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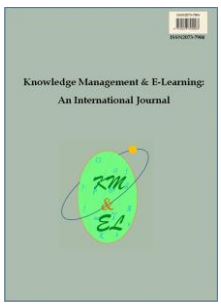

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Unleashing the power of responsible knowledge management: A catalyst for sustainable business transformation

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Abstract: This study examines the impact of employees' knowledge and competencies on the development of sustainable businesses through the lens of responsible knowledge management. We conducted a multinomial logistic regression using Flash Eurobarometer data to analyze the relationships among knowledge, competencies, and sustainability-related actions in the context of companies' strategies and action plans. Our findings reveal that the absence of employees' knowledge/competencies impedes the development of sustainable strategies. Additionally, isolated actions such as evaluation of the company's impact on society, sustainable product or service development, and actions to save energy or switch to sustainable energy sources have a greater impact on the development of sustainable businesses than actions for involving employees in the management and

actions to reduce impact or consumption on natural resources. Conversely, reuse or recycling actions have no significant impact. Thus, this research confirms and highlights the need for companies to prioritize knowledge management practices that incorporate sustainability-related competencies. By adopting a values-driven approach to knowledge management, organizations can unlock new avenues for growth, innovation, and competitive advantage while contributing to the larger goal of achieving sustainability. The contributions comprise providing empirical evidence supporting responsible knowledge management development and advancing with the convergence of a reframed knowledge management field and sustainability.

Keywords: Responsible knowledge management; Knowledge management; Knowledge; Competencies; Sustainability; Sustainable business; Entrepreneurship

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1. Introduction

All cultures and nations, whether developed or developing, face the challenge of achieving sustainability (Bakri & Abbas, 2020). The United Nations (2021) defined it as "*meeting the needs of the present without compromising the ability of future generations to meet their own needs*". They established the Sustainable Development Goals (SDG) to provide a shared blueprint for achieving a more sustainable future. Also, sustainability is recognized as a new frontier of innovation (Bakri & Abbas, 2020) and is one of the primary priorities of the European Commission (2022a).

Europe aspires to be the first climate-neutral continent by building a contemporary, resource-efficient economy (European Commission, 2022a). Furthermore, the EC wants to guarantee that environmental, industrial, climate and energy policies are synchronized to create the best possible business environment for long-term job creation, growth, and innovation. Hence, it has set out an ambitious plan to transform the European economy into a circular economy, in which the value of products and materials is conserved for as long as feasible, resulting in significant economic advantages (European Commission, 2022a). The major initiative from the EC towards sustainability and circular economy is the European Green Deal, the European Union's new strategy for long-term growth; one of its cornerstones is the new Circular Economy Action Plan for a cleaner and more competitive Europe (European Commission, 2022a). Other remarkable tools provided by the EC are the European Circular Economy Stakeholder Platform (European Union, 2022) and the Green Transition Support (European Commission, 2022b), which respectively provide the whole collection of the project's research outputs (European Union, 2022) and include best practices illustrated by case studies and showcases aiming to improve the resource efficiency of companies (European Commission, 2022b).

Understanding the relationship between Knowledge Management (KM) and sustainability is crucial as we strive to create a sustainable future. Despite its significance, this relationship remains unclear and lacks explicit evidence (Arduini et al., 2023). Therefore, gaining a comprehensive understanding of the connection between KM and sustainability is imperative for organizations to achieve their sustainability goals. The relevance of KM to organizational change and learning, strategy, performance, and the connection to other areas is well established in the field literature (e.g., Ali et al., 2022; Bolisani & Bratianu, 2018; Chaurasia et al., 2020; Durst & Zieba, 2020). Furthermore, previous theoretical studies emphasized responsible knowledge management (rKM) potential to support businesses' transition toward sustainability (Durst, 2021; Rocha et al., 2022). According to Durst (2021), rKM is the intentional and strategic approach to managing knowledge considering ethical and social issues. It is closely related to the SDGs, and various are directly related to rKM. For example, in SDG 4, rKM is crucial by ensuring that knowledge is accessible to all and shared, including marginalized communities. Similarly, SDG 9 rKM can foster the knowledge transfer in best practices in innovation and technology. Likewise, for SDG 16, rKM supports the promotion of transparency, fairness, and accountability in knowledge dissemination. In sum, rKM practices can support the development of a more sustainable future.

Notwithstanding growing interest in the role of responsible knowledge management in sustainable business transformation, there is still a lack of empirical

research on this topic (Rocha et al., 2022). In response, this study aims to address it by investigating the impact of employees' knowledge and competencies on building sustainable businesses. To achieve this objective, we employ a responsible knowledge management outline to analyze the contexts, problems, barriers to innovation, and actions towards sustainability in companies that have implemented strategies and action plans for sustainable transformation. This analysis is based on Eurobarometer data (European Commission, 2022b).

This study significantly contributes to the KM literature and its evolution into a value-based field. Our research provides a deeper understanding of the role of KM in promoting sustainable transformations in businesses. It adds value to the fields of rKM, sustainable business transformation, and development. The study highlights the importance of a responsible KM in addressing societal challenges collaboratively by providing empirical evidence, identifying best practices, enhancing stakeholder engagement, and advancing the convergence of rKM and the SDGs.

2. Theoretical background and hypotheses

2.1. Knowledge management

Although the origins of KM are assumed to date back to the 13th century, it was not until the late 1980s that the term began to be used by consultants (Koenig & Neveroski, 2008), and in the 1990s, it became academically fashioned (Drucker, 1993; Nonaka & Takeuchi, 1995). It is any deliberate effort to manage a company's workforce knowledge. There are various means for perpetrating it, including direct methods, technology-based approaches, and indirect methods, such as configuring organizational structures in a specific way or using cultural and personnel management practices (Hislop et al., 2013)

For more than twenty years, scholars have recognized that dynamic and complex global business environments require companies to build robust and adaptative knowledge management systems (KMS) to develop and sustain competitive advantages (Adams & Lamont, 2003; Davenport & Prusak, 1998). The prescription for a superb KMS has been there for several years; organizations need to disseminate and embed knowledge internally while creating superior KM practices (KMP) to foster innovation (Lubit, 2000). Therefore, in recent years, the field has been focusing on how to implement it to improve business performance (Heisig et al., 2016). For example, Hussinki *et al.* (2017) observed that KMPs are valuable in capitalizing on companies' knowledge potential, leveraging intellectual capital, and positively influencing their innovation performance. Butt et al. (2018) investigated the individual KM engagement affecting their innovation and productivity. Similarly, the impact of KM on knowledge worker productivity also appears in the debate about business competitiveness and innovation (Kianto et al., 2019; Shujahat et al., 2019; Umer et al., 2023). Furthermore, knowledge workers' satisfaction is relevant to understanding knowledge-based innovation (Shujahat et al., 2018). Other research has focused on the relationship between knowledge sharing, intellectual capital, absorptive capacity, innovation, and organizational performance in specific contexts and cultures, such as small and mid-size enterprises (SMEs) in Brazil and Portugal (Oliveira et al., 2020). Accordingly, in response to COVID-19, new KM frameworks have been adopted by healthcare workers (Liu et al., 2022).

KM has primarily been focused on resolving organizational issues rather than tackling wicked problems that extend beyond the boundaries of companies. Ethics and morality have traditionally been considered outside the scope of KM. However, recent research has suggested that a reevaluation of KM is necessary, particularly about incorporating ethical considerations and supporting organizations to become more sustainable and responsible (e.g., Dumay, 2022; Durst, 2021; Rocha et al., 2022). On this matter, Durst (2021) recently proposed the concept of responsible Knowledge Management

2.2. Responsible knowledge management

Durst (2021) points out several consequences of the pandemic; for example, at the individual level, the digital era post-pandemic is further dividing people, especially women; educational disadvantages increased due to the pandemic; there is an increase in poverty and child labor. At the organizational level, a high number of companies are ceasing their activities, digitalization, and flexibilization. At the industry level, raw material scarcity and supply chains collapsed. These and the various other consequences of the pandemic emphasize that we need a more collaborative Knowledge Management. Therefore, "*rKM goes beyond organizational/national/etc. boundaries and acknowledges that only a collaborative and inclusive approach involving different and diverse partners of equal standing is capable of addressing present and future challenges*" (Durst, 2021).

There is an eminence in adopting value-based KM for companies to achieve their goals related to sustainability, corporate social responsibility, and the creation of shared value (Rocha et al., 2022). Moreover, managing the changes toward sustainability in the current context announces the role of responsible knowledge management (rKM) in companies (Durst, 2021; Rocha et al., 2022). It "*seeks the common good and may support the approach of current and upcoming social challenges. […] It can be seen as a managerial approach that incorporates ethical and value-based considerations*" (Rocha et al., 2022). Moreover, "*rKM emphasizes knowledge creation, sharing, and retention for the greater good; the latter also forms the starting point of this approach to KM and not as typically found in the individual organization and its particular challenges*" (Durst, 2021). For this reason, we adopt the rKM lens to discuss the outcomes.

2.3. Hypotheses

Achieving a sustainable business is a path with barriers. Some of these are directly related to the employee's lack of knowledge and competencies to implement strategic plans driven toward sustainability and innovation (Nonaka & Takeuchi, 2019). Likewise, employee-driven innovation arises from organizational job performance and everyday practices (Buhl et al., 2016). Furthermore, knowledge is considered a strategic resource for the innovation process and an organization's competencies and sustainable development (Liang et al., 2019). Besides, the sustainability journey is also crossed with the help of well-trained human resources.

At this point, the relevance of competencies does emerge. Therefore, the focus is on the tacit knowledge of employees, the unique knowledge of organizations, practical skills, and the ability to solve problems, all of which are acquired through learning experiences throughout everyday work. Moreover, tacit knowledge is "*wholly embodied in the individual, rooted in practice and experience, expressed through skillful execution, and*

transmitted by apprenticeship and training through watching and doing forms of learning" (Johannessen & Olsen, 2003).

Knowledge is fundamental for organizations' sustainability policies and practices. Knowledge is even more necessary in crises to identify and solve problems rapidly and efficiently. Developing strategies aiming at open knowledge will incentivize employees to contribute to knowledge application, innovation, and sustainability (Batool et al., 2022). It is seen as a key capability for an organization that seeks to increase its sustainability and is essential to successfully implementing sustainable practices (Ulewicz & Blaskova, 2018). In addition, KM has the potential to address complex social issues that extend beyond organizational boundaries (Dumay, 2022).

Competencies are related to successful performance, which should be noticed in current employee behavior patterns. Their results endorsed theoretical and practical strategies for modeling transversal and disciplinary competencies for sustainability grounded in economic, social, or environmental commitment (Daniali et al., 2022). The integration of knowledge and abilities into sustainability is defended, and prior research has discussed these capabilities among professionals exploring various sustainability strategies, depending on the sector investigated (Perez Salgado et al., 2018).

Moreover, knowledge risk is "*a measure of the probability and severity of adverse effects of any activities engaging or related somehow to knowledge that can affect the functioning of an organization on any level*" (Durst & Zieba, 2019, 2020). It requires techniques to identify, analyze, and act on the risks detected. Despite knowledge risk being impactful in all organizations, smaller ones are especially affected by it (Durst, 2021; Durst & Zieba, 2020). Knowledge Rizk Management is also related to sustainability through innovativeness and agility (Zieba et al., 2022). Thus, given the relevance of the knowledge and competencies in the transformation toward a sustainable business, the following hypotheses were developed:

H1a: Employees' lack of knowledge/competencies affects the transformation process toward companies' sustainability.

H1b: Problems related to employee knowledge/competencies affect the transformation process toward companies' sustainability.

H1c: The absence of employees with the knowledge/competencies necessary for business growth affects the transformation process toward companies' sustainability.

H1d: The lack of knowledge/competencies about integrating sustainability into the business model affects the transformation process toward companies' sustainability.

Companies must prioritize sustainability to remain competitive and relevant in today's global market. Adopting a strategy that prioritizes sustainability can lead to increased innovation and investment, which can help establish competitive advantages (Imran et al., 2019). Furthermore, companies should consider implementing sustainability-driven innovation practices, which go beyond traditional innovation and focus on creating products and services that contribute to sustainable development. These practices can help companies survive and thrive in a rapidly changing and competitive business environment (Schaltegger & Wagner, 2011). By prioritizing sustainability, companies can reduce their environmental impact, create new business opportunities, and enhance their overall competitiveness.

Social innovation is gradually seen as an option to address sustainability challenges; for instance, many social innovations related to climate change have chased sustainability challenges (Repo & Matschoss, 2019). Also, there is a clear difference between environmental and social innovations. The latter concerns offering new/improved products/processes in a better way. In turn, social innovations are related to the offer of new services/new uses with something more incorporated than environmental innovations (Abaza, 2017). Social innovation is intrinsically linked to social values, practices, and effects; it can be considered an extension of technological innovation and notably responds to societal challenges. On the other hand, sustainable innovation exists as a form of innovation that considers not only immediate needs but also environmental and social concerns, as well as the needs of upcoming generations, thus adopting a long-term perspective. Accordingly, sustainable innovation tends to be more challenging since it includes supplementary levels of complexity (Ketata et al., 2015).

The study of the impact of social innovation programs on developing societies remains unexplored when compared with corporate social strategies; social innovation goes further since it considers the community needs as an opportunity to develop ideas, enter into new markets, and solve long-standing business problems (Tarnovskaya et al., 2022). In turn, sustainable innovation assures a competitive advantage and brings environmental benefits and social well-being (Paoloni & Modaffari, 2022).

Bearing in mind the stated above and considering that many companies start their journey toward sustainability by taking isolated small sustainable innovations, we formulate the subsequent hypotheses:

H2a: Isolated sustainable actions affect the transformation process toward companies' sustainability.

H2b: Material recycling or reuse actions only affect the transformation process toward companies' sustainability.

H2c: Actions to reduce consumption or impact on natural resources only affect the transformation process toward companies' sustainability.

H2d: Actions to save energy or switch to sustainable energy sources only affect the transformation process toward companies' sustainability.

H2e: Sustainable product or service development actions only affect the transformation process toward companies' sustainability.

H2f: Evaluation of the company's impact on society only affects the transformation process toward companies' sustainability.

H2g: Actions involving employees in the company's management only affect the transformation process toward the company's sustainability.

H2h: The absence of solo action for sustainability affects the transformation process toward companies' sustainability.

3. Method

3.1. Multinomial logistic regression method

Multinomial logistic regression is a statistical technique for modeling relationships between a categorical dependent variable with multiple categories and several independent variables. Thus, this method estimates the probability of each category of the dependent variable occurring based on the values of the independent variables. For Flash Eurobarometer data, the technique is particularly useful for analyzing relationships between independent variables and the dependent variable.

3.2. Data and measures

We used information from the 2020 edition of the GESIS Data Archive's Flash Eurobarometer 486 (SMEs, Start-ups, Scale-ups, and Entrepreneurship). It contains data from a comprehensive survey conducted across all 27 European Union Member States, the United Kingdom, and candidate countries. It is a cross-sectional survey that used stratified probability as a sampling procedure to collect 16,365 answers from entrepreneurs and SME managers, and the data provides valuable insights into the state of entrepreneurship in Europe. Considering that the respondents are entrepreneurs and SME managers, and the questions are about their knowledge and competencies regarding the company's sustainability strategies, they are an appropriate sample. The respondents were questioned over the phone using a computer-assisted technique. It was conducted between February 19 and May 5, 2020 (European Commission, 2020). The survey aimed to elicit information on small and medium-sized enterprise (SME) characteristics and activities, start-ups, and scale-ups, as well as attitudes towards entrepreneurship and government policies supporting entrepreneurship. Moreover, the unity of analysis is the organizations (European Commission, 2020).

The dependent variable derives from Question 25: "*Do you have a strategy or action plan to become a sustainable enterprise, i.e., combine long-term success and profitability with a positive impact on society and the environment?*". The answers are: (1) Yes, and it has already been implemented; (2) Yes, and it is in the process of being implemented; (3) No, but it may be considered in the future; (4) No, and it will not in the future; (5) No applicable; (6) Do not know. Therefore, we re-coded the answers into the following variables: Q25.2 (2.00) – Both Yes ('1' and '2'), Q25.1 (1.00) – Both No ('3' and '4'), and Q25.0 (.00) – The others ('5' and '6').

The independent variables are derived from the questions (Q) and correspondent responses:

- Q7B "*Which of the following statements best explain your enterprise's situation?*", Q7B.2 Absence of employees with knowledge/competencies to grow (AKC).
- Q17 "From the following list, please indicate up to three key areas which pose the biggest problems for your enterprise", Q17.7 Problems regarding competencies (PC).
- Q24 "*In terms of environmental and social sustainability, which of the following actions, if any, is your enterprise actively taking?*", Q24.1 Recycling or reusing materials (ESA1), Q24.2 Reducing consumption of or impact on natural resources (e.g., saving water or switching to sustainable resources) (ESA2), Q24.3 Saving

energy or switching to sustainable energy sources (ESA3), Q24.4 Developing sustainable products or services (ESA4), Q24.7 Evaluating the impact of your enterprise on society (ESA5), Q24.8 Engaging employees in the governance of the enterprise (ESA6), and Q24.9 None (ESA7).

- Q26 "*Which of the following, if any, are currently preventing your enterprise from becoming sustainable, i.e., combining long-term success and profitability with a positive impact on society and the environment*?", Q26.3 Lack of knowledge about integrating sustainability into the company's business model (LKC1) and Q26.6 lack of knowledge/competencies (LKC2).

Additionally, we used the following control variables, country (European or not), size (E), year of registration (FUND), and annual revenue (REV). Accordingly, we re-coded the answers into dummy variables.

In sum, to investigate the impact of employees' knowledge and competencies in building sustainable businesses, using a rKM lens to analyze the dataset, our dependent variable, derived from Question 25, indicates the presence or absence of a sustainability strategy or action plan. The independent variables, derived from Questions 7B, 17, 24, and 26, cover various aspects related to sustainability, including problems and barriers, actions taken, and lack of knowledge and competencies. We also control for country, size, year of registration, and annual revenue. By examining these variables, we aim to contribute to a better understanding of rKM's role in businesses' sustainable transformations.

4. Results and analysis

4.1. Statistical analyses

After re-coding some of the variables, using IBM SPSS Statistics 28.0.1, we conducted a bivariate correlational test to assess the correlation between the variables (see Table 1 and Table 2), and the results fit recommended parameters (Hosmer et al., 2013). Also, since the nominal dependent variable has more than two categories, we used Multinomial Logistic Regression (MLR) to measure the impact of the predictor variables (Hosmer et al., 2013). Furthermore, we conducted several MLRs, adding and removing independent variables until we achieved a fitting Goodness-of-Fit p-value > 0.05 (Hosmer et al., 2013). Lastly, we calculated the analyses with a 95% confidence interval (95% CI). Likewise, a p-value < 0.05 was considered statistically significant.

Table 1
Control variables correlations

	Q25	FUND	E	REV	EU
Q25	/				
FUND	-0,006	/			
E	.139**	.209**	/		
REV	0.002	.113**	.255**	/	
EU	0.005	-.050**	0.001	.085**	/

Note. **Correlation is significant at the 0.01 level (2-tailed); Q25: Question number 25; FUND: Year of registration; E: Size; REV: Annual revenue; EU: European

Table 2
Dependent variables correlations

	Q25	ACK	PC	ESA1	ESA2	ESA3	ESA4	ESA5	ESA6	ESA7	LKC1	LKC2
Q25	/											
ACK	0.00	/										
PC	.021**	.17**	/									
ESA1	.14**	.03*	.07**	/								
ESA2	.19**	.05**	.07**	.39**	/							
ESA3	.20**	.03*	.08**	.32**	.48**	/						
ESA4	.24**	.05**	.04**	.27**	.35**	.31**	/					
ESA5	.23**	.03**	.04**	.26**	.32**	.27**	.34**	/				
ESA6	.17**	0.02	.07**	.27**	.32**	.27**	.28**	.34**	--			
ESA7	- .15**	- .04**	- .05**	- .35**	- .28**	- .29**	- .19**	- .18**	-.26**	/		
LKC1	- .05**	.08**	.09**	.12**	.10**	.07**	.04**	.07**	.13**	- .10**	/	
LKC2	- .00	.18**	.23**	.08**	.09**	.07**	.04**	.06**	.09**	- .07**	.34**	/

Note. **Correlation is significant at the 0.01 level (2-tailed); *Correlation is significant at the 0.05 level (2-tailed); Q25: Question number 25; AKC: Absence of employees with knowledge/competencies to grow; PC: Problems regarding competencies; ESA1: Recycling or reusing materials; ESA2: Reducing consumption of or impact on natural resources; ESA3: Energy or switching to sustainable energy sources; ESA4: Developing sustainable products or services; ESA5: Evaluating the impact of your enterprise on society; ESA6: Engaging employees in the governance of the enterprise; ESA7: None; LKC1: Lack of knowledge about integrating sustainability into the company's business model; LKC2: Lack of knowledge/competencies

4.2. Multinomial logistic regression

The total of valid answers is 4,471, of which 56% (2,502) answered Q25.1 (1.00), 32.8% (1,467) answered Q25.2 (2.00), and 11.2% (502) answered Q25.0 (.00). Thus, once 1.00 is the most frequent answer, we selected it as the reference category (Hosmer et al., 2013). In Table 3, we identify the significance of the model (p-value < 0.05). The Goodness-of-Fit statistic also shows no significant difference between our model and the anticipated values (p-value > 0.05). Therefore, according to the model classification accuracy, the model predicts observed outcomes in 61.2% of the cases, which measures how well the model foretells future events. Additionally, our model explains 19.9% of the total variance of the independent variables, according to the Pseudo R2 (Nagelkerke of 0.29). In sum, we appropriately provide the most common fit indices for MLR, namely, deviance statistics, likelihood ratio test, Hosmer-Lemeshow test, and classification accuracy, as Hosmer and colleagues (2013) recommended.

The Odds (ratio of probability) are measured by Exp (β). It estimates the probability of success over the probability of failure (Hosmer et al., 2013). According to Table 4, H1a (β = 0.401, p-value < 0.01) and H1d (β = 0.711, p-value < 0.01) are significant and support businesses that have established or are in the process of implementing sustainability strategy or action plans. Once β is lower than zero, employees' lack of knowledge and competencies negatively affect the companies' transformation toward sustainability. Likewise, the lack of knowledge about integrating sustainability into the company's business model affects both business categories (Q25.0 and Q25.2). The likelihood that the business will continue without creating this strategy increases with the degree of lack of knowledge (Q25.0). Similarly, for companies with a strategy, the greater the lack of knowledge, the greater the probability of reducing this strategy (Q25.2).

Table 3
Model fitting information, Goodness-of-Fit, and classification accuracy

Model fitting information				
Model	Model fitting criteria -2 Log likelihood	Likelihood ratio tests Chi-square	*df*	Sig.
Intercept only	6135.382			
Final	5310.305	825.078	56	< .001
Goodness-of-Fit				
	Chi-Square		*df*	Sig.
Pearson	5144.202		5196	0.693
Deviance	4447.783		5196	1.000
Classification accuracy				
Observed	Predicted .00	1.00	2.00	Per cent correct
.00	5	437	60	1.0%
1.00	6	2148	348	85.9%
2.00	3	881	583	39.7%
Overall percentage	0.3%	77.5%	22.2%	61.2%

Regarding the second hypothesis, isolated sustainable actions can be significant and related to the transformation toward sustainability. For example, the presence of actions to reduce consumption or impact on natural resources (H2c – β = 1.195), actions to save energy or switch to sustainable energy (H2d – β = 1.466), sustainable product or service development actions (H2e – β = 1.894), evaluation of the company's impact on society (H2f – β = 1.836), and actions for involving employees in the management of the company (H2g – β = 1.184), and no actions at all (H2h – β = 0.581) impact the transformation. The transition will be positively impacted by H2c to H2g. H2h; however, it has a negative effect. Conversely, recycling or reusing materials is a somewhat ineffective strategy (H2b). Moreover, for companies the respondent does not know or is not applicable, H1a, H1d, and H2h are significant and supported. What was expected, once the lack of knowledge/competencies and problems related to the transformations, should not be significant to those. Additionally, H1a, H1d, and H2h are significant and support companies the respondent is unaware of or not applicable. What was anticipated once the challenges associated with the transitions and the absence of knowledge/competencies should not be substantial to those. Also, the absence of solo action for sustainability was expected to be significant. Hence, H1a, H1d, and H2h are supported for both categories of companies. In contrast, H1b and H1c failed to show statistical significance and were rejected.

Concerning the control variables, the registration year after 2019 (FUND1) and being in Europe (EU) are the only significant variables for companies that implemented or are implementing strategies or an action plan toward sustainability. In contrast, for companies that the respondent does not know or are not applicable, the year of registration is between 2000 and 2014 (FUND4), all sizes, and revenues up to 100 thousand (REV1) and between 1 and 2 million (REV4) are significant.

Table 4
Multinomial logistic regression

	Parameter estimates Q25.0 (0.00)*					Parameter estimates Q25.2 (0.00)*				
Variable	B	Std. error	Wald	Sig.	Exp (β)	B	Std. error	Wald	Sig.	Exp (β)
INTER^	0.842	0.484	3.028	0.08		- 1.011	0.466	4.714	0.03	
AKC	- 0.296	0.168	3.085	0.07	0.744	- 0.191	0.105	3.332	0.06	0.826
PC	0.128	0.152	0.713	0.39	1.137	0.078	0.100	0.606	0.43	1.081
LKC1	- 1.023	0.193	28.028	0.00	0.360	- 0.914	0.104	77.930	0.00	0.401
LKC2	- 0.647	0.212	9.340	0.00	0.524	- 0.341	0.115	8.825	0.00	0.711
ESA1	- 0.200	0.120	2.769	0.30	0.819	- 0.070	0.083	0.721	0.39	0.932
ESA2	- 0.225	0.136	2.753	0.09	0.798	0.178	0.087	4.245	0.03	1.195
ESA3	- 0.029	0.126	0.053	0.09	0.971	0.383	0.083	21.293	0.00	1.466
ESA4	0.015	0.156	0.009	0.81	1.015	0.639	0.086	54.663	0.00	1.894
ESA5	- 0.060	0.169	0.125	0.92	0.942	0.608	0.090	46.110	0.00	1.836
ESA6	- 0.310	0.134	5.362	0.72	0.733	0.169	0.081	4.374	0.03	1.184
ESA7	0.178	0.143	1.548	0.02	1.195	- 0.544	0.147	13.707	0.00	0.581
FUND1	- 1.456	1.072	1.845	0.21	0.233	0.933	0.455	4.210	0.04	2.543
FUND2	- 0.639	0.325	3.868	0.17	0.528	0.251	0.255	0.970	0.32	1.285
FUND3	- 0.387	0.253	2.344	0.04	0.679	0.130	0.213	0.371	0.54	1.139
FUND4	- 0.552	0.250	4.885	0.12	0.576	0.061	0.210	0.084	0.77	1.063
E1	- 1.647	0.401	16.883	0.02	0.193	- 0.431	0.411	1.101	0.29	0.650
E2	- 1.618	0.412	15.397	0.00	0.198	- 0.055	0.415	0.018	0.89	0.946
E3	- 1.336	0.430	9.667	0.00	0.263	0.253	0.422	0.360	0.54	1.288
E4	- 1.227	0.517	5.628	0.00	0.293	0.598	0.456	1.723	0.18	1.819
REV1	- 0.323	0.183	3.107	0.01	0.724	0.038	0.130	0.085	0.77	1.039
REV2	- 0.237	0.153	2.401	0.07	0.789	- 0.096	0.108	0.798	0.37	0.908
REV3	- 0.488	0.231	4.445	0.12	0.614	0.104	0.136	0.580	0.44	1.109
REV4	- 0.231	0.256	0.813	0.03	0.794	- 0.222	0.166	1.774	0.18	0.801
REV5	- 0.304	0.292	1.085	0.36	0.738	- 0.068	0.170	0.161	0.68	0.934
REV6	- 0.465	0.376	1.530	0.29	0.628	0.071	0.201	0.125	0.72	1.074
REV7	- 0.483	0.308	2.463	0.21	0.617	- 0.075	0.168	0.202	0.65	0.927
REV8	0.792	0.482	2.701	0.11	2.207	0.175	0.377	0.216	0.64	1.191
EU	0.207	0.200	1.076	0.10	1.230	0.279	0.129	4.691	0.03	1.322

Note. *The reference category is Q25.1 (1.00); ^ Intercept; Year of Register: After 2019 (FUND1), Between 2015 and 2018 (FUND2), Between 2000 and 2014 (FUND3), Before 2000 (FUND4); Number of Employees: 1 to 9 employees (E1), 10 to 49 employees (E2), 50 to 249 employees (E3), 250 employees or more (E4); Annual Revenue: Up to 100 thousand (REV1), 100 to 500 thousand (REV2), 500 thousand to 1 million (REV3), 1 million to 2 million (REV4), 2 million to 5 million (REV5), 5 million to 10 million (REV6), 10 million to 50 million (REV7), 50 million or more (REV8), Do not know (REV9); Countries: Europe (EU)

Overall, categories Q25.0 and Q25.2 present complementary results. Accordingly, companies funded after 2019 have 2.543 times more probability of presenting a sustainability strategy, and companies in European countries are 1.322 times. The likelihood that the organization will abandon the project of sustainability transformation increases with the degree of personnel knowledge/competency gaps and lack of understanding of sustainability integration. Similarly, the likelihood that the business will not transform sustainability increases with the degree of employee ignorance regarding their skills and knowledge regarding sustainability integration.

5. Discussion

The outcomes of this study empirically show that employees' knowledge/competencies, about sustainability or not, and sustainable innovations (both social and environmental) affect the businesses' transformation toward sustainability. This finding highlights the value of effective KM in promoting sustainable transformations in businesses. This is a relevant advancement, given that previous research has not adequately clarified the relationship between knowledge management and sustainability (Arduini et al., 2023). Furthermore, our results are aligned with previous research that indicates such a need, adding continuous innovation with a focus on shared value creation (Nonaka & Takeuchi, 2021a; Rocha et al., 2022) and the relevance of KM to sustainability (Bolisani & Bratianu, 2018; Cugueró-Escofet & Rosanas, 2020; Durst & Zieba, 2020). In particular, our study supports the importance of developing rKM towards sustainability, in line with previous theoretical and conceptual research (Durst, 2021; Rocha et al., 2022). Moreover, our outcomes present empirical outcomes rather than only theoretical ones. Accordingly, addressing a call for a more collaborative and critical KM (Dumay, 2022), we point out the imperative to review and renew knowledge management practices since rKM offers a theoretical frame.

While the Eurobarometer survey only deals with generic, management-related knowledge and knowledge about integrating sustainability into the company's business model. We emphasize the reasoning and ethics necessary for developing transformations for sustainability. Looking at rKM elements, we underline practical wisdom (phronesis), an evolution KM. It puts "*the quality of knowledge and its application in the spotlight*" (Rocha et al., 2022). Additionally, phronesis brings "*pertinent rational and ethical support for addressing recent alterations in the corporate environment and for responsibly and sustainably aligning organizations for the future*" (Rocha et al., 2022). It requires a new work design for rKM covering the major areas of KM, e.g., knowledge creation, sharing, use, hiding, and memory.

Furthermore, our outcomes identified the value of companies' characteristics, such as the country and year of foundation, as they affect the relationship between knowledge/competence and the businesses' transformation toward sustainability. Also, our findings pointed out that companies in other stages of maturity did not show significant differences in the results. What is not common in research regarding KM and sustainability (Chaurasia et al., 2020). Likewise, our outcomes indicated no significance on the business size concerning employees' knowledge, which differs from previous research (Durst, 2021). It sheds light on possible future research to understand the degree and context where the business size relates to sustainable transformation and employees' knowledge and competencies.

The findings regarding the importance of employee competencies could inform the design of strategies focused on building employee knowledge and skills. It reinforces the value of establishing guidelines for the collection, storage, and use of knowledge and ensuring that the company's KM practices are aligned with the SDGs. For example, organizations should align their KM practices with sustainability goals, establish metrics to measure the effectiveness of their sustainability initiatives, develop and foster a culture of continuous learning, and provide training and development opportunities to support their employees in developing the competencies needed to contribute to sustainable business transformation. They should encourage employees to participate in communities of practice or provide opportunities for cross-functional collaboration to facilitate the sharing

and creation of knowledge. Also, KM strategies should aim to facilitate collaboration and co-creation among stakeholders and encourage the sharing of diverse knowledge and expertise; it can provide businesses with valuable insights and perspectives on sustainability. Moreover, digital technologies should be included to facilitate the sharing and dissemination of knowledge and support sustainable business practices. Accordingly, organizations can implement the abovementioned suggestions by aligning their KM initiatives with sustainability goals and values. For instance, it can establish a sustainability-focused KM team responsible for developing and implementing KM strategies that align with the SDGs. The team can also develop guidelines for ethical knowledge sharing and dissemination, ensuring that knowledge is shared responsibly and sustainably.

Therefore, the issue at hand is not to reinvent KM from scratch but to ensure that the company's KM initiatives are built on a value-driven foundation. Organizations adopting a value-driven approach can integrate their KM strategies with their core values and objectives, including their commitment to the SDGs. It helps the company focus its KM efforts on generating and sharing knowledge relevant to its sustainability goals and aligning with its overall mission and vision.

Overall, our study contributes to a deeper understanding of the role of rKM in promoting sustainable transformations in businesses. It provides tangible evidence, identifies best approaches, enhances stakeholder engagement, and advances the convergence of rKM and the SDGs. By identifying the value of KM and sustainable innovations, our study underscores the imperative to renew KM practices toward sustainability. Within this context, below, we underline relevant implications for theory and practitioners.

5.1. Implications for the field

This research contributes to KM literature and improves the understanding of the role of KM in business transformations toward sustainability. It addresses a call for a value-based KM addressing societal challenges through collaboration (Dumay, 2022; Durst, 2021). However, previous research approaches KM and sustainability (Bolisani & Bratianu, 2018; Chaurasia et al., 2020). This study is a pioneer in using empirical data from a large and stratified European Union sample and the rKM lens to discuss knowledge dynamics in business sustainable transformation. Second, it confirms and improves our understanding of the position of KM in business transformation toward sustainability, and even more, rKM is a valued-driven approach to KM. The third contribution is to the literature on sustainability. Our results report the lack of relationship between isolated actions of recycling or reusing and sustainable business transformation. Therefore, this study challenges the assumption that any single action could lead to the development of a transition to sustainability. Since empirical analysis identifies a lack of relationship between such single actions and sustainable business transformation, highlighting the need for a comprehensive approach to sustainability. Accordingly, research ought to examine how companies can address sustainability through integrated and collaborative approaches aligned with their KMP and KMS.

Previous research used data from the Middle East, arguing the need for employee competency management to foster desirable behaviors toward succeeding in a sustainable strategy (Daniali et al., 2022). Then, the fourth contribution was to demonstrate that the lack of knowledge/competencies impacts European start-ups while mature businesses and

non-Europeans do not. Thus, with our outcomes, we ascertain that further research is needed to understand how and why the European context is relevant in improving knowledge for the sustainable transition.

Considering the Knowledge Fields theory (Bratianu & Bejinaru, 2019) and the categorization of knowledge into three fields: emotional, rational, and spiritual knowledge, organizations should be aware of these fields and how they ought to be approached to foster business transformations toward sustainability. Particularly spiritual knowledge that shapes our forms of rational knowledge. Therefore, further research should identify how the interactions between the fields of knowledge are critical for sustainable business transformation and support the development of strategies to leverage these knowledge resources effectively.

5.2. Implications for practice

Regarding practical implications, it is inevitable to observe the relationship between lack of knowledge and problems in the transition to sustainability without thinking about the KM practices that must be updated to encompass this values-based component. Therefore, entrepreneurs and leaders should address this challenge by determining the KM structure and culture that can enable their organizations to build the competencies required for sustainability. This underscores the practical implication of updating KM practices to encompass a value-based approach.

Moreover, it is inexorable not to ignore society's demand for sustainable business (Durst, 2021; Nonaka & Takeuchi, 2021b; Rocha et al., 2022). In response to the growing demand for sustainable business, entrepreneurs and leaders must take practical steps and procedures to implement sustainability transitions. This includes developing protocols to share tacit knowledge, training on sustainability, embodying collective phronesis, and building an organizational culture that fosters sustainable habits. Collaboration with the supply chain and customer base is essential to bring sustainability competencies and strategies to the entire process of transforming into a circular business and similarly, developing integrated and collaborative transformations toward sustainability while supported by KMP and KMS addressing societal challenges.

Furthermore, entrepreneurs and leaders can strengthen sustainable transformations by addressing wicked challenges while embracing social and environmental innovations. Small businesses, in particular, can leverage this pathway as a stepping stone towards achieving sustainability goals. The key here is to power existing KM practices and supplement them with sustainability-related knowledge and competencies rather than reinventing KM from scratch. By adopting a values-driven approach to KM, organizations can unlock new avenues for growth, innovation, and competitive advantage while simultaneously contributing to the larger goal of achieving the SDGs.

6. Conclusion

The present study analyzed the impact of knowledge and competencies on companies' ability to innovate toward sustainability using the rKM lens. To accomplish this, we assessed various hypotheses through a multinomial logistic regression. The findings suggest that the absence of knowledge/competencies affects the development of sustainable strategies. Actions such as sustainable product or service development,

evaluating the company's impact on society, and switching to sustainable energy sources have a greater impact on the development of sustainable businesses than actions to reduce consumption or impact on natural resources or actions for involving employees in the management. Recycling or reuse actions have no impact. Therefore, this study's findings confirm and emphasize the need for companies to enhance their knowledge management practices, integrate socially responsible practices, and foster the transformation towards sustainability.

Nevertheless, this study also has some limitations. For instance, the database uses the constructs "*knowledge*" and "*competencies*" together in the items regardless of their ontological and epistemological diversity. Additionally, the number of variables used in the model was reduced. Therefore, future research should add more variables to find models with better sensitivity, specificity, and prediction of the independent variables. Likewise, we suggest future research that employs variables referring to other dimensions of knowledge management, i.e., digitalization. Furthermore, testing for the mediating effects of social and environmental innovation could be a promising avenue for future research. Lastly, to overcome the barriers related to knowledge management practices preventing companies from innovating toward sustainability, further empirical research should be developed, including longitudinal data, qualitative methods, and experiments. In summary, this study contributes new insights to the discussion about the role of (responsible) knowledge management practices in sustainable business transformation. We encourage future research to continue this debate as it is crucial for promoting sustainable development.

Author Statement

The authors declare that there is no conflict of interest.

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