

Article

The Changing Role of Management Accounting in Product Development: Directions to Digitalization, Sustainability, and Circularity

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Abstract: In an environment of multiplying uncertainties, management accounting plays an important role in addressing product development issues. Changing business models, the capabilities of companies, and increasing consumer needs require reconsideration of the directions in the product development process. The purpose of this paper is to identify the changing role of management accounting in product development, to understand how research is progressing according to such vital directions as digitalization, sustainability, and circularity. Bibliometric analysis and a systematic literature review were used to determine the main directions of the changing role of management accounting in product development. Results revealed that these directions were related to innovation, which could be considered the main driver for the changes in management accounting in product development. Furthermore, these directions are related to better company performance, which is a consequence of changes.

Keywords: management accounting; product development; digitalization; sustainability; circularity; innovation; performance



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1. Introduction

Research in product development is crucial in times of uncertainty. Multiple uncertainty types, such as technical, organizational, resource, and market [1], can cause “uncertainty multiplicity” [2]. The listed uncertainty types are especially relevant to consider in the product development context. Technical uncertainty represents knowledge of a product transforming into a physical product [2,3], e.g., it corresponds to the need for changing a business model due to digitalization. Organizational uncertainty consists of the capabilities and needs of companies [2,4], e.g., internal procedures, such as management accounting. Resource uncertainty encompasses aspects of the continuity of resources [1], e.g., we could consider the role of circularity. Moreover, market uncertainty represents the understanding of customer needs [5], e.g., an important role can be assigned to sustainability issues.

By analyzing product development, researchers are focusing on the product development process, product innovativeness, and impact on performance [6–8]. The subject of management accounting has been investigated in various areas, but the main attention is on the methods, technics and tools [9–11]; adoption and usage [12,13]; and impact on organizational performance [14,15]. Digitization in the scientific literature is usually discussed through such aspects as the application of digital technologies, such as integrated information systems, robotic process automation and advanced analytics [16,17], and the effect of digitalization on management accounting [18–20]. The literature has further examined the role of sustainability management tools in general [21–23], the factors affecting sustainability [24,25], and the impact on a company's performance [26,27]. The subject of circularity has been analyzed in such areas as the circular business model [28,29], capabilities in a circular economy [30,31], and the implementation of a circular economy [32,33]. However,

there is lack of research that draws attention to changing the management accounting role in product development, in terms of analyzing together such vital trends as digitalization, sustainability, and circularity.

Therefore, the purpose of this paper is to identify the changing role of management accounting in product development, with the following research questions:

RQ 1: What are the directions of previous studies in product development?

RQ 2: What are the directions of previous studies in management accounting?

RQ 3: What are the directions to be considered for the changing role of management accounting in product development?

Our study contributes to this contemporary field of research by showing that research directions, such as digitalization, sustainability, and circularity, form the medium for changes in management accounting in product development.

2. Product Development and Management Accounting: Relevance and Directions

2.1. What Areas Are Important for Product Development?

Innovations and product development play a vital role in the competitiveness of a company. When seeking to provide the relevant added value for customers, the needs determined by digitalization processes in the market must be considered. Importantly, proper product development results in optimized costs and in customer satisfaction [34].

Nowadays, the definition of a product has expanded, i.e., a *product* can be described as tangible, intangible (services), or both (products and services) [34]. *Product development*, including intangible products, including services as well, according to Krishnan and Ulrich [35], can be described as “the transformation of market opportunity and technology assumptions into marketable products” [34] (p. 87). New product development is expressed as a conversion of rapidly changing market opportunities into a valuable product to the customer, mostly covering particular steps in companies taken to achieve commercialization objectives [36].

Recently, considerable literature has emerged around sustainability [21,23,36–41] and circularity [30,38] in product development. Ruffino [38] describes the method of sustainable product development in three principal areas, such as:

1. Sustainable inputs, consisting of such design content aspects as the sustainability and recyclability of the materials, usage of energy, amount of usage, etc.;
2. Sustainable outputs, involving such aspects as extended usability, disassembling processes, relationship with the product from the side of the company and consumers, the lifetime of the product, disposability, reusability, etc.;
3. Resting implications, consisting of such aspects as biodegradability, further usability in the ecosystem, recyclability, etc.

Three areas of new product development can be distinguished: sustainable product design, ecodesign, and common product design [36]. Sustainable product development is described as “a principal issue in the manufacturing business, and designers are concerned with producing increasingly sustainable items” (p. 14). Ecodesign deals with the reduction in the effect on nature of products and administrations for the lifecycle time. Meanwhile, common product design consists of products that are not considered as being used sustainably, and ecodesign factors.

Therefore, we can identify three important directions of product development, i.e., digitalization, sustainability, and circularity, which are visualized in Figure 1.

The proposed three directions of product development, in digitalization, sustainability, and circularity, can be described as guidelines for the management of uncertainty in product development. Digitalization represents the application of digital technologies into the changing environment-related processes, including business and social processes in the society as well. A literature analysis showed growing customer and company needs for sustainable product development and extended usability in the ecosystem. Thus, the role of sustainability and circularity has a significant role in product development as well.

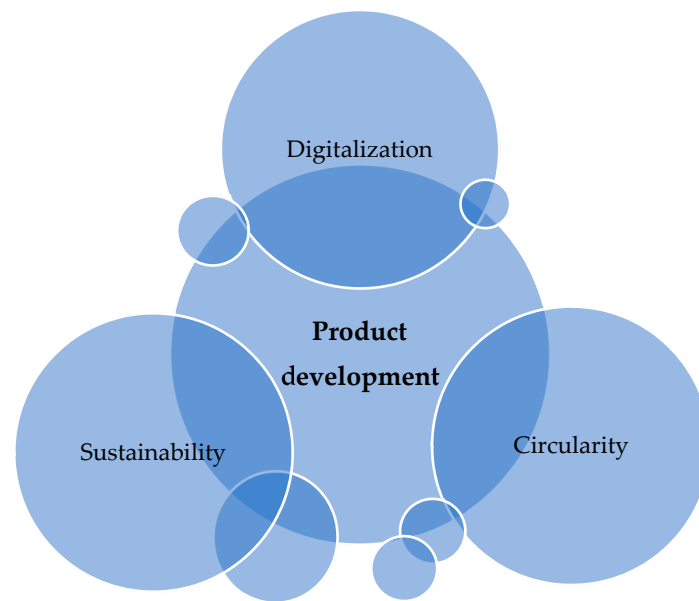


Figure 1. Directions of product development.

2.2. Why Is Management Accounting Important for Product Development?

The Chartered Institute of Management Accountants [42] describes management accounting as “the process to assist with decision-making to create value and guarantee sustainable achievements”. This is attained when the provided and analyzed information allows companies to plan, implement and control their strategies. Oyewo [40] (p. 354) describes provided information as:

- Financial information, which “is important for management because many objectives of organizations, especially profit-making ones, are stated in financial terms such as profitability, liquidity, and solvency”;
- Nonfinancial information, which “is equally important, especially at the strategic level where management may need to know about developments in their markets, new technology, activities of competitors, future demand for products, and new product development”.

Management accounting provides information that supports management at strategic, tactical and operational levels [42,43]. In general, management accounting helps managers within a company make decisions at different levels. As product development plays a vital role in the competitiveness of companies, usually, these decisions are related to the development of the product. As product development not only generates revenue but also incurs costs for the company, in order to maintain an efficient balance for the product’s financial flexibility, management accounting needs to be used. The application of contemporary management accounting can assist in the product development process by providing information for company managers to deploy strategically important resources for value creation [40,44–46], and by determining the financial viability of a product.

However, it must be noted that management accounting must be in line with the changes that are essential in an ever-changing environment and affect changes in product development. Therefore, as we have identified three directions of product development (i.e., digitalization, sustainability, and circularity; Figure 2), it can be observed that these directions are important not only in terms of product development, but also in terms of management accounting, as management accounting is closely linked to the successful and efficient development of a product.

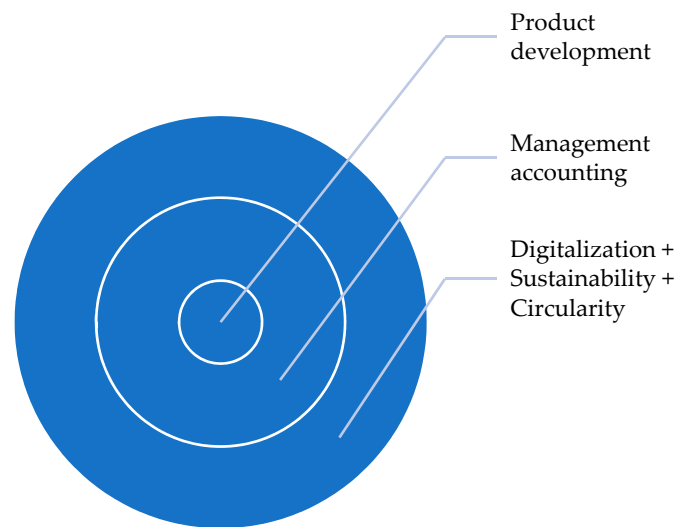


Figure 2. Changing role of management accounting, digitalization, sustainability, and circularity in product development.

Digitalization represents the application of digital technologies into changing environmental processes, as more innovative or digital companies are using more modern management accounting practices. In addition, there is growing pressure from stakeholders to hold companies accountable for the environmental impact of their activities, which is also reflected in the changes in management accounting regarding sustainability and circularity issues. Thus, these directions of digitalization, sustainability and circularity have a vital role in management accounting as well.

3. Research Methods

The bibliometric approach and a systematic literature review were used to determine the main directions of management accounting regarding digitalization, sustainability, and circularity. The period of our analysis was between 2012 (January) and 2022 (February). As this topic is highly relevant, we included 2 months of 2022 in our analysis, in order to disclose the actual/current papers on the topic.

The use of bibliometric analysis leads to the identification of competing thematic networks within an academic field based on the co-occurrence of words. Here, the co-occurrence of terms in author keywords was visualized based on the number of keywords that were used in the papers. By searching papers in the Web of Science bibliometric database and by focusing on the keywords related to the analyzed topic, the dataset for the bibliometric analysis was developed. For the co-word analysis, the *VOSviewer* software was used. According to Waltman, van Eck, and Noyons [47], this software offers a unified approach towards mapping and clustering networks.

The process of the co-word analysis (from Web of Science Core Collection) for the period of 2012–2022 was prepared by taking into account various keywords in the field of management accounting regarding digitalization, sustainability, and circularity, by the *VOSviewer* program, thus creating a map that is based on a text corpus (a Web of Science file):

1. “management accounting & digitalization”—full record and cited references > binary counting > the minimum number of occurrences of a term: 3 > the number of terms 19/322 > map > result: 19 items in 3 clusters;
2. “management accounting & sustainability”—full record and cited references > binary counting > the minimum number of occurrences of a term: 3 > the number of terms 40/328 > map > result: 40 items in 4 clusters;
3. “management accounting & circularity”—full record and cited references > binary counting > the minimum number of occurrences of a term: 3 > the number of terms 13/179 > map > result: 13 items in 2 clusters;

4. “management accounting & product development”—full record and cited references > binary counting > the minimum number of occurrences of a term: 3 > the number of terms 25/354 > map > result: 25 items in 4 clusters.

The bibliometric data were used to develop a network of keywords by co-occurrence links where the circles are a representation of keywords, and the diameters of circles is the representation of the frequency of occurrence of each keyword. The distance between two keywords indicates their relatedness in terms of co-occurrence links. These co-occurrence links were determined based on the number of documents in which keywords occur together. This means that the closer two keywords are located to each other, the stronger their relatedness is. The results of the bibliometric analysis are presented in the Section 4.

Meanwhile, the systematic literature review was used to understand how the papers addressed the changing role of management accounting in the product development process through different directions, such as digitalization, sustainability, and circularity. The process of the systematic literature review was prepared by using the Web of Science (WoS) database. Thus, the material was further evaluated by undergoing refinement and critical analysis of what could be used in the search. After this, the selected content was classified on a theoretical basis. Finally, extensive analysis was performed so as to classify, order and present the content regarding the changing role of management accounting in product development. All of these steps were carried out by the research team, without recourse to further verification of the analyses, which can be considered a limitation of the adopted method. The results of the systematic literature review are presented in the discussion section.

4. Results

The results of the analysis (from the Web of Science Core Collection) for the period of 2012–2022 were prepared by considering the different keywords in the field of management accounting regarding digitalization, sustainability, and circularity.

The dataset of papers consisted of 11,087 papers with publication years from 2012 to 2022. The distribution of papers based on year of publication is shown in Figure 3. It is notable that, in the field of management accounting regarding digitalization, sustainability, circularity, and product development, the number of papers has been constantly growing. Although the product development topic in the context of management accounting was stable, directions in digitalization, sustainability, and circularity have been growing rapidly since 2018. Although 2022 is not over yet, the results for the two initial months of 2022 exhibit the same trend.

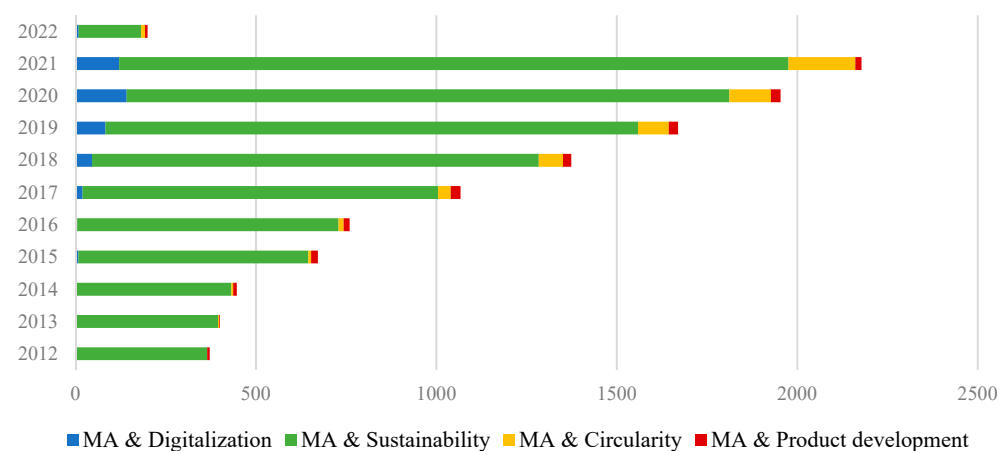


Figure 3. Distribution of papers by year of publication.

The recent years, 2018–2021, featured the highest number of papers. This finding indicates that the changing role of management accounting is still a potential issue for researchers in product development that requires more research contributions.

The network for the co-citation of journals for the period of 2012–2022 showed that, despite its extremely high overall density indicating that the journals are highly interconnected through co-citation relationships, three clusters of publication sources provide the base for the management accounting field (Figure 4).

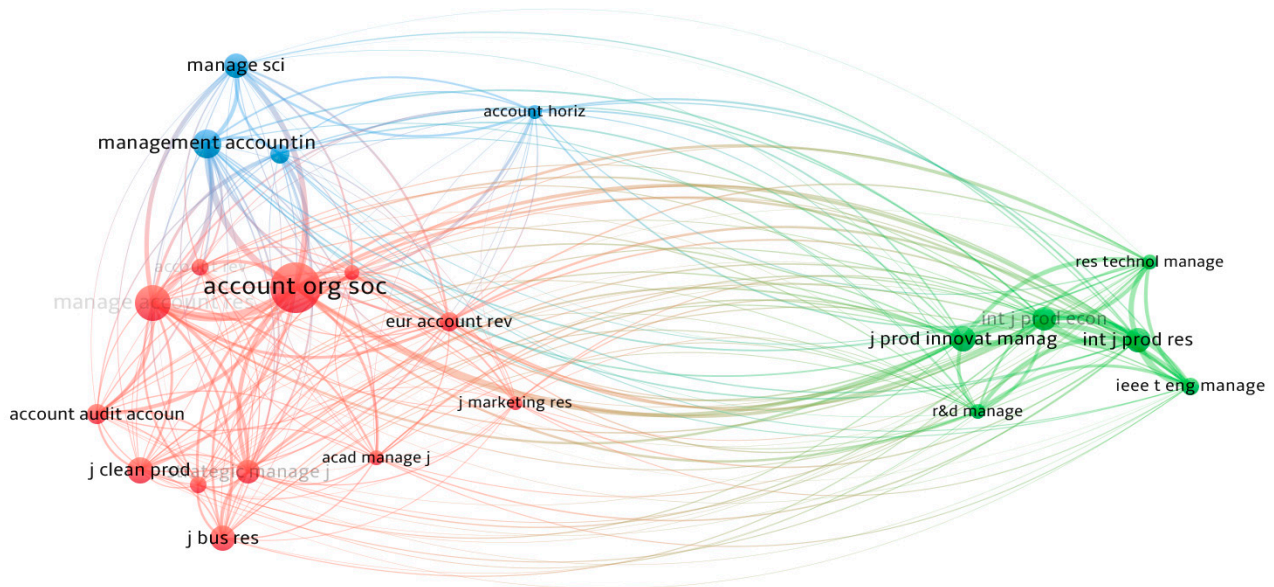


Figure 4. Co-citation network of journals (2012–2022).

The first cluster (red) represents general management or general accounting journals (such as Accounting, Organizations and Society; Academy of Management Journal, etc.), the second (blue) denotes the practice in management accounting journals (Management Accounting, etc.), and the third (green) cluster represents (e.g., International Journal of Production Research, Journal of Product Innovation Management) journals focusing on product development.

Given the changing role of management accounting in providing relevant information for decision making, the dynamic nature of the business environment also means that management accounting needs to be improved from time to time, in different directions, to support the performance of companies.

4.1. Directions of Management Accounting: Digitalization, Sustainability, and Circularity

Management accounting and digitalization. It is observed that, in various companies, digitalization and its impact on management accounting and information for decision making are changing managers' trust in traditional information [20]. Hence, this leads to growing research on this topic. The search results indicated that, during the analyzed period, there were 444 results from the Web of Science Core Collection for the *management accounting* and *digitalization* keywords. Publications analyzing *management accounting* and *digitization* have been growing rapidly since 2018 (46), while, in 2021, it reached 118 items. It is to be observed that most search results were related to the management (128), economics (112) and business (102) fields, such as “digitalization is the use of digital technologies to change a business model and provide new revenue and value-producing opportunities” [48] (Figure 5).

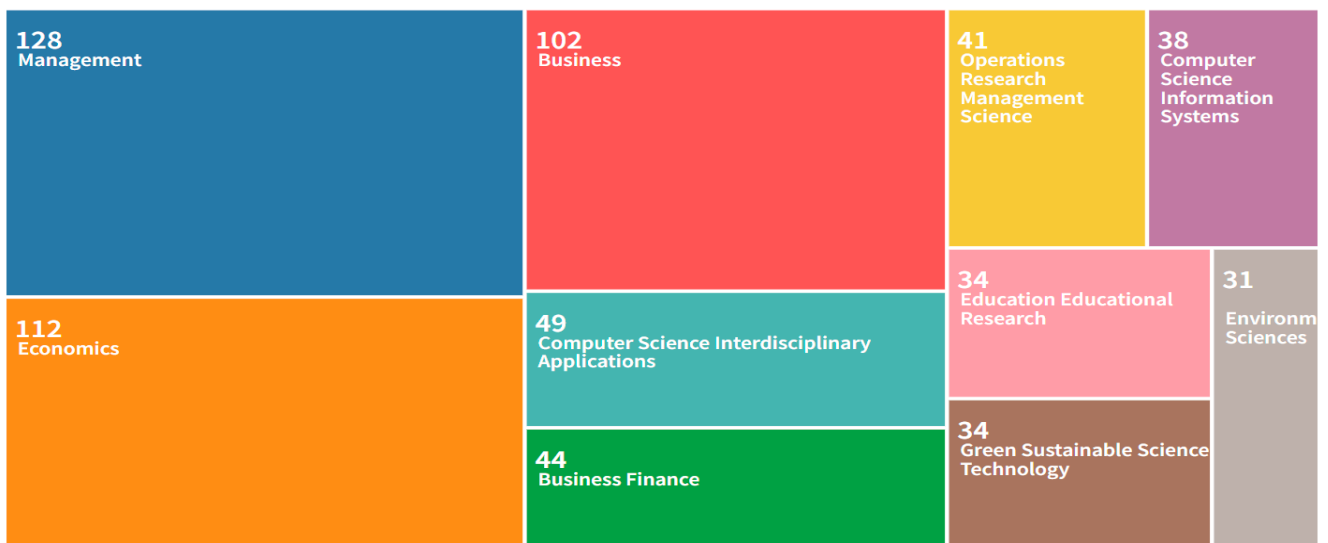


Figure 5. Research field: management accounting and digitalization.

The analysis showed three main clusters: digitalization, management, and transformation (Figure 6). The *digitalization* frame usually unfolds to include innovation, technologies, etc. The *management* frame shows the importance of revealing aspects, such as effective risk management, relevant information for decision making, and proper accounting, which leads to better performance. The *transformation* frame shows that, in scientific research, it is important to disclose possible transformation due to digitalization, big data, and social media, which influence the future opportunities for changes in management accounting and strategic management.

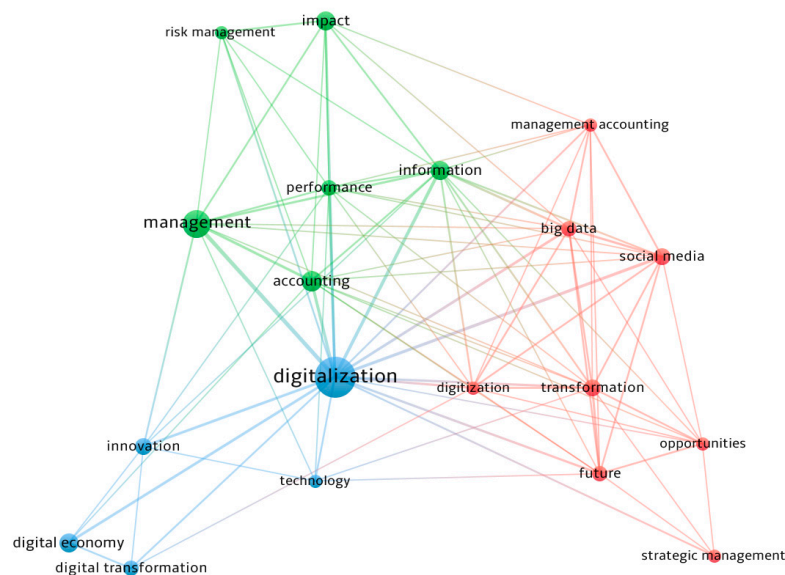


Figure 6. Co-occurrence network of terms in the fields “management accounting & digitalization” (2012–2022).

Management accounting and Sustainability. Stakeholders are increasingly demanding that companies should account for the impact of their activities on the environment; due to this, the literature on sustainability is growing not only in general terms, but also in terms of management accounting [40,49,50]. The search results indicated that, during the analyzed period, there were 9940 results from the Web of Science Core Collection for the *management accounting* and *sustainability* keywords. Publications analyzing *management accounting* and

sustainability have been constantly growing since 2012 (362). It is notable that, in 2021, the number of publications under these keywords was 1818. It is to be observed that most search results are related to the fields of environmental sciences (3634), green sustainable science technology (3245), and environmental studies (2762) (Figure 7).

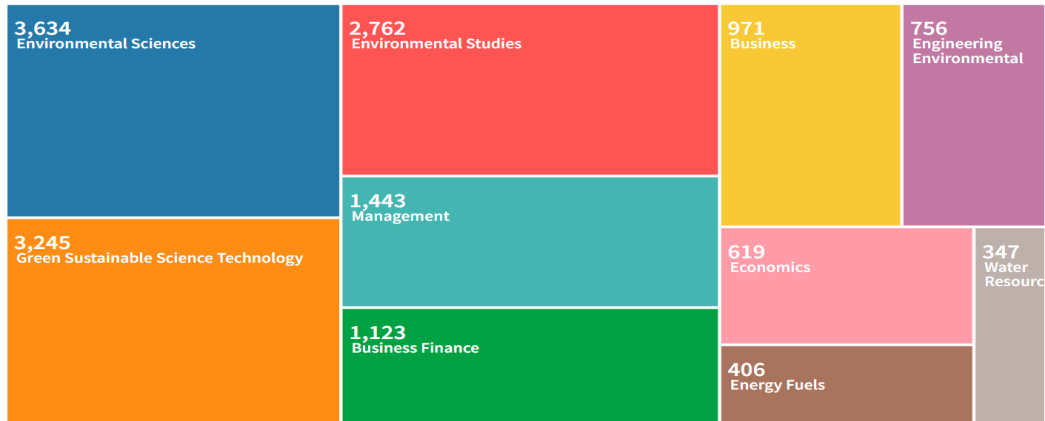


Figure 7. Research field: management accounting and sustainability.

This analysis showed the four main frames: sustainability, management accounting, environmental management accounting, and disclosure (Figure 8). The *sustainability* frame showed that, in scientific research, it is important to disclose the possible opportunities and the impact of sustainability through eco-control, sustainability implementation, and performance measurement. The frames *management accounting* (through strategy, performance, and control systems) and *environmental management accounting* (through economic performance, environmental performance, and resource-based views) in the scientific research were perceived as possible tools to promote the development of sustainability. The *disclosure* frame revealed that not only tools for implementing sustainability are important, but also the reporting of environmental results, climate change and sustainable development.

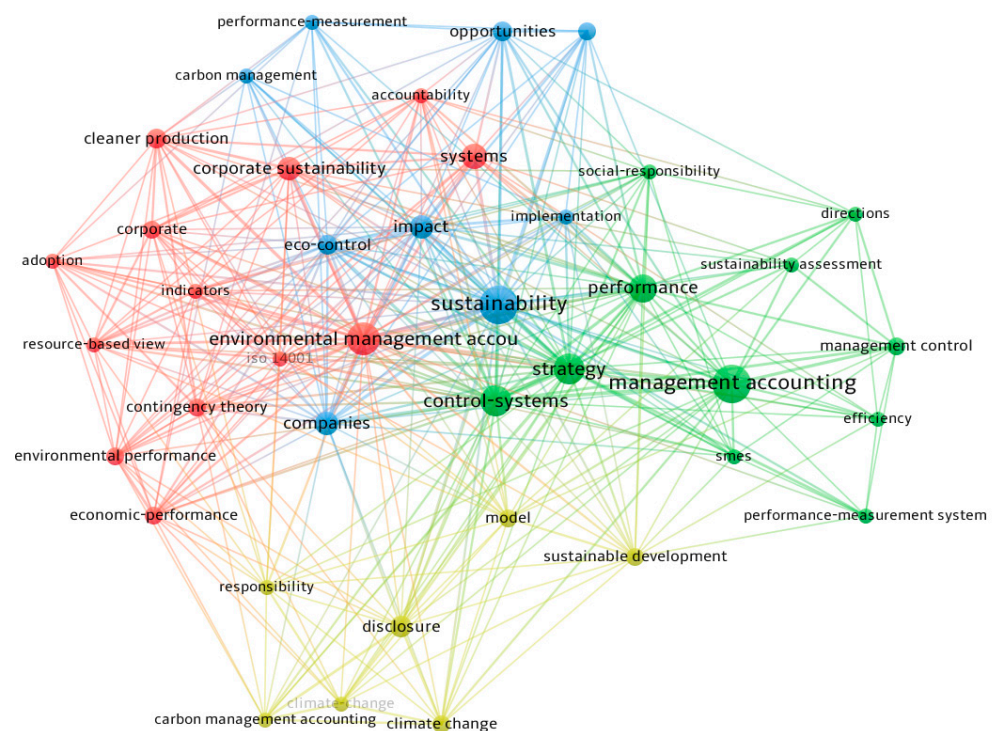


Figure 8. Co-occurrence network of terms in the fields “management accounting & sustainability” (2012–2022).

Management accounting and Circularity. Gould [51] emphasized that a “circular economy must drive management accounting in the 21st century”. The search results indicated that, during the analyzed period, there were 528 results from the Web of Science Core Collection for the *management accounting* and *circularity* keywords. Publications analyzing *management accounting* and *circularity* were produced the most frequently in 2021 (176). It is observed that most search results are related to the environmental sciences (274), green sustainable science technology (187), and engineering environmental (164) fields (Figure 9). This result is not surprising, as the theme of circularity is very close to the theme of sustainability.

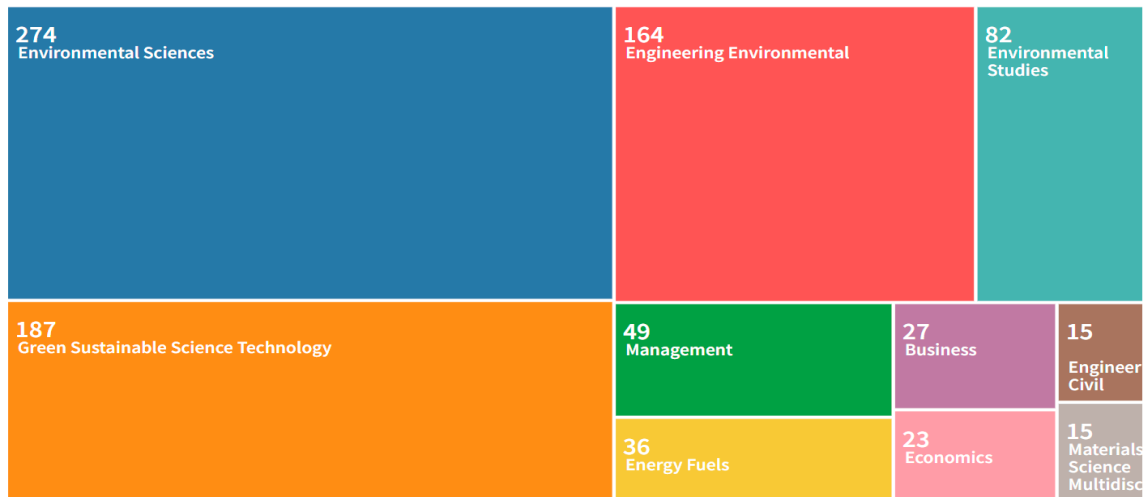


Figure 9. Research field: management accounting and circularity.

In light of this analysis, we indicated two main frames: circular economy and environmental management accounting (Figure 10). The *environmental management accounting* frame unfolds as performance and cleaner production, which could be achieved through eco-innovation, a resource-based view, and corporate finance. This environmental management accounting frame could be understood as a tool to implement the other frame, *circular economy*, which was expressed as sustainability, which could be achieved through the supply chain, waste management and management in general.

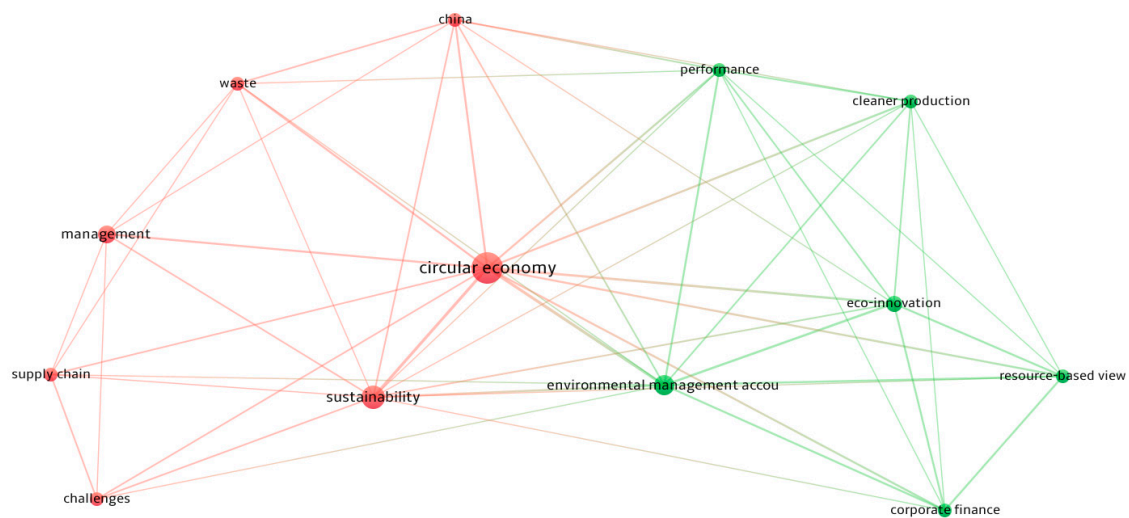


Figure 10. Co-occurrence network of terms in the fields “management accounting & circularity” (2012–2022).

To summarize, from the results of the co-word analysis (from the *Web of Science Core Collection*) for the period of 2012–2022, it could be observed that broader search results were obtained when analyzing such keywords as *management accounting* and *sustainability*, which revealed that sustainability should be implemented through appropriate management accounting tools and should be clearly communicated and reported, thereby indicating possible future opportunities and impacts.

4.2. The Changing Role of Management Accounting in Product Development

Management accounting and Product development. Management accounting can assist in the product development process in a variety of ways. The main way is to determine the financial viability of a product. The search results indicated that, during the analyzed period, there were 175 results from the *Web of Science Core Collection* for management accounting and product development keywords. Publications analyzing management accounting and product development were very constant (about 25 articles a year). It is observed that most search results were related to management (62), business finance (44), and business (42) fields (Figure 11).

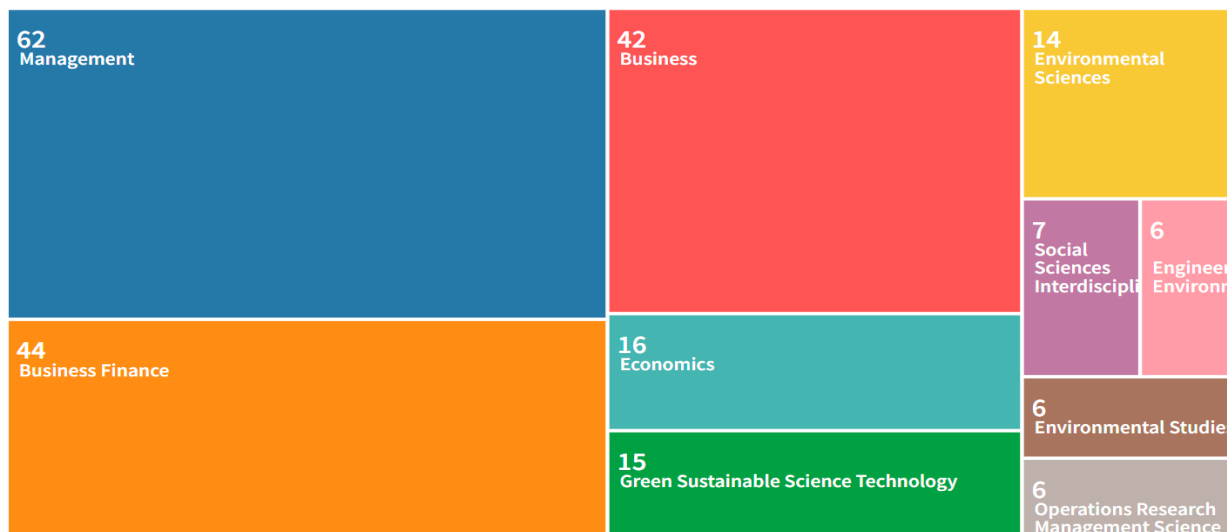


Figure 11. Research field: management accounting and product development.

The analysis indicated four main frames: innovation, management accounting, management accounting, performance, and strategic management (Figure 12). The *management accounting* frame showed that, in scientific research, it is important to disclose product innovation and sustainability issues in product development. The frames *strategic management* (through research and development, systems, and cost management) and *innovation* (through its evolution and knowledge) in scientific research were understood as the way they should be in line with *management accounting* and lead to the *performance* frame. The *performance* frame can be ensured through product design, management control, and control systems.

After exploring the cluster network, it was of interest to note that there is relatively strong relatedness of the keywords, as they are close to each other (Figure 13).

In addition, it is of interest to discover the evolution over time of the keywords in the network by using the overlay and density visualization of *VOSviewer*, which shows the same network displaying the total occurrence and the time period of research relating to each keyword. It can be observed that the present research issue is a recent topic, with the average time of publication of a paper ranging between 2018 and 2020. The evolution of the relationship between keywords due to the changing role of management accounting in product development is shown by the colors, which are defined by the average paper per year of each keyword, with the yellow color representing the most recent and the dark blue

color representing the oldest publications. Hence, this shows a demand for studies focused more on changes in management accounting due to digitalization and circularity.

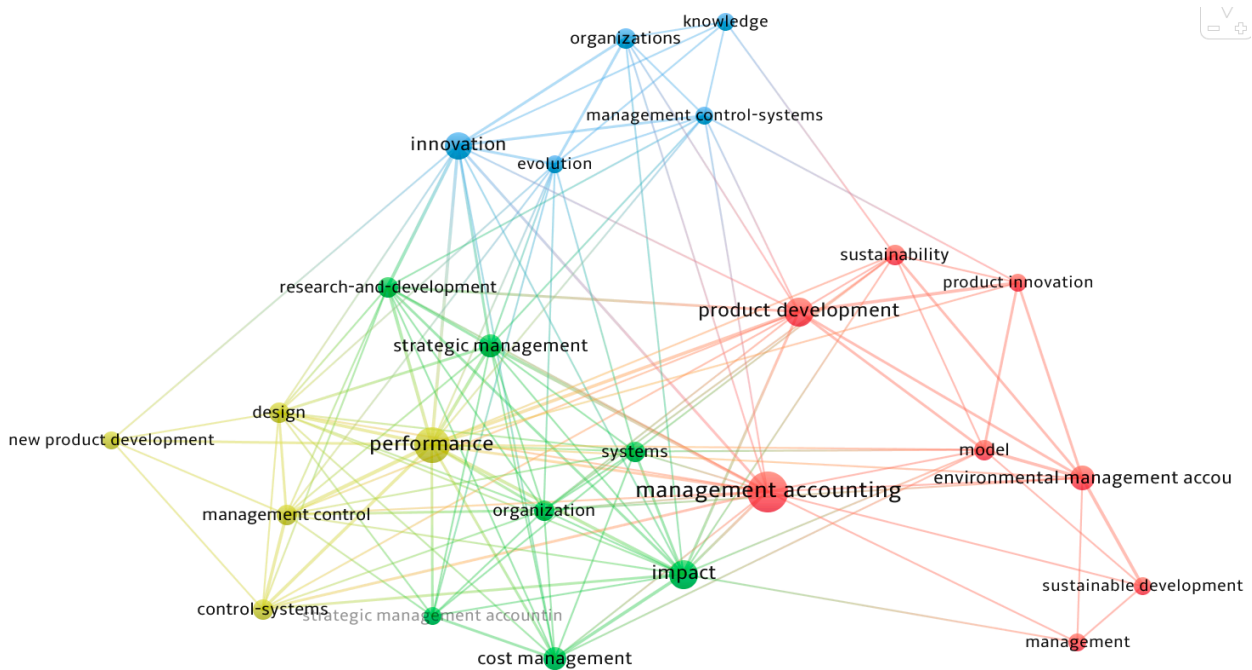


Figure 12. Co-occurrence network of terms in the fields “management accounting & product development” (2012–2022).

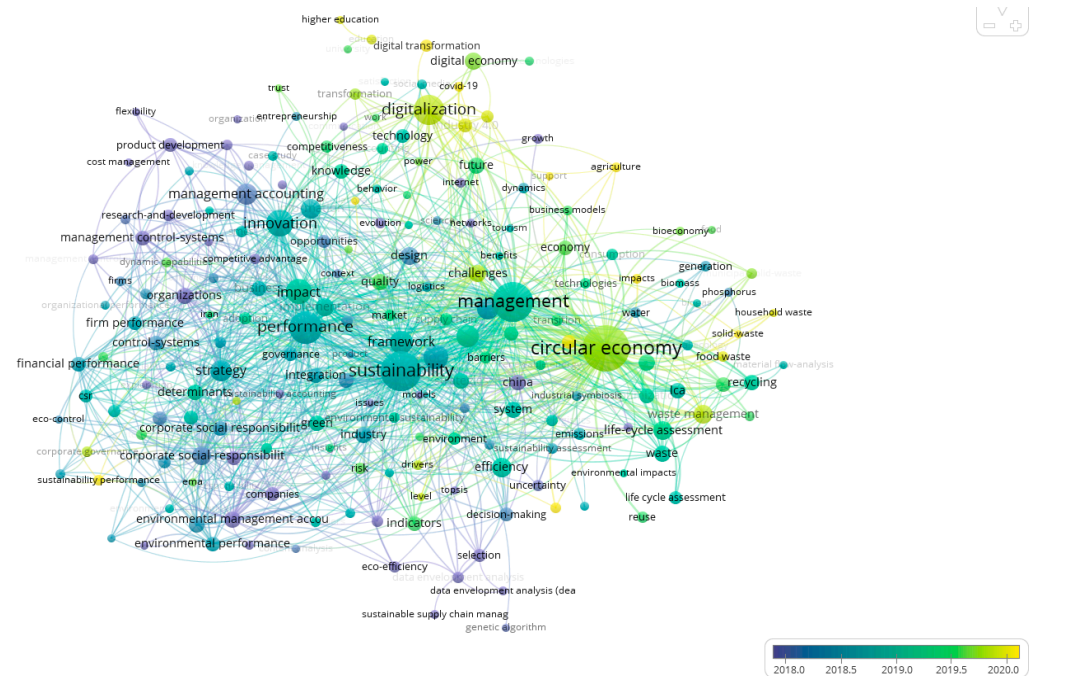


Figure 13. Evolution of the relationship between keywords due to the changing role of management accounting in product development.

To summarize the results, it could be observed that management accounting is an appropriate tool to ensure product development and overall company performance.

5. Discussion and Conclusions

5.1. Discussion

Implementation of an interdisciplinary view and the results of the co-occurrence network of terms in the field *management accounting, digitalization, sustainability, circularity* and *product development* led to three directions being proposed for the analysis of the changing role of management accounting in product development (Figure 14).

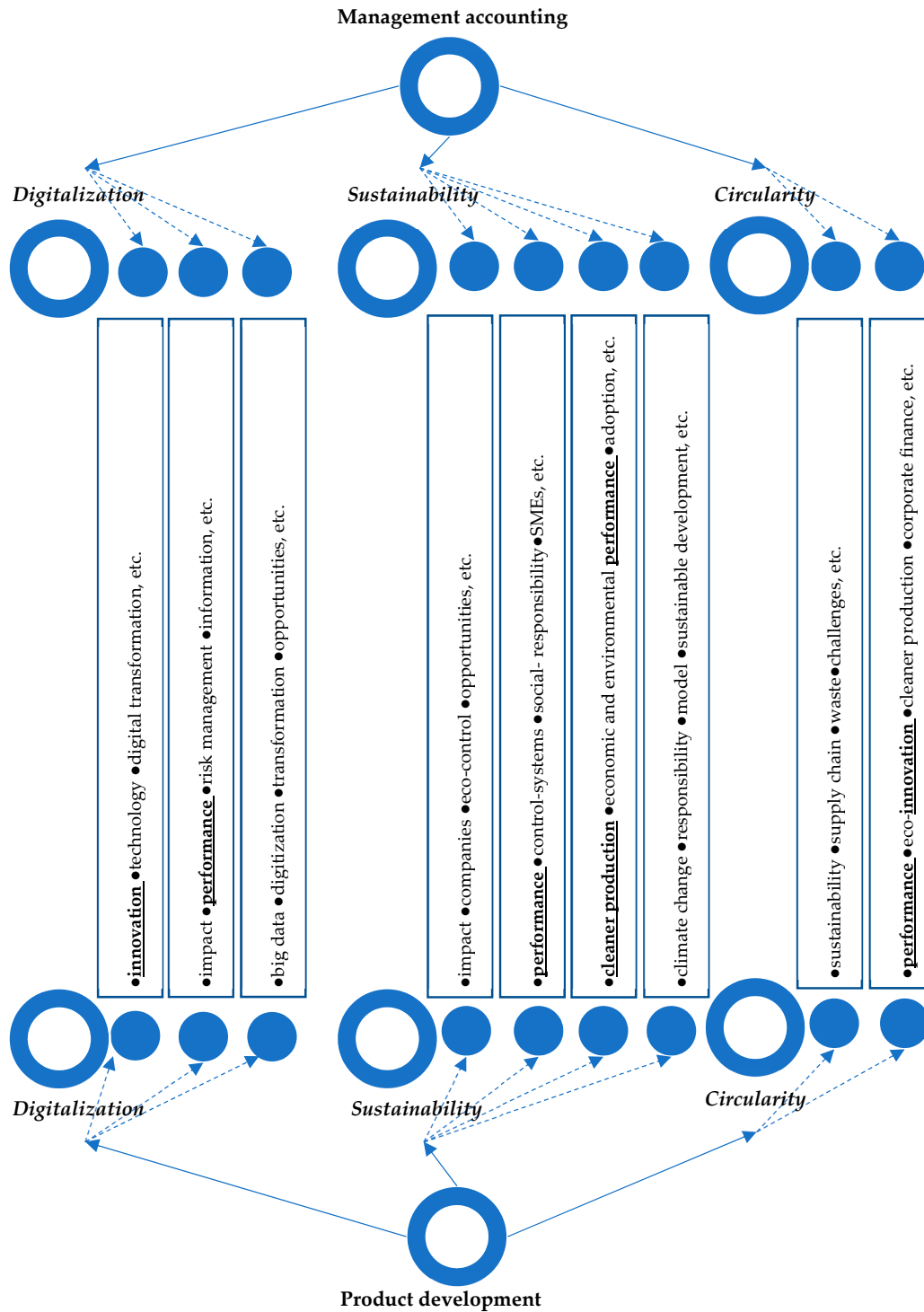


Figure 14. Changing role of management accounting in product development with directions to digitalization, sustainability, and circularity.

Quattrone [52] stated that the evolution of management accounting as a practice is the main source of knowledge for decision making; due to this, the “digitisation of accounting will require management accountants to be able to exercise judgement (rather than to possess data-processing capabilities)” [53] (p. 8). In addition, changes in management accounting due to digitalization were stressed by Bessieux-Ollier [54], as the use of digital technologies will be key for developing a dialogue that is conducive to decision making. Bhimani [55] also supported this idea by arguing that “the possibilities for the digitally enabled business create a range of ‘information literacy’ challenges as well as new possibilities for accounting information providers” (p. 470), which also leads to proper decision making.

Taking into account the changes in management accounting due to the sustainability issue and considering that this topic is relatively extensively developed, it was noted that current practice and future potentials were from different points of view, such as environmental management accounting implementation [56,57]; financial, social, and environmental disclosure [58]; and environmental issues reporting [59–61]. In terms of circularity, it is observed that changes in management accounting are also related to environmental issues [62,63]. In addition, Dorado, Leal and Vila [64] noted that companies implementing environmental aspects in their management accounting adopted a higher number of circular economy practices.

Management accounting plays an important role in addressing the issues of product development. Unfortunately, companies are not taking full advantage of it. A study of Taipaleenmäki [65] analyzed issues in new product development from the perspectives of the absence and presence of management accounting. The research indicated that, in new product development, management accounting absence stems from such factors as the technical, economic, functional, and a lack of consideration arising from an engineering-oriented culture. Meanwhile, recently, authors have been analyzing such aspects as how the new product development process can be underpinned by management control anchor practices (e.g., [66]).

The determination of the important aspects to be considered for the changing role of management accounting in product development revealed that, considering the research directions (digitalization, sustainability, and circularity), *innovation* is found to be treated as the main driver for the changes in management accounting in product development. On the one hand, innovation leads to changing the management accounting techniques and the methods that are currently evolving [67]; on the other hand, a changing product determines that management accounting must function appropriately in response to a changing environment. The role of innovation in the evolution of management accounting was also stressed by Chenhall [68], who tried to examine how management accounting evolved from the traditional, cybernetic approach, to a control operating within a closed system with little attention to adaptive processes. According to Barros [69], innovation can be weighed against the necessity of goal achievement taking place within fields in which a company can exploit the developed effort. This means that companies should redesign their management accounting to enhance the proper product development by taking into account the aspects of digitalization, sustainability and circularity.

Moreover, the research revealed that, if considering the research directions (digitalization, sustainability, and circularity) and innovation as key drivers for changes in management accounting in product development, the better *performance* of a company is observed as a consequence of this process. This result is in line with Gomez-Conde, Lunkes, and Rosa [39] who claimed that management accounting can help companies to achieve the potential benefits of innovation [70], as stakeholder pressures are forcing companies to be more environmentally efficient and transparent [71–73]. In addition, our research results are in line with other scientists’ research [39,71,74–76], which have been emphasizing the ways innovation practices can play a significant role in organizational performance. Hence, the superior performance of a company can be more productive due to the digitalization aspects being used; it may be superior in terms of taking into account the attitudes and pressure of customers and the entire society towards sustainability, and it

may become more beneficial due to the applicable aspects of the circular economy so as to save available resources.

5.2. Conclusions

Regarding RQ1, analysis of the previous studies allowed us to distinguish the main broad directions in product development: digitalization, sustainability, and circularity.

Furthermore, RQ2 allowed identifying the directions of management accounting according to digitalization, sustainability, and circularity. Analysis of the results of co-occurrence revealed that, in the scientific research, sustainability is one of the most important topics in the analysis of management accounting. However, aspects of digitization are also fundamentally important in the scientific literature so as to ensure that the impact of digitization on the changes in management accounting should be sustainable as well.

Finally, RQ3 contributed to the determination of the important aspects to be considered for the changing role of management accounting in product development. Considering the research directions (digitalization, sustainability, and circularity), innovation is found to be treated as the main driver for the changes in management accounting in product development, which, in some way, can be seen as a consequence of better company performance that can be linked to sustainability and circularity.

Limitations and future research directions. One limitation of the bibliometric analysis and a systematic literature review is that the obtained results were not tested to ascertain whether they are statistically significant; due to this, there is a need to test the research results empirically, which should show possible future research direction(s). In addition, the results of the co-word analysis cover a fairly limited period, i.e., a decade from 2012 to 2022. On the other hand, looking at the relevance of issues in the fields of digitalization, sustainability, and circularity, the time period is reasonable. The period of the analysis spans between 2012 (January) and 2022 (February). As this topic is very relevant, we included two months of 2022 into our analysis in order to disclose the actual/current papers on the topic. However, we understand that the number of journals increased during this time, and it should be taken into consideration that the performed analysis should be repeated at the end of the analysis period to assess whether the trend of determining the changing role of management accounting in product development with different directions is still the same. Furthermore, there is a risk of the researchers' subjective interpretation of the results from the research analysis. Although the authors were careful to choose the best search terms related to the research aim, some potentially relevant papers may have been excluded.

The analysis allowed identifying the changing role of management accounting in product development with the directions to digitalization, sustainability, and circularity theoretically, while the demand for practical insights and quantitative data analysis can be an extension for the future research.

This study contributes to the management accounting literature by providing novel evidence on research directions, such as digitalization, sustainability, and circularity in the field of product development, which could be the basis for the directions of the future research.

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References

- O'Connor, G.C.; Rice, M.P. A comprehensive model of uncertainty associated with radical innovation. *J. Prod. Innov. Manag.* **2013**, *30*, 2–18. [CrossRef]
- Lasso, S.; Kreye, M.; Daalhuizen, J.; Cash, P. Exploring the link between uncertainty and project activities in new product development. *J. Eng. Des.* **2020**, *31*, 531–551. [CrossRef]
- Hooge, S.; Kokshagina, O.; Le Masson, P.; Levillain, K.; Weil, B.; Fabreguettes, V.; Popiolek, N. Gambling versus designing: Organizing for the design of the probability space in the energy sector. *Creat. Innov. Manag.* **2016**, *25*, 464–483. [CrossRef]
- Galbraith, J.R. Organization Design: An Information Processing View, in “Interfaces”. *Eur. Inst. Adv. Stud.* **1974**, *4*, 28–36. [CrossRef]
- Song, M.; Xie, J.; Di Benedetto, C.A. Message and source factors, market uncertainty, and extrafunctional information processing: Hypotheses and empirical evidence. *IEEE Trans. Eng. Manag.* **2001**, *48*, 223–238. [CrossRef]
- Iqbal, M.; Suzianti, A. New Product Development Process Design for Small and Medium Enterprises: A Systematic Literature Review from the Perspective of Open Innovation. *J. Open Innov.* **2021**, *7*, 153. [CrossRef]
- Florén, H.; Frishammar, J.; Parida, V.; Wincent, J. Critical success factors in early new product development: A review and a conceptual model. *Int. Entrep. Manag. J.* **2018**, *14*, 411–427. [CrossRef]
- Marion, T.J.; Fixson, S.K. The Transformation of the Innovation Process: How Digital Tools are Changing Work, Collaboration, and Organizations in New Product Development. *J. Prod. Innov. Manag.* **2021**, *38*, 192–215. [CrossRef]
- Shang, Z. Relationship between Multiple Management Accounting Tools for Strategy Implementation. Available online: <https://ssrn.com/abstract=3977917> (accessed on 9 March 2022).
- Armitage, H.M.; Webb, A.; Glynn, J. The use of management accounting techniques by small and medium-sized enterprises: A field study of Canadian and Australian practice. *Account. Perspect.* **2016**, *151*, 31–69. [CrossRef]
- Petera, P.; Šoljaková, L. Use of strategic management accounting techniques by companies in the Czech Republic. *Econ. Res. Ekon. Istraživanja* **2020**, *33*, 46–67. [CrossRef]
- Ax, C.; Jan Greve, J. Adoption of management accounting innovations: Organizational culture compatibility and perceived outcomes. *Manag. Account. Res.* **2017**, *34*, 59–74. [CrossRef]
- Ferdous, M.I.; Adams, C.A.; Boyce, G. Institutional drivers of environmental management accounting adoption in public sector water organisations. *Account. Audit. Account. J.* **2019**, *32*, 984–1012. [CrossRef]
- Alvarez, T.; Sensini, L.; Bello, C.; Vazquez, M. Management accounting practices and performance of SMEs in the Hotel industry: Evidence from an emerging economy. *Int. J. Bus. Soc. Sci.* **2021**, *12*, 24–35. [CrossRef]
- Pedroso, E.; Gomes, C.F.; Yasin, M.M. Management accounting systems: An organizational competitive performance perspective. *Benchmarking Int. J.* **2020**, *27*, 1843–1874. [CrossRef]
- Bhimani, A. Digital data and management accounting: Why we need to rethink research methods. *J. Manag. Control* **2020**, *31*, 9–23. [CrossRef]
- Moll, J.; Yigitbasioglu, O. The role of internet-related technologies in shaping the work of accountants: New directions for accounting research. *Br. Account. Rev.* **2019**, *51*, 100833. [CrossRef]
- Korhonen, T.; Selos, E.; Laine, T.; Suomala, P. Exploring the programmability of management accounting work for increasing automation: An interventionist case study. *Account. Audit. Account. J.* **2020**, *34*, 253–280. [CrossRef]
- Al-Htaybat, K.; von Alberti-Alhtaybat, L. Big Data and corporate reporting: Impacts and paradoxes. *Account. Audit. Account. J.* **2017**, *30*, 850–873. [CrossRef]
- Bredmar, K. Digitalisation of enterprises brings new opportunities to traditional management control. Business Systems Research. *Int. J. Soc. Adv. Innov. Res. Econ.* **2017**, *31*, 115–125. [CrossRef]
- Maas, K.; Schaltegger, S.; Crutzen, N. Integration of corporate sustainability measurement, management and reporting. *J. Clean. Prod.* **2016**, *136*, 237–248. [CrossRef]
- Johnson, M.P.; Schaltegger, S. Two decades of sustainability management tools for SMEs: How far have we come? *J. Small Bus. Manag.* **2016**, *54*, 481–505. [CrossRef]
- Kelsall, C.A. Ecological Management Accounting—Taking into Account Sustainability, Does Accounting Have Far to Travel? *Sustainability* **2020**, *12*, 8854. [CrossRef]
- Plati, C. Sustainability factors in pavement materials, design, and preservation strategies: A literature review. *Constr. Build. Mater.* **2019**, *30*, 539–555. [CrossRef]
- Rosati, F.; Faria, L.G. Addressing the SDGs in sustainability reports: The relationship with institutional factors. *J. Clean. Prod.* **2019**, *215*, 1312–1326. [CrossRef]
- Kamali, M.; Hewage, K.; Milani, A.S. Life cycle sustainability performance assessment framework for residential modular buildings: Aggregated sustainability indices. *Build. Environ.* **2018**, *138*, 21–41. [CrossRef]
- Sun, H.; Mohsin, M.; Alharthi, M.; Abbas, Q. Measuring environmental sustainability performance of South Asia. *J. Clean. Prod.* **2020**, *251*, 119519. [CrossRef]

28. Witjes, S.; Lozano, R. Towards a more Circular Economy: Proposing a framework linking sustainable public procurement and sustainable business models. *Resour. Conserv. Recycl.* **2016**, *112*, 37–44. [CrossRef]
29. Bocken, N.M.; De Pauw, I.; Bakker, C.; Van Der Grinten, B. Product design and business model strategies for a circular economy. *J. Ind. Prod. Eng.* **2016**, *33*, 308–320. [CrossRef]
30. Scarpellini, S.; Marín-Vinuesa, L.M.; Aranda-Usón, A.; Portillo-Tarragona, P. Dynamic capabilities and environmental accounting for the circular economy in businesses. *Sustain. Account. Manag. Policy J.* **2020**, *11*, 1129–1158. [CrossRef]
31. Río González, P.D.; Carrillo Hermosilla, J.; Könnölä, T.; Bleda, M. Resources, capabilities and competences for eco-innovation. *Technol. Econ. Dev. Econ.* **2015**, *22*, 274–292. [CrossRef]
32. Katz-Gerro, T.; López Sintas, J. Mapping circular economy activities in the European Union: Patterns of implementation and their correlates in small and medium-sized enterprises. *Bus. Strategy Environ.* **2018**, *28*, 485–496. [CrossRef]
33. Lieder, M.; Rashid, A. Towards circular economy implementation: A comprehensive review in context of manufacturing industry. *J. Clean. Prod.* **2016**, *115*, 36–51. [CrossRef]
34. Naicker, A.; Naidoo, S.; Rajcoomar, A. Product Development in the Ict Industry: Critical Enablers of Customer Satisfaction. *S. Afr. J. Ind. Eng.* **2021**, *32*, 86–96. [CrossRef]
35. Krishnan, V.; Ulrich, K.T. Product Development Decisions: A Review of the Literature. *Manag. Sci.* **2001**, *47*, v-204. [CrossRef]
36. Khannan, M.S.A.; Tontowi, A.E.; Herliansyah, M.K.; Sudiarmo, A. New Product Development Method Trends and Future Research: A Systematic Literature Review. *J. Tek. Ind.* **2021**, *23*, 11–23. [CrossRef]
37. Ali, S.; Li, G.; Yang, P.; Hussain, K.; Latif, Y. Unpacking the importance of intangible skills in new product development and sustainable business performance; strategies for marketing managers. *PLoS ONE* **2020**, *15*, e0238743. [CrossRef]
38. Ruffino, R. Sustainable Design: Aspects of Sustainable Product Development. *BioResources* **2021**, *16*, 6548–6550. [CrossRef]
39. Gomez-Conde, J.; Lunkes, R.J.; Rosa, F.S. Environmental innovation practices and operational performance: The joint effects of management accounting and control systems and environmental training. *Account. Audit. Account. J.* **2019**, *32*, 1325–1357. [CrossRef]
40. Oyewo, B.M. Outcomes of interaction between organizational characteristics and management accounting practice on corporate sustainability: The global management accounting principles (GMAP) approach. *J. Sustain. Financ. Investig.* **2021**, *11*, 351–385. [CrossRef]
41. Ascani, I.; Ciccola, R.; Chiucchi, M.S. A structured literature review about the role of management accountants in sustainability accounting and reporting. *Sustainability* **2021**, *13*, 2357. [CrossRef]
42. CIMA (Chartered Institute of Management Accountants). *Paper P3: Performance Strategy Study Text*; Kaplan Publishing: Berkshire, UK, 2013.
43. Kaplan. *ACCA Paper F2: Management Accounting*; Kaplan Publishing Limited: Berkshire, UK, 2013.
44. Ittner, C.; Larcker, D. Assessing Empirical Research in Managerial Accounting: A Value-Based Management Perspective. *J. Account. Econ.* **2001**, *32*, 349–410. [CrossRef]
45. Al-Khadash, H.A.; Feridun, M. Impact of Strategic Initiatives in Management Accounting on Corporate Financial: Evidence from Amman Stock Exchange. *Manag. Glob. Transit.* **2006**, *4*, 299–312.
46. Alao, M.E. A review of the Management Accountant's Role in the effective utilization of organization's resources: Implication for developing countries. *IOSR J. Econ. Financ.* **2014**, *5*, 16–22. [CrossRef]
47. Waltman, L.; van Eck, N.J.; Noyons, E.C. A unified approach to mapping and clustering of bibliometric networks. *J. Informetr.* **2010**, *4*, 629–635. [CrossRef]
48. Digitalization. Available online: <https://www.gartner.com/en/information-technology/glossary/digitalization> (accessed on 14 February 2022).
49. Weber, O.; Hoque, A.; Ayub Islam, M. Incorporating environmental criteria into credit risk management in Bangladeshi banks. *J. Sustain. Financ. Investig.* **2015**, *2*, 1–5. [CrossRef]
50. Carolina Rezende de Carvalho Ferreira, M.; Amorim Sobreiro, V.; Kimura, H.; Luiz de Moraes Barboza, F. A systematic review of literature about finance and sustainability. *J. Sustain. Financ. Investig.* **2016**, *2*, 112–147. [CrossRef]
51. A Circular Economy Must Drive Management Accounting in the 21st Century. Available online: <https://www.ifac.org/knowledge-gateway/preparing-future-ready-professionals/discussion/circular-economy-must-drive-management-accounting-21st-century> (accessed on 25 February 2022).
52. Quattrone, P. Management accounting goes digital: Will the move make it wiser? *Manag. Account. Res.* **2016**, *31*, 118–122. [CrossRef]
53. Bromwich, M.; Scapens, R.W. Management Accounting Research: 25 Years On. *Manag. Account. Res.* **2016**, *31*, 1–9. [CrossRef]
54. Bessieux-Ollier, C.; Nègre, E.; Verdier, M.A. Moving from Accounting for People to Accounting with People: A Critical Analysis of the Literature and Avenues for Research. *Eur. Account. Rev.* **2022**, 1–26. [CrossRef]
55. Bhimani, A.; Willcocks, L. Digitisation, 'Big Data' and the transformation of accounting information. *Account. Bus. Res.* **2014**, *44*, 469–490. [CrossRef]
56. Johnstone, L. Theorising and Modelling Social Control in Environmental Management Accounting Research. *Soc. Environ. Account. J.* **2018**, *38*, 30–48. [CrossRef]
57. Bartolomeo, M.; Bennett, M.; Bouma, J.J.; Heydkamp, P.; James, P.; Wolters, T. Environmental management accounting in Europe: Current practice and future potential. *Eur. Account. Rev.* **2000**, *9*, 31–52. [CrossRef]

58. De Villiers, C.; Cho, C.H.; Turner, M.J.; Scarpa, R. Are Shareholders Willing to Pay for Financial, Social and Environmental Disclosure? A Choice-based Experiment. *Eur. Account. Rev.* **2021**, *1–29*. [[CrossRef](#)]
59. Lamberton, G. Sustainability accounting—A brief history and conceptual framework. *Account. Forum* **2005**, *29*, 7–26. [[CrossRef](#)]
60. Adams, C.A.; Frost, G.F. Integrating sustainability reporting into management practices. *Account. Forum* **2008**, *32*, 288–302. [[CrossRef](#)]
61. Hartmann, F.G.H.; Hartmann, F.G.H.; Perego, P.; Young-Ferris, A. Carbon Accounting: Challenges for Research in Management Control and Performance Measurement. *Abacus* **2013**, *49*, 539–563. [[CrossRef](#)]
62. Scarpellini, S.; Valero-Gil, J.; Moneva, J.M.; Andreaus, M. Environmental management capabilities for a “circular eco-innovation”. *Bus. Strategy Environ. Wiley Blackwell* **2020**, *29*, 1850–1864. [[CrossRef](#)]
63. Scarpellini, S. Social impacts of a circular business model: An approach from a sustainability accounting and reporting perspective. *Corp. Soc. Responsib. Environ. Manag.* **2021**, 1–11. [[CrossRef](#)]
64. Barón Dorado, B.; Giménez Leal, G.; Castro Vila, R. Environmental policy and corporate sustainability: The mediating role of environmental management systems in circular economy adoption. *Corp. Soc. Responsib. Environ. Manag.* **2022**, 1–13. [[CrossRef](#)]
65. Taipaleenmäki, J. Absence and Variant Modes of Presence of Management Accounting in New Product Development—Theoretical Refinement and Some Empirical Evidence. *Eur. Account. Rev.* **2014**, *23*, 291–334. [[CrossRef](#)]
66. Carlsson-Wall, M.; Goretzki, L.; Kraus, K.; Lind, J. Exploring the Role of Management Control Anchor Practices in new Product Development. *Eur. Account. Rev.* **2021**, *30*, 251–276. [[CrossRef](#)]
67. Oyewo, B.; Isa, R. Improving Corporate Sustainability Reporting Through the Adoption of Integrated Reporting: A Study of Nigerian and South African Firms. *Afr. Account. Financ. J.* **2017**, *1*, 52–94.
68. Chenhall, R.H.; Frank, M. The role of innovation in the evolution of management accounting and its integration into management control. *Account. Organ. Soc.* **2015**, *47*, 1–13. [[CrossRef](#)]
69. Barros, R.S.; Ferreira, A.M.D.S. Management Control Systems and Innovation: A levers of control analysis in an innovative company. *J. Account. Organ. Chang.* **2021**. *ahead-of-print*. [[CrossRef](#)]
70. Parker, L.D.; Chung, L.H. Structuring social and environmental management control and accountability: Behind the hotel doors. *Account. Audit. Account. J.* **2018**, *31*, 993–1023. [[CrossRef](#)]
71. Wagner, M. The link of environmental and economic performance: Drivers and limitations of sustainability integration. *J. Bus. Res.* **2015**, *68*, 1306–1317. [[CrossRef](#)]
72. Tingey-Holyoak, J. Sustainable water storage by agricultural businesses: Strategic responses to institutional pressures. *J. Bus. Res.* **2014**, *67*, 2590–2602. [[CrossRef](#)]
73. Rodrigue, M.; Magnan, M.; Boulianne, E. Stakeholders’ influence on environmental strategy and performance indicators: A managerial perspective. *Manag. Account. Res.* **2013**, *24*, 301–316. [[CrossRef](#)]
74. Li, S.; Ngñiatedema, T.; Chen, F. Understanding the impact of green initiatives and green performance on financial performance in the US. *Bus. Strategy Environ.* **2017**, *6*, 776–790. [[CrossRef](#)]
75. Albort-Morant, G.; Leal-Millán, A.; Cepeda-Carrión, G. The antecedents of green innovation performance: A model of learning and capabilities. *J. Bus. Res.* **2016**, *69*, 4912–4917. [[CrossRef](#)]
76. Bstieler, L.; Gruen, T.; Akdeniz, B.; Brick, D.; Du, S.; Guo, L.; Khanlari, M.; McIlroy, J.; O’Hern, M.; Yalcinkaya, G. Emerging research themes in innovation and new product development: Insights from the 2017 PDMA-UNH doctoral consortium. *J. Prod. Innov. Manag.* **2018**, *35*, 300–307. [[CrossRef](#)]