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Research Article

Advancing Sustainability through Management Accounting: Insights from a Portuguese Ornamental Stone Processing Company

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Abstract

This study investigates the role of management accounting in supporting sustainability management within an ornamental stone processing company. The research focuses on understanding both the methods (how) and the motivations (why) behind the use of management accounting to address sustainability goals. A case study methodology was employed, allowing for an in-depth examination of the company's practices. Qualitative data were collected through interviews with key personnel and an analysis of company documents to provide a comprehensive view of its approaches to sustainability. The findings highlight that management accounting plays a significant role in supporting the economic and environmental pillars of sustainability. For instance, it is used to track and optimize resource usage, reduce environmental impacts, and ensure cost-efficiency. However, while the company also engages in various initiatives within the social dimension of sustainability, these efforts are not directly guided or supported by management accounting practices. Instead, they appear to be driven by other factors, such as corporate values, community engagement, or compliance with social responsibility standards. Overall, the study underscores the importance of management accounting as a tool for achieving sustainability, particularly in areas related to financial and environmental performance. It also points to the need for a broader integration of management accounting into social sustainability efforts to create a more balanced approach. This research provides valuable insights for companies seeking to enhance their sustainability management frameworks.

Keywords: management accounting, sustainability, ornamental stone, case study.

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Introduction

The Portuguese territory is characterized by a large quantity and diversity of geological resources, which reflects its ability to generate, through various processes of transformation of these raw materials, a wide range of products that are globally recognized and highly important for the Portuguese economy (Direção-Geral de Energia e Geologia [DGEG] 2020). According to the Associação Nacional da Indústria Extrativa (ANIET 2017), the extraction and transformation sector is divided into four segments: ornamental stones, industrial stones, industrial minerals, and metallic minerals. For DGEG (2022), the extractive industry is divided into metallic minerals, industrial minerals, construction minerals, and energy minerals. Companies in this sector are involved in the extraction and processing of different types of stone, whether for decorative purposes, flooring, cladding, funerary art, or the construction industry, serving different types of customers with different needs. In particular, this sector is closely linked to the civil construction and public works industry (ANIET 2017).

The ornamental stone extraction and processing sector plays a crucial role in Portugal's economy, as it offers numerous growth opportunities on both national and international markets, due to the high reputation of Portuguese ornamental stones (DGEG 2020). In recent years, Portugal has made progress in the ornamental stone sector, moving from a simple extractive industry to one that both extracts and transforms stone into finished products for international markets, becoming a high value-added sector (DGEG 2020). In this sector, technological factors, in particular the modernization of equipment, are an important element in aspects such as increased productivity, growth in the value of the company and greater competitiveness against competitors.

Sustainability is no longer just a concern for managers of listed companies, it is also gaining attention among smaller companies, especially those in sectors with environmental impacts (Garcia and Junior, 2019; Horcea-Milcu et al., 2024). In sectors such as stone extraction and processing, where natural resources are a key part of the activity, it is essential to manage them effectively, efficiently, and sustainably. Integrating sustainable practices into day-to-day management meets stakeholder expectations and provides an opportunity for the company to differentiate itself from competitors and achieve long-term growth. In addition, integrating sustainability into management contributes significantly to the achievement of management objectives (Grejo and Lunkes, 2022).

Management accounting is crucial for processing information that is essential for decision-making and, consequently, for the good performance of an organization (Alsharari and Lasyoud, 2019). This branch of accounting is essential for planning and control, enabling the analysis of data, the monitoring of indicators and the identification of opportunities for improvement (Pramono et al., 2023). The need for detailed control of a company's internal operations is fundamental because decisions can be made in a more timely and informed manner, contributing to organizational performance (Dubinina et al., 2020).

The pursuit of more sustainable practices has become a priority for many companies, and managers increasingly need information that enables them to make decisions in favour of these practices, based on management accounting systems (Ascani et al. 2021; Garcia and Junior 2019). These accounting tools have emerged as crucial tools that provide analysis and cost reduction, whether operational or production related (Chofreh et al., 2014). In this context, it is necessary to align management accounting systems with sustainability in order to achieve not only the best economic results, but also in a sustainable manner (Innocenti and Gasparetto, 2021).

Based on a case study of an ornamental stone processing company, herein referred to as "Soft PT Stone, PLC", this work aims to understand how and why management accounting can support the integration of sustainability into management.

Literature Review

Sustainable initiatives are now considered essential for sustainable development (Nogueira et al., 2022; Lahsen, 2024). The Triple Bottom Line concept is one of the most widely used frameworks to explain corporate sustainability

(Zaharia and Zaharia, 2021). Developed by John Elkington (Elkington, 1994), the term "bottom line" in accounting refers to net income, as it represents the "last line" of a profit and loss account, focusing on the economic performance of a company. The Triple Bottom Line expands the concept of business success beyond profit to include not only the economic pillar, but also the environmental and social pillars (Correia, 2019; Pimplapure et al., 2020). Despite the amount of research and practice on sustainability, it still does not provide clear guidance on which strategy or action will be truly transformative and have an impact on promoting sustainability (Horcea-Milcu et al., 2024).

Industry is a pillar of any country's economy and generates much of its wealth. However, it is important to recognise that any industry can bring environmental and social problems along with its benefits (Khurana et al., 2022). Industry is a major emitter of pollutants and waste, and consumes large amounts of natural, water and energy resources during production (Liang et al., 2024). Due to the impact of industry on the economy and nature, companies in this sector are facing a critical and urgent moment for transformation that helps to conserve resources and strike a balance between profit, environment, and people (Liang et al., 2024; Niu et al., 2019). By integrating sustainable aspects into management, companies can increase process efficiency while reducing costs, which is an opportunity for value creation and growth (Barnett et al., 2015; Beier et al., 2017; Reis et al., 2022; Zhang and Haapala, 2012).

The adoption of a particular management accounting system influences the way sustainability is measured and assumes the positioning of the company in relation to sustainability (Garcia and Junior, 2019). The strategic use of management accounting enables the implementation of sustainable practices in the long term, providing fundamental guidance to ensure the most effective and efficient management of resources with maximum benefits (Ascani et al., 2021; Dubinina et al., 2020). The challenge for this area of accounting is to be able to evolve to incorporate criteria that go beyond the financial dimension, including social and environmental dimensions (Nassereddine and Ahmad, 2019). In this sense, Pencle's paradox theory (2022) helps to integrate and balance the different aspects of sustainability.

In the context of an economically, socially, and environmentally sustainable approach in industry, a new concept called Industry 5.0 has emerged as the result of a fifth industrial revolution (Xu et al., 2021). Industry 5.0 aims to achieve social goals while respecting the limits of the environment, prioritizing human capabilities, and using technology as a base to support these values. One of the fundamental elements of this industry is sustainability, which helps to optimize industrial processes and reduce waste and associated costs (Davim and Machado, 2023; Pramono et al., 2023).

Income and cost management in industry is a complex but fundamental activity for achieving sustainability (Pramono et al., 2023). As such, companies' actions should be guided by management accounting systems that can incorporate sustainability aspects and are adapted to the principles of each organization (Innocenti and Gasparetto, 2021). For example, the Activity-Based Costing (ABC) system, Kaizen costing, and the Balanced Scorecard are tools that allow sustainability to be integrated into management accounting (Alsaid and Mutiganda, 2023; Chofreh et al., 2014; Kolev, 2023; Nguyen, 2023; Saeed et al., 2023; Trisyulianti et al., 2023).

Methodology

The aim of this study is to understand "how" and "why" management accounting can be used to support sustainability in an ornamental stone processing company. To achieve this aim, the case study method was chosen, which is widely used in research with qualitative data and allows for an in-depth and detailed analysis of concrete cases in specific circumstances, serving both to challenge existing theory and to define new hypotheses for future research (Yin, 2017).

The case concerns "Soft PT Stone, PLC" (fictitious name to ensure anonymity), a company specialized in the processing and sale of ornamental stone, which has been operating successfully in this sector for over 40 years. The company has around 50 employees and its customers are in Portugal, France, and Spain. The company's production process involves the purchase of raw material, either in blocks or slabs. If the raw material is purchased in block form, it goes through the sawing and finishing process and is transformed into plates and sold as a finished product or for transformation. The plate transformation process involves cutting and finishing to customer requirements, and then packaging and transporting the plate to its destination.

The data were collected through two interviews and the analysis of company documents. One of the interviews (E1) was conducted with the person responsible for cost control and focused on the management accounting practices used. At the request of the interviewee, the questions were answered in writing. The other interview (E2) was conducted directly with the Human Resources (HR) manager and covered issues related to the company's history, transformation processes and sustainability practices/challenges. This interview was not recorded, at the interviewee's request, but written notes were taken. The documents analyzed included the company's online platform to gather more general information, as well as internal documents containing management accounting and sustainability data. The evidence gathered was treated qualitatively, seeking to answer the research question by identifying the underlying practices (how?) and motivations (why?).

Results

At "Soft PT Stone, PLC" the management accounting is mainly focused on cost control and there is a daily recording of information, both by the employees who work directly with the machines and by the individual accounts of each piece of equipment. This practice is fundamental to cost control, according to the interview (E1): "It's done with daily records, (...) the analysis is done quarterly to see if we're making a profit in production. This control is very important in this area."

In terms of controlling equipment costs, it is possible to categorize and assign each machine or piece of equipment precisely. Each machine involved in production and used in the business has an individual account that records the costs associated with maintenance/repair, parts required for its operation and the use of external services, as mentioned by the interviewee (E1): "We do cost accounting for the equipment. Each piece of equipment has an account where some maintenance or repair costs, parts or external services are charged." This method is in line with invoice control, which indicates the final destination (section) of the materials ordered. This practice was directly observed from the interview (E1): "(...) every invoice that arrives is signed by the person who ordered it and they have to write down which machine it's for".

Although the above costs are related to the equipment, they do not include the costs of the workers directly involved in production, i.e., the hours of each worker are not directly recorded in the specific account for each piece of equipment. These costs are included in the production costs, as shown in the following extract (E1): "Although we account for our employees' hours in repair/maintenance, we do not include these costs in the machine."

In the case of specific projects and work carried out by the company on a contract basis, there is greater control over the costs of higher-value work. In these cases, the cost of raw materials, which is one of the main costs in this type of project, and the number of machine hours are considered. To do this, the company has a standard value per hour of operation for each machine, which is then included in the final cost of the work. All processes for the production of each piece of work are accounted for in a generic way, except for the sawing machines, where there is more specific monitoring, according to the interview (E1): "We already have a value assigned per hour of machine operation, which is then accounted for on site. In the sawmill area we have a more detailed cost control (...)".

Regarding the cost of purchasing raw materials (stone), rather than purchasing all the raw materials required for the entire project at once, the firm has chosen to purchase them in stages according to production requirements. The company is already implementing more rigorous systems for collecting information on production costs. These practices related to management accounting and economic sustainability are in line with the interview (E1): "We are implementing cost accounting in a more rigorous way (…). In the future, the factory will be divided into cost centers to make management accounting more effective. (…) The creation of cost centers in the different sectors and the assignment of people to manage the sector will, I hope, make it possible to control the whole process more effectively".

"Soft PT Stone, PLC" does not have a formal budget that would allow monthly forecasts to be made, as its products are made to order, customized and have specific characteristics. According to the interview (E1), the company is flexible, efficient, and prepared to deal with unforeseen events: "We don't use any kind of budget. The only program we have is preventive maintenance of the equipment. Sometimes this program fails because corrective maintenance has already been carried out. The type of equipment and work we do doesn't allow us to forecast expenses or income. We work on a just-

in-time and made-to-order basis, so we don't produce for stock".

Regarding sustainability, as mentioned in the interview (E2) with the HR manager, it is a concern for the company: "Sustainability is something we've been concerned about since the company was founded". Although not certified, the company has voluntarily chosen to follow the guidelines of ISO 26000 – Social Responsibility and other ISO standards. The interview (E2) focused on this aspect: "We are not ISO certified, but we have adopted ISO policies internally, which we do not make public."

Under the social pillar, "Soft PT Stone, PLC" has developed various policies that reflect its commitment to its employees, suppliers, and society. For example, the company adopts an ethical approach to its employees, welcomes foreign workers and makes annual donations to local institutions, particularly those dedicated to promoting sport. The company prioritizes the purchase of raw materials from local suppliers in order to minimize its environmental footprint and support the local economy.

These aspects are also confirmed in the following extract from the interview (E2): "(...) we promote value to society, not only because we are part of it, but because we believe we can make a significant contribution".

"Soft PT Stone, PLC" also takes on student interns from various nearby universities and mentioned in the interview (E2): "There is special attention paid to young people [students] who have an interest in this area".

Although the company is not certified to the ISO 45001 – Occupational Health and Safety Management Systems, it is concerned about adopting these guidelines. This can also be seen on the company's website: "We have invested heavily in professional training, particularly in quality, hygiene and safety".

All employees have the right to any medical examination or consultation they may require, in addition to those routinely carried out each year to ensure the best possible health conditions. The safety of employees is paramount, and the company works daily to ensure that there is never a shortage of good quality personal protective equipment and that it is used correctly. In accordance with the standard, the company recognizes the importance of specific training for workers in this sector, including training on the correct use of personal protective equipment, emergency response and the handling of hazardous and non-hazardous waste. The company monitors noise, vibration and dust generated during the production process to protect workers. These objectives were based on the topics in the following interview extract (E2): "For workers: medical examinations and consultations, safety equipment, specific training in the use of this equipment, emergency training, handling of hazardous and non-hazardous materials".

From an environmental and economic point of view, the company complies with some of the ISO guidelines, namely ISO 9001 – Quality Management Systems and ISO 14001 – Environmental Management Systems. In terms of waste management, the company has contracts for the collection of hazardous and non-hazardous waste with companies that manage the disposal of tons of waste. This waste is registered through the Electronic Waste Monitoring Guide, managed by the Portuguese Environment Agency, which is essential for reducing waste and for achieving sustainability at national level. This practice continues the valorization and reuse of waste by selling it for a symbolic price.

In line with the company's commitment to a landscape restoration plan, the production sludge is used and compacted and applied to areas damaged by the stone quarrying process. This prevents waste from being deposited in inappropriate places and puts the landscape restoration plan into practice. This practice was described in more detail in the following extract from the interview (E2): "The stone waste is used for the landscape restoration of the quarries, because at the same time as we are replenishing the fauna and flora, we are applying the mandatory landscape restoration plans".

Energy efficiency enables quality resource management, ensuring the company's environmental and economic sustainability. In this context, the company monitors environmental dust, noise, and vibration in accordance with the ISO 14001 standard. It has also invested in solar panels so that part of the energy used in production processes comes from renewable sources, allowing consumption to be monitored.

Integrating sustainability into management accounting is already a company practice. For various materials, there are several local suppliers that are already commonly used. The choice of suppliers is not only based on price, but

also on the quality of the production processes, which is in line with economic sustainability. The choice of raw material dimensions avoids or reduces waste, contributing to environmental sustainability. This approach applies not only to materials, but also to equipment that is not regularly replaced and requires a large investment.

In these cases, "Soft PT Stone, PLC" always considers efficiency and quality before any other factor, especially in larger, major investment projects. This is supported by the following extracts from the interview (E1): "For day-to-day management, we already have a list of regular suppliers. The choice is not based on price alone. There are several factors that support the choice. For example, in the case of raw materials, the choice is often made based on size rather than price, to allow less waste or more efficiency in production". (...) "For machine parts and consumables, the process is similar but always discussed before decisions are made. The need for investment is put to the top manager, who consults all the people with management responsibility in all areas. We try to find out what machines or additional labor or whatever is needed, and we look for the most viable suppliers and solutions."

The financial evaluation and purchase decision phase is essential to ensure that investments are viable and in line with the company's financial structure. Since the solutions found in the previous phase have already been compiled, they are passed on to the various people in the company, starting with the top manager, through the financial manager and even the section heads, until the final decision is made, as can be seen in the following extract (E1): "An analysis is made of the various options presented to the top manager. Normally, this manager consults the financial manager on the possibilities of the investment to be made. If it's favorable, the financial manager will look for the best forms of financing to present to the top manager. This decision is then presented to all the section managers and whatever is necessary to make the purchase is adjusted."

In the coming years, "Soft PT Stone, PLC" plans to continue its economic growth by expanding its activities in the market in which it operates. This growth will need to be accompanied by investment in technologies that will help to reduce the impact on the environment and on workers, in particular the reduction of stone waste, dust, noise, and vibrations.

"Soft PT Stone, PLC" intends to continue its inclusive and sustainable industrial process by protecting the environment and creating shared prosperity. The company believes that to achieve sustainability it must consider partnerships that promote the circular economy, which encourages sharing, reuse, repair, and recycling of products. Despite its commitment to sustainability, the company recognizes the risks and challenges involved. One of the main risks is globalization and the emergence of substitute products that could threaten the company's market position, especially if these products are cheaper and very similar. It is important that the company continues to innovate and implement strategies that maintain or improve its market position.

Discussion and Conclusion

In light of the results of this case study, it is possible to understand that management accounting can be an indispensable tool for the functioning of the company as well as for promoting sustainability, in line with the literature (Ascani et al., 2021; Davim and Machado, 2023; Dubinina et al., 2020; Pramono et al., 2023). In other words, these findings do not challenge existing theory, but rather reinforce its importance for managing sustainability in the context of Industry 5.0 challenges (Xu et al., 2021). From the interviews, it was observed that the company integrates management accounting practices into its daily operations because it understands that these are fundamental to cost control, and that reducing costs in turn contributes to integrating sustainability into its daily practices.

The company, although not formally certified, applies ISO 26000 – Social Responsibility, ISO 45001 – Occupational Health and Safety Management Systems, ISO 9001 – Quality Management Systems, and ISO 14001 – Environmental Management Systems. This demonstrates that there is a commitment to social, environmental, and economic sustainability in this case, even though there is no requirement from an external entity. Regarding the social pillar, the company (i) fulfills its employer obligations related to health, hygiene, and workplace safety; (ii) integrates foreign workers; (iii) prioritizes local suppliers; (iv) supports local institutions through donations; and (v) hosts interns from public higher education institutions. In terms of the environmental pillar, the company (i) ensures the treatment, reuse, and recycling of its production waste; (ii) carries out landscape

restoration of quarries; and (iii) has made investments in the production and use of "clean energy". The economic pillar involves a set of ongoing management accounting practices, such as (i) daily cost tracking, (ii) supplier analysis, (iii) selection of raw materials, and (iv) evaluation of new investments. These practices not only allow for the understanding and management of costs associated with producing each piece of work or each piece of equipment, but also help to assess their efficiency in making decisions that contribute not only to the economic pillar but also to the environmental pillar through better resource management.

This study demonstrates how and why management accounting contributes to sustainability in a company belonging to the ornamental stone processing sector, highlighting the contribution of management accounting to the economic and environmental pillars of sustainability. Through the evidence collected, it was possible to obtain detailed information on how the company integrates sustainability into its daily operations and accounting practices, as well as during decision-making moments. Furthermore, there is a commitment to sustainable practices that not only benefit the company economically but also favor the environment, workers, and the local community. This study underscores the importance of management accounting as a means of controlling costs and aligning the company's objectives in terms of sustainability.

Regarding limitations, as this is a case study, the results presented here may not be generalizable to other companies, especially those in different sectors. This study also does not address a recent aspect of sustainability, which is governance. For future work, it is suggested to explore this latter aspect, as well as entities from other sectors, either through case studies or by using quantitative research methods.

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