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Beyond Monetary Considerations: The Transformative Role of Research and Development Information in Shaping Organizations' Environmental Performance, Evidence from Jordan

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Abstract

This study explores the dynamic interaction between Environmental Research and Development (ER&D) Information and the Organizations' Environmental Performance (OEP). The investigation involves the distribution of a questionnaire to Jordanian organisations listed on the Amman Stock Exchange. The Resource-Based View Theory is employed to validate this relationship. The research establishes significant positive connections between these variables by utilising partial least square structural equation modelling for data analysis. This study underscores the vital role of ER&D information as an intangible resource in enhancing OEP as a tangible environmental enhancement. The research contributes by broadening the scope of ER&D to incorporate its informational value beyond monetary considerations. Additionally, the empirical insights from the study offer invaluable guidance for policymakers and regulatory bodies aiming to foster sustainable business practices, particularly within developing nations.

Keywords: *Environmental Research and Development Information; Environmental Performance.*

Abstrak

Kajian ini meneroka interaksi dinamik antara Maklumat Penyelidikan dan Pembangunan Alam Sekitar (ER&D) dan Prestasi Alam Sekitar Organisasi (OEP). Penyelidikan ini melibatkan pengedaran soal selidik kepada organisasi Jordan yang tersenarai di Bursa Saham Amman. Teori Pandangan Berasaskan Sumber digunakan untuk mengesahkan hubungan ini. Penyelidikan ini mendapati hubungan positif yang signifikan antara pembolehubah-pembolehubah ini dengan menggunakan pemodelan persamaan struktur kaedah kuasa dua terkecil separa untuk analisis data. Kajian ini menekankan peranan penting maklumat ER&D sebagai sumber tidak ketara dalam meningkatkan OEP sebagai peningkatan alam sekitar yang ketara. Penyelidikan ini menyumbang kepada bidang ilmu dengan memperluaskan skop ER&D untuk menggabungkan nilai maklumatnya di luar pertimbangan kewangan. Selain itu, penemuan empirikal daripada kajian ini menawarkan panduan yang amat berharga untuk pembuat dasar dan badan pengawal selia negara yang bertujuan untuk menggalakkan amalan perniagaan yang mampan, terutamanya dalam negara-negara membangun.

Introduction

A notable and discernible shift has recently unfolded, characterised by a heightened emphasis from governments and societies on Organizations' Environmental Performance (OEP) (Imran et al., 2021; Matuszewska-Pierzynka, 2021; Wijethilake et al., 2017). This shift has given organisations an even greater spotlight, compelling them to elevate their dedication to environmental responsibility (Frempong et al., 2021; Ning et al., 2017; Qian et al., 2018). If organisations

disregard environmental considerations in their operations, it potentially jeopardises the fabric of their long-term sustainability (Qian et al., 2018; Xue et al., 2020).

As a result, it becomes an indisputable imperative for organisations to orchestrate strategic resource utilisation, a move that mitigates detrimental environmental effects and concurrently safeguards their operational sustainability (Huang et al., 2023; Silva & Oliveira, 2020). This impetus to enhance OEP drives relentless attempts to improve material efficiency, curb energy and water consumption, and streamline waste and emissions during production and service activities (Rae et al., 2015; Zhang et al., 2020).

According to Barney's (1991) pioneering work on the Resource-Based View Theory (RBVT), attaining competitive advantages that elevate corporate performance is contingent upon an organization's adept utilisation of its resources and capabilities. These resources encompass tangible and intangible assets, each difficult to replicate (Lin et al., 2020). Correspondingly, capabilities refer to the adeptness in harnessing assets to create product and service modifications that align with environmental needs (Kipyegon et al., 2018). This research capitalizes on these concepts, intending to improve OEP by harnessing the value embedded in Environmental Research and Development (ER&D) information as intangible resources.

ER&D is any R&D addressing environmental issues that manifest in various forms within organizations, each serving a distinct purpose and potential impact. Scott (2005) categorizes ER&D into three forms: R&D for processing, R&D for production, and R&D for organization management. Each type of ER&D yields valuable insights that guide decision-making processes toward environmentally responsible outcomes, promoting sustainable practices and OEP.

In the realm of R&D for processing, organisations channel efforts into devising innovative solutions to address environmental challenges. ER&D initiatives in this category focus on developing advanced waste treatment technologies. This type of ER&D reduces the environmental footprint by minimizing pollutants released into ecosystems (Alhadid & Abu-Rumman, 2014). Furthermore, Guoyou et al. (2013) highlight research on designing efficient and eco-friendly treatment processes for wastewater and emissions. ER&D initiatives foster the mitigation of adverse environmental impacts and position organizations as responsible stewards of the environment.

R&D for production entails refining production design to align with sustainable principles. This category involves improving the design to utilise resource efficiency, reduce energy consumption, and minimise waste generation (Huang & Li, 2017). In the domain of R&D for organisation management, ER&D becomes a driving force in enhancing overall corporate sustainability strategies. Wong et al. (2020) underline the significance of incorporating environmental management systems through ER&D initiatives. This approach aids in effective environmental governance, allowing corporations to adhere to regulations, reduce risks, and cultivate a culture of responsible practices.

Previous studies delved into the exploration of ER&D as practices or activities as potential catalysts for enhancing OEP (Huang et al., 2020; Tang et al., 2021; Zhu & Sarkis, 2004); however, there is a gap in the literature regarding the significance of ER&D informational value and its role in fostering informed decision-making within OEP. Furthermore, this study expands the understanding of ER&D beyond secondary studies that examine the amount spent on R&D to the extent the valuable information of ER&D can change OEP (Huang et al., 2020; Tang et al., 2021; Zhu & Sarkis, 2004). In other words, this study seeks to transcend the scope of previous secondary investigations, which often focused solely on the financial investment in R&D, by highlighting the transformative influence of ER&D information insights on shaping OEP (Jang, 2019). Organisations may access this information internally through practice

ER&D or externally through consultants. Hence, this study advocates for a comprehensive perspective that transcends mere procedural aspects and emphasises the pivotal role of ER&D's informational value, irrespective of its origin, to impact OEP, paving the way for organisations to bolster their environmental initiatives on a broader scale.

In a developing country context like Jordan, where environmental issues stemming from business activities persist (Aladwan, 2018; Arwa Abu Islaih, 2020; Fallah & Mojarrad, 2019), the urgency to address these concerns is pronounced (Asa'd et al., 2024; Bany-Yasin, 2019). Society and government's heightened concern about OEP stems from the business sector's prominent role in environmental degradation (Abdallah & Al-Ghwayeen, 2020; Abu Hajar et al., 2020). However, research on OEP in developing countries such as Jordan remains limited (Asa'd et al., 2024). This study employs primary data to uncover how ER&D information can reshape the OEP landscape for organizations listed on the Amman Stock Exchange (ASE). Furthermore, the study extends information accessibility, promoting a more holistic approach to ER&D information sourcing and its influence on OEP enhancement.

Accordingly, the study delves into the unexplored territory of the ER&D information-OEP nexus. This research's empirical insights provide valuable information for policymakers and regulatory bodies aiming to enhance environmental regulations (Bany-Yasin, 2019). The findings could facilitate the development of informed and contextually relevant policies that encourage organizations to prioritize ER&D, fostering a more sustainable business ecosystem. Thus, the research seeks to lay the groundwork for informed environmental decisions within organization practices. This effort holds the potential to contribute significantly to mitigating environmental problems in Jordan and beyond.

This study can contribute to several aspects. Firstly, unlike previous studies, this new perspective promotes aligning corporate strategies with sustainable practices, thus advancing the cause of environmental protection. Second, this research expands the scope of ER&D beyond traditional boundaries, such as practices and, how much money is spent on these practices, and how well R&D information can make an organisation's product design, operations, and management strategies greener. Hence, by exploring the potential of ER&D information to drive eco-friendly practices across multiple domains, this study unlocks innovative avenues for organisations to enhance their OEP and contribute to sustainability (Guoyou et al., 2013). Thirdly, by investigating OEP within the context of a developing nation like Jordan, this research extends beyond the typical focus on developed economies (Asa'd et al., 2024). The study acknowledges the unique challenges countries face in striving for sustainable development while addressing the environmental impact of business activities (Asiri et al., 2020). Based on these discussions, these multifaceted contributions collectively establish this research as a comprehensive and insightful attempt to augment the understanding and application of environmental management within organisations.

Literature Review

Organizations' Environmental Performance

The International Organization for Standardization (ISO) 4031 has defined an Organization' Environmental Performance (OEP) as "measurable results of an organisation's management of its environmental aspects" (ISO, 2013, sec. 3.9). However, Dragomir (2018) pointed out that this definition by ISO is rather general and concise, which consequently introduces some ambiguity. This matter is primarily due to the term "environmental aspects" having an open-ended meaning that lacks specificity and is challenging to quantify comprehensively. Consequently, this lack of clarity surrounding the term hinders researchers from achieving a consensus on the precise dimensions encompassed within this framework.

Prior research has examined OEP from several perspectives. Some studies focused on environmental influences and compliance with standards (Lisi, 2015; Pérez et al., 2007), while others delved into pollution and waste (Journeault, 2016). Additionally, scholars stated that OEP signifies an organisation's capacity to establish robust relationships with various stakeholders concerned about environmental issues (Henri & Journeault, 2010). Some scholars have highlighted integrating environmental considerations into production systems to reduce pollution and enhance product quality (Song et al., 2018). Similarly, Tam and Fernando (2018) emphasized OEP's utility in evaluating the environmental impacts of polluting activities. Correspondingly, De Burgos-Jimenez and Céspedes (2001) outlined that OEP's objective is to diminish the adverse environmental effects of corporate activities.

Environmental Research and Development Information

According to Scott (2005), ER&D encompasses all research and development attempts to mitigate or control activities with adverse environmental impacts. This category covers research on emissions reduction, developing new processes to minimise waste and emissions, creating environmentally friendly cleaning products, and investigating management practices. Therefore, ER&D serves as a valuable source of information for designing environmentally conscious products, services, processes, and overall activities.

Scott (2005) delineates ER&D into three distinct components. R&D is for production, R&D is for processing, and R&D is for organisation management. Firstly, ER&D for production revolves around crafting or modifying cleaner products and packaging by utilising environmentally friendly materials and energy production technologies, all while retaining the existing processing design. Illustrative examples encompass innovations such as energy-efficient washing machines, easily recyclable or reusable packaging, and inherently eco-friendly products like bicycles and insulation materials (Hao et al., 2019; Huang & Li, 2017; Lai & Wong, 2012; Sroufe, 2003; Wong et al., 2020; Wu, 2013; Zhu & Sarkis, 2004). Secondly, ER&D for processing concentrates on modifying processing and logistical procedures without altering the product design, aiming to curtail waste generation and resource consumption, notably energy, during these activities (Christmann, 2000; Huang et al., 2016; Lin & Ho, 2011; Roberts, 2003; Wong et al., 2020). Lastly, ER&D for management activities involves the exploration of green management practices to provide stakeholders with transparent insights into organisations' environmental initiatives, promoting accountability and fostering a positive corporate image (Birkinshaw et al., 2008; Chen, 2011; Maqsood et al., 2007; Tariyan, 2016; Zaman & Sedera, 2015).

Resource-based View Theory

RBVT is grounded in achieving competitive advantage. It operates because organisations should leverage their resources to establish a competitive edge. This theory, formulated by Barney (1991), posits that an organisation's competitive advantage is predominantly driven by its resources and capabilities. According to Barney, tangible and intangible resources, such as information, knowledge, water, energy, raw materials, personnel, plants, and equipment, are valuable, distinctive, and challenging to replicate.

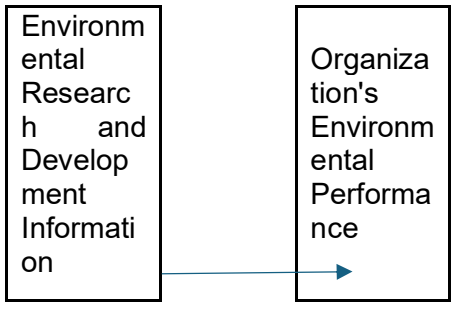
Within the framework of this theory, ER&D information is classified as an intangible resource that facilitates the effective management of tangible resources, thereby creating superior value for organisations and fostering long-term sustainability advantages (Montobbio & Solito, 2015; Page & Rautenstrauch, 2011; Rennings et al., 2006). Consequently, ER&D information insight can be harnessed by organisations to exploit and enhance their resources and capabilities to improve OEP by developing their sustainability advantages since this valuable resource is characterised by being

scarce, difficult to replicate, long-term orientation, and alignment with the environmental requirements of companies (Hart, 1995). In more detail, ER&D information aids in designing or redesigning cleaner products, optimising resource consumption through efficient processes, and curbing waste and emissions in operations. Furthermore, it facilitates the creation of environmentally friendly products at competitive prices, reduces material costs through resource efficiency, and consequently contributes to OEP (Alam et al., 2019; Ganda, 2018; Kusi-Sarpong et al., 2015; Lèbre et al., 2017; Oliveira et al., 2017; Reyes-Bozo et al., 2014; Teece et al., 2003; Tiwary et al., 2014).

Figure I illustrates the interconnections between ER&D information and OEP. In this paradigm, ER&D information is the independent variable, and OEP is the dependent variable. Concurrently, ER&D information acts as the driving force, propelling an understanding of variances in OEP. This matter emphasises that any alteration in ER&D information triggers a corresponding change in OEP. Based on this framework, this study suggested the following hypotheses:

H1: There is a positive and significant relationship between ER&D information and OEP.

Figure 1
Conceptual Framework



Previous study

Existing literature has provided valuable insights into the complex interaction between Environmental Research and Development (ER&D) and Organizational Environmental Performance (OEP)—for example, Shahbaz et al. (2020) examined how economic growth, R&D spending, financial development, and CO2 emissions from energy consumption interrelate in the UK context. Their findings emphasized the significant role of R&D investment in reducing CO2 emissions. Similarly, Alam et al. (2019) investigated the connection between R&D endeavours and CO2 emissions using data from various organizations. Their rigorous analysis, covering G-6 countries from 2004 to 2016, highlighted the substantial impact of R&D efforts on lowering carbon intensity.

Furthermore, Lee & Min (2015) scrutinized the link between ER&D investments targeting eco-innovation and the subsequent decrease in CO2 emissions within Japanese manufacturing firms. Their study, spanning from 2001 to 2010, revealed a noteworthy observation: eco-innovation leads to significant reductions in carbon emissions. While many previous studies relied on secondary data, primarily focusing on R&D spending and specific aspects of OEP, like CO2 emissions reduction, this study stands out by centring on ER&D use.

Methodology

The research methodology employed in this study embodies a systematic approach to examining the intricate relationships between ER&D information and OEP. A pilot study was initially conducted to ensure the robustness of the research instruments and the effectiveness of the data collection process. This phase aimed to fine-tune the questionnaire, refining its content and structure based on participant feedback, thereby enhancing the reliability and validity of the final research tool. Following the pilot study, the data were collected using a questionnaire distributed to ASE-listed organizations. This thorough process extended for about five months, commencing in mid-June and concluding in mid-December of 2022.

The survey questionnaire employed in this study was meticulously structured

into three distinct sections, each serving a specific purpose in capturing essential data about variables. The initial section of the questionnaire was designed to gather relevant information about organizations participating in this study, laying the foundation for contextual insights and analysis. The subsequent two sections were dedicated to probing the study's focal variables, encompassing ER&D information and OEP, thereby facilitating an in-depth exploration of their interrelationships.

The measurement of ER&D information encompasses a comprehensive set of ten items. These items were thoughtfully adapted from renowned scholarly works to ensure the questionnaire's reliability and alignment with existing research. Specifically, the sources included studies conducted by Guo et al. (2019), Oeptureanu et al. (2020), Cheng et al. (2014), and Ch'ng et al. (2021). These items inquire about the role of ER&D information in creating new eco-friendly products and services, sourcing environmentally friendly materials for design, minimizing waste generation and carbon emissions, mitigating environmental damage from waste, optimizing energy and water use, conserving resources in production processes, developing an environmental management system, and identifying avenues to reduce environmental costs.

Meanwhile, EOP's measurements comprise ten items thoughtfully curated from scholarly literature. These items were sourced from seminal works by Henri and Journeault (2010), Phan et al.(2018), Latan et al. (2018), Lisi (2015), and Spencer et al. (2013). It includes inquiries about the efficient use of energy, water, and resources and efforts to decrease waste generation and carbon emissions. Additionally, it delves into whether the firm actively recycles its waste, reduces costs through resource efficiency, mitigates liabilities related to environmental damage, enhances relationships with local communities, regulators, and environmentally conscious organizations, and improves compliance with environmental regulations regarding emissions and waste disposal.

From the initial distribution of 169 questionnaires to the complete list of organizations registered on ASE, 125 questionnaires were returned. After meticulous data screening procedures, four questionnaires were excluded due to instances of missing or incomplete data. As a result, the final dataset selected for comprehensive analysis comprised 121 valid cases. This carefully curated sample size holds particular significance as it meets the requisite criteria for employing advanced analytical techniques, specifically structural equation modelling (SEM) and partial least squares (PLS-SEM). This alignment with Hair et al.'s recommended sample size range (Hair et al., 2014) underlines the study's methodological robustness.

Strategically, this research utilized SPSS v26 and SmartPLS v4.0.8.7 to navigate different phases of our research analysis. SPSS v26 played a pivotal role in the initial stages of data preparation, serving as a reliable instrument for cleaning and organizing our dataset. Subsequently, SmartPLS v4.0.8.7 took the reins for hypothesis testing, particularly in measurement and structural models through PLS-SEM.

Results and Discussion

Descriptive Analysis

The organisational profiles are delineated based on fundamental attributes: sector, specialisation, age, and size. This comprehensive overview yields valuable insights into the diverse composition and characteristics of the included organisations, shedding light on their varying backgrounds and contributing factors. Initiating the analysis by distributing organisations across different sectors reveals a diverse landscape, with 24.8% operating in the industrial sector, 26.4% in services, and a substantial 48.8% in the financial sector. This sectoral diversity mirrors the intricate and varied nature of the study's participants. Examining organisations based on specialization uncovers a spectrum of industries, including pharmaceuticals, medical fields, chemicals, food and

beverages, mining, and extraction, emphasising the sample's heterogeneous nature and underscoring the study's inclusivity.

A well-balanced spread is observed regarding age distribution, with 24.0% of organisations under 16 years old, 40.5% falling within the 16 to 30-year range, and 35.5% surpassing 30 years of age. This variance reflects the dataset's breadth of experience and longevity. Similarly, the size distribution provides valuable insights, with 51.2% of organisations having fewer than 100 employees, 31.4% encompassing 100 to 500 employees, and 17.4% boasting more than 500 employees. This diverse range of sizes contributes to a holistic understanding of the participating organisations, effectively highlighting the intricate contextual backdrop of the study.

We conducted a deeper analysis within these categories to address whether the results differed based on sector, specialisation, age, and organisation size. Regarding the sector, we observed notable variations in environmental practices and impacts. For instance, organizations in the industrial sector exhibited higher levels of resource consumption and emissions than those in the services or financial sectors, which may be attributed to the nature of their operations. Similarly, when examining specialisation, industries such as pharmaceuticals and chemicals demonstrated a greater emphasis on environmental sustainability initiatives compared to others like mining and extraction, likely due to regulatory pressures or market demands. Age-wise, younger organisations tended to have more innovative approaches toward sustainability, while older ones often struggled to adapt to newer environmental practices. Additionally, we found that larger organisations generally had more resources to invest in sustainable initiatives, leading to greater environmental impact reduction than smaller counterparts. These findings provide valuable insights into the nuanced relationship between organizational characteristics and environmental practices, enhancing the depth and relevance of our study.

Assessment of Measurement Model

Hair et al. (2014) emphasised that the measurement model's reliability and validity should be assessed before hypothesis testing. This preliminary evaluation ensures the credibility of the model's underlying constructs. Per their guidelines, a valid measurement model should have factor loadings exceeding 0.40 for all analysed items in their respective constructs. In cases where an item's outer loading falls between 0.40 and 0.70, its deletion is considered if it significantly improves the Average Variance Extracted (AVE) and Composite Reliability (Hulland, 1999). Following these guidelines, 24 elements surpassed the permissible loading barrier, while six items were deleted to improve the model's quality.

The outcomes presented in Table 1, detailing the factor loadings, Cronbach's α, Composite Reliability, and AVE for the variables, provide a comprehensive evaluation of the measurement model's reliability and validity. Factor loadings indicate the strength of the relationship between each indicator and its underlying latent construct. The high factor loadings (e.g., above 0.7) suggest that the indicators effectively capture the intended constructs. The Cronbach's α values, which assess internal consistency, are well above the recommended threshold of 0.7, indicating the reliability of the scales. Additionally, the Composite Reliability values, also above 0.7, signify the internal consistency and reliability of the constructs. Furthermore, the AVE values, exceeding 0.5 for all constructs, conorganisation convergent validity, demonstrating that the indicators capture a substantial portion of the variance. These findings are consistent with established statistical guidelines for assessing measurement model factor loadings, reliability, and validity.

Table 1

Factor Loadings, Cronbach's α, Composite Reliability, and AVE

Variables	Items	Factor loadin	Cronbach's α	Composite Relia	AVE

		g		bility	
ER&D information	ER&D1	0.814	0.894	0.898	0.575
	ER&D10	0.666			
	ER&D2	0.759			
	ER&D5	0.732			
	ER&D6	0.799			
	ER&D7	0.708			
	ER&D8	0.798			
	ER&D9	0.775			
OEP	OEP1	0.810	0.875	0.885	0.533
	OEP2	0.798			
	OEP3	0.703			
	OEP4	0.623			
	OEP5	0.707			
	OEP7	0.780			
	OEP8	0.709			
	OEP9	0.690			

The outcomes from Table II, which displays Fornell and Larcker's criterion results, offer insights into the discriminant validity of the model's latent constructs. The diagonal elements represent the square root of the AVE for each construct, while the off-diagonal elements are the correlations between the constructs. Fornell and Larcker's criterion assesses discriminant validity by comparing the square root of the AVE for each construct with the correlations between that construct and all other constructs. In this scenario, the diagonal values (AVE values) are larger than the corresponding off-diagonal correlations, indicating that each construct has more variance captured by its indicators than shared with other constructs. This pattern supports the validity of the measurement model, as it suggests that the constructs have sufficient discriminant validity. These findings align with established statistical guidelines that consider constructs to have discriminant validity when the square root of the AVE for each construct is more than its correlations with other constructs (Fornell & Larcker, 1981; Hair et al., 2014).

Table 2

Fornell and Lacker's Criterion

Variables	ER&D Information	OEP
ER&D Information	0.758	
OEP	0.643	0.730

The findings presented in Table III, which depict the results of cross-loading analysis, provide insights into the convergent validity of the measurement model. Cross-loading analysis assesses whether each indicator predominantly loads on its intended construct and not on other constructs. In this context, the matrix displays the loadings of each indicator on all constructs. The values in the diagonal elements are the highest loadings for each indicator, representing their primary associations with the intended constructs. The diagonal values are notably higher than the corresponding off-diagonal values, indicating that the indicators are more strongly related to their intended constructs than other constructs. This pattern supports the convergent validity of the measurement model, as it signifies that the indicators effectively measure the constructs they are meant to represent. These findings adhere to established

statistical criteria, where indicators should exhibit higher loadings on their designated constructs than other constructs to convergent validity (Fornell & Larcker, 1981; Hair et al., 2014).

Table 3

Results of the Cross-Loading

Variables	ER&D Information	OEP
ER&D1	0.814	0.524
ER&D10	0.666	0.371
ER&D2	0.759	0.540
ER&D5	0.732	0.339
ER&D6	0.799	0.611
ER&D7	0.708	0.496
ER&D8	0.798	0.519
ER&D9	0.775	0.462
OEP1	0.515	0.810
OEP2	0.492	0.798
OEP3	0.319	0.703
OEP4	0.325	0.623
OEP5	0.321	0.707
OEP7	0.445	0.780
OEP8	0.546	0.709
OEP9	0.628	0.690

Assessment of Structural Model

Table IV presents the outcomes of the bootstrapping process. The results of the path coefficient analysis reveal significant relationships between the variables in the proposed model. H1, which posits a relationship between ER&D information and OEP, is strongly supported with a path coefficient of 0.509 (t = 4.912, p < 0.01). This matter implies that higher levels of ER&D information positively influence OEP. These findings align with established statistical rules in path coefficient analysis, where the t-statistics and p-values are used to determine the significance of relationships between variables (Chin, 2010). The results underscore the importance of ER&D information in enhancing OEP.

Table 4

Results of Path Coefficient

H	Variables	Original Sample	Mean	Deviation	T Statistics	P Values	Result
H1	ER&D Information -> OEP	0.509	0.502	0.104	4.912	0.000	Supported***

Notes: Significant level at *** = p < 0.01, ** p < 0.05, and * p < 0.10

The R-square values provide insights into the amount of variance explained by the respective variables in the model (Hair et al., 2014). Table V shows an R-square value of 0.441, which explains around 44.1% of the variance in its associated outcome. These R-square values highlight the substantial contribution of OEP to the variability observed in their respective dependent variables. Considering these values in conjunction with other statistical measures is essential to assess the robustness and significance of the relationships within the model (Porter et al., 1993).

Table 5

Coefficient of Determination (R-square)

Variable	R-Square
OEP	0.441

Results and Discussion

This study aimed to investigate ER&D information and OEP within the context of Jordanian organisations. The study's findings have been presented and analysed in the previous sections. In this section, the discussion focuses on interpreting and contextualising the results within the existing literature, highlighting the study's contributions, implications, limitations, and potential avenues for future research.

The results of this study contribute to understanding how ER&D information impacts OEP in Jordanian organisations. The analysis revealed significant positive relationships between ER&D information and OEP—the positive relationship between ER&D information and OEO. The observed relationships between ER&D

information and OEP offer several practical implications for Jordanian organisations and potentially for organisations in similar contexts. First, organisations are encouraged to invest in developing and acquiring robust ER&D information. Such information equips decision-makers with valuable insights that can lead to informed choices, enhancing OEP. Second, organisations should prioritise strategies that improve OEP, recognising the role of translating ER&D information into actual environmental improvements. This matter could involve enhancing decision-making processes, improving quality, and promoting a culture of sustainability-focused decision-making.

The study's findings are noteworthy compared to existing literature, particularly regarding the relationship between ER&D information and OEP. The research uncovered a significant positive correlation between ER&D information and OEP within Jordanian organisations. This finding aligns with prior scholarly works, suggesting that organisations have the potential to augment their environmental performance by leveraging insights garnered from ER&D endeavours. Such insights enable the development of eco-friendly products, the optimisation of resource utilisation, and the implementation of sustainable practices. Consequently, strategic investments in ER&D coupled with the effective utilisation of ER&D information serve as pivotal mechanisms for organisations to enhance their OEP and actively contribute to environmental sustainability.

Moreover, the study marks a notable departure from conventional approaches concerning R&D, representing a qualitative shift in perspective. Rather than solely focusing on the financial allocations made by companies towards environmental objectives, the study underscores the importance of R&D information provision. In contrast to previous studies centred on monetary expenditures, this research emphasises the significance of information derived from R&D activities. Such information can emanate from internal R&D practices or be acquired from external sources such as consulting firms. This paradigm shift underscores the critical role of leveraging insights from R&D efforts to bolster environmental performance. By directing attention towards the informational value embedded within R&D activities, the study underscores the transformative potential of leveraging these insights to enhance environmental sustainability efforts. Besides, the study analysed differences in OEP and ER&D among organisations operating in different sectors. It found notable variations in environmental practices and impacts across sectors, with industrial organisations exhibiting higher resource consumption and emissions levels than services or financial sectors. These findings align with the literature, which suggests that sectoral differences may influence organisations' environmental performance and their investment in ER&D. Industries with higher environmental impacts may prioritise ER&D initiatives to mitigate their environmental footprint and comply with regulations.

Specialisation, Age, and Size of Organizations: The study also examined differences in OEP and ER&D based on specialisation, age, and size. It found that younger organisations tend to have more innovative approaches toward sustainability, while larger organisations generally have more resources to invest in sustainable initiatives. These findings are consistent with the literature, suggesting that organisational characteristics such as age and size may affect their environmental performance and capacity to engage in ER&D activities. Specialisation in certain industries, such as pharmaceuticals and chemicals, may also influence organisations' focus on sustainability and their investment in ER&D.

Finally, the study's findings suggest that organisational leaders and policymakers should consider designing interventions that strengthen the relationship between ER&D information, thereby enhancing OEP. These interventions could include training programs, workshops, and information dissemination efforts to improve decision-makers' understanding of the environmental implications of their choices.

Limitations and Recommendations for Future Studies

The study's findings may lack generalizability due to the small sample size limited to organisations listed on ASE. This suggests the need for more extensive and diverse samples in future research. Its cross-sectional design impedes causal inference, urging longitudinal or experimental designs. Reliance on self-reported measures may introduce bias, emphasising the need for mixed-methods approaches. Overlooking contextual factors like regulatory environments and industry characteristics highlights avenues for future exploration. Recommendations include longitudinal studies, mixed-methods approaches, comparative analyses, incorporation of external factors, and expanding the scope beyond ER&D information to understand environmental performance drivers comprehensively.

Conclusion

This article systematically examined the interplay between ER&D information and OEP within the context of Jordanian organisations listed on the Amman Stock Exchange. The study's empirical findings demonstrate significant positive relationships between ER&D information and OEP. The study's contributions include expanding the conceptual understanding of ER&D beyond conventional boundaries and emphasising the value of ER&D information in shaping OEP. The research intervenes in a developing country context, providing insights into unique challenges and opportunities. The study's methodological approach, focusing on primary data and contextual factors, adds a novel dimension to the literature on sustainable practices. Practical implications suggest that organisations should invest in robust ER&D information and prioritise strategies to improve OEP. Policymakers and organisational leaders could design interventions that strengthen the relationship between ER&D information and enhancing OEP.

While this study contributes valuable insights to understanding the relationship between ER&D information and OEP, several limitations must be acknowledged. Firstly, the study is focused on Jordanian organisations listed on the ASE, which limits the generalizability of the findings to other contexts and cultures. Future research should aim to replicate and extend this study to different regions to enhance the external validity of the findings. Second, the cross-sectional nature of the data hampers the establishment of causal relationships among variables. Longitudinal studies could provide insights into the temporal dynamics and causal directions of the relationships between ER&D information and OEP. Future research could delve deeper into the mechanisms that drive the mediation pathway. Fifthly, the study primarily focuses on organisations listed on a stock exchange, which might not fully represent all types of organisations. Future research could encompass a broader range of organisations, including non-listed entities, small and medium-sized enterprises (SMEs), and nonprofit organisations, to better understand the relationships under various organisational settings.

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