involves the use of resources during procurement, processing, transportation, and the integration of externalities into the SME's production chain or that of other economic actors.

In the context of SMEs, social practices relate to relations with employees. In concrete terms, it is a matter of human resources management, several aspects of which are still strongly codified by law. However, each SME has a certain amount of latitude in this area and can adopt behaviors that may or may not be in line with sustainable development.

Qualified as societal or community-based, the practices of investment in the community and local commitment involve both social and economic aspects.

Entrepreneurial orientation.

Entrepreneurial orientation is a concept perfectly adapted to the situation of SMEs [7]. The entrepreneurial act is intimately linked to the idea of an SME since it is its founding impetus.

Entrepreneurial orientation refers to a repertoire of organizational behaviors in terms of strategy and decision-making. These organizational behaviors are articulated along three dimensions: proactivity, risk-taking, and product innovation. These behaviors can be linked to the idea of performance, one aspect of sustainability. The entrepreneurial dimensions have been measured for several years using questions developed by researchers Covin and Slevin in 1989 [8].

An evaluation of these aspects allows to distinguish on a continuum the most entrepreneurial profiles from the most conservative. The innovation strategies of companies are then seen as responses dictated by the environment (conservative), or as emanating from the convictions and voluntary initiatives of managers (entrepreneurial). Proactivity (entrepreneurial) is seen as the opposite of reactivity (conservative). Risk-taking is seen as the concrete reflection of a proven will to maximize development opportunities.

2.2 The profiles

The traditional SME.

The traditional SME knows that energy savings, recycling, and waste control can provide economic benefits (cost reduction) in the short or medium term. However, its sustainable development practices are far from being at the center of its strategy. It considers social and environmental costs as externalities. Its main objective remains the improvement of profit and the growth of the company.

The strategic SME.

The strategic SME lives and grows by innovation and by seizing opportunities related to sustainable development. Sustainable development is an integral part of its competitive advantage and the positioning that allows it to stand out. Its strategy involves the development and marketing of innovative products and services that contribute directly to sustainable development targets. This is how this SME differentiates itself.

The Reactive.

The sustainable development practices of the reactive SME are limited to the strict minimum, framed by the regulations. It is not really interested in sustainable development. Its main

concern is survival, rather than growth or development. Commercial performance is not a major objective either. Above all, this SME is looking for stability, financial autonomy and decision-making independence and is probably not in a position to take risks.

The Activist.

Sustainable development is its *raison d'être*. Contributing to the protection of the natural environment and the social development of its community are at the heart of its business model. Establishing and maintaining trusting relationships with its stakeholders is a priority. Its main motivations are its sense of duty and a certain idea of the role of business in society.

3 The SME-Sustainability compass as a melioration tool

While the SME-Sustainability compass allows SMEs to identify, through an online tool, their profiles in terms of managing sustainability aspects, it provides little information on how to improve according to these profiles and the underlying characteristics that can further distinguish them. The tool is, for the moment, very general and only distinguishes the profiles according to their sustainable practices and entrepreneurial orientation.

In order to improve the SME-SC tool, a service science-based approach has been used to identify the requirements of the transformation from a diagnostic tool as a melioration tool, which proposes a recommender system for improving the sustainable performance of SMEs. Consequently, the objectives of this step cover different levels of services [9][10]:

- The *management dimension* focuses on the sustainable development goals;
- The *science dimension* involves the characteristics for identifying the role models as champions; and
- The *engineering dimension* deals with a general architecture for a recommender system to identify a champion as models for an SME.

3.1 Management dimension

The management dimension deals with how to improve service systems and focuses on improving the performance of service systems based on key dimensions of performance measurement [10].

To improve the tool such as the SME-Sustainable compass, a more refined distinction based on a set of different characteristics would be necessary to make comparisons, which are more useful for SMEs. Furthermore, a set of multiple impacts could be used, for example, the positive impacts on the various "Sustainable Development Goals" suggested by the UN².

3.2 Science dimension

The science dimension deals with what the service systems are and how to understand their evolution in order to promote the application of competencies of an economic entity to benefit another entity [10].

Accordingly, it would be appropriate to distinguish SMEs belonging to the various profiles according to the sectors, size (a micro-enterprise, a small enterprise, or a medium enterprise), target markets (end-users, B-to-B, national, international), management values, and so on. This breakdown would also make it possible to identify the champions of the various profiles according to a set of multiple impacts as mentioned above. These champions would then serve as models for SMEs that complete the Sustainability Compass.

² <https://www.un.org/sustainabledevelopment>

3.3 Engineering dimension

The engineering dimension deals with how to invent new technologies that improve the scaling of service systems such as AI-powered tools [10].

In the manner of a recommender system [11] such as *Netflix*³ type systems, the SME that completes the questionnaire would receive website links from SMEs (2-3) that are champions in their sustainability profile and have similar characteristics with respect to several other variables. These champions would become models for SMEs to emulate and implement practices and processes inspired by similar SMEs.

The suggested system would be self-sustaining and in continuous improvement mode. Indeed, from a basic sample, the first categories in each profile and the first champions would be identified, but the sample would be alive, growing at the rate of voluntary respondents, and the champion SMEs of a period could be surpassed by new respondents.

4 General Architecture for the SME-Sustainable Compass

In order to demonstrate the proposed approach, this section presents a general architecture of a knowledge-based smart service system, which provides recommendations as a service. Figure 1 presents the general architecture for the SME-Sustainable compass. The architecture is based on the Trivi open-source solution for building smart service systems [12].

Data sources.

Concerning the data sources, data are categorized into demographic, diagnostic, open data, and third-party data. *Demographic data* contain data related to the characteristics of SMEs. *Diagnostic data* is data extracted from the previous diagnostic system in order to overcome the challenge of cold start, which is defined as the insufficient amount of data input for the development of recommendation services [11]. *Open data and third-party data* help the SME-SC to capture different types of knowledge related to the sustainability development of SMEs.

Engineering dimension.

Concerning the engineering dimension, different types of knowledge have been captured and organized. Firstly, *know-who* entities involve all data about SMEs and stakeholders of the SME-SC system, which can be used for developing business profiles. Secondly, *know-what* entities contain data about products/services, which are useful for sustainable development. Thirdly, *know-how* entities involve data relating to activities that support the sustainable development process.

Science dimension.

Concerning the science dimension, the architecture focuses on a portfolio of analytics techniques such as descriptive and predictive analytics [12]. *Descriptive analytics* is the examination of data that can be used to identify business profiles. *Predictive analytics* makes recommendations using historical data combined with data mining techniques and machine learning [11].

Management dimension.

Concerning the management dimension, *context recognizing* identifies the context based on the business situation of the SME [11]. On the other hand, *context reasoning* understands specifically the situation, along with how it fits the overall business context of the whole

³ <https://www.netflix.com/>

ecosystem, and then determines the corresponding knowledge related to a similar context in the knowledge base to make specific recommendations for the SME [11].

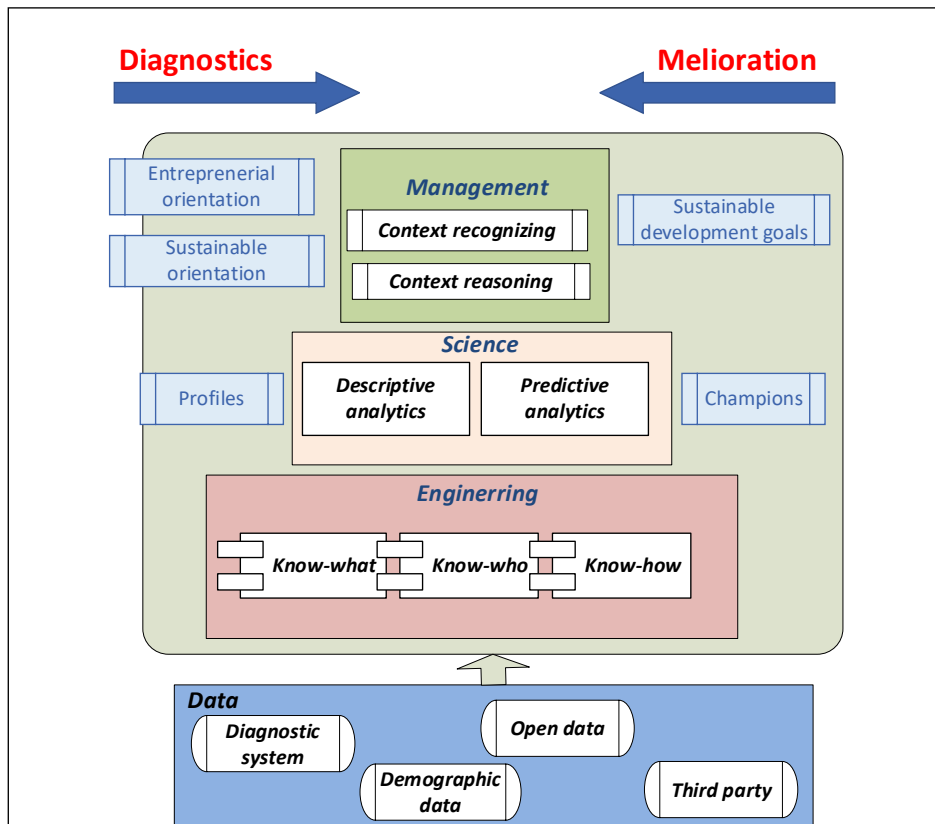


Fig. 2. The general architecture for the SME-Sustainable compass.

5 Conclusion

In conclusion, SMEs need models that resemble them in order to draw inspiration from their practices, their processes, and their attitudes toward sustainable development. This improved version of the SME-Sustainability compass aims to foster the isomorphism effect that seems to operate in large companies, but, which has not yet been observed in SMEs.

To be effective, the SME-SC tool must be highly visible so that a sufficient number of respondents use it on a recurring basis (over several years) in order for the classification to be increasingly precise (distinction by characteristics) and for the sample to be able to capture improvements in the practices of the champions.

Several challenges must be considered in the development of the tool, including the management of confidentiality in relation to the disclosure of champion SMEs for the various profiles and periods. We must also ensure that we have the means to filter the respondents to ensure the quality of the information shared.

Furthermore, what algorithms can be used to identify the champions and what is the best analytic technique can be used to make the recommendations will also be an interesting research direction.

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