

Article

# Knowledge Management and Performance Measurement Systems for SMEs' Economic Sustainability

Andrea Cardoni <sup>1,\*</sup>, Filippo Zanin <sup>2</sup>, Giulio Corazza <sup>2</sup> and Alessio Paradisi <sup>1</sup>

<sup>1</sup> Department of Economics, University of Perugia, Via Alessandro Pascoli, 20, 06123 Perugia, Italy; alessio.paradisi@studenti.unipg.it

<sup>2</sup> Department of Economics and Statistics, University of Udine, Via Tomadini, 30/A, 33100 Udine, Italy; filippo.zanin@uniud.it (F.Z.); corazza.giulio@spes.uniud.it (G.C.)

\* Correspondence: andrea.cardoni@unipg.it; Tel.: +39-75-585-52-53

Received: 23 January 2020; Accepted: 23 March 2020; Published: 25 March 2020



**Abstract:** This paper aims to explore the relationships between knowledge management (KM), performance measurement systems (PMSs), and small and medium enterprises' (SMEs) economic sustainability in knowledge-intensive sectors. The literature demonstrates that SMEs are often characterized by unstructured KM approaches and limited PMS implementation, being at the same time affected by scarce profitability and financial issues. Adopting the knowledge-based view of the firm and the contingency theory of PMSs, we tested the impact of two alternative KM approaches (exploitation and exploration) on SMEs' economic sustainability, measuring the moderating effect of PMS use (diagnostic and interactive). Through an ordinary least squares (OLS) regression of data collected for 219 Italian medium firms operating in knowledge-intensive sectors, this study provides evidence on how a specific KM approach supports the SME economic sustainability and how a consistent implementation and use of PMS amplify the relationship between KM and economic sustainability. Data analysis confirms the relevance of some key concepts of the knowledge-based view of the firm, especially the positive impact of the KM exploration approach on economic sustainability. Additionally, the paper extends empirical evidence for the PMS moderating effect on the KM–performance relationship. To the best of our knowledge, this is the first time that a study provides evidence for the relationships among KM, PMSs, and economic sustainability in the SME setting. Moreover, our findings lead to some managerial implications, especially they encourage SME entrepreneurs and managers to design a coherent KM approach and to implement an adequate PMS in order to support economic sustainability.

**Keywords:** economic sustainability; knowledge management (KM); performance measurement systems (PMSs); SMEs; KM exploration; KM exploitation

## 1. Introduction

In continuously changing and unpredictable environments [1], sustainability has become a key goal for business success [2]. The sustainable management of financial, human, environmental, and social resources is a critical issue for business strategy and survival [3]. As the literature widely demonstrates [4], providing and sharing organizational values can help firms reach superior profits, thus benefitting from greater motivation, commitment, and loyalty of internal and external stakeholders as well as assuring the alignment between individual goals and sustainability efforts of the firm [5]. Pursuing sustainability can create long-term competitive advantages related to a better brand reputation and a differentiated position from competitors [5]. As widely demonstrated [6], such factors act as fundamental mediators between sustainability practices and firms' financial performance. Hence,

it becomes crucial that a firm engages in environmental, social, and governance strategies slowly and consistently starting from economic dimension [7].

The literature highlights a growing interest in the field of sustainability for small and medium-sized enterprises (SMEs) [8]. In such context environmental and social sustainability are equally relevant for financial success [9], even if organizational practices are strongly influenced by the more limited SMEs' motivations and capabilities [10] and the economic side of sustainability becomes prevalent. Despite the incidence of SMEs in terms of global GDP and employment [11], the high failure rates [12,13] still represent a major challenge in the current economic scenario. Due to the specific characteristics of SMEs, a problem of economic sustainability of SMEs is emerging [8], as is the need to detect the critical factors able to positively affect the firm's economic performance and survival. Therefore, there is a growing interest in researching the determinants of SMEs' economic sustainability [14], especially in country like Italy where the SMEs count for 92% of total, provide 82% of workforce [15] and show heterogeneous level of competitiveness and profitability [16], similarly to many other European countries.

Companies are facing a knowledge economy [17] where everything rapidly changes, demanding a capacity to continuously readapt themselves to confront the new challenges. In the specific context of SMEs, knowledge and knowledge management (KM) have become a primary source to support firms' innovation and sustain economic survival [18]. The question of knowledge is particularly relevant for SMEs, since they have to often rely on employees' knowledge and skill in order to build their competitive advantages instead of relying on physical and financial assets, as compared to larger firms [19,20].

According to the knowledge-based view [21], the knowledge located in various places within the firms, such as employees, organizational culture, routines, policies, systems, and documents [22], is the main asset used to reach and sustain competitive advantages, since it is unique and hard to replicate and replace. Consequently, the enterprise must implement KM practices able to value and develop the knowledge resource [17,23]. This makes it easier to understand how to manage people and processes, how to achieve growth and competitive processes, and how to organise new products and technologies [24].

When implementing KM processes, conflictual tensions between two basic orientations must be adequately managed in order to link innovation and KM [25]: exploitation and exploration. These tensions become one of the major issues related to KM because they influence the clear definition of the strategic approach to follow. Indeed, as addressed by Kyriakopoulous and Moorman's [26], exploitation and exploration compete for (a) scarce resources and opposite organizational structures/cultures, (b) focus on self-excluding strategic priorities, and (c) best possible match with external environment opportunities. Particularly, the exploitation approach involves refinement, implementation, efficiency, production, and selection [27], pointing to more conservatism through stable revenues, thus maintaining key customers and efficiency for increasing the average performances [28]. The exploration approach relates to knowledge creation and is concerned with the development of new knowledge and experiments, in order to foster changes and variations to support radical innovations [29]. In the long run, the continuous challenge for every organization is to simultaneously manage the conflicting demands derived from these two basic orientations (ambidexterity). However, the limitation of resources stimulates the enterprise to select a particular orientation. For some structural characteristics [30], SMEs should then adopt a clear definition of KM approaches to assure the needed consistency in knowledge processes and finalize the use of limited resources. Therefore, in the short run, it is very important to evaluate the impact of a clear definition of the KM approach, be it exploration or exploitation, on SMEs' economic sustainability.

In addition, our paper considers a moderating effect, which can be played by performance management systems (PMSs). Several studies [31] analyse the role of decision-making tools to enhance the impact of KM. Particularly, our paper focuses on PMSs because they may support and facilitate KM development, leading towards full knowledge resource use [32]. Even though there are several tools enabling KM processes relying on information technologies and web-based solutions [33], literature

found PMSs as particularly suitable in a business context where “executives require timely and relevant information to augment the effectiveness of their decision making for ensuring success” [32]. This is especially true for smaller firms where “the centrality of a managing director and managers in SME knowledge is most evident” [34]. In other words, PMSs are asked to support strategic and operative decision makers by explicitly taking into consideration the sustainability perspective [35].

According to contingency theory [36], the implementation and use of PMSs in SMEs are influenced by some factors [37] affecting corporate governance, management information systems, strategy, organizational culture and the external environment. In the context of SMEs, resource constraints [30,38] and personal control approaches can hinder the implementation of PMSs [39] and influence their use [40–42]. A distinction is possible between [43,44]: diagnostic controls and interactive controls. In the first case, PMSs are used to define rules that are widely recognized and used, measure organizational results, fulfil the planned objectives, and, generalizing, support the implementation of the strategy. The interactive approach enables us to detect strategic uncertainties, thus promoting strategic dynamics relying on informal and continuous dialogue at different managerial levels, which are able to support the elaboration of the strategy.

Particularly relevant for the current research is the effect of PMSs on KM [45]. Our point of view refers to a consistent use of different PMSs (diagnostic and interactive) to leverage the KM strategic approaches (exploitation and exploration). Indeed, by combining the knowledge-based view of the firm with the contingency theory, it is expected that KM approaches and PMSs are able to simultaneously evolve [32] and find the needed coherence to support the SMEs economic sustainability [46]. Thus, we are aligned with Simons’ perspective [43] where a consistent use of PMS with respect to firms’ strategy and other contextual variables can produce organizational learning and foster entrepreneurship and innovation [46–48].

Based on the above literature, this study aims to evaluate the effect that KM approaches and PMSs have on the economic sustainability of SMEs, focusing particularly on medium-sized companies operating in knowledge-intensive sectors. Their medium size, in fact, allowed us to include in the sample only the companies that still have the typical characteristics of the SME, excluding those entities that are too small to have a minimal structuring of KM and PMS systems. The sample was limited to knowledge-intensive industries because the sector influence is considered an external context condition that requires companies to manage knowledge and implement a PMS, in a scenario where only large companies are usually able to compete.

Despite the fact that all these topics are not new in literature, to the best of our knowledge they present the following gaps. First, the study of knowledge exploration and exploitation strategies on performance is highly developed [49], with the prevailing part of the literature emphasizing the importance of ambidexterity [28,29,50–52], also with reference to SMEs [53]. However, in our study, we believe that, in the short term, the limited resources of SMEs allow them to select, in the best case, only one KM approach in order to reach an adequate profitability. In our paper, we aim to verify whether the clear definition of a KM approach is able to bring these results and, if so, which KM approach is preferable. To the best of our knowledge, there are no studies on the relationship between exploration/exploitation and economic sustainability that adopt this perspective. Second, the literature also explores the relationship between knowledge management and sustainability, mostly focusing on the role of innovation [54] and proposing an integrated model synthesizing the sustainable competitive advantage [55]. These papers are mostly qualitative and exploratory, supported by case studies and focusing on large companies. In our paper, we aim to test the relationship through a quantitative study, specifically devoted to SMEs, characterized by different contextual factors. Finally, there are contributions in the literature to the interplay between KM and PMSs, both at the network level [56] and single-entity level. In this latter perspective, the relevant study of Ditillo [57] focuses on knowledge-intensive firms and demonstrates the influence of knowledge complexity on management control mechanisms, in order to foster coordination and knowledge integration. Even in this case, the study is qualitative and refers to a big company. Further insights on the combined effects between KM,

innovation, and PMSs have recently been conducted by Bedford [58], Asiaei et al. [32], and Asiaei and Bontis [59], leading to the conclusion that knowledge assets and innovation forms are able to produce higher performance if leveraged by a coherent use of PMSs. As those studies are not tailored to smaller dimensions, our research aims to expand these conclusions and test this relationship in SMEs.

Summarizing, the topics addressed in literature are often treated in a non-integrated way and are not contextualized with particular reference to SMEs. Given the actual relevance of SMEs survival and success, our paper aims to extend and integrate these streams of research and fill the above-mentioned gaps, presenting a study that simultaneously combines KM, PMSs, and economic sustainability in the particular context of SMEs. Furthermore, as previous research mostly relies on exploratory research based on case studies, useful in order to understand the “why” and “how” of a certain phenomenon, our study aims to uncover stronger generalizable outcomes in order to fill the existing gap [28,51].

In so doing, we aim to reply to several calls in the recent literature. Particularly, Cantele and Zardini [14] call for major empirical contributions in order to investigate what determinants affect SMEs’ sustainability. The study also takes into consideration the call of Speziale and Klovienè [35], claiming a scarcity of studies related to the relationship between PMSs and corporate sustainability [60].

The paper is organized as follows. The second section describes our research framework and the hypothesis development. The third part presents the methodology used to empirically test the hypothesis. The fourth section shows the results of our empirical research, and the last part offers conclusions, main results, and considerations for future researches.

## 2. Literature Review and Hypothesis Development

### 2.1. Economic Sustainability in SMEs

Among the different proposals provided by the literature, sustainability may be defined as the ability to meet “the needs of a firm’s direct and indirect stakeholders (such as shareholders, employees, clients, pressure groups, communities, etc.), without compromising its ability to meet the needs of future stakeholders as well” [61]. Thus, sustainability plays a crucial role in identifying what products/services to provide, in which way (processes), to whom (people), and the consequences for stakeholders (investors, consumers, and society) [3,62]. In achieving these goals, organizations must improve stakeholders’ loyalty and avoid mistaken, dangerous, and damaging actions [63] in order to maintain and increase their economic, social, and environmental capital [61].

According to the most consolidated approach, sustainability is based on three fundamental dimensions [64]—economic, social, and environmental. Respectively, it involves the firms’ capacity to [61]

- guarantee at any time cash-flow sufficient to ensure liquidity while producing a persistent above-average return to their shareholders (economic);
- add value to the communities within which they operate by increasing the human capital of individual partners as well as furthering the societal capital of these communities (social);
- use only natural resources that are consumed at a rate below the natural reproduction, or at a rate below the development of substitutes (environmental).

Therefore, establishing sustainability-oriented performance can guarantee appropriate liquidity and remuneration to owners, make the system of values and beliefs understandable to stakeholders, and avoid activities that may deteriorate the ecosystem [61,64].

If the sustainability perspective is now universally affecting the strategic and managerial efforts of every kind of organization, the different dimensions of sustainability are significantly influenced by the operational and dimensional context. According to Choi et al. [65], SMEs have a different sustainability approach compared to larger firms, due to specific organizational features, particularly linked to

- small size of markets served;
- personal ownership and/or family management;

- financial and resources limitation;
- prevalence of personal relationships and informal business practices.

Due to these characteristics, the authors demonstrate that the perception of low social and environmental impacts [66] and the limited impact on stakeholders cause the following two main consequences:

- owners and managers are more sensitive to financial and marketing issues and more focused on internal and business-related stakeholders (employees, customers, and suppliers) than external;
- for sustainability practices, the strategic processes maintain a strong dependence on personal values of the owner/manager and are influenced by profit maximization and family succession.

In this context, the economic component of sustainability becomes prevalent. Specifically focusing on the impact of stakeholders, Lizano et al. [8] seek to verify what the main determinant is which affects SME's failure and find that the employees, customers, and suppliers play a crucial role. Indeed, they provide the needed resources to support the long-term sustainability of smaller firms [8]. According to them, the recent literature [14,67] confirm that SMEs must pay particular attention to the main economic components of business (clients, suppliers, and the entrepreneur himself) who represent the most influential stakeholders, together with the employees.

The SME's sustainability orientation and practices can also be influenced by other conditions [68], such as a decreasing level of government support, a strong perspective on efficiency and cost-saving and the owner's perception of receiving few benefits from environmental practices [14,69].

Consequently, some authors [70] highlight the fact that, despite the increasing relevance of social and environmental sustainability, SMEs survival in the long-term still basically depends on achieving profitability results, as well as their capability to satisfy customer needs. Moreover, the authors [70] demonstrate that financial performance (economic dimension of sustainability) allows the firm to hire more employees (social dimension of sustainability) and improve product/service quality and customer base (competitive dimension). At the same time, recent literature [14] highlights that sustainability practices of SMEs can be not grounded on environmental aspects, since, contrary to what happens with larger firms [64], these are perceived as not so necessary by employees and customers. Therefore, within the context of SMEs, the environmental dimension of sustainability can be seen as a cost rather than a benefit, negatively affecting competitive advantages [66,68,69].

On the basis of these findings, our research focuses on the economic dimension as the main dimension of sustainability for survival and competitiveness of smaller firms. It is then fundamental to investigate what the determinants are that can positively affect the SMEs economic sustainability, considering tangible and intangible resources as well as financial aspects [61]. Particularly, Cantele and Zardini [14] highlight the relevance of financial indicators related to SMEs' sustainability, which is mainly composed by customers and suppliers' satisfaction. Therefore, in this perspective, it becomes particularly important to measure the firm's perception of higher performance on sales, profit margins, and return on investments over competitors [14].

## 2.2. Knowledge Management (KM) for Economic Sustainability in SMEs

In contrast to larger firms, within the SMEs context, economic sustainability and competitive advantages do not depend on physical and financial assets. Indeed, they are mostly influenced by entrepreneurs' ability and employees' knowledge [19,20]. As clearly highlighted by Vasudevan and Chawan [71], "in manufacturing SMEs, knowledge can come from owners, production managers, supervisors, workers, vendors, customers, consultants, conferences, social media, market orientation, knowledge portals, knowledge forums, books, case studies, research papers and the list goes on. The role of knowledge management in business strategy has to be justified in the context of survival in the competitive market today."



As the statistics show, SMEs' economic sustainability is now threatened by a very challenging business environment. The survival rate of small firms is particularly low—36% and 50% of them perish after the third and fifth year of their life, respectively [12,13].

Several reasons cause such failure rates [12]:

- business is not able to reach or maintain a sustainable level of economic profitability;
- strategic management and governance are interrupted by the death or retirement of the entrepreneur/owner; and
- operations efficiency and effectiveness suffer due to changes in personal motivation and aspirations of the key players.

This demonstrates the importance of capturing the individual and organizational knowledge to foster competitive advantages within SMEs [12]. In this direction, the process of transferring tacit knowledge owned by the key members into explicit knowledge to spread within the organization [72] becomes crucial.

By adopting a knowledge-based view of the firm [21], knowledge assets become the main sources of value added and competitive advantage. Consequently, in the context of SMEs, this view is particularly needed in order to implement strategies, practices and tools [73] which enable the firm to acquire, develop, manage, transfer and make productive the knowledge resources inside the company [17,23]. Through this perspective, a fundamental determinant of economic sustainability of SMEs is basically related to knowledge management (KM), as demonstrated by several studies. Some authors [74,75] show that knowledge acquisition can have a greater role than environmental factors in the SMEs' business survival and success. Similarly, Salojärvi et al. [76] addressed a positive relationship between high KM maturity levels and sustainable growth in the long run. Alegre et al. [22] found a positive relationship between KM practices and innovative performances of SMEs through a moderate effect of KM dynamic capabilities. In this perspective, Kim [73] reviewed KM practices within the context of SMEs, underscoring the importance of such practices on the economic-financial, market, technical, human, and, overall, organizational performances. However, considering the high complexity and integration of KM processes, linking culture, people, finance, technology, and organizational structures [12], the literature demonstrated that SMEs are often characterized by inefficient or ineffective behaviours when engaging in KM practices and/or tools [77].

From a general point of view, knowledge management (KM) is a complex set of processes for the acquisition, storage, updating, and dissemination of knowledge [78] that allows a company to manage significant data and information in order to make the knowledge resource productive [17]. According to a consolidated approach [79], KM is composed of different processes, represented by (i) identification, (ii) creation, (iii) storage/retention, (iv) knowledge transfer, and (v) use.

All these KM components are influenced by the enterprise's basic orientation in terms of conflicting tensions between two strategic options [25]—exploration and exploitation. More specifically, according to Donate and Sánchez de Pablo [23],

- Exploitation strategies are related to knowledge storage, transfer, and application. They refer to the firms' ability to enhance or refine exiting products or services exploiting existing knowledge to hone and extend the existing routines guaranteeing a greater efficiency within the organization supporting an increase of average performances [29]. Therefore, exploitation involves refinement, implementation, efficiency, production, and selection [27] pointing to more conservatism through stable revenues, maintaining key customers and efficiency for increasing the average performances [28].
- Exploration strategies are related to knowledge creation and are concerned with the development of new knowledge and experimentation, in order to foster changes and variations to support radical innovations. Therefore, it involves new breakthroughs, a "loose coupling" approach toward clients to explore new markets and products, and a lower strictness in relation to employees [29],

seeking innovative opportunities which foster higher variations of performance [28]. In other words, exploration fits with research, breakthrough, experiments, risk-taking, and innovation [27].

The continuous challenge for every organization is to simultaneously manage the conflicting demands derived from the two basic orientations. This usually means dealing with latent dualisms, such as global vs. local integration, adaptability vs. alignment, efficiency vs. flexibility, and evolutionary vs. revolutionary changes [27]. To this extent, a relevant research stream [28,29,50–52] has addressed the importance of achieving an organizational ambidexterity—that is, the ability to contextually reach conflicting and multiple goals, guaranteeing business survival and success in a long-term perspective. Particularly, Gupta et al. [52] point out that both activities are needed to support innovation, in order to reach competitive advantages through learning processes. Lubatkin et al. [50] stress that organizational ambidexterity is “capable of exploiting existing competencies as well as exploring new opportunities with equal dexterity.” Gschwantner and Hiebl [80] claim that, although “exploration and exploitation are often considered to be contradictory activities, several authors argue that they need to be pursued at the same time in a healthy balance to achieve organizational ambidexterity.”

Even if the focus on a single strategic orientation can lead to temporary advantages [25], some authors [52] highlight that, in the short run, the limitation on resources must force the enterprise to select a particular orientation, as usually happens within the context of SMEs [30]. Consequently, exploration and exploitation may compete for scarce resources and can be seen as “two ends of a continuum” [52]. Similarly, in the university setting, Centobelli et al. [81] underline the need to balance exploration and exploitation strategies, also advising that it is not necessary to invest in the two processes simultaneously, reaching ambidexterity over time.

Based on the above-mentioned positions, this paper aims to analyze the short-term effects of KM basic approaches in the specific context of SMEs and their limited resource availability. Regardless of the specific direction undertaken (exploration or exploitation), it is assumed that a clear KM orientation is able to positively influence the governance, strategy and operations of the company, enabling it to consciously implement the necessary processes and tools to consistently pursue the chosen direction. As claimed by most authors engaged in KM research, “knowledge acquisition, storing, retrieving and sharing processes should be seen as crucial and core by knowledge intensive companies, notably by SMEs” [82]. Indeed, knowledge-intensive firms are characterized by several factors, such as creativity, high educational and professionalization levels of workers. Especially in the context of SMEs, lesser centrality is played by physical assets and crucial role is linked to loyalty of key employees, their knowledge and clients relationship [82]. Based on these premises, in the light of prominent heterogeneity characterizing the SMEs specializations, we focus on knowledge-intensive companies and formulate the following research hypothesis.

### 2.2.1. KM Exploitation Approach in SMEs

According to Kyrgidou and Petridou [83], the exploitation KM approach “captures the tendency of a firm to invest resources to refine and extend its existing knowledge, skills and routines.” To this extent, a greater role is played by organizational learning as a key factor for SMEs’ competitiveness and survival. Particularly, Migdadi [84] found that training, education, and human resource management are critical factors for SMEs’ success. Along the same line, Meaza et al. [85] point out that external training is a very relevant KM practice for smaller firms aiming to maintain or improve employees’ skills and competences. Shirokova et al. [86] point out that exploitation within SMEs can be achieved through investment in internal and knowledge resources, organizational learning, and the development of organizational changes. Shirokova et al. [86] demonstrated the necessity to invest into resources such as know-how, technologies, patents, licenses, and skilled employees, since they represent rare, valuable, hardly imitable resources and are not replaceable assets, according to a knowledge-based view of the firm [21]. Particularly, the authors stress the importance of training and development of human resources investments to continuously exploit the existing opportunities needed for growth. In this lens, Abiola’s [18] study also stresses the importance of organizational learning for enhancing the

strength of smaller firms' sustainability practices and increasing their financial performances. Finally, together with organizational learning, routines are also considered an important factor to achieve an exploitation activity within the context of SMEs [87]. Indeed, "competence exploitation embeds experience-led refinement and the selection and reuse of existing routines as core firm values" [83].

The above discussion is particularly relevant for smaller knowledge-intensive firms. Indeed, in such a context, the processes of hiring, training, and managing people allows these firms to translate ideas into routines and social capital, converting tacit knowledge into explicit knowledge and vice-versa [88]. Small knowledge-intensive firms particularly rely on organizational learning in order to adapt themselves to the changes of organization and environment through the quick learning of the employees [89]. As claimed by Huggins and Weir [90], the capability to take advantage of their peculiarities is the main source of competitive advantages for small knowledge-intensive firms.

On the basis of the above literature, this paper tests the following research hypotheses:

**Hypothesis 1 (H1).** *A KM exploitation approach will be positively related to SMEs economic sustainability.*

### 2.2.2. KM Exploration Approach in SMEs

According to Andriopoulos and Lewis [29], smaller firms tend to follow exploration strategies, building their success on reputation and risk-taking approaches, while larger firms are typically engaged in exploitation activities [80]. Exploration seems to be the prevalent attitude in KM practices within the context of SMEs, because of a lack of resources which continuously fosters them to seek new ideas and assume an innovative approach in order to survive and develop [86]. The authors find that entrepreneurship is a key in launching new ideas, becoming market-oriented, and supporting the growth and profits of smaller firms, thanks to their creativity. More specifically, the entrepreneurial orientation and culture are particularly relevant for "young growing companies that compete with large well-established companies, including multinationals, because it allows companies to achieve the necessary growth rates and the desired level of competitiveness" [86]. Hence, entrepreneurial orientation and culture lead towards better firms' performance, represented by higher profits and greater firm's growth [86]. Similarly, Stein et al. [91] underline the importance of entrepreneurship in enhancing the firm's profitability, market share, and sales growth. "Exploration suggests that organizations are categorized by search, discovery, experimentation, risk taking and innovation" [27], which is a feature often associated with SMEs [92]. Furthermore, Lubatkin et al. [50] claim that SMEs are closer to the customers' change trend and as such are the first to feel the need to explore new sources of competitive advantages.

With specific reference to knowledge-intensive firms, Jenssen and Aasheim [93] found that innovation, understood as product, market, or process changes, is fundamental to improve performance, despite the increasing level of risk. They stress the importance of leaders' awareness about explorative activities, underlying the role of informal management approaches that foster innovation. Bell et al.'s [94] study shows the greater risk-taking inclination of knowledge-intensive firms with respect to traditional firms. Generalizing, they conclude that the degree of knowledge possessed by knowledge-intensive firms (e.g., managerial skills and expertise, supports received by external advisors and non-executive directors, or external financial sources) enables them to achieve more aggressive business strategies.

On the basis of the above literature, the second hypothesis to test is the following:

**Hypothesis 2 (H2).** *A KM exploration approach will be positively related to SMEs economic sustainability.*

### 2.3. The Mediating Role of Performance Management Systems (PMSs) for KM and Economic Sustainability in SMEs

In the current business environment [17], everything quickly changes, which requires companies to continuously readapt to face new challenges. In this context, performance management systems



(PMSs) can support decision makers with relevant and timely information in order to assume the best possible decisions for successful strategies [32]. The literature demonstrates how the importance of PMSs has expanded over time, although they are still “perceived as one of the most critical, yet most misunderstood and most complicated functions in management accounting and control systems” [32].

Performance management systems (PMSs) can be defined as the set of “evolving formal and informal mechanisms, processes, systems, and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and ongoing management through analysis, planning, measurement, control, rewarding, and broadly managing performance, and for supporting and facilitating organizational learning and change” [41].

Among the several theories and approaches developed during the last few decades [95], the contingency theory of management control [36] still represents the main theoretical reference for a large part of the research in the field [96,97]. According to contingency theory, there is no universally appropriate framework that is suitable to all organizations and all contextual conditions. Conversely, the design and the implementation of management control is influenced by a set of variables, such as environmental uncertainty, size and organizational structure, outsourcing relationships, environmental management [98], national cultures [96], and strategy [99,100], with which the control system needs to be customized [95,101].

This theory has been adopted to interpret the role and characteristics of management control in SMEs, often influenced by resource constraints [30,38] and personal control approaches which can hinder PMS implementation [39]. Garengo and Bititci [37] systematized five contingency factors that influence the implementation and use of management control in SMEs: (i) corporate governance structure, (ii) management information system, (iii) strategy, (iv) organizational culture and management style, and (v) external environment.

One of the most relevant issues in a contingency perspective relate to PMS design and use [40–42]. Particularly, Neely et al. [42] claim that the real challenge for managers refers to how the measures are used in order to manage the business, as well as maintained over time. Moreover, in the context of SMEs, Klovienè and Speziale [102] highlight that there is no general structure or framework for the usage of PMSs in the most effective and efficient manner in SMEs.

To investigate PMS use, the most comprehensive view is addressed by Simons’ framework [43,44], that provides four different types (or levers) of control: belief systems, boundary systems, feedback systems and measurement systems. These components can be used in two alternative ways:

- Diagnostic use—the PMS is used to set standards, monitor organizational outcomes and correct deviations. In this case, the systems provide “the traditional feedback role as MCSs are used on an exception basis to monitor and reward the achievement of pre-established goals” [46];
- Interactive use—the PMS is able to promote adaptability and strategic dynamic relying on informal and continuous dialogue at different levels of organization. In this case, the process of measurement is able to “focus organizational attention, stimulate dialogue and support the emergence of new strategies” [46].

Particularly relevant for the current research is the effect of PMSs on KM [45]. More specifically, Asiaei et al. [32] demonstrate that a PMS can enable and encourage intellectual capital development and positively affect organizational performances. In a similar view, even though it does not specifically refer to PMS matters, Centobelli et al. [103] discuss that suitable systems to support SMEs’ managers (i.e., software) allow evaluation of KM processes and “increase the level of alignment between an enterprise’s knowledge and its KM-Tools and the KM-Practices, improving the efficiency and effectiveness of the KMSs adopted and thus improving its overall knowledge management process” [103].

For the aim of this paper, we focus on the use of diagnostic and interactive PMSs which well match the exploitation and exploration KM activities [27]. Indeed, an evident alignment between exploration/exploitation and interactive/diagnostic controls lead us to investigate the possible moderator effect played by PMSs within the KM-SME relationship for economic sustainability. This is especially

consistent with knowledge-intensive firms' context, where the relationship between knowledge complexity and PMS is relevant [104], and the organizational tasks are characterized by a high degree of uncertainty [104].

Hence, we focus on the use phase of PMSs within the context of SMEs; particularly, we want to be the first to launch a model that simultaneously takes into account KM, PMS use, and sustainability issues. SMEs need to translate their overall KM strategy into specific practices for each identified key performance area to assess the actual achievement of these practices [102]. Thus, we investigate the mediating effect of diagnostic and interactive PMS use, since they well match the exploitation and exploration KM approaches [27].

### 2.3.1. Diagnostic Use of PMS in KM Exploitation Approach

PMSs are traditionally perceived as systems to exploit existing resources [80], using diagnostic tools that are able to monitor and check pre-set goals [46]. Thus, managers are capable of checking their own strategies more efficiently and better exploit existing resources through a variance analysis [28]. Exploitation emphasises profits, a relevant customer orientation able to gain satisfaction and loyalty, and a relationship with employees based on discipline to provide them with rules and targets needed in order to attain speed and standardization useful for responding to customers' requests [29]. Hence, there exists a need for strictness, which can be achieved through structures and controls, that is, diagnostic controls [105]. Therefore, diagnostic tools well fit with exploitation requirements, since they have the effect of "enhancing the commitment of employees and focusing their actions on the desired outcomes" [80]. Severgnini et al. [27] find that PMSs are able to align workers' behaviour on the business focus while performing exploitation activities. Similarly, Isobe et al. [1] show that exploitation and diagnostic controls share the same goal, that is, operative efficiency [46]. As Bedford [58] says, if firms conduct exploitation activities and pay attention to diagnostic tools, they can gain positive performances. McCarthy and Gordon [106] affirm the need to combine diagnostic controls and administrative controls in order to limit employees' activities and, in so doing, facilitate their performance analysis. Feedback tools make the organization's performance and purposes transparent, thus "enhancing the commitment of employees and focusing their actions on the desired outcomes" [80], supporting a more efficient exploitation of existing resources.

Moving toward the context of SMEs, we can show similar findings. Fujino et al.'s [105] case study finds that the budget plays a key role in enabling managers to understand the needed productive capacity, in order to enhance small firm's efficiency. In contexts characterized by an internal-oriented culture (typically, smaller firms), efficiency acts as the main driver to seek cost advantages, entailing a need for economic-financial feedback tools (e.g., profit margins, variance analysis, turnover, ROI, etc.) [107]. Jamil and Mohamed [108] highlight a positive relationship between diagnostic controls and performance in the context of small-sized hotels.

As demonstrated for knowledge-intensive firms [104], when the organizational tasks are characterized by a low degree of newness the adoption of authoritative, prescriptive, formal, and feedback tools is suitable to develop the enterprise knowledge. Similarly, Groen et al. [109] highlight the important role of PMS in the knowledge transfer process in the small professional service firms, facilitating the staff collaboration, thus increasing their satisfaction and retention.

On the basis of the above discussion, the paper tests the following research hypothesis:

**Hypothesis 3 (H3).** *Diagnostic use of PMS will positively moderate the relationship between KM exploitation approach and SMEs economic sustainability.*

### 2.3.2. Interactive Use of PMS in KM Exploitation Approach

Exploration may be evolved and supported by interactive control tools [46], able to foster better dialogue, communication and ideas, giving more space to employees' creativity and leading to the

exploration of new knowledge processes [80]. Several contributions [85,110,111] address the relevance of soft and social methods in smaller firms to exchange knowledge among the workers (e.g., mind-mapping, brainstorming, knowledge networking, storytelling). Metaxiotis [112] highlights the importance of lessons-learned systems and technological networks, combined with face-to-face discussions and meetings for knowledge sharing, as well as discussion lists, groupware, and work-flow systems. In short, the existing literature shows the relevance of critical factors, such as technology/information systems (e.g., databases), document management systems, e-mail, data mining [113], culture, networks, external consultants, employees' learning and experience, public institutions (e.g., university), and management best practices [85,110] for effective exploration execution within the context of SMEs.

Differently from the previous hypothesis, when organizational tasks present a high degree of newness (for example technology and market are not known), Ditillo's study [104] demonstrates the need to support interaction, cooperation, and information sharing with informal tools. Similarly, Jenssen and Aasheim [93] underlie the importance for small knowledge-intensive firms of "strong, innovative and informal management approaches that encourage innovation." Groen et al. [109] point out PMS are very important for knowledge creation process in the small professional service firms if developed together with employees.

Therefore, on the basis of the above literature, we test the following research hypothesis:

**Hypothesis 4 (H4).** *Interactive use of PMS will positively moderate the relationship between KM exploration approach and SMEs economic sustainability.*

The Figure 1 summarizes our research hypothesizes.

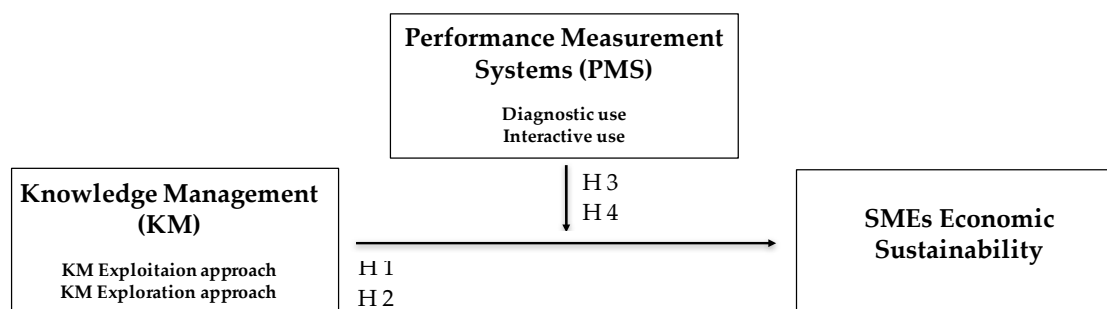


Figure 1. Research framework.

### 3. Materials and Methods

The study of the relationships between KM approaches, economic sustainability, and the use of PMS is conducted by adopting quantitative research techniques. In order to test research hypotheses, we performed a statistical analysis on a survey submitted during the year 2017 by Italian Medium firms operating in knowledge-intensive industries.

The following paragraphs provide a description of the steps, methodology, and analysis of the research.

#### 3.1. Sample Strategy

The population companies are represented by medium firms headquartered in Italy and operating in knowledge-intensive industries. The dimensional classification of Recommendation 2003/361/CE of the European Commission has been taken as reference to identify medium-sized companies; this guide constitutes the only authentic reference relating to the dimensional qualification of SMEs (Recommendation 2003/361/CE). Consequently, medium companies can be defined as those that have a number of employees between 50 and 250, an annual turnover value of over 10 million and less than 50 million euros, or an annual value of total assets of over 10 million and less than 43 million euros. Medium companies represent the most suitable target for this research because in this sample

the implementation of PMSs is likely to be found. At the same time, they do not have the typical distortions of large corporations (e.g., quotation).

The geographical region is represented by the Italian country. The reason for this geographical choice is based on the fact that the firms located within this area were more easily accessible and knowable by researchers. This has allowed contact with the firms during the survey phase.

Finally, the third criterion of the sample strategy implies the choice of the economic activity sectors. In order to ensure the reliability of the main independent variables—knowledge exploitation approach and knowledge exploration approach—this analysis has been focused only on the knowledge-intensive industry sectors, according to the specific segments defined by the Organization for Economic Cooperation and Development (OECD) (see Appendix A).

The sample strategy was performed with the use of Amadeus, a Bureau Van Dijk comprehensive database of 14 million companies across Europe that combines data from over 35 sources, with software for searching and analysis. Steps of the sample strategy are summarized in Table 1.

**Table 1.** Steps of the sample strategy.

Sample Steps	Criteria	Number of Identified Firms
1. Medium companies in Italy	50 < number of employees < 250; 10 million < annual value of turnover < 50 million or 10 million < annual value of total assets < 43 million	11,293
2. Italian Firms	Firms headquartered in Italy NACE Rev. 2 codes:	1,239,971
3. Knowledge Intensive Firms	50; 51; 58; 59; 60; 61; 62; 63; 64; 65; 66; 69; 70; 71; 72; 73; 74; 75; 78; 80; 84; 85; 86; 87; 88; 90; 91; 92; 93	207,509
<b>Total</b>		<b>1603</b>

Intersection of the three criteria used in the Amadeus research strategy—medium companies headquartered in Italy and that main activities is related to knowledge intensive sectors—has allowed us to identify a final sample represented by 1603 firms.

The firms' e-mail addresses were manually extracted from each website. The survey was sent in January 2017. Three mailings were carried out in the period between January and June 2017; each of these was followed by specific contact, in order to verify completion of the survey. Our final sample is composed of 219 surveys collected after this procedure. The response rate (13.6%) is consistent with the range of responses found in previous studies that used mail surveys sent to SMEs [114].

### 3.2. Variables Description

#### 3.2.1. Dependent Variable—Firm Performance

The dependent variable of this study is represented by the firm financial performance. The last question of the survey is related to the collection of necessary information for measuring this variable. Each responding company has indicated the exact amount of the net operating profit after tax (NOPAT) and invested capital (IC) included in the last financial statements. These two values are necessary for the measurement of corporate profitability, the percentage that investors in a company are earning from their invested capital.

This profitability measure allowed us to analyze the firms' financial strengths, weakness, opportunities and threats [115]. It is also a powerful measure of corporate financial performance, able to sterilize the common problem of performance measurement [116]. Based on these, the return on capital invested (ROI) has become the central measure of firms' performance, able to reduce the level of subjectivity normally expressed by the common measures used in the survey [117]. ROI is an objective measure of financial performance, without any managerial valuation.

As widely argued, ROI can describe the efficiency of the use of invested capital [118]. While economists and analysts may rely on other alternatives to assess profitability, Dale et al. [119] suggested

ROI as economic sustainability indicator because of its practicality and ease of use. ROI is a paramount indicator of profitability that is highly recognized in economic theory [119]. Although we recognize that other measures of firm performance have been used in the literature, it is more practical, for measurement and operational reasons, to measure the concepts of economic sustainability using this standard measure (i.e., ROI).

### 3.2.2. Independent Variable—Knowledge Strategies

The independent variables of this study are represented by two knowledge strategy types—knowledge exploitation strategy and knowledge exploration strategy.

Scales validated in prior work were adapted and combined specifically for this study. All items of this study were measured on five-point Likert scales [120], where a score of 1 means strongly disagree, and 5 means strongly agree.

The expectation of this study—connected to the first and second hypothesis—is related to the positive effects on firms' performance that arise from the adoption of knowledge strategies.

*Knowledge exploitation.* As previously illustrated, knowledge exploitation is defined as the use and further development of existing competencies [25,121]. Basically, exploitation refers to the processes of adopting, adapting and applying existing knowledge [122,123]. This level of existing knowledge and experience is essential for adopting incremental knowledge actions [124,125]. Consequently, measures of knowledge exploitation strategy were adapted from Kohli, et al. [126] and He and Wong [127]. The exploitation items were created for measuring the importance for a firm to improve the existent offer of product or to explore the implemented processes or to enhance the research in old product or to exploit the reference product market (e.g., improve the research activities in the actual offers of products; maintain the existent market position; exploit the reference market). Collectively, the expectation is that these items capture the process of exploitation of existent knowledge. Therefore, the eight items of our exploitation scale (Cronbach Alpha = 0.78) is related to the firms' knowledge activities and practices, like the use of existing knowledge repositories, the pursuit of efficiency in performing activities, and the emphasis on incremental improvement of research and development (R&D) processes.

*Knowledge exploration.* On the opposite side, knowledge exploration is related to the pursuit of new competencies [25]; learning activities linked with the process of new resource addition. Exploration reflect the firms' ability to acquire new knowledge rather than use the existing level of knowledge and experience [122]. For these reasons, measurements of the knowledge exploration strategy were adapted from the same sources [126,127]. Therefore, the eight items of our exploration scale (Cronbach Alpha = 0.75) is focused on the firms' knowledge activities and practices, such as the systematic use of teamwork practices, the interaction with external knowledge sources and the recognition of opportunities including not just product and process innovations, but also new markets and organizational structures. The expected result is related to the capability of the items to measure the importance for a firm of pursuing knowledge exploration activities and practices. Conversely, the employed items were related the importance of explore new process or to focus the research in new product or to explore new market (e.g., focus the research activities in new product; change the process technology; explore new market with new product). Cronbach Alpha values of this scale are reported in Table 2.

Cronbach alpha is an internal consistency reliability index [128]. It measures the proportion of variance in the scores that is attributable to the true score variance. For this reason, the Cronbach Alpha is a measure of the strength of the factor. In this analysis, the Cronbach Alpha of the two independent variables is higher than 0.70, that indicates a higher degree of coherence between the items that are part of the same scale.



**Table 2.** Cronbach Alpha for KM approaches measurement.

Variables	Items	Cronbach Alpha
KM Exploitation Approach	ET_1	0.78
	ET_2	
	ET_3	
	ET_4	
	ET_5	
	ET_6	
	ET_7	
	ET_8	
KM Exploration Approach	EX_1	0.75
	EX_2	
	EX_3	
	EX_4	
	EX_5	
	EX_6	
	EX_7	
	EX_8	

### 3.2.3. Moderating Variable—Performance Measurement Systems Adoption

The moderating variable of this study is represented by the use of PMSs by distinguishing between diagnostic control systems and interactive control systems. The role of this variable is to interact with the fundamental relationship between firm performance (dependent variable) and knowledge strategy approaches (independent variable). For the analysis of the types of PMSs, previous scales were specifically adapted and combined. All items of this study were measured on five-point Likert scales [120], where a score of 1 means strongly disagree and 5 means strongly agree.

The expectation of this study (third and fourth hypothesis) is related to the enhancing effect on Knowledge strategy performance. Directly connected to the positive relationship between the specific characteristics of the two types of PMS and of the two types of KM approach, we expect that: knowledge exploitation firms' economic sustainability is higher for Diagnostic PMS adopters; and knowledge exploration firms' performance effect is enhanced for Interactive PMS adopters.

*Diagnostic control systems.* Diagnostic control systems are used to monitor and reward the achievement of specific goals through the analysis of critical performance variables [129]. They provide a powerful guide for deliberate strategies, but they are not very useful in the search for emergence strategies [44]. Thus, this type of system is correlated with conservative strategies, based on existing resources and experience. Indeed, the research expectation has to do with the moderating role of this PMS type in the relationship between the KM exploitation approach and economic sustainability.

*Interactive control systems.* On the opposite side, interactive control systems are related to informal information systems used regularly by managers for discussing the implementation of the strategy and for fostering the organizational debate [130]. Consequently, interactive control systems provide a guide in the search for emergent strategies, and are directly connected to the implementation of innovative strategies [44]. For this reason, this research investigated the moderating role of this type of PMS in the relationship between Knowledge exploration strategies and firm performance.

The measurement of these two types of PMS use were done by adapting the Vandenbosch's [131] items scale to the scope of this work. These items were developed with the main goal of understand the orientation of the PMS use. Diagnostic control systems represent the traditional ways of monitoring the performance with a focus on the difference between set and achieved goals. Consequently, the use of this systems is measured by the importance for the firms to carry out the corrective actions or a consistent financial reporting or a robust measurement system (e.g., relevance of the measurement process; importance of the measurement process; significance of the formalized procedure). On the opposite side, Interactive control systems is focused on the interaction between the different organizational

levels. This use of PMS is based on the interactive processes and on the process of knowledge sharing. Therefore, the aim of the employed items was to measure the use of the PMS as an interactive system or the importance of the informative dialog or the relevance of problem solving and new ideas development (e.g., importance of the meeting and interaction; relevance of the formalized process and routine; significance of the interrelated decision making). Cronbach Alpha values are reported in Table 3.

**Table 3.** Cronbach Alpha for PMS use measurement.

Variables	Items	Cronbach Alpha
Diagnostic PMS	DIA_1	0.85
	DIA_2	
	DIA_3	
	DIA_4	
	DIA_5	
	DIA_6	
	DIA_7	
	DIA_8	
Interactive PMS	INT_1	0.88
	INT_2	
	INT_3	
	INT_4	
	INT_5	
	INT_6	
	INT_7	
	INT_8	

As for the previous variable, we employed the Cronbach Alpha to evaluate the internal validity of the considered multi-item scales. Values of Cronbach alpha for the two moderating variables are higher than 0.80, indicating a higher degree of coherence between the items that are part of the same scale.

#### 3.2.4. Control Variable

The regression model includes some control variables to account for the specific effects of the observational framework that can influence the statistical relationships. To measure the effects of the firm's size in the relationship between KM approaches and firm economic sustainability in the analysis the natural logarithm of the net sales—sales, has been employed. The role of this variable is to take into account the size effect on the firm's performance. Medium companies should achieve higher performance than others for many clear factors, e.g., economies of scale.

The last part of the survey concerns the collection of the necessary information for controlling the main hypotheses. Responding companies have indicated the exact amount of operating sales—included in the last financial statements. This variable represents the control variable of the statistical regression.

### 3.3. Statistical Analysis and Methodology

Quantitative data analysis was employed in this study, including principal component analysis (PCA) and the OLS regression method. Statistical analysis was performed using STATA 16.

In the first step, PCA analysis has allowed us to identify specific factor for each independent and moderating variable (KM exploitation approach, Knowledge exploration approach, Diagnostic PMS; Interactive PMS), assuming a number of principal components that represents at least 75% of the total variance. Jolliffe [132] suggested 0.70 of total variance as the minimum level to take into account for retaining the factor. After the selection of the factor, the factor score was calculated by the single score of the retained principal component, weighted for the % of the total variance retained by each single component.

The four factors scores are used to identify the value of each independent and moderating variable. After the process of factor calculation, in order to test the research hypothesis, four different OLS regression models were used. All variables were standardized to conform to a standard normal distribution, in observance of the requirements of regression analysis [133].

Model 1:

$$\text{Performance} = \alpha + \beta_1 \text{ Knowledge Exploitation} + \beta_2 \text{ Logsales} + \varepsilon. \quad (1)$$

Model 2:

$$\text{Performance} = \alpha + \beta_1 \text{ Knowledge Exploration} + \beta_2 \text{ Logsales} + \varepsilon. \quad (2)$$

Model 3:

$$\text{Performance} = \alpha + \beta_1 \text{ Knowledge Exploitation} + \beta_2 \text{ Diagnostic PMS} + \beta_3 \text{ Knowledge Exploitation* Diagnostic PMS} + \beta_4 \text{ Logsales} + \varepsilon. \quad (3)$$

Model 4:

$$\text{Performance} = \alpha + \beta_1 \text{ Knowledge Exploration} + \beta_2 \text{ Interactive PMS} + \beta_3 \text{ Knowledge Exploration* Interactive PMS} + \beta_4 \text{ Logsales} + \varepsilon \quad (4)$$

#### 4. Results

The correlations of the variables are provided in Table 4. The matrix indicates a positive correlation between the independent variables and the dependent variable of the model. The correlation between the control variable (net sales) and firm performance is non-significant; then, we exclude the firm's size effect.

Table 4. Correlation matrix.

	1	2	3	4	5	6	7	8
1 ROI	1.00							
2 ET	0.22	1.00						
3 EX	0.34	0.34	1.00					
4 DIA	0.07	0.23	0.36	1.00				
5 INT	0.15	0.22	0.33	0.77	1.00			
6 DIA*ET	0.39	0.19	−0.01	0.04	0.07	1.00		
7 INT*EX	0.60	0.07	0.08	−0.11	−0.03	0.32	1.00	
8 Sales	0.02	−0.07	0.11	−0.02	0.00	−0.11	−0.03	1.00

Table 5 displays the results of the four OLS regression models. Each theoretical hypothesis corresponds to a specific statistical model. The results of the model application are displayed in columns; each line indicates the reference value for the key variable. The next few paragraphs analyze the statistical implication of each hypothesis.

*First hypothesis, KM exploitation effect.* The OLS regression of the 219 surveys received from medium firms headquartered in Italy that operate in knowledge-intensive sectors, confirm the first expectation. Firms that pursue a Knowledge exploitation strategy achieve a higher performance than the others. Model 1 (1) shows the positive effect derived from the Knowledge exploitation strategy, even if this influence is not particularly relevant and, in general, the model explains the performance dynamic to a very limited extent. In fact, the R2 for Model 1 (1) is very low (0.0517), though statistically significant ( $p \leq 0.01$ ). Positive correlation between this variable and the firm's performance is also confirmed by the correlation matrix (0.22).

Table 5. Results of regression.

Independent Variable	Model 1 (1)	Model 2 (2)	Model 3 (3)	Model 4 (4)
ET	<b>0.2272 ***</b> <b>(0.0664)</b>		0.1553 * (0.0649)	
EX		<b>0.3444 ***</b> <b>(0.0643)</b>		0.2638 *** (0.0541)
DIA			0.0192 (0.0636)	
INT				0.0855 (0.0535)
DIA*ET			<b>0.3653 ***</b> <b>(0.0634)</b>	
INT*EX				<b>0.5849 ***</b> <b>(0.0507)</b>
Cons	−0.0247 (0.0661)	−0.0331 (0.0637)	−0.0274 (0.0618)	−0.0288 (0.0502)
Sales	0.0361 (0.0664)	−0.0200 (0.0643)	0.0721 (0.0624)	0.0043 (0.0508)
Observation	219	219	219	219
R <sup>2</sup>	0.0517 **	0.1174 ***	0.1793 ***	0.4569 ***
F	5.89	14.37	11.69	45.01

\*\*\*, \*\*, \* indicates value of *P*-value equal or less than 0.001, 0.01 and 0.05. Standard error in parentheses. The four hypotheses (ET, EX, DIA\*ET, INT\*EX) are reported in bold.

*Second hypothesis, KM Exploration effect.* Model 2 (2) also confirms the second theoretical hypothesis. Firms that pursue KM exploration approaches achieve a higher performance in terms of economic sustainability. Model 2 (2) confirms this positive effect on firm performance. We have a higher positive correlation (0.34), very significant ( $p \leq 0.001$ ). The R<sup>2</sup> for Model 2 (2) is 0.1174 and significant ( $p \leq 0.001$ ). In this case, the positive effect on the firm's performance is higher for the KM explorative firms than the KM exploitative firms. This result is confirmed by the degree of the correlation index – also confirmed by the correlation matrix.

*Third hypothesis, KM exploitation, economic sustainability, and the moderating role of the Diagnostic PMS.* Model 3 (3) tests the moderating role of diagnostic PMS use. Firms that pursue KM exploitation and at the same time use the PMS as a diagnostic system achieve higher performance. The correlation index of the moderating variable is positive and higher (0.39) than the independent variable. The R<sup>2</sup> for Model 3 (3) is 0.1793 and significant ( $p \leq 0.001$ ). This relation is very significant ( $p \leq 0.001$ ). The moderating effect of this variable is also confirmed by the value of R<sup>2</sup>. A significant change in R<sup>2</sup> in Model 3 (3) indicates a pure moderator role. In this model, by adding the moderating variable, R<sup>2</sup> increases to 0.1793. This change of 0.1276 confirms once more this moderating relationship.

*Fourth hypothesis, KM exploration, economic sustainability, and the moderating role of the interactive PMS.* Testing of the moderating role of Interactive PMS use confirms the fourth hypothesis of this research. Firms that pursue KM exploration approaches and use PMSs as Interactive systems achieve higher performance. The correlation index of the moderating variable is higher (0.60) than the dependent variable. The value of R<sup>2</sup> for Model 4 (4) is 0.4569 and significant ( $p \leq 0.001$ ). The relation between the moderating variable and the firm's economic sustainability is very significant ( $p \leq 0.001$ ). In this case, as in the previous model, the role of the moderating variable is confirmed by the increase in the value of R<sup>2</sup>. The change of 0.3395 indicates the role of the variable as a pure moderator.

*Control variable.* The natural logarithm of net sales is employed for controlling the effect of the firm's size. In the four regression models, the relationship between this variable and the firm's

performance is not significant. Based on this, it is possible to exclude the effect of the firm's size on corporate performance.

In the four models, a maximum VIF value—harmful collinearity [134] of 1.1 is reached, indicating that there is no serious multicollinearity between variables. Consequently, the data is normally analyzed.

Finally, we performed further research to assess the adequacy of the R2, highlighting that social sciences have revealed over the time a particular level of strengthens in the relation between an independent and dependent variable. As a matter of fact, Falk and Miller [135] recommended a level of R2 equal or greater than 0.10. Cohen [136] suggested a level of R2 higher than 0.02 for demonstrating a statistical relation. In the same vein, some recent empirical studies support their hypotheses with low values of R2. For example, Ali et al. [137] confirm their hypotheses with statistical model fitted at level of R2 between 0.118 to 0.401. Alda [138] supports the hypotheses formulated with statistical model that showing low level of R2 (0.0756; 0.1577). Suzuki, Ando, and Nishikawa [139] discuss their hypotheses with level of R2 around 0.10. Finally, Cha, Adebe, and Dadanlar [140] demonstrate their evidence with similar level of R2. For these reasons, we consider our R2 level to be coherent with the recent empirical literature and able to support our discussion and conclusion.

## 5. Discussion and Conclusions

The findings of this study contribute to the existing literature in a number of ways.

First, this paper provides empirical evidence on the positive impact of KM on SMEs economic sustainability. Building on the premise that the pursue of economic profitability is relevant for the long-term survival of SMEs [8] this empirical research demonstrates that the design and implementation of an adequate KM approach is important for the economic sustainability of SMEs. Given that SMEs typically suffer from resource constraints [30,38], our results show that the adoption of exploitation or exploration KM approach supports SMEs profitability. Even if the existing literature has usually referred these evidences to large companies [49], often emphasizing the role of ambidexterity [28,29,50], our study demonstrates that managing knowledge is a process that also generates value for SMEs when adopting a coherent KM approach, especially for the KM exploration strategy. This is in line with previous studies that have recognized the importance of KM, which allow entrepreneurs to identify and exploit opportunities [141], to enhance entrepreneurial orientation [142] and to reinforce organizational learning [19].

Second, the study provides empirical evidence about the impact of explorative innovation activities on SMEs economic sustainability. Data analysis demonstrates that the effect on performance is much stronger for SMEs that adopt KM exploration approach rather than for SMEs adopting KM exploitation approach. First of all, this finding is consistent with the study of Garcia-Alvarez [143] and Gaziullusoy et al. [144] and demonstrates the importance for SMEs to build on the positive interaction between KM and innovation. In other words, innovative capabilities that originate from KM activities can play an essential role for SMEs sustainability [145]. Consequently, this study provides empirical evidence on the importance of adopting business models that are able to integrate KM and innovation. When this occurs, SMEs are able to reach sustainable competitive advantage and superior performance. This is coherent with the Lopes et al.'s [55] research and extend their theoretical implications to SMEs. Lopes et al.'s research [55] shows that absorptive capacity [146] plays a very important role in this interplay. Since absorptive capacity has not been investigated in our research, understanding the relevance of absorptive capacity for SMEs innovation and economic sustainability could be the main focus of a next research project. Second, the important role of KM exploration is also consistent with the features of knowledge intensive industries. Managing valuable processes in those sectors tends to be more difficult, as firms have to carry out activities characterized by uncertainty, asymmetries and scarce observability [57,147]. The uncertainty is linked to a greater level of innovation and problem solving activities, resulting in critical issues that evolve dynamically [148]. The asymmetries mainly concern the relationship between managers and staff, since managers and experts possess different information. Observability is linked to the very intangible nature of the KM



processes. From the knowledge based-view perspective [21], exploration activities act as cross-learning mechanisms that are able to integrate specialized knowledge to deal with uncertainty, asymmetries and scarce observability. Conversely, exploitation activities are more effective in contexts of less uncertainty and greater standardization as in traditional manufacturing companies, where knowledge codification and transfer are performed more effectively. Finally, our study shows that KM exploration, despite increasing uncertainty and the risk exposure, is able to perform a better impact on economic performance than KM exploitation.

Third, this study examines the moderating role of PMS between KM and SMEs performance, making our evidences consistent with some seminal works in PMS literature. Firstly, empirical results confirm that PMS, both as a diagnostic and interactive systems, are a necessary tool for successful management [149]. These findings are consistent with the knowledge-based view of the firm, which demonstrates the ability of organizations to reach higher performance when the intangible resources, especially knowledge, are managed strategically. Consequently, from the Simons perspective [44] and Kaplan and Norton [150] analysis, PMS can play a powerful lever to monitor the critical success factors and develop a sustainable competitive advantage. Our paper shows that SMEs supporting a consistent KM strategy with a coherent use of PMS report a positive impact on sustainability. This is consistent with arguments that explain the scarce economic sustainability of SMEs with the poor quality of managerial decisions [151]. The implementation of a consistent KM strategy, both KM exploitation strategy and KM exploration strategy, is greatly amplified by the use of coherent PMS since the quality of decision-making increases. This is especially true for SMEs whose decision-making activities is largely influenced by the entrepreneurial decision styles and for family firms with limited professionalization on business administration [65]. This raises a managerial issue for SMEs and family businesses [152], since our findings demonstrate that the use of PMS allows SMEs to reach a higher level of economic sustainability and encourage to increase the level of professionalization in management.

Fourth, this study enriches the existing literature that investigates the role of PMS for innovation and KM exploration strategies [32,58,153]. The study shows that PMS is a mechanism that leverages KM exploration strategies for SMEs that operate in knowledge-intensive industries, and it confirms the effectiveness of interactive controls in supporting innovation processes [129]. This is consistent with the theoretical propositions of the knowledge-based theory of the firm and the contingency theory of PMS. The use of interactive controls facilitates the integration of different knowledge bundles in a systematic way when SMEs competitive action is deployed in turbulent environments that require fast and innovative responses [154]. Indeed, the uncertainty that is intrinsic in exploration strategies is one of the most relevant contingency factors that affects PMS design and use [96]. As stated by Ditillo [57], interactive control mechanisms reinforce knowledge integration processes and sustain performance of firms in the knowledge intensive sectors.

In sum, this study provides empirical evidence on how a specific KM approach supports economic sustainability of SMEs and how a consistent implementation and use of PMS leverage the link between KM and ES. It addresses some literature gaps and claims for an extension of the relevant stream of research on the use of PMS by providing some theoretical and managerial implications.

As for the theoretical insights, our research framework puts together the concepts of sustainability, knowledge management, and PMS, thus making an innovative contribution to the existing literature. The study is addressed to solve some research gaps that concerns the effects of KM and PMS use for SMEs sustainability. In this sense, our results confirm that the quality of the decision-making process and the effects of KM strategies on firm performance are enhanced when the alignment of the PMS use with the KM strategy is verified. Therefore, results contribute to find the mechanisms of economic sustainability for SMEs survival.

As for managerial implications, there are several lessons for practice. First, the findings encourage SME entrepreneurs and managers to design and implement a coherent KM approach and to explicitly adopt a strategic and operative focus on the economic value embedded in the relevant knowledge

that entrepreneurs, employees, and key external stakeholders possesses. The unleashing of relevant knowledge in the firm operative processes is the key for the development of a sustainable competitive advantage. Second, the study stimulates SMEs to take advantage from exploration and innovation activities. This is true especially for SMEs operating in knowledge intensive industries. The search for new markets and the involvement of suppliers, customers and employees for the deployment of a more articulated value propositions to the market emerge as the two relevant drivers for the achievement of two goals: the absorption of knowledge that is relevant for the competitive action and the firm long-term profitability. Third, results show that PMS is nowadays a fundamental tool to facilitate decision-making and support KM activities. Then, the alignment of the design and use of PMS with the KM strategy and other contextual factors is an excellent managerial practice that SME entrepreneurs and managers have to take seriously into consideration. To gain a full advantage of the positive effects of KM on economic sustainability, managers and accountants are encouraged to strategically align and integrate KM, innovation, and PMS design and use. Our study demonstrates that these three managerial actions are relevant for SMEs sustainability.

This study is subject to several limitations that represent opportunities for further research. Data were obtained from a survey potentially affected by some biases. In order to restrict the bias effects, first, we paid great attention to the research method by performing a preliminary test of the questionnaire and a pilot implementation of the survey. Moreover, we conducted diagnostic tests that confirmed that there were no significant statistical errors. Application of the traditional statistical regression method (OLS) unexplained part of the variation in performance and the noise of the model. The data should be further analyzed to investigate other specific factor that could also influence the adoption of different knowledge strategies or the use of different PMS approach. Another issue related to the OLS regression model regards the reverse causality and the simultaneously. Other statistical methods, such as generalized method of moment (GMM), could aim to solve these problems by the use of instrumental variable estimation. Given the cross-sectional nature of the study, the findings on exploration and exploitation strategies are fixed at a certain point in time, assuming that the KM approach adopted by an SME is relatively stable over time. Although some respondents may have implemented a strategic shift in the period between the questionnaire release and the analysis of collected data, we can assume that the number of transitions is relatively low in the short term. The distinction between the two KM approaches refers to the different nature of some KM activities; thus, it does not consider in a structured way all the KM activities that could be conceptually associated with the two approaches. Even the way of conceptualizing the use of the PMS is mainly based on prevailing managerial accounting practices. Therefore, it might be interesting to analyze a narrower whole of PMS, like strategic performance management system (SPMS) or value-based management system (VBMS). Another limitation concerns the measurement of SME sustainability, since we refer to economic sustainability by selecting ROI as the main indicator of profitability. To this end, other profitability indicators and further dimensions of SME sustainability might be considered in future research with the aim to analyze the multiple interrelation between KM and PMS for SMEs' long-term profitability.

Furthermore, the use of quantitative methodology is not able to provide rich answers to “why” and “how” the linkages among KM, PMS, and ES work. Future research may perform qualitative methodologies to gain a better understanding of the effects that organizational and environmental structures generate on KM and PMS. Also, adopting a longitudinal study for the analysis of the key variables could explain in more fine detail the link among KM, PMS, and SMEs sustainability.

**Author Contributions:** A.C.: conceptualization, methodology, writing, and review; F.Z.: data collection, data analysis, methodology, and review; G.C.: data collection, data analysis, and writing; A.P. investigation, data analysis, and writing the draft. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## Appendix A

Knowledge intensive industries according to OECD classification with NACE Rev.2 codes between brackets (OECD, 2006):

- Water transport (50);
- Air transport (51);
- Publishing activities (58);
- Motion picture, video and television programme production, sound recording, and music publishing activities (59);
- Programming and broadcasting activities (60);
- Telecommunications (61);
- Computer programming, consultancy, and related activities (62);
- Information service activities (63);
- Financial service activities, except insurance and pension funding (64);
- Insurance, reinsurance, and pension funding, except compulsory social security (65);
- Activities auxiliary to financial services and insurance activities (66);
- Legal and accounting activities (69);
- Activities of head offices; management consultancy activities (70);
- Architectural and engineering activities; technical testing and analysis (71);
- Scientific research and development (72);
- Advertising and market research (73);
- Other professional, scientific, and technical activities (74);
- Veterinary activities (75);
- Employment activities (78);
- Security and investigation activities (80);
- Public administration and defense; compulsory social security (84);
- Education (85);
- Human health activities (86); Residential care activities (87);
- Social work activities without accommodation (88);
- Creative, arts, and entertainment activities (90);
- Libraries, archives, museums and other cultural activities (91);
- Gambling and betting activities (92);
- Sports activities and amusement and recreation activities (93).

## References

1. Isobe, T.; Makino, S.; Montgomery, D.B. *Exploitation, Exploration, and Firm Performance: The Case of Small Manufacturing Firms in Japan*; Research Collection Lee Kong Chian School Of Business: Singapore, 2014; p. 36.
2. Benn, S.; Dunphy, D.C.; Griffiths, A. *Organizational Change for Corporate Sustainability, Understanding Organizational Change*, 3rd ed.; Routledge: Abingdon, UK, 2014.
3. Robinson, H.S.; Anumba, C.J.; Carrillo, P.M.; Al-Ghassani, A.M. STEPS: A knowledge management maturity roadmap for corporate sustainability. *Bus. Process Manag. J.* **2006**, *12*, 793–808. [[CrossRef](#)]
4. Porter, M.E.; Kramer, M.R. Strategy and society: The link between competitive advantage and corporate social responsibility. *Harv. Bus. Rev.* **2006**, *84*, 78–92.
5. Galpin, T.; Whittington, J.L. Sustainability leadership: From strategy to results. *J. Bus. Strat.* **2012**, *33*, 40–48. [[CrossRef](#)]
6. Saeidi, S.P.; Sofian, S.; Saeidi, P.; Saeidi, S.; Saeidi, S.A. How does corporate social responsibility contribute to firm financial performance? The mediating role of competitive advantage, reputation, and customer satisfaction. *J. Bus. Res.* **2015**, *68*, 341–350. [[CrossRef](#)]

7. Tang, Z.; Hull, C.E.; Rothenberg, S. How Corporate Social Responsibility Engagement Strategy Moderates the CSR–Financial Performance Relationship. *J. Manag. Stud.* **2012**, *49*, 1274–1303. [[CrossRef](#)]
8. Lizano, M.; Alfaro-Cortés, E.; Priego de la Cruz, A.M. Stakeholders and Long-Term Sustainability of SMEs. Who Really Matters in Crisis Contexts, and When. *Sustainability* **2019**, *11*, 6551. [[CrossRef](#)]
9. Torugsa, N.A.; O'Donohue, W.; Hecker, R. Proactive CSR: An Empirical Analysis of the Role of its Economic, Social and Environmental Dimensions on the Association between Capabilities and Performance. *J. Bus. Ethics* **2013**, *115*, 383–402. [[CrossRef](#)]
10. Arend, R.J. Social and Environmental Performance at SMEs: Considering Motivations, Capabilities, and Instrumentalism. *J. Bus. Ethics* **2014**, *125*, 541–561. [[CrossRef](#)]
11. Organisation for Economic Co-operation and Development. *Meeting of the OECD Council at Ministerial Level*; OECD: Paris, French, 2017.
12. Egbu, C.O.; Hari, S.; Renukappa, S.H. Knowledge management for sustainable competitiveness in small and medium surveying practices. *Struct. Surv.* **2005**, *23*, 7–21. [[CrossRef](#)]
13. Wee, J.C.; Chua, A. The peculiarities of knowledge management processes in SMEs: The case of Singapore. *J. Knowl. Manag.* **2013**, *17*, 958–972. [[CrossRef](#)]
14. Cantele, S.; Zardini, A. Is sustainability a competitive advantage for small businesses? An empirical analysis of possible mediators in the sustainability–financial performance relationship. *J. Clean. Prod.* **2018**, *182*, 166–176. [[CrossRef](#)]
15. Pmi, quanto conta in Italia il 92% delle aziende attive sul territorio? Available online: [https://www.infodata.ilssole24ore.com/2019/07/10/40229/?refresh\\_ce=1](https://www.infodata.ilssole24ore.com/2019/07/10/40229/?refresh_ce=1) (accessed on 10 July 2019).
16. Rapporto sulla competitività dei settori produttivi, Istat, Roma, Edizione: 2018. Available online: <https://www.istat.it/storage/settori-produttivi/2018/Rapporto-competitivita-2018.pdf> (accessed on 15 July 2019).
17. Beijerse, R.P. Knowledge management in small and medium-sized companies: Knowledge management for entrepreneurs. *J. Knowl. Manag.* **2000**, *4*, 162–179. [[CrossRef](#)]
18. Abiola, I. Organizational Learning, Innovativeness and Financial Performance of Small And Medium Enterprises (Smes) In Nigeria. *Eur. J. Business Manag.* **2013**, *5*, 179–187.
19. Cardoni, A.; Dumay, J.; Palmaccio, M.; Celenza, D. Knowledge transfer in a start-up craft brewery. *Bus. Process Manag. J.* **2018**, *25*, 219–243. [[CrossRef](#)]
20. Castellani, D.; Fassio, C. From new imported inputs to new exported products. Firm-level evidence from Sweden. *Res. Policy* **2019**, *48*, 322–338. [[CrossRef](#)]
21. Grant, R.M. Toward a knowledge-based theory of the firm: Knowledge-based Theory of the Firm. *Manag. J. Strat.* **1996**, *17*, 109–122. [[CrossRef](#)]
22. Alegre, J.; Sengupta, K.; Lapidra, R. Knowledge management and innovation performance in a high-tech SMEs industry. *Int. Small Bus. J.* **2011**, *31*, 454–470. [[CrossRef](#)]
23. Donate, M.J.; Sánchez de Pablo, J.D. The role of knowledge-oriented leadership in knowledge management practices and innovation. *J. Bus. Res.* **2015**, *68*, 360–370. [[CrossRef](#)]
24. West, G.P.; Noel, T.W. The Impact of Knowledge Resources on New Venture Performance. *J. Small Bus. Manag.* **2009**, *47*, 1–22. [[CrossRef](#)]
25. March, J.G. Exploration and exploitation in organizational learning. *Organ. Sci.* **1991**, *2*, 71–87. [[CrossRef](#)]
26. Kyriakopoulos, K.; Moorman, C. Tradeoffs in marketing exploitation and exploration strategies: The overlooked role of market orientation. *Intern. J. Res. Mark.* **2004**, *21*, 219–240. [[CrossRef](#)]
27. Severgnini, E.; Vieira, V.A.; Cardoza Galdamez, E.V. The indirect effects of performance measurement system and organizational ambidexterity on performance. *Bus. Process Manag. J.* **2018**, *24*, 1176–1199. [[CrossRef](#)]
28. Raisch, S.; Birkinshaw, J.; Probst, G.; Tushman, M.L. Organizational Ambidexterity: Balancing Exploitation and Exploration for Sustained Performance. *Organ. Sci.* **2009**, *20*, 685–695. [[CrossRef](#)]
29. Andriopoulos, C.; Lewis, M.W. Exploitation-Exploration Tensions and Organizational Ambidexterity: Managing Paradoxes of Innovation. *Organ. Sci.* **2009**, *20*, 696–717. [[CrossRef](#)]
30. Massaro, M.; Handley, K.; Bagnoli, C.; Dumay, J. Knowledge management in small and medium. Enterprises: A structured literature review. *J. Knowl. Manag.* **2016**, *20*, 258–291. [[CrossRef](#)]
31. Centobelli, P.; Cerchione, R.; Esposito, E. How to deal with knowledge management misalignment: A taxonomy based on a 3D fuzzy methodology. *J. Knowl. Manag.* **2018**, *22*, 538–566. [[CrossRef](#)]
32. Asiaei, K.; Jusoh, R.; Bontis, N. Intellectual capital and performance measurement systems in Iran. *J. Intellect. Cap.* **2018**, *19*, 294–320. [[CrossRef](#)]

33. Ghani, S.R. Knowledge Management: Tools and Techniques. *J. Libr. Inf. Technol.* **2009**, *29*, 33–38.
34. Sparrow, J. Knowledge Management in Small Firms. *Knowl. Process Manag.* **2001**, *8*, 3–16. [[CrossRef](#)]
35. Speziale, M.-T.; Klovienè, L. The Relationship between Performance Measurement and Sustainability Reporting: A Literature Review. *Procedia Soc. Behav. Sci.* **2014**, *156*, 633–638. [[CrossRef](#)]
36. Otley, D.T. The contingency theory of management accounting: Achievement and prognosis. In *Readings in Accounting for Management Control*; Emmanuel, C., Otley, D., Merchant, K., Eds.; Springer: Berlin/Heidelberg, Germany, 1980.
37. Garengo, P.; Bititci, U. Towards a contingency approach to performance measurement: An empirical study in Scottish SMEs. *Organ. Soc.* **2007**, *27*, 802–825. [[CrossRef](#)]
38. Wong, K.Y.; Tan, L.P.; Lee, C.S.; Wong, W.P. Knowledge Management performance measurement: Measures, approaches, trends and future directions. *Inf. Dev.* **2015**, *31*, 239–257. [[CrossRef](#)]
39. Lavia López, O.; Hiebl, M.R.W. Management Accounting in Small and Medium-Sized Enterprises: Current Knowledge and Avenues for Further Research. *J. Manag. Acc. Res.* **2015**, *27*, 81–119. [[CrossRef](#)]
40. Bourne, M.; Mills, J.; Wilcox, M.; Neely, A.; Platts, K. Designing, implementing and updating performance measurement systems. *Int. J. Oper. Prod. Manag.* **2000**, *20*, 754–771. [[CrossRef](#)]
41. Ferreira, A.; Otley, D. The design and use of performance management systems: An extended framework for analysis. *Manag. Acc. Res.* **2009**, *20*, 263–282. [[CrossRef](#)]
42. Neely, A.; Mills, J.; Platts, K.; Richards, H.; Gregory, M.; Bourne, M. Performance measurement system design: Developing and testing a process-based approach. *Syst. Des.* **2000**, *27*, 81–119. [[CrossRef](#)]
43. Simons, R. *Levers of Control: How Managers Use Innovative Control Systems to Drive Strategic Renewal*; Harvard Business School Press: Boston, MA, USA, 1995.
44. Simons, R. *Performance Measurement and Control Systems for Implementing Strategies*; Prentice Hall: Upper Saddle River, NJ, USA, 2000.
45. Mårtensson, M. A critical review of knowledge management as a management tool. *J. Knowl. Manag.* **2000**, *4*, 204–216. [[CrossRef](#)]
46. Henri, J.-F. Management control systems and strategy: A resource-based perspective. *Acc. Organ. Soc.* **2006**, *31*, 529–558. [[CrossRef](#)]
47. Aureli, S.; Cardoni, A.; Del Baldo, M.; Lombardi, R. Traditional management accounting tools in SMEs' network. Do they foster partner dialogue and business innovation? *Manag. Control* **2019**, *1*, 35–50. [[CrossRef](#)]
48. Choong, K.K. Are PMS meeting the measurement needs of BPM? A literature review. *Bus. Process. Manag. J.* **2013**, *19*, 535–574. [[CrossRef](#)]
49. Lavie, D.; Stettner, U.; Tushman, M.L. Exploration and Exploitation Within and Across Organizations. *Acad. Manag. Ann.* **2010**, *4*, 109–155. [[CrossRef](#)]
50. Lubatkin, M.H.; Simsek, Z.; Ling, Y.; Veiga, J.F. Ambidexterity and Performance in Small-to Medium-Sized Firms: The Pivotal Role of Top Management Team Behavioral Integration. *J. Manag.* **2006**, *32*, 646–672. [[CrossRef](#)]
51. Cao, Q.; Gedajlovic, E.; Zhang, H. Unpacking Organizational Ambidexterity: Dimensions, Contingencies, and Synergistic Effects. *Organ. Sci.* **2009**, *20*, 781–796. [[CrossRef](#)]
52. Gupta, A.K.; Smith, K.G.; Shalley, C.E. The interplay between exploration and exploitation. *Acad. Manag. J.* **2006**, *49*, 693–706. [[CrossRef](#)]
53. De Clercq, D.; Thongpapanl, N.; Dimov, D. Contextual ambidexterity in SMEs: The roles of internal and external rivalry. *Small Bus. Econ.* **2014**, *42*, 191–205. [[CrossRef](#)]
54. Seebode, D.; Jeanrenaud, S.; Bessant, J. Managing innovation for sustainability. *R&D Manag.* **2012**, *42*, 195–206.
55. Lopes, C.M.; Scavarda, A.; Hofmeister, L.F.; Thomé, A.M.T.; Vaccaro, G.L.R. An analysis of the interplay between organizational sustainability, knowledge management, and open innovation. *J. Clean. Prod.* **2017**, *142*, 476–488. [[CrossRef](#)]
56. Lima, R.H.P.; Carpinetti, L.C.R. Analysis of the interplay between knowledge and performance management in industrial clusters. *Knowl. Manag. Res. Pract.* **2012**, *10*, 368–379. [[CrossRef](#)]
57. Ditillo, A. *Ordine e Creatività nelle Imprese ad alta Intensità di Conoscenza*; Pearson: Milano, Italy, 2006.
58. Bedford, D.S. Management control systems across different modes of innovation: Implications for firm performance. *Manag. Acc. Res.* **2015**, *28*, 12–30. [[CrossRef](#)]



59. Asiaei, K.; Bontis, N. Translating knowledge management into performance: The role of performance measurement systems. *MRR Ahead Print* **2019**. [[CrossRef](#)]
60. Bititci, U.; Garengo, P.; Dörfler, V.; Nudurupati, S. Performance Measurement: Challenges for Tomorrow: Performance Measurement. *Int. J. Manag. Rev.* **2012**, *14*, 305–327. [[CrossRef](#)]
61. Dyllick, T.; Hockerts, K. Beyond the business case for corporate sustainability. *Bus. Strat. Env.* **2002**, *11*, 130–141. [[CrossRef](#)]
62. Hay, L.; Duffy, A.; Whitfield, R.I. The Sustainability Cycle and Loop: Models for a more unified understanding of sustainability. *J. Environ. Manag.* **2014**, *133*, 232–257. [[CrossRef](#)] [[PubMed](#)]
63. WWF. Sustainability in the Construction Business – A Case study. *Corp. Environ. Strategy* **2003**, *8*, 157–164.
64. Schaltegger, S. Sustainability as a driver for corporate economic success: Consequences for the development of sustainability management control. *Soc. Econ.* **2010**, *33*, 15–28. [[CrossRef](#)]
65. Choi, J.; Kim, S.; Yang, D.-H. Small and Medium Enterprises and the Relation between Social Performance and Financial Performance: Empirical Evidence from Korea. *Sustainability* **2018**, *10*, 1816. [[CrossRef](#)]
66. Lawrence, S.R.; Collins, E.; Pavlovich, K.; Arunachalam, M. Sustainability practices of SMEs: The case of NZ. *Bus. Strat. Environ.* **2006**, *15*, 242–257. [[CrossRef](#)]
67. Bourlakis, M.; Maglaras, G.; Aktas, E.; Gallea, D.; Fotopoulos, C. Firm size and sustainable performance in food supply chains: Insights from Greek SMEs. *Int. J. Prod. Econ.* **2014**, *152*, 112–130. [[CrossRef](#)]
68. Günerergerin, M.; Penbek, Ş.; Zaptçioğlu, D. Exploring the Problems and Advantages of Turkish SMEs for Sustainability. *Procedia Soc. Behav. Sci.* **2012**, *58*, 244–251. [[CrossRef](#)]
69. Eikelenboom, M.; de Jong, G. The impact of dynamic capabilities on the sustainability performance of SMEs. *J. Clean. Prod.* **2019**, *235*, 1360–1370. [[CrossRef](#)]
70. Bianchi, C.; Cosenz, F.; Marinković, M. Designing dynamic performance management systems to foster SME competitiveness according to a sustainable development perspective: Empirical evidences from a case-study. *IJBPM* **2015**, *16*, 84. [[CrossRef](#)]
71. Vasudevan, H.; Chawan, A. Demystifying Knowledge Management in Indian Manufacturing SMEs. *Procedia Eng.* **2014**, *97*, 1724–1734. [[CrossRef](#)]
72. Nonaka, I.; Takeuchi, H. *The Knowledge-Creating Company: How Japanese Companies Create the Dynamics of Innovation*; Oxford University Press: New York, NY, USA, 1995.
73. Kim, M.K. A knowledge management model for SMEs in the knowledge-based economy. In Proceedings of the Entrepreneurship and Innovation in the Knowledge-based Economy: Challenges and Strategies, Taipei, China, 23–26 July 2002; pp. 15–30.
74. Matlay, H. Organisational learning in small learning organizations: An empirical overview. *Educ. Train.* **2000**, *4*, 202–210. [[CrossRef](#)]
75. Penn, D.W.; Ang'wa, W.; Forster, R.; Heydon, G.; Richardson, J.S. Learning in smaller organizations. *Learn. Organ.* **1998**, *5*, 128–137. [[CrossRef](#)]
76. Salojärvi, S.; Furu, P.; Sveiby, K. Knowledge management and growth in Finnish SMEs. *J. Knowl. Manag.* **2005**, *9*, 103–122. [[CrossRef](#)]
77. Centobelli, P.; Cerchione, R.; Esposito, E. Efficiency and effectiveness of knowledge management systems in SMEs. *Prod. Plan. Control* **2019**, *30*, 779–791. [[CrossRef](#)]
78. Gornjak, M. Knowledge Management and Management Accounting. In Proceedings of the Conference Paper, Portorož, Slovenia, 25–27 June 2014. [[CrossRef](#)]
79. Durst, S.; Runar Edvardsson, I. Knowledge management in SMEs: A literature review. *J. Knowl. Manag.* **2012**, *16*, 879–903. [[CrossRef](#)]
80. Gschwantner, S.; Hiebl, M.R.W. Management control systems and organizational ambidexterity. *J. Manag. Control* **2016**, *27*, 371–404. [[CrossRef](#)]
81. Centobelli, P.; Cerchione, R.; Esposito, E.; Sha, S. Exploration and exploitation in the development of more entrepreneurial universities: A twisting learning path model of ambidexterity. *Technol. Forecast. Soc. Chang.* **2019**, *141*, 172–194. [[CrossRef](#)]
82. Nunes, B.M.; Annansingh, F.; Eaglestone, B.; Wakefield, R. Knowledge management issues in knowledge-intensive SMEs. *J. Doc.* **2006**, *62*, 101–119. [[CrossRef](#)]
83. Kyrgidou, L.P.; Petridou, E. The effect of competence exploration and competence exploitation on strategic entrepreneurship. *Technol. Anal. Strateg. Manag.* **2011**, *23*, 697–713. [[CrossRef](#)]

84. Mahmoud, M. Knowledge management enablers and outcomes in the small-and-medium sized enterprises. *Ind. Manag. Data Syst.* **2009**, *109*, 840–858.
85. Alvarez, M.; Carrasco, C.E.; Elguezabal, I.Z.; Bilbao, Z.E. Knowledge Management Practices in SME. Case study In Basque Country SME. In Proceedings of the 6th International Conference on Industrial Engineering and Industrial Management. XVI Congreso de Ingeniería de Organización, Vigo, Spain, 18–20 July 2012.
86. Shirokova, G.; Vega, G.; Sokolova, L. Performance of Russian SMEs: Exploration, exploitation and strategic entrepreneurship. *Crit. Perspect Bus* **2013**, *9*, 173–203. [[CrossRef](#)]
87. Filippini, R.; Güttel, W.H.; Nosella, A. Dynamic capabilities and the evolution of knowledge management projects in SMEs. *IJTM* **2012**, *60*, 202. [[CrossRef](#)]
88. Starbuck, W.H. Learning by knowledge-intensive firms. *J. Manag. Stud.* **1992**, *29*, 713–740. [[CrossRef](#)]
89. Purushothaman, A. Organizational learning: A road map to evaluate learning outcomes in knowledge intensive firms. *Dev. Learn. Organ.* **2015**, *29*, 11–14. [[CrossRef](#)]
90. Huggins, R.; Weir, M. Intellectual assets and small knowledge-intensive business service firms. *J. Small Bus. Enterp. Dev.* **2012**, *19*, 92–113. [[CrossRef](#)]
91. Stein, C.; Wales, W.; Shirokova, G. Entrepreneurial orientation in the emerging Russian regulatory context: The criticality of interpersonal relationships. *Eur. J. Int. Manag.* **2016**, *10*, 359–382. [[CrossRef](#)]
92. Davidsson, P. *Researching Entrepreneurship*; Springer: Berlin/Heidelberg, Germany, 2004.
93. Jøsssen, J.I.; Aasheim, K. Organizational innovation promoters and performance effects in small, knowledge-intensive firms. *Entrep. Innov.* **2010**, *11*, 19–27. [[CrossRef](#)]
94. Bell, J.; Crick, D.; Young, S. Small Firm Internalization and Business Strategy. *Int. Small Bus. J.* **2004**, *22*, 23–56. [[CrossRef](#)]
95. Demartini, C. Performance Management Systems. In *Design, Diagnosis and Use*; Springer: Berlin/Heidelberg, Germany, 2014.
96. Chenhall Robert, H. Management control systems design within its organizational context: Findings from contingency-based and research directions for the future. *Acc. Organ. Soc.* **2003**, *28*, 127–168. [[CrossRef](#)]
97. Otley, D. The contingency theory of management accounting and control: 1980–2014. *Manag. Acc. Res.* **2016**, *31*, 45–62. [[CrossRef](#)]
98. Perego, P.M.; Hartmann, F.G.H. Aligning performance measurement systems with strategy: The case of environmental strategy. *Abacus* **2009**, *45*, 397–428. [[CrossRef](#)]
99. Chenhall, R. Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: An exploratory study. *Acc. Organ. Soc.* **2005**, *30*, 395–422. [[CrossRef](#)]
100. Langfield-Smith, K. Strategic management accounting: How far have we come in 25 years? *Acc. Audit Acc. J.* **2008**, *21*, 204–228. [[CrossRef](#)]
101. Brignall, S.; Ballantine, J. Strategic enterprise management systems: New directions from research. *Manag. Account. Res.* **2004**, *15*, 225–240. [[CrossRef](#)]
102. Klovienė, L.; Speziale, M.-T. Is Performance Measurement System Going Towards Sustainability in SMEs? *Procedia Soc. Behav. Sci.* **2015**, *213*, 328–333. [[CrossRef](#)]
103. Centobelli, P.; Cerchione, R.; Esposito, E. Aligning enterprise knowledge and knowledge management systems to improve efficiency and effectiveness performance: A three-dimensional Fuzzy-based decision support system. *Expert Syst. Appl.* **2018**, *91*, 107–126. [[CrossRef](#)]
104. Ditillo, A. Dealing with uncertainty in knowledge-intensive firms: The role of management control systems as knowledge integration mechanisms. *Account. Organ. Soc.* **2004**, *29*, 401–421. [[CrossRef](#)]
105. Fujino, M.; Li, Y.; Sawabe, N.; Horii, S. Performance Measurement Systems for Managing Exploration/Exploitation Tensions within and between Organizational Levels. *SSRN J.* **2014**. [[CrossRef](#)]
106. McCarthy, I.P.; Gordon, B.R. Achieving contextual ambidexterity in R&D organizations: A management control system approach. *R&D Manag.* **2011**, *41*, 240–258.
107. Miraglia, R.A. Nuove tendenze nei sistemi di controllo e di misurazione delle performance. *Manag. Control* **2012**, *2*, 5–14. [[CrossRef](#)]
108. Jamil, C.Z.M.; Mohamed, R. The Effect of Management Control System on Performance Measurement System at Small Medium Hotel in Malaysia. *IJTEF* **2013**, 202–208. [[CrossRef](#)]
109. Groen, B.A.C.; Van de Belt, M.; Wilderom, C.P.M. Enabling performance measurement in a small professional service firm. *Int. J. Prod. Perform. Manag.* **2012**, *61*, 839–862. [[CrossRef](#)]

110. Haddara, M.; Zach, O. ERP Systems in SMEs: A Literature Review. In Proceedings of the 2011 44th Hawaii International Conference on System Sciences (HICSS 2011), Kauai, HI, USA, 4–7 January 2011; pp. 1–10. [\[CrossRef\]](#)
111. Fink, K.; Ploder, C. Balanced system for knowledge process management in SMEs. *J. Enterp. Inf. Manag.* **2009**, *22*, 36–50. [\[CrossRef\]](#)
112. Metaxiotis, K. Exploring the rationales for ERP and knowledge management integration in SMEs. *J. Enterp. Inf. Manag.* **2009**, *22*, 51–62. [\[CrossRef\]](#)
113. Gresty, M. What role do information systems play in the knowledge management activities of SMEs? *Bus. Inf. Rev.* **2013**, *30*, 144–151. [\[CrossRef\]](#)
114. Newby, R.; Watson, J.; Woodliff, D. SME survey methodology: Response rates, data quality, and cost effectiveness. *Entrep. Theory Pract.* **2003**, *28*, 163–172. [\[CrossRef\]](#)
115. Jacobson, R. The validity of ROI as a measure of business performance. *Am. Econ. Rev.* **1987**, *77*, 470–478.
116. Chen, S.; Dodd, J.L. Economic value added (EVA (TM)): An empirical examination of a new. Corporate performance measure. *J. Manag. Issues* **1997**, *9*, 318.
117. Stewart, G.L. Reward structure as a moderator of the relationship between extraversion and sales per performance. *J. Appl. Psychol.* **1996**, *81*, 619. [\[CrossRef\]](#)
118. Figge, F.; Hahn, T. Is green and profitable sustainable? Assessing the trade-off between economic and environmental aspects. *Int. J. Prod. Econ.* **2012**, *140*, 92–102. [\[CrossRef\]](#)
119. Dale, V.H.; Efromson, R.A.; Kline, K.L.; Langholtz, M.H.; Leiby, P.N.; Oladosu, G.A.; Davis, M.R.; Downing, M.E.; Hilliard, M.R. Indicators for assessing socioeconomic sustainability of bioenergy systems: A short list of practical measures. *Ecol. Indic.* **2013**, *26*, 87–102. [\[CrossRef\]](#)
120. Likert, R. A Technique for the Measurement of Attitudes. *Arch. Psychol.* **1932**, *140*, 1–55.
121. Sitkin, S.B.; Sutcliffe, K.M.; Schroeder, R.G. Distinguishing control form learning in total quality management a contingency perspective. *Acad. Manag. Rev.* **1994**, *19*, 537–564. [\[CrossRef\]](#)
122. Liu, W. Knowledge exploitation, knowledge exploration, and competency trap. *Knowl. Process Manag.* **2006**, *13*, 144–161. [\[CrossRef\]](#)
123. March, J.G. *The Pursuit of Organizational Intelligence*; Blackwell Business: Oxford, UK, 1999.
124. Marengo, L. Knowledge distribution and coordination in organizations: On some social aspects of the Exploitation vs. exploration trade-off. *Revue Int. Systémique* **1993**, *7*, 553–571.
125. Marengo, L. *Knowledge, Communication and Coordination in an Adaptive Model of the Firm*; Mimeo: Rome, Italy, 1991.
126. Kohli, A.; Jaworski, B.J.; Ajith, K. MARKOR: A measure of market orientation. *J. Mark. Res.* **1993**, *30*, 467–477. [\[CrossRef\]](#)
127. He, Z.; Wong, P. Exploration vs. exploitation: An empirical test of the ambidexterity hypothesis. *Organ. Sci.* **2004**, *15*, 481–494. [\[CrossRef\]](#)
128. Cronbach, L.J. *Essentials of Psychological Testing*, 3rd ed.; Harper & Row: New York, NY, USA, 1970.
129. Bisbe, J.; Otley, D. The effects of the interactive use of management control systems on product innovation. *Account. Organ. Soc.* **2004**, *29*, 709–737. [\[CrossRef\]](#)
130. Bisbe, J.; Malagueño, R. The choice of interactive control systems under different innovation management modes. *Eur. Account. Rev.* **2009**, *18*, 371–405. [\[CrossRef\]](#)
131. Vandenbosch, B. An empirical analysis of the association between the use of executive support systems and perceived organizational competitiveness. *Account. Organ. Soc.* **1999**, *24*, 77. [\[CrossRef\]](#)
132. Jolliffe, I.T. Discarding variables in a principal component analysis. I: Artificial data. *J. R. Stat. Soc. Ser. C* **1972**, *21*, 160–173. [\[CrossRef\]](#)
133. Heise, D.R. Separating reliability and stability in test-retest correlation. *Am. Sociol. Rev.* **1969**, *34*, 93–101. [\[CrossRef\]](#)
134. Mason, C.H.; Perreault, W.D., Jr. Collinearity, power, and interpretation of multiple regression analysis. *J. Mark. Res.* **1991**, *28*, 268–280. [\[CrossRef\]](#)
135. Falk, R.F.; Miller, N.B. *A Primer for Soft Modeling*; University of Akron Press: Akron, OH, USA, 1992.
136. Cohen, J. *Statistical Power Analysis for the Behavioral Sciences*, 2nd ed.; Erlbaum: Hillsdale, NJ, USA, 1988.
137. Ali, M.H.; Zailani, S.; Iranmanesh, M.; Foroughi, B. Impacts of Environmental Factors on Waste, Energy, and Resource Management and Sustainable Performance. *Sustainability* **2019**, *11*, 2443. [\[CrossRef\]](#)

138. Alda, M. Corporate sustainability and institutional shareholders: The pressure of social responsible pension funds on environmental firm practices. *Bus. Strategy Environ.* **2019**, *28*, 1060–1071. [[CrossRef](#)]
139. Suzuki, M.; Ando, N.; Nishikawa, H. Recruitment of local human resources and its effect on foreign subsidiaries in Japan. *Manag. Res. Rev.* **2019**, *42*, 1014–1032. [[CrossRef](#)]
140. Cha, W.; Adebeye, M.; Dadanlar, H. The effect of CEO civic engagement on corporate social and environmental performance. *Soc. Responsib. J.* **2019**, *15*, 1054–1070. [[CrossRef](#)]
141. Acs, Z.J.; Braunerhjelm, P.; Audretsch, D.B.; Carlsson, B. The knowledge spill-over theory of entrepreneurship. *Small Bus. Econ.* **2009**, *32*, 15–30. [[CrossRef](#)]
142. Politis, D. The Process of Entrepreneurial Learning: A Conceptual Framework. *Entrep. Theory Pract.* **2005**, *29*, 399–424. [[CrossRef](#)]
143. García-Álvarez, M.T. Analysis of the effects of ICTs in knowledge management and innovation: The case of Zara Group. *Comput. Hum. Behav.* **2015**, *51*, 994–1002. [[CrossRef](#)]
144. Gaziulusoy, A.İ.; Boyle, C.; McDowall, R. System innovation for sustainability: A systemic double-flow scenario method for companies. *J. Clean. Prod.* **2013**, *45*, 104–116. [[CrossRef](#)]
145. Sanders Jones, L.J.; Linderman, K. Process management, innovation and efficiency performance: The moderating effect of competitive intensity. *Bus. Process Manag. J.* **2014**, *20*, 335–358. [[CrossRef](#)]
146. Zahra, S.A.; George, G. AC: A Review, Reconceptualization, and Extension. *AMR* **2002**, *27*, 185–203. [[CrossRef](#)]
147. Austin, R.D.; Larkey, P. Performance measurement—emerging issues and trends. In *Business Performance Measurement—Theory and Practice—Cambridge*; Neely, A., Ed.; Cambridge University Press: Cambridge, UK, 2002.
148. Ekstedt, E. Knowledge renewal and knowledge companies. In *Uppsala papers in Economic History, Research Report No. 22*; Uppsala Universitet: Uppsala, Sweden, 1989.
149. Widener, S.K. An empirical analysis of the levers of control framework. *Acc. Organ. Soc.* **2007**, *32*, 757–788. [[CrossRef](#)]
150. Kaplan, R.S.; Norton, D.P. Using the Balanced Scorecard as a Strategic Management System. *Harvard Bus. Rev.* **1996**, *14*, 15.
151. Schlierer, H.-J.; Werner, A.; Signori, S.; Garriga, E.; von Weltzien Hoivik, H.; Van Rossem, A.; Fassin, Y. How Do European SME Owner–Managers Make Sense of ‘Stakeholder Management’?: Insights from a Cross-National Study. *J. Bus Ethics* **2012**, *109*, 39–51. [[CrossRef](#)]
152. Cardoni, A. Le sfide evolutive del Management Control tra relazioni strategiche, innovazione e discontinuità: A knowledge transfer matter? *Manag. Control* **2018**, *1*, 5–15. [[CrossRef](#)]
153. Löfstål, E.; Jontoft, A.-M. Tensions at the intersection of management control and innovation: A literature review. *J. Manag. Control* **2017**, *28*, 41–79. [[CrossRef](#)]
154. Scott, T.W.; Tiessen, P. Performance measurement and managerial teams. *Account. Organ. Soc.* **1999**, *24*, 263–285. [[CrossRef](#)]

