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Research Article

The Impact of Digital Human Resources Management on Environmental Sustainability: An Applied Study on Jordanian Cement Factories

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ABSTRACT

Jordanian cement factories strive for Digital Human Resources Management to achieve sustainable development in an uncertain and volatile environment. This study investigates the impact of Digital Human Resources Management (organizational vision, digital competence) on environmental sustainability (environmental approach, green products, environmental innovation). Relying on a descriptive-analytical approach and applying a questionnaire as the study tool to a simple random sample of the study population, which included all Jordanian cement factories, the study results showed a statistically significant impact at a significance level (α≤0.05) of Digital Human Resources Management with its dimensions (organizational vision, digital competence) on environmental sustainability with its combined dimensions (environmental approach, green products, environmental innovation) from the perspective of top and middle management in Jordanian cement factories. The results also indicated that the level of environmental sustainability from the perspective of top and middle management in Jordanian cement factories was moderate, while the level of Digital Human Resources Management from their perspective was high. Based on the study's findings, several recommendations were proposed.

Keywords: Digital Human Resources Management, Environmental Sustainability, Jordanian Cement Factories.

Introduction

Environmental issues arising from climate change, air pollution, and increased energy consumption have become more critical globally, particularly in emerging economies. Organizations in these economies need to adjust their operations, strategies, and processes to seek effective environmental innovations throughout the product lifecycle (Al-Samak & Al-Samak, 2019).

Consequently, organizations have sought to keep pace with scientific and technological developments in digital technologies that assist in the design and implementation of products and contribute to innovative environmental processes to address environmental protection pressures. As a result, Digital Human Resources Management has become an important means for companies to enhance sustainability. Digital technologies lead to environmental sustainability through Digital Human Resources Management's ability to support organizations in accessing and accurately analyzing data and information flows, thereby using resources more efficiently, working to reduce waste, and controlling pollution (Jahllol & Khudier, 2021).

Study Problem and Questions

Global discussions revolve around environmental sustainability based on the perspective of organizational capability. Technological capabilities, environmental capabilities, and innovation capabilities play a crucial role in promoting environmental sustainability. Digital Human Resources Management is a vital organizational capability that helps in

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the sustainable operation of companies in the information age. Digital technologies enhance organizations' ability to implement environmental practices, which may also affect environmental sustainability. However, very little research has explored the relationship between Digital Human Resources Management and environmental sustainability (Kajo & Al-Hussaini, 2023). Moreover, the existing literature remains insufficient in addressing the impact of Digital Human Resources Management on other aspects of environmental sustainability, especially for industrial companies.

At the same time, Digital Human Resources Management also requires significant investment in human and financial resources and may negatively impact performance if organizations do not have sufficient resources or fail to adapt the required processes and structure for Digital Human Resources Management (Karim & Abboud, 2023). Based on the above, this study focuses on the following main question: What is the impact of Digital Human Resources Management on environmental sustainability from the perspective of top and middle management in Jordanian cement factories? This question branches into several sub-questions:

- What is the level of Digital Human Resources Management from the perspective of top and middle management in Jordanian cement factories?
- What is the level of environmental sustainability from the perspective of top and middle management in Jordanian cement factories?

Study Objectives

This study aims to:

- Identify the impact of Digital Human Resources Management (organizational vision, digital competence) on environmental sustainability from the perspective of top and middle management in Jordanian cement factories. This main objective is further divided into the following sub-objectives:
    - To identify the level of Digital Human Resources Management from the perspective of top and middle management in Jordanian cement factories.
    - To identify the level of environmental sustainability from the perspective of top and middle management in Jordanian cement factories.

Study Significance

The significance of the current study lies in its focus on the level of Digital Human Resources Management and its impact on environmental sustainability from the perspective of top and middle management in Jordanian cement factories. Therefore, the significance of the study can be clarified from both a scientific and practical standpoint, as follows:

A. Scientific Significance

This study is expected to be significant for most researchers, analysts, and those interested in the study topic. By addressing Digital Human Resources Management and its impact on environmental sustainability, this study will provide up-to-date results that clarify the importance and concept of Digital Human Resources Management, its elements, and the ability to link all results to real-world events and evidence. Therefore, we hope that this study will be of great importance to researchers and those interested in the study topic, providing them with recent findings related to the subject.

B. Practical Significance

The practical significance of this study lies in understanding the impact of Digital Human Resources Management with its dimensions (organizational vision, digital competence) on environmental sustainability from the perspective of top and middle management in Jordanian cement factories. This understanding has implications for both the private and public sectors, which are the cornerstones of the global economy. The application of the findings of this study can benefit various organizations, adding scientific value and providing recommendations based on these results. The results included in the study are expected to be significant in both the topics of Digital Human Resources Management and environmental sustainability.

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Study Hypothesis

Based on the study model and to achieve the study objectives, the following hypothesis was formulated:

Main Hypothesis Ho: There is no statistically significant impact at a significance level (α≤0.05) of Digital Human Resources Management with its dimensions (organizational vision, digital competence) on improving environmental sustainability with its dimensions (environmental approach, green products, environmental innovation) in Jordanian cement factories.

Study Limitations and Delimitations

There are several spatial, temporal, thematic, and human delimitations specific to the study, as explained below:

- **Spatial Delimitation:** Jordanian cement factories.
- **Temporal Delimitation:** The first half of the year 2025.
- **Human Delimitation:** Top and middle management in Jordanian cement factories.
- **Thematic Delimitation:** Understanding the impact of Digital Human Resources Management on environmental sustainability from the perspective of top and middle management in Jordanian cement factories.

Previous Studies

The following is a review of the most relevant previous studies, from the most recent to the oldest:

Marinakis & White (2023) conducted a systematic literature review on Digital Human Resources Management in the fields of management, marketing, and finance, highlighting the impact of digital technologies such as artificial intelligence and blockchain on consumer behavior and green innovation. Sakinah (2023) addressed business management strategies for small and medium-sized enterprises in the digital age, noting the importance of adopting digital technology to enhance efficiency and market access. Sustainable Business Performance (2023) explored the role of green human resource management practices and responsible leadership in promoting sustainable business performance, focusing on positive environmental behavior as a mediator. Marinakis & White (2023) focused on the role of leadership in the success of Digital Human Resources Management processes, pointing to the importance of strategic guidance and organizational flexibility. Abdelrazaq et al. (2021) conducted a study in five-star hotels in Amman, Jordan, and found that sustainable operational practices, such as rationalizing water and energy consumption, contribute to improving environmental performance. Serio et al. (2020) showed that emerging organizations that rely on green production in Italy have higher survival rates compared to others, highlighting the importance of sustainability in organizational success. Wilson et al. (2020) reviewed the impact of Digital Human Resources Management on business models, emphasizing the need to adapt to digital changes to achieve sustainable success. Nosratabadi et al. (2019) provided a comprehensive review of sustainable business models, highlighting how to integrate economic, social, and environmental dimensions into organizational strategies.

The Concept of Digital Human Resources Management

Dhonoun et al. (2023) indicated that Digital Human Resources Management expresses procedures and policies for the technological modernization of information through the invention of new digital business models, aiming for the physical development of new service, commercial, and manufacturing processes. Kajo and Al-Hussaini (2023) pointed out that it is the process of exploiting the ongoing technological development to serve customers better and faster. Sai and Xiongfeng (2023) view it as increasing efficiency and effectiveness in workflow, reducing errors and increasing productivity, through the application of modern technology in all production and operational processes of organizations.

Environmental Sustainability

The term environmental sustainability dates to the early 1990s, through public discussions on the process of environmental sustainability at the United Nations Conference in Stockholm (1972), which included advocating for and improving the environment for future and present generations. A set of definitions for environmental sustainability has been proposed, but there is no agreement on the concept. Sommer (2023) defined environmental sustainability as all ideas that arise for a product through the manufacturing stages from beginning to end, including the production

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processes that this product undergoes, with the aim of reducing environmental risks, pollution, negative impacts, and the use of natural resources compared to the list of available alternatives.

It is an organizational activity that works to find significantly improved products or production processes with the aim of reducing environmental risks, confronting climate fluctuations, and pollution (Ali & Kadhim, 2022).

Dimensions of Environmental Sustainability

1. **Environmental Approach:** Any initiatives driven by the process that are preventive rather than curative and include improving current processes or increasing new production processes or solutions to reduce environmental impact, such as smoke purification devices, replacing raw materials, general improvement in equipment and technologies, and working on waste management, water conservation, and reducing energy consumption (Al-Mulla & Hussein, 2021).
2. **Green Products:** Products, goods, and services provided to customers that are significantly improved in technical specifications, materials, components, and applied technologies in a way that facilitates their use while preserving the environment (Shuliang et al., 2023). They are also the processes and procedures followed in organizations to introduce new products or services that are reusable or recyclable in a manner consistent with international standards for conserving resources and reducing environmental pollution (Yini et al., 2023).
3. **Environmental Innovation:** Environmental innovation has become an important factor in the sustainable competitive advantage of organizations. It is the process of applying new ideas to the factory with the aim of creating direct or indirect added value for customers through the incorporation of novelty in services, products, work organization, and marketing (Hammoudi & Kajo, 2023). Innovation processes in environmental management can be at the individual (micro) and collective (industry) levels. It represents a necessity for adapting to developments in the company's internal environment, with the aim of reducing environmental impacts and working to provide new technological opportunities for the company (Al-Abadi, 2022).

Study Methodology

The study population consisted of all top and middle management members in Jordanian cement factories. The sample was selected using a simple random sampling method to ensure accurate representation of the population, and the final sample size was 154 questionnaires. The study relied on secondary sources, including books, peer-reviewed scientific journals, and previous studies, in addition to primary sources represented by a field study using a questionnaire specifically prepared for this purpose, based on the study variables and related references. The questionnaire was adopted as the main tool for collecting primary data.

Validity of the Study Instrument

To ensure the validity of the study instrument, it was presented to a number of faculty members in Jordanian universities for review and to provide their opinions on its suitability, the clarity of its items for the dimension to which they belong, and its suitability for statistical analysis. Based on their opinions and modifications, several items were amended. Consequently, the study instrument consisted of (25) items. Regarding construct validity: the questionnaire has construct validity if its items actually measure what they were designed to measure. This was done by extracting the Pearson correlation coefficient for this purpose, based on (Sekaran, 2016), as shown in the following two tables:

Table (1): Correlation Coefficients of Instrument Items for the Digital Human Resources Management Axis

Dimension	Item	Correlation Coefficient with Axis	Correlation Coefficient with Dimension	Dimension	Item	Correlation Coefficient with Dimension	Correlation Coefficient with Axis
Organizational Vision	1	.737**	.853**	Digital Competence	6	.663**	.796**
	2	.681**	.794**		7	.689**	.753**

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	3	.733**	.855**		8	.691**	.758**
	4	.727**	.818**		9	.667**	.763**
	5	.583**	.644**		10	.721**	.721**

Correlation is statistically significant at the 0.001 level.

The table above shows that the correlation coefficients of the items with their main dimensions and with the total axis of the instrument representing Digital Human Resources Management are positive and statistically significant at 0.001 level. Therefore, the construct validity indicators of the instrument are high and suitable for the study purposes based on the Pearson correlation coefficient as follows:

Table (2): Correlation Coefficients of Instrument Items for the Environmental Sustainability Axis

Dimension	Item	Correlation Coefficient with Axis	Correlation Coefficient with Dimension	Dimension	Item	Correlation Coefficient with Dimension	Correlation Coefficient with Axis
Environmental Approach	11	.575**	.683**	Environmental Innovation	17	.684**	.766**
	12	.596**	.722**		18	.729**	.809**
	13	.710**	.832**		19	.789**	.846**
	14	.707**	.817**		20	.710**	.813**
	15	.689**	.779**		21	.775**	.819**
Green Products	16	.727**	.807**				
	22	.732**	.859**				
	23	.719**	.892**				
	24	.680**	.823**				
	25	.779**	.887**				

Correlation is statistically significant at the 0.001 level.

The table above shows that the correlation coefficients of the items with their main dimensions and with the total axis of the instrument representing environmental sustainability are positive and statistically significant at the 0.001 level. Therefore, the construct validity indicators of the instrument are high and suitable for the study purposes.

Reliability of the Study Instrument

The reliability of the instrument used to measure the variables (the questionnaire) was verified by calculating the Cronbach's Alpha coefficient using SPSS software. The result is statistically acceptable if the coefficient value is greater than or equal to (0.60) (Sekaran, 2016). The closer the value is to (1), or 100%, the higher the reliability of the study instrument. Looking at the results in Table (3), we find that the overall reliability coefficient (Cronbach's Alpha) for the questionnaire dimensions is high, reaching (0.874) for the total items, while the reliability of individual dimensions ranged between (0.811) as the minimum and (0.949) as the maximum. This means that the study instrument (the questionnaire) has a high degree of reliability and can be relied upon in the field application of the study.

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Table (3): Cronbach's Alpha Test Results for Questionnaire Items

Dimensions	**Number of Items**	**Internal Consistency Coefficient (Cronbach's Alpha)**
Digital Human Resources Management	10	.923
Organizational Vision	5	.846
Digital Competence	5	.811
Environmental Sustainability	15	.949
Environmental Approach	5	.826
Green Products	5	.907
Environmental Innovation	5	.869
Overall	**25**	**.874**

Normality Test

The researcher conducted a normality test for the collected data to ensure that it follows the normal distribution curve. The skewness coefficient was extracted, as was the kurtosis coefficient. It is assumed that if the skewness and kurtosis values are less than (1.960), this means that the data is normally distributed with a confidence level of (95%). Based on the test information shown in Table (4), which indicates that the data distribution was normal, as the skewness coefficient values were less than (1.960) for all study variables.

Table (4): Normal Distribution of Data Based on Skewness Coefficient

Variable Type	**Variables and Dimensions**	**Skewness Coefficient**	**Standard Deviation**	**Skewness Value**	**Kurtosis Coefficient**	**Standard Deviation**	**Kurtosis Value**
Independent Variable	Digitization	-0.073	0.177	-0.412	-0.207	0.353	-0.586
	Organizational Vision	-0.337	0.177	1.903	-0.141	0.353	-0.399
	Digital Competence	-0.127	0.177	-0.717	-0.351	0.353	-0.994
Dependent Variable	Environmental Sustainability	0.116	0.177	0.655	-0.408	0.353	-1.155
	Environmental Approach	0.046	0.177	0.259	-0.524	0.353	-1.484
	Green Products	-0.034	0.177	-0.1920	-0.614	0.353	-1.739
	Environmental Innovation	-0.236	0.177	-1.333	-0.144	0.353	-0.407

Table (5) refers to the One-Sample Kolmogorov-Smirnov Test to demonstrate the normal distribution of the study data.

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Table (5): One-Sample Kolmogorov-Smirnov Test Results

	Digitization	Organizational Vision	Digital Competence	Environmental Sustainability	Environmental Approach	Green Products	Environmental Innovation
Kolmogorov-Smirnov Z	0.482	1.617	1.070	0.955	1.135	0.949	0.985
Asymp. Sig. (2-tailed)	0.974	0.011	0.202	0.321	0.152	0.329	0.287

Table (5) shows that the data follow a normal distribution, as indicated by the results of the Kolmogorov–Smirnov test. This was confirmed by the values ranging from (.482 to 1.617), where the significance values (Sig) were all greater than (0.05), which is the significance level ($\alpha \leq 0.05$) adopted for the statistical treatment in this study (Gujarati, Porter, & Sangeetha, 2017).

Presentation of Data Analysis Results and Hypothesis Testing

Description of the Demographic Characteristics of the Study Sample

This part presents a description of the demographic characteristics of the study sample, which included gender and years of practical experience. Table (6) shows the distribution of the sample members according to gender.

1. Gender

Table (6): Frequencies and Percentages of Study Sample by Gender

Gender	Frequency	Percentage %
Male	96	66.2
Female	49	33.8
Total	145	100.0

It is clear from the results of Table (6), which shows the distribution of the study sample members by the gender variable, that the largest category of sample members are males, constituting (66.2%) with a count of (96) employees.

2. Years of Experience

Table (7): Frequencies and Percentages of Study Sample by Years of Experience

Years of Experience	Frequency	Percentage %
Less than 10 years	17	11.7
10 - 15 years	46	31.7
15 - 20 years	70	48.3
More than 20 years	12	8.3
Total	145	100.0

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The results in Table (7) regarding the study sample by years of experience showed that the largest category was '15 - 20 years', accounting for (48.3%) with a frequency of (70) individuals. Meanwhile, the category 'More than 20 years' had the lowest frequency, with (12) individuals representing (8.3%).

Means and Standard Deviations

This section reviews the responses of the study sample members to the questionnaire items related to the dimensions of digitization (Organizational Vision, Digital Competence) as the independent variable, and the dimensions of environmental sustainability (Environmental Approach, Green Products, Environmental Innovation) as the dependent variable, by measuring the mean and standard deviation for each item separately.

First: Description of Digitization Dimensions

Table (8): Description of Digitization Dimensions

Dimensions	Mean	Rank	Level
Organizational Vision	3.77	1	High
Digital Competence	3.72	2	High
Digitization (Overall)	**3.74**		**High**

Table (8) shows that the level of digitization, from the perspective of top and middle management in Jordanian cement factories, was high. The overall mean score for the study sample's responses regarding the digitization domain was (3.74). The table also indicates that the means for the sample's ratings of the digitization dimensions ranged between (3.72 and 3.7798), with a high evaluation level for all dimensions. The 'Organizational Vision' dimension ranked first with a mean of (3.7798).

First: The Dimension of Organizational Vision

Table (9): Means and Standard Deviations of the Sample Members' Responses to the Items of (Organizational Vision)

No.	Item	Mean	Standard Deviation	Importance Rank of Items	Assessment Level
1	The factory's strategy clarifies the Digital Human Resources Management mechanism	3.8936	.84611	2	High
2	The factory's vision includes Digital Human Resources Management processes	3.9947	.78418	1	High
3	The factory's objectives include Digital Human Resources Management processes	3.5638	.93715	5	Medium
4	The factory's mission includes Digital Human Resources Management processes	3.7606	.87211	3	High
5	The factory's strategy defines the targeted level of Digital Human Resources Management	3.6862	.98785	4	High
	Overall Organizational Vision	**3.7798**	**.69913**		**High**

Table (9) indicates that the overall indicator reached (3.7798) of the total scale area for the strategy, which reflects a high level of importance from the respondents' perspective. It is noted from Table (9) that item (2), which states "The

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factory's vision includes Digital Human Resources Management processes," ranked first with a mean of (3.9947) and a standard deviation of (.78418), reflecting a high level of importance. On the other hand, item (3), which states "The factory's objectives include Digital Human Resources Management processes," obtained the lowest mean of (3.5638) with a standard deviation of (.93715), reflecting a medium level of importance.

Second: The Dimension of Digital Competence

Digital competence is one of the dimensions of Digital Human Resources Management, where the means and standard deviations of the responses of the study sample members regarding the Digital Human Resources Management items from the perspective of the upper and middle management in Jordanian cement factories were found.

Table (10): Means and Standard Deviations of the Sample Members' Responses to the Items of (Digital Competence)

No.	Item	Mean	Standard Deviation	Importance Rank of Items	Assessment Level
6	The organizational structure provides opportunities for information exchange and enhances communication among employees	3.9255	.93350	1	High
7	Information systems support knowledge management processes in the factory	3.5745	1.03407	5	Medium
8	The factory possesses a developed information system that leads to positive outcomes in adopting Digital Human Resources Management	3.7766	.81633	2	High
9	The software available in the factory is flexible for use by more than one beneficiary at the same time	3.6809	.86788	4	High
10	The factory employs programmers who can operate the software with high skill	3.6862	.98242	3	High
	Overall Digital Competence	**3.7287**	**.70219**		**High**

Table (10) indicates that the overall indicator reached (3.7287) of the total scale area for digital competence, which reflects a high level of importance from the respondents' perspective. It is noted from Table (10) that item (6), which states "The organizational structure provides opportunities for information exchange and enhances communication among employees," ranked first with a mean of (3.9255) and a standard deviation of (.93350), reflecting a high level of importance. On the other hand, item (7), which states "Information systems support knowledge management processes in the factory," obtained the lowest meaning of (3.5745) with a standard deviation of (1.03407), reflecting a medium level of importance.

Second: Description of the Dimensions of Environmental Sustainability (Dependent Variable)

The dependent variable in this study is environmental sustainability. To determine the relative importance of environmental innovation with its dimensions (environmental approach, green products, environmental innovation), and to answer the second research question: "What is the relative importance of environmental innovation from the perspective of upper and middle management in Jordanian cement factories?", the means and standard deviations of the responses of the study sample members regarding the level of environmental sustainability from the perspective of upper and middle management in Jordanian cement factories were extracted.

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Table (11): Means and Standard Deviations of the Study Sample's Responses to the Dimensions of Environmental Sustainability

Dimension	Mean	Importance Rank of Items	Assessment Level
Environmental Approach	3.6053	1	Medium
Green Products	3.3479	3	Medium
Environmental Innovation	3.4383	2	Medium
Environmental Sustainability	**3.4638**		**Medium**

Table (11) shows that the level of environmental sustainability from the perspective of upper and middle management in Jordanian cement factories was medium, as the mean of the study sample's responses to the environmental sustainability domain reached (3.4638). The table also shows that the means of the study sample's estimates for the dimensions of the environmental sustainability domain ranged between (3.6053 - 3.3457), with a medium assessment level for all dimensions. The "Environmental Approach" dimension came in the first rank with a mean of (3.6053) and a medium assessment level, while the "Green Products" dimension came in the last rank with a mean of (3.3479) and a medium assessment level.

To determine the importance of each dimension of environmental sustainability from the perspective of upper and middle management in Jordanian cement factories according to the items belonging to it, the means and standard deviations were calculated, and the following are these results.

Environmental Approach

The environmental approach is one of the dimensions of environmental sustainability. The means and standard deviations of the responses of the study sample members to the items of the environmental approach from the perspective of upper and middle management in Jordanian cement factories were found.

Table (12): Means and Standard Deviations of the Sample Members' Responses to the Items of (Environmental Approach)

No.	Item	Mean	Standard Deviation	Importance Rank of Items	Assessment Level
11	The factory believes that environmentally friendly manufacturing reduces costs	3.7660	.86433	2	High
12	There are continuous updates in production lines to improve and develop the environmental product	3.7819	.88378	1	High
13	The factory works to reduce the waste of the production process that harms the environment	3.5266	1.02082	3	Medium
14	The factory uses renewable energy sources such as solar energy in manufacturing processes	3.5106	.97832	4	Medium
15	The factory uses environmentally friendly raw materials	3.4415	1.05048	5	Medium
	Overall Environmental Approach	**3.6053**	**.73925**		**Medium**

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Table (12) indicates that the overall indicator reached (3.6053) of the total scale area for attraction and selection, which reflects a medium level of importance from the respondents' perspective. It is noted from Table (5-10) that item (12), which states "There are continuous updates in production lines to improve and develop the environmental product," ranked first with a mean of (3.7819) and a standard deviation of (.88378), reflecting a medium level of importance. On the other hand, item (15), which states "The factory uses environmentally friendly raw materials," obtained the lowest mean of (3.4415) with a standard deviation of (1.05048), reflecting a medium level of importance.

Green Products

Green products are one of the dimensions of environmental sustainability. The means and standard deviations of the responses of the study sample members to the items of green products from the perspective of upper and middle management in Jordanian cement factories were found.

Table (13): Means and Standard Deviations of the Sample Members' Responses to the Items of (Green Products)

No.	Item	Mean	Standard Deviation	Importance Rank of Items	Assessment Level
16	The factory management works to introduce all that is new in the market to keep pace with environmental technological developments	3.4255	.96450	1	Medium
17	The factory possesses the capabilities that enable it to develop the product and improve processes	3.3404	1.01910	3	Medium
18	The factory works to provide environmentally friendly products to customers	3.2766	1.03835	4	Medium
19	Product packaging and wraps are recyclable	3.4202	1.04396	2	Medium
20	The factory continuously works to improve green products	3.2766	1.06880	5	Medium
	Overall Green Products	**3.3479**	**.87731**		**Medium**

Table (13) indicates that the overall indicator reached (3.3479) of the total scale area for green products, which reflects a medium level of importance from the respondents' perspective. It is noted from Table (14) that item (16), which states "The factory management works to introduce all that is new in the market to keep pace with environmental technological developments," ranked first with a mean of (3.4255) and a standard deviation of (.96450), reflecting a medium level of importance. On the other hand, item (20), which states "The factory continuously works to improve green products," obtained the lowest means of (3.2766) with a standard deviation of (1.06880), reflecting a medium level of importance.

Environmental Innovation

Environmental innovation is one of the dimensions of environmental sustainability. The means and standard deviations of the responses of the study sample members to the items of environmental sustainability from the perspective of upper and middle management in Jordanian cement factories were found.

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Table (14): Means and Standard Deviations of the Sample Members' Responses to the Items of (Environmental Innovation)

No.	Item	Mean	Standard Deviation	Importance Rank of Items	Assessment Level
21	The factory management encourages employees capable of innovation and design and provides them with the necessary requirements	3.5213	1.03137	2	Medium
22	The factory management benefits from information technology in the field of research and development	3.5691	.96489	1	Medium
23	The factory management is keen to create suitable conditions for research and development in the environmental field	3.4043	1.05789	3	Medium
24	The factory management could plan, control, and direct development projects	3.3936	1.04158	4	Medium
25	Marketing activities are characterized by reduced energy and natural resource consumption	3.3032	1.07404	5	Medium
	Overall Environmental Innovation	**3.4383**	**.83827**		**Medium**

Table (14) indicates that the overall indicator reached (3.343147) of the total scale area for environmental innovation, which reflects a medium level of importance from the respondents' perspective. It is noted from Table (15) that item (22), which states "The factory management benefits from information technology in the field of research and development," ranked first with a mean of (3.5213) and a standard deviation of (1.03137), reflecting a medium level of importance. On the other hand, item (25), which states "Marketing activities are characterized by reduced energy and natural resource consumption," obtained the lowest mean of (3.3032) with a standard deviation of (1.07404), reflecting a medium level of importance.

Hypothesis Testing of the Study:

Ho: There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of Digital Human Resources Management, as measured by its dimensions (organizational vision, digital competence), on environmental sustainability, as measured by its combined dimensions (environmental approach, green products, environmental innovation), from the perspective of senior and middle management in Jordanian cement factories.

Before testing the hypotheses and conducting regression analysis, it is essential to assess the suitability of the data for statistical analysis and ensure the absence of multicollinearity among the independent variables. Therefore, a multicollinearity test was conducted, which calculates two important indicators:

- **Variance Inflation Factor (VIF):** Multicollinearity is considered present if the VIF value is 10 or higher.
- **Tolerance:** The tolerance value should be 0.1 or higher to indicate acceptable levels.

Table (15): Variance Inflation Factor and Tolerance Test – *Coefficients*[a]

Collinearity Statistics		Model
VIF	Tolerance	
2.153	.464	Organizational Vision
2.634	.380	Digital Competence

a. Dependent Variable: DecisionMaking

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Table (16): Summary of the Linear Model for the Relationship between Digital Human Resources Management and Environmental Sustainability

Model Summary[b]						
Durbin-Watson	Std. Error of the Estimate	Adjusted R Square	R Square	R	Model	
1.884	.49032	.546	.553	.744[a]	1	
ANOVA[a]						
Sig.	F	Mean Square	df	Sum of Squares	Model	
.000[b]	76.027	18.278	3	54.835	Regression	1
		.240	184	44.237	Residual	
			187	99.071	Total	
Coefficients[a]						
Sig.	t	Standardized Coefficients	Unstandardized Coefficients		Model	
		Beta	Std. Error	B		
.003	2.999	.217	.075	.226	Organizational Vision	1
.153	1.435	.115	.083	.119	Digital Competence	
a. Dependent Variable: Environmental Sustainability						

The results shown in **Table (16)** indicate a **positive relationship** in testing the main hypothesis, which stated: *There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of Digital Human Resources Management, as measured by its dimensions (Organizational Vision and Digital Competence), on Environmental Sustainability, as measured by its combined dimensions (Environmental Approach, Green Products, and Environmental Innovation), from the perspective of senior and middle management in Jordanian cement factories.*

The correlation coefficient (R) was **0.744[a]**, which is statistically significant and indicates a strong statistical relationship between the independent variables and the dependent variable. The **R-square** value was **0.553**, which is also statistically significant, indicating that the dimensions of **Digital Human Resources Management** explain **55.3%** of the variance in **Environmental Sustainability**. The **significance level** (p-value) of **0.000** confirms this effect.

The F-test value was **76.027**, with a significance level of **0.00**, indicating significant variance in the ability of the independent variables to predict the dependent variable.

From the coefficients table:

- The **B** value for **Organizational Vision** was **0.226**, with a **t-value** of **2.999** and a significance level of **0.003**, indicating that this dimension has a statistically significant effect.
- The **B** value for **Digital Competence** was **0.119**, with a **t-value** of **1.435** and a significance level of **0.153**, indicating that this dimension does not have a statistically significant effect.

Based on these results, the **null hypothesis is rejected**, and the **alternative hypothesis is accepted**, which states that there is a statistically significant effect at the significance level ($\alpha \leq 0.05$) of **Digital Human Resources Management**, as measured by its dimensions (Organizational Vision and Digital Competence), on **Environmental Sustainability**, as measured by its combined dimensions (Environmental Approach, Green Products, and Environmental Innovation), from the perspective of senior and middle management in Jordanian cement factories.

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Results:

The following results were obtained:

- The results showed that the level of digitization, from the perspective of top and middle management in Jordanian cement factories, was high. As indicated by the means of sample responses for the digitization dimensions, the "Organizational Vision" dimension ranked first with a high evaluation level, followed by the "Digital Competence" dimension, also with a high evaluation level.
- The results also showed that the level of environmental sustainability, from the perspective of top and middle management in Jordanian cement factories, was medium. Furthermore, the mean scores for the environmental sustainability dimensions ranged from 3.3479 to 3.6053, indicating a medium evaluation level for all these dimensions. "Environmental Approach" ranked first with a medium evaluation level, followed by "Environmental Innovation" with a medium evaluation, while "Green Products" ranked last, also with a medium evaluation level. This can be interpreted considering the nature of work in Jordanian cement factories and their efforts to raise their performance level through environmental sustainability. Consequently, environmental sustainability contributes to enhancing the factory's operations in line with its vision and objectives.
- The results also indicated a statistically significant effect at the significance level ($\alpha \leq 0.05$) of digitization, represented by its dimensions (Organizational Vision, Digital Competence), on environmental sustainability (encompassing Environmental Approach, Green Products, and Environmental Innovation), from the perspective of top and middle management in Jordanian cement factories. This finding may be attributed to the high level of digitization observed, which consequently reflects positively on environmental sustainability practices from the perspective of top and middle management in these factories. For instance, Organizational Vision helps maintain the alignment of services/operations [implicitly enhancing efficiency and timely delivery], thereby boosting environmental sustainability. Additionally, the element of Digital Competence directly and rapidly contributes to achieving higher levels of environmental sustainability, potentially with lower costs.

Recommendations

Based on the results achieved by the study, it recommends the following:

- Preparing and conducting necessary training courses, seminars, and workshops continuously and periodically for employees, especially regarding developments in environmental sustainability processes.
- Working to enhance digitization processes in Jordanian cement factories with the aim of raising and increasing the efficiency of the environmental approach and developing performance.
- Conducting future studies on digitization and its implications for environmental sustainability in various sectors such as insurance companies, private hospitals, and pharmaceutical factories.

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