

An Empirical Check-Up Approach Using Data Analytics for Sustainability in Micro, Small and Medium-Sized Enterprises

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Abstract

The effects and importance of sustainability are felt more and more every day. Companies that want to take part in the global supply chain need to go a long way in terms of sustainability. It is obvious that micro, small and medium-sized companies have a large share in the global market. It is difficult to collect the sustainability data required in GRI SASB etc. standards especially for micro and small businesses. The second step that is after collection sustainability data needs analysing to develop strategy and tactics for decision makers. In this study, the aim is to provide suggestions for global micro, small and medium-sized companies to check-up their sustainability status about using data and analytics

Keywords: Sme, Sustainability

1. Introduction

The effects and importance of sustainability are felt more and more every day. Companies that want to take part in the global supply chain need to go a long way in terms of sustainability. When it comes to sustainability in SMEs, it is a difficult process. Both adapting to standards and applying them effectively are a few of the problems. Complying with the Sustainability standards need both knowledge and skill of applying. Basically data gathering is needed for sustainability. Big companies have their capability and skills to collect data. In fact, they can afford to establish separate departments for sustainability.

There are lots of studies that focus on sustainability and sustainability for SMEs. But in practice awareness and solutions are needed that are simple to execute for SMEs. Most of studies focus on small and medium companies but fail to adress micro companies.

Firstly, literature regarding the sustainability for companies and SMEs is reviewed. The importance of SMEs also is mentioned. Third part is dedicated to digitalization for SMEs. Because digital solutions may be easy to use for collecting data and analysing for sustainability. The fourth topic is data analytics for sustainability especially in SMEs. In these topics sustainability reporting also is focused in literature review. After literature review a check-up approach is suggested for sustainability in SMEs.

2. Literature Review

A basic way to integrate sustainability to companies is presented in Figure 1. Integrating sustainability to corporate operations is important too. (Borsa Istanbul Rehberi 2020) Basically integrating sustainability process can be summarized in three steps. At first, companies should determine sustainability development goals that they want to reach. They also determine sub-goals that suits them. Collecting data is an another important step for them because companies need data and data analytics for both checking the situation and improvement needs. Last step is reporting, integrating and applying. It also contains improvement actions in terms of results.

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Figure 1: Sustainability Implementation Process Example

Source: Borsa Istanbul Rehberi 2020

Creating sustainability strategy is an important issue for each companies. It needs data in each step. Micro, small and medium-sized companies can benefit from them. Strategic planning process needs data. Basically data can be used for sustainability reporting that is expected by the authorities and decision makers. Data and analytics issues are studied by many researchers.

When we define SMEs according to EU: micro: less than 10 persons employed, small: 10-49 persons employed medium-sized enterprises: 50-249 persons employed. (Eurostat)

It is estimated that there are approximately 332.99 million SMEs worldwide in 2021, slightly more than in 2019 when there were 328.5 million. The number of SMEs in the most recent year was the highest in the provided time period. We can see the numbers in Figure 2. (Statista)

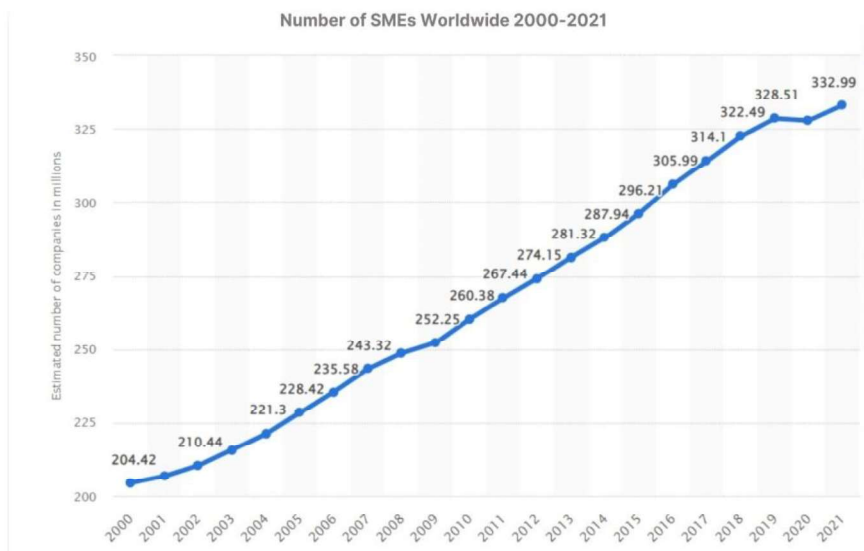


Figure 2. The approximate number of SMEs in the world in 2021

Source: (Statista)

Employment creation, fast adaptation, flexibility feature; encouraging entrepreneurship; product differentiation; working as sub-industry are some of the contributions of SMEs to the economy (Erdin, Özkaya 2020)

Arena and Azzone (2012) asserted key sustainability indicators to support small and medium sized enterprises in initiating sustainability reporting (Arena M, Azzone G. 2012). Another study also asserted an approach to support decision-makers in SMEs and prioritize sustainability reporting standards. They proposed a multi criteria decision method approach to prioritize sustainability reporting standards (Gutierrez P. R et al 2021).

There are many studies that focus on areas (innovation, reporting, examining measurement of sustainability etc.) that deal with sustainability of SMEs (Bos-Brouwers H E J 2010) (Martinez E O et al 2020) (Prabawani B 2013).

Developing sustainability reporting especially in social and environmental issues for SME is an important issue (Martins A et al. 2022).

There is a study that compares consultants and academic perceptions regarding sustainability reporting in SMEs (Polo C F and Guerrero-Baena MD 2023).

A study examined the relation between sustainability and SME performance. (Kautonen T. et al. 2020) Another study examined association between innovation, sustainability and its impact in SMEs (Chege M.S., Wang D. 2020)

Traveso M. et al suggested a dashboard that shows assessing the sustainability performance of products. This dashboard has integration with life cycle sustainability assessment (Traveso M. et al 2012).

Briefly, there are important points for SMEs according to Worldbank (Worldbank 2023):

- SMEs (Small and Medium-sized Enterprises) generally make up around 90% or more of all businesses in most countries.
- In the European Union, SMEs represent about 99% of all businesses and provide two-thirds of private sector employment.
- In the United States, SMEs make up approximately 99.7% of all businesses and employ about 47.3% of the private workforce.
- In developing countries, SMEs represent a significant portion of the economy and often contribute to more than 50% of total employment and GDP.
- There are approximately 400 million small businesses worldwide.
- 600 million jobs will be needed by 2030 to absorb the increasing global workforce, making SME development a high priority for many governments around the world.

2.1. Data Analytics for Sustainability

There are lots of studies focusing on data analytics for sustainability. A study about usage of business analytics to corporate sustainability analysis tells sentiment analysis-based method, its benefits and superiorities. (Wen J. 2014)

There are many studies that indicated usage of big data for sustainability into different aspects (application, analysis, organization of unstructured data etc). (Kumar Etal 2021) (Barnes S.J. et al 2022) (Lv Z. 2018) One of them indicated smart grid (Ponnusamy V.K et al 2021)

A study investigated big data analytics for SME by using a focus group. (Falahat M. et al 2022). Another study is about usage of big data for supply chain sustainability and is about predictive analysis. (Hazen BT et al 2016)

Business analytics and sustainability was told in a study by asking questions to clarify relationship between them. (Tal A.S 2022)

Predicting financial sustainability is one of topic that business analytics used. (Kim K et al. 2018)

Data collection is also another important issue for sustainability.. Data collection is another problem especially micro and small companies. There are different approaches about collection data via network especially in Europe. But most companies don't use these data collection

networks. This network is for farms. There are advantages and disadvantages according to study. (Vroljck H et al. 2016)

Data mining for sustainability is another different topic. For example, sensor technologies need analysing data. Like scalability, integration, distributed data mining, real-time prediction, understandability topics are important challenges. (Morik K. et al 2012)

There is a study that uses numbers for sustainability and lifecycle analyses among countries. (Ramakrishna1 S. et al 2022) Different aspects of sustainability analytics are exemplified in a study (Choi TM et al. 2022)

Wu P. J. examined the environmental sustainability in logistics systems through big data analytics. (Wu P. J. 2016)

There is a study that named sustainability check-up which focus on methodology multi-attributive assessment of clean development mechanism in the literature. (Sutter, C. 2003)

There is a study that develops sustainability practices framework with using multi criteria decision making methods for Micro, small and medium-sized enterprises (Jamwal A et al. 2021)

2.2 Sustainability Reporting for SMEs

There are many studies for sustainability reporting especially for SMEs. A study evaluating the effect of psychological factors of business owner-managers on sustainability reporting in SMEs and how they communicate their operations through various channels was found in the literature. (O. Acheampong et al. 2022)

A study examines the effects mandatory sustainability reporting (Bergmann A. and Posch P. 2018) The adoption process of sustainability reporting in small and medium-sized enterprises (SMEs) is examined too. (Massa L et al. 2015)

Cankaya F and Sahin Z investigated the reasons why SMEs cannot achieve sustainability by examining the reports (Cankaya F and Sahin Z 2018)

Borge F et al aimed to explore the importance of sustainability principles and corporate social responsibility for SMEs and to assess the potential of sustainability reporting as a tool to engage stakeholders. (Borge F et al 2009)

Another study examined sustainability reporting practices in German small and medium-sized manufacturing enterprises, focusing on the implementation of the Global Reporting Initiative (GRI) framework. (Steinhoff E et al 2019)

Rossi and Vilchez examined the process that sustainability is integrated into practices of accounting. The results indicated different factors and organizational dynamics contribute to sustainability reporting and diffusion of sustainability practices in SMEs. (Rossi A, Vilchez M L. 2020)

Shields, and Shelleman examined the importance and advantages of sustainability dashboards in SMEs. Sustainability dashboards can use both making decision and reporting. (Shields, J. F., & Shelleman J. M. 2020)

Given their limited staff and financial resources, preparing a sustainability report can be challenging for SMEs. Shields, J. F., and Shelleman J. M. proposed the use of "Impact Assessment", a framework developed for SMEs to structure their approach to sustainability. (Shields, J. F., & Shelleman, J. M. 2017)

Corporate sustainability can be managed with management information systems (Caldelli A and Parmigiani M.L 2004) There are some limitations, but also advantages using MIS for sustainability. (Nowduri S. and Al Dorassy S 2012) MIS solutions are costly, needed expertise,

difficulty adapted in some scenarios, may be difficult to develop for some organizations (Nowduri S. and Al Dorassy S 2012)

2.3 Digital Transformation in SMEs

Digitization or digital transformation is another issue that is examined together with sustainability. (Zoric N. et al. 2023) (Wut T.M. et al 2021) (Mere J.O. et al. 2020) The digital transition is another issue that is examined together with sustainability. (Rosario A.T. et al. 2022) Digitalization and sustainability together are the drivers of great change. (Thiede S. 2021)

The UNEP focuses on accelerating, scaling sustainability by applying data, digital solutions and technologies In figure 3 part of the sub-programme is shown. (The UNEP 2023)

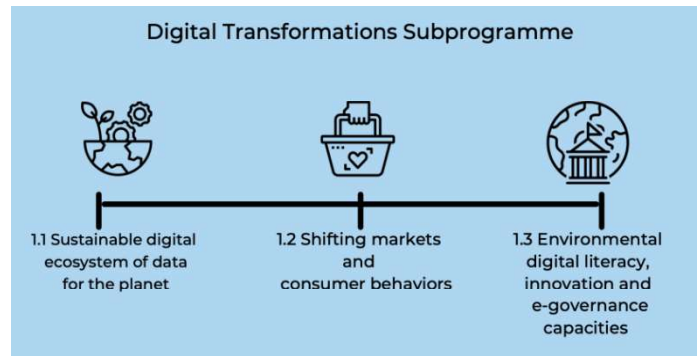


Figure 3: Digital Transformation Subprogramme

Source: The UNEP

Digitalization is another important issue for the SMEs. In fact, Covid 19 accelerated the process. As can be seen in Figure 4 diffusion rates are not the same for each aspect. It shows us there may be lots of improvement areas. According to this study, there are some barriers that affect the digitalization of SMEs. Some of them are internet skill gap, financial gap, infrastructure gap. (OECD (2021) The Digital Transformation of SMEs)

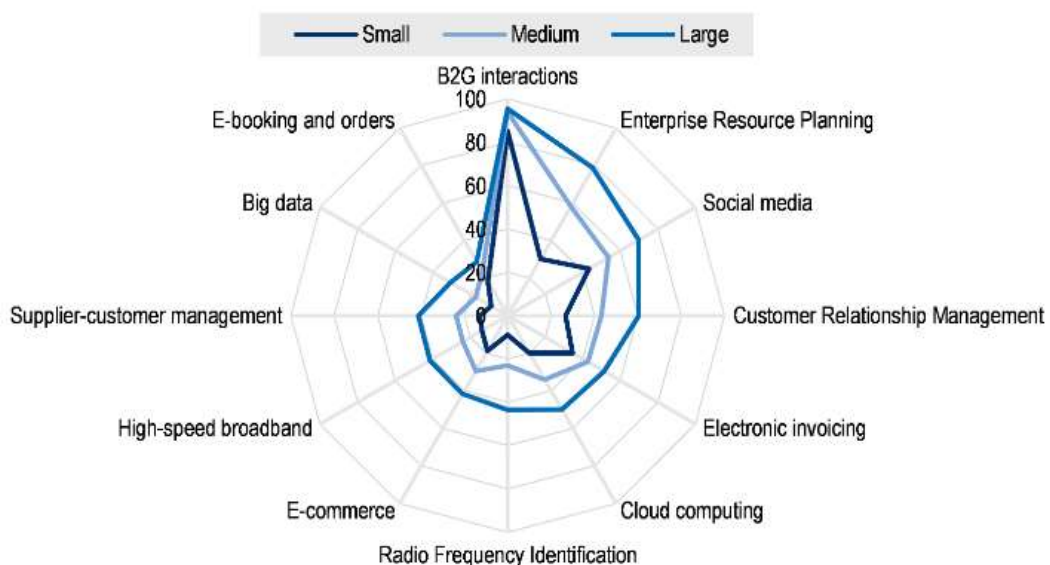


Figure 4: Digital Adaption in SMEs

Source: OECD (2021) The Digital Transformation of SMEs

3. Empirical Approach

According to European Council Council of the European Union SME has rules on sustainability reporting. The rules should be applied on corporate sustainability reporting until January 1st 2016 for listed SMEs. (European Council Council of the European Union, 2022) In this point, MSMEs aren't big companies, sustainability consulting is expensive for them, understanding of sustainability standards are difficult for entrepreneurs that aren't interested in, they will have to conform sustainability standards.

First suggestion may be a digital based solution. It can be useful for users and decision makers. In the literature review digitalization and sustainability issues were examined.

Management information systems (MIS) can be also a solution. Corporate sustainability can be managed with management information systems (Caldelli A and Parmigiani M.L 2004) There are limitations and advantages using MIS for sustainability. But It is a difficult to have a MIS especially for micro and small companies.

Reporting and decision making are important issues for MSMEs. They have to survive in the supply chain in the future. Check-up is required for development in sustainability. Check-up results help to identify sustainability situation of MSMEs. It allows to take precautionary by identifying the risks in advance. It needs to be a software or application that every MSMEs can use easily.

An empirical solution can be suggested. There are four steps.

1- Creation of application or software: It may be internet based. Authorities or organisations or companies can support to build it. MSMEs should access it easily and buy it at very low budgets.

It must be user friendly, accessible, understandable, agile and automatized (as far as it can be)

2- Data collection: Data collection for sustainability is a big problem for companies. GRI, SASB, etc. standards want to see the situations of companies. Standards include two types of data. The first one can be collected automatically. The second one is hard to collect automatically. In this study suggests that converting this data to the questions to collect them by asking understandable questions. Question based data collection is both easy and understandable for employee that hasn't been interested in sustainability yet method.

The questions may also change according to the changing standards. These standards can vary by industry. Questions can be open-ended, multiple choice, or require the input of numerical values. Approximately 1232 question sets have been identified, with 1082 of them being qualitative and 150 being quantitative.

This type of questions can use to collect data according to GRI standards by application for example:

“What is your industry? Please select.

Can you provide information on the size and relative importance of markets? (e.g., net sales, net revenues). Enter values.

What are the geographical locations where your products and services are offered?

What are the demographic or other characteristics of the markets?

What types of suppliers do you have? Please select.

What is the estimated number of suppliers at each level of the supply chain (e.g., first tier, second tier)?”

3- Data analysing: After data collection companies have quantitative and qualitative data. They can be analysed with business analytics methods. Briefly, analytical methods can be categorized as,

- Descriptive Analytics
- Predictive Analytics
- Prescriptive Analytics

Descriptive analytics describes what has happened in the past. It can show the company situation in terms of sustainability. Output of this analytics can help for decision makers regarding to compare before after situations to reach sustainability standards. In fact, it shows the development areas in different aspects.

Predictive analytics, calculates prediction using past data to predict the future or determine the effect of one variable on another. (For example: time series analysis & forecasting, simulation, data mining) As data accumulates, sustainability indicators can be predict for the future. It presents a vision for the future. Sustainability simulations can be applied for company

Prescriptive analytics indicates a best alternative or number for example optimization models, decision analysis, simulation (Camm J et al. 2015)

4- Check-up the situation and reporting:

In each time period, system can check-up corporate sustainability situation. It can,

- Compare before – after values of indicators to improve standards
- Determine the risky points, by examining irregular transactions
- Forecast quantitative variables for the future
- Simulate indicators for example: if-then rule based

The empirical process is shown in figure 5th. Check-up the situation step is development step according to check up result for companies. Decision makers can take action. This approach also helps to report sustainability situation. It is a easy way to write a report.



Figure 5: Empirical Approach Steps

4. Conclusion

As a conclusion this study aimed at showing the importance for micro small medium-sized companies for sustainability and suggesting data collection-based check-up approach via software. MSMEs can survive in the changing conditions and be ready for sustainability reporting. They can adapt to the environment and monitor their situation (advantages and disadvantages). Also they can control themselves by using data analytics. They can easily collect sustainability data and report sustainability according to sustainability standards.

The software solution has to become cheap, accessible and understandable. Although there is less study in the literature, this study also points to the sustainability need of micro enterprises.

For further research, each step of this approach can be detailed. Different methods can be suggested and applied. If a software is developed, user experience can be measured and tested.

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