

The Effect of Information Systems and Knowledge Management Interaction on Cost Reduction in Algerian Industrial Sector Organizations

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Article Information

Article history

Received: 09 October 2025

Accepted: 13 December 2025

Published: 31 December 2025

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Suggested Citation

Bentata, A. (2025). The Effect of Information System and Knowledge Management Interaction on Cost Reduction in Algerian Industrial Sector Organizations, Finance and Business Economics Review, Vol. 9, No. 4, pp. 64-78.

DOI: 10.58205/fber.v9i4.2039

Abstract: This study aimed to analyze the effect of information system and knowledge management interaction on cost reduction in Algerian industrial sector organizations. A questionnaire was developed and distributed; which consisted of (125) subjects, (87) questionnaire of which were returned and analyzed. The main important results were: The existence of a significant effect of organizational requirements on cost reduction, also it turns out that there is no significant affection of technological requirements on cost reduction. This study aimed to analyze the effect of information system and knowledge management interaction on cost reduction in Algerian industrial sector organizations. A questionnaire was developed and distributed; which consisted of (125) subjects, (87) questionnaire of which were returned and analyzed. The main important results were: The existence of a significant effect of organizational requirements on cost reduction, also it turns out that there is no significant affection of technological requirements on cost reduction.

Keywords: Information System; knowledge Management; Interaction; cost; Algerian Organizations, industrial Sector.

1.Introduction

Today's business environment is witnessing rapid development in various fields. In light of this development, information has become an important element and a strategic resource. To keep pace with this development, any organization must have an information system. Numerous studies and research indicate the growing trend of organizations adopting information systems to benefit from them in processing the vast amounts of data and making sound decisions, based on the appropriate information they provide in terms of accuracy, timeliness, and modernity.

As a result of the highly competitive nature of today's markets, knowledge also plays a major role in the competitiveness and sustainability of organizations. Therefore, there is an increasing need to possess knowledge. (Ndlele & du Toit, 2001) believe that the success of organizations in the twenty-first century in a highly competitive market depends primarily on the quality of knowledge these institutions apply in their core business processes. (kanya, Ntaya, & Ahiauzu, 2010) emphasized in their study that possessing only the traditional mix of tangible assets alone is not sufficient to gain a competitive advantage without intangible assets, including information and knowledge, which represent the primary contributor to wealth in modern economies.

A firm's relentless pursuit of becoming the low-cost leader in its field is a powerful competitive imperative in markets where many buyers are highly price-oriented. Success in achieving a cost advantage and outperforming competitors stems from exploring all avenues for reducing costs and insisting on continuous cost reduction.

Current studies in the field of strategic management confirm the importance of costs as a fundamental pillar of achieving a low-cost advantage and a strong foundation for a project's survival and continuity in an environment characterized by rapid change, development, and intense competition. The primary objective of cost reduction is to offer lower prices compared to competitors offering similar, high-quality products, rather than an absolute lower cost.

The Algerian business environment was not immune to all these developments. Algerian business organizations in various sectors, including those in the industrial sector, were also affected. These organizations, in turn, seek to address these various challenges by developing their information systems and knowledge management, as well as building a database and knowledge base that includes various information and knowledge, which can be made available at the appropriate time and updated continuously. This database can be accessed and utilized to reduce costs and satisfy customers, thus enabling them to ensure their survival and continuity in an environment whose most prominent features are increasing competition.

Based on the above, the researcher was able to formulate the research problem as follows:
To what extent does the interaction of information systems and knowledge management affect cost reduction in industrial sector organizations in Algeria?

The research problem can be divided into a number of sub-questions:

- What is the impact of information systems requirements on cost reduction in industrial sector organizations in Algeria?
- What is the impact of knowledge management processes on cost reduction in industrial sector organizations in Algeria?
- What is the impact of the interaction of information systems and knowledge management on cost reduction in industrial sector organizations in Algeria?

1.1. Research Objectives

The research objectives are represented in trying to answer the questions contained in the research problem, which can be summarized as follows:

- Analyzing the impact of information systems requirements on cost reduction in industrial sector organizations in Algeria.
- Analyzing the impact of knowledge management processes on cost reduction in industrial sector organizations in Algeria.
- Analyzing the impact of the interaction of information systems and knowledge management on cost reduction in industrial sector organizations in Algeria.
- Providing a set of recommendations and proposals for the industrial sector organizations under study in light of the research findings.

1.2. Research Importance

The importance of the research can be summarized as follows:

The importance of the studied variables and their role in developing organizational performance. Today, no organization can do without building and using information systems to perform its work to ensure survival and continuity, especially in light of the tremendous development in information and communications technology and the necessity of constantly keeping pace with it. On the other hand, knowledge represents an important dimension in today's world, as societies have transformed into information and knowledge societies. Knowledge has become the primary source of achieving excellence, and whoever possesses it possesses power and control in the twenty-first century, in which the economy has become digital and knowledge-based. Therefore, the issue of the joint use of information systems and knowledge management on the one hand, and cost reduction on the other, and the resulting benefits are considered a matter of great importance that deserves research and study.

The results of such a study have practical importance in various business sectors that aspire to succeed in implementing both information systems and knowledge management, to benefit from the positives of these applications to achieve a high level of cost reduction.

1.3. Research Hypotheses

The focus will be on testing the following hypotheses:

Hypothesis 1: There is no significant effect of information system requirements on cost reduction in industrial sector organizations in Algeria.

Hypothesis 2: There is no significant effect of knowledge management processes on cost reduction in industrial sector organizations in Algeria.

Hypothesis 3: There is no significant effect of the interaction of information systems and knowledge management on cost reduction in industrial sector organizations in Algeria.

1.4. Previous studies

(Meihami & Meihami, 2014)'s study:

This study aimed to examine the relationship between knowledge management and achieving competitive advantages in industrial companies. To achieve the main objective of the study, a questionnaire was developed and sent to managers of institutions in the industrial zone. The results revealed a statistical relationship between knowledge management and achieving competitive advantages.

The results of testing sub-hypotheses using Pearson's coefficient showed the following:

- There is a significant relationship between knowledge management and product innovation amounting to (62%)
- There is a significant relationship between knowledge management and organizational performance amounting to (78%).

Ensour and Alinizi (2014)'s study:

Aimed to identify the impact of management information systems (MIS) technologies on the quality of service provided at Tabuk University, Saudi Arabia, from the perspective of employees.

The results of the study showed that employees' perceptions of IT at Tabuk University were high. Ease of use ranked first, followed by software, security, and hardware. This could improve the use of modern information systems to facilitate administrative procedures, increase employee efficiency, improve outcomes, and save time and money.

(Cantner, Joel, & Schmidt, 2009) 's study:

Aimed to analyze the effects of knowledge management (KM) on the innovation success of firms in Germany. A similar procedure was used on data from the German Innovation Survey (2003), comparing firms that implemented KM with similar firms with no KM implementation. The study focused on investigating the effects of KM techniques on the economic success of firms engaged in product and process innovations. The results of a similar analysis revealed the following:

- Firms that implement KM perform better in terms of higher than average sales shares with innovative products compared to their peers.
- KM has no significant effect on cost reductions associated with process innovations.

(Yu, Chang, & Liu, 2006) 's study:

This study was designed to develop quantitative models to measure the time, man-hour, and cost benefits resulting from knowledge management systems for an engineering consulting firm. The results of measuring the benefits of knowledge management systems were:

- Knowledge management systems approach can save (86.6%) of the cost of solving the problem in a traditional way.
- Knowledge management systems approach can save (73.8%) of the man-hour required to solve the problem in a traditional way.
- Knowledge management systems approach can save (63%) of the time required to solve the problem in a traditional way.

(Broderick & Boudreau, 1990) 's: included an interview with managers of the ten leading companies that are prominent in their use of human resources information systems. It was found that the managers of these companies were satisfied with the system and supported the possibility of the system achieving competitive advantages represented in: cost reduction, quality, and innovation.

2. Literature review

2.1. Information Systems: Definition and Importance

2.1.1. *Definition of an Information System:* (Laudon & Laudon, 1996, p. 9) define an information system as: "A set of interconnected components for collecting (or retrieving), processing, storing, and distributing information to support decision-making and control in organizations, as well as assisting managers and employees in analyzing problems, conceptualizing complex issues, and creating new products."

(Vidal, 2009, p. 5) proposed a primarily functional definition: "The function of information systems is to produce and store information representations for the operational system's activity, and then make them available, generally also in an interactive manner, to the decision-making system."

(Reix, Fallery, Kalika, & Row, 2011, p. 4) in their book *Information Systems and Organizational Management* attempted to propose a more modern definition: "An information system is a set of social actors that stores and transforms information representations and operational methods."

2.1.2. *The Importance of Information Systems:* Information systems play a fundamental role in any type of organization, for several reasons: Many organizations cannot develop without the extensive use of information systems. E-commerce would be impossible without significant investments in information systems. Organizations such as Amazon, eBay, or Google simply could not exist today without information systems. Service sectors (finance, insurance, real estate, travel agencies, medicine, and education) cannot operate without information systems. Retail companies such as Carrefour, Leclerc, PPR and its subsidiary (La Redoute), and industrial companies such as Renault, Airbus, and (Valeo), all need information systems to survive and evolve. There is a growing correlation between an organization's readiness to transform and use information systems and its ability to develop appropriate strategies (Laudon & Laudon, *Management des d'information*, 2010, p. 16)

2.2. Knowledge Management: Concept and Processes

2.2.1. *The Concept of Knowledge Management:* (Grundstein, 2012, p. 2) believes that knowledge can be defined from two different perspectives: One arises from information management and views knowledge as a higher level of information, often embodied as a triangle evolving from data, through information, and knowledge, to the pinnacle of wisdom. Knowledge here is understood as a thing or entity that can be managed and disseminated through the advanced use of technology. The second perspective views the problem from a social perspective. (Turban, Rainer R., & Jr. Poter, 2005, p. 87) described knowledge management as the process that helps organizations identify, select, organize, disseminate, transform, and apply information and expertise that are part of the organization's memory and that reside within the organization in an unstructured manner. (González & González, 2012, p. 130) refers to knowledge management as a system that deals with the collection and dissemination of knowledge for the benefit of the organization and the individuals who create it.

2.2.2. Knowledge Management Processes:

First: Knowledge Creation

As a result of the highly competitive nature of today's markets, there is an increasing need within organizations to create new knowledge, generate innovative concepts and ideas, and capture these concepts, ideas, and knowledge (Uriarte & Jr, 2008, p. 45)

The knowledge creation process relies on a double helix between tacit and explicit knowledge. The four methods for transforming knowledge are: (social interaction) from individual tacit knowledge to collective tacit knowledge; (embodiment) from tacit knowledge to explicit knowledge; (synthesis) from individual explicit knowledge to collective explicit knowledge; and (imitation/inspiration) from explicit knowledge to tacit knowledge (Uriarte & Jr, 2008, p. 7)

Nonaka asserts that knowledge creation is the essence of organizational learning (González & González, 2012, p. 131). (Choi & Lee, 2002, p. 176) adds that the organizational ability to create knowledge is the most important source of sustainable competitive advantage for the organization.

Second: Knowledge Storage

(Reix, Fallery, Kalika, & Row, 2011, p. 229) emphasizes that the challenge of the storage process is to provide quick and easy access to stored knowledge. Therefore, the organization must ensure that the acquired and shared knowledge is easily accessible to others. This can be done by storing information in a central location with sufficient reserves for easy retrieval (Uriarte & Jr, 2008, p. 61)

Third: Knowledge Dissemination:

Knowledge dissemination means making knowledge available in a form (format) that is useful to anyone in the organization who may need it, anywhere, and at any time (Turban, Rainer R., & Jr. Poter, 2005, p. 88)

(Uriarte & Jr, 2008, pp. 64-65) emphasizes that unless knowledge is disseminated effectively, its impact will remain limited.

Fourth: Knowledge Application:

Knowledge application is the solution to covering knowledge to ensure widespread use. Furthermore; Knowledge application translates information into practical tools, and knowledge application to the real world represents the application of knowledge in a clear and storable way (Karadsheh, Mansour, Alhwari, & El- Bathy, 2009)

2.3. The Relationship of Cost Reduction to Information Systems and Knowledge Management

2.3.1. The Concept of Cost Reduction: Low-cost advantage is one of Porter's types of competitive advantage. It is achieved through a superior position relative to the primary cost drivers. The cost leader delivers a product of acceptable quality at the lowest possible cost and seeks to create a sustained and significant cost gap with all other competitors (Tarafdar & Gordon, 2007, p. 161) . When employing a cost leadership strategy, the company must be careful not to use such aggressive price cuts that its own profits are low or nonexistent. It must continually pursue cost-saving technological breakthroughs or other value chain advancements that could weaken or destroy the company's competitive advantage (David, 2011, p. 153).

2.3.2. The Concept of Continuous Cost Reduction: The strategic value of a cost advantage depends on its sustainability. Sustainability will be achieved if the company's sources of cost advantage are difficult for competitors to copy or imitate (Porter, 1985, p. 97). He adds that a cost advantage is sustainable if barriers to entry or ease of movement exist that prevent competitors from imitating its sources.

According to (Varricchio & Bishop, 2009, p. 10), the concept of continuous cost reduction involves moving beyond cost reduction and into a more challenging area of thinking about how an organization uses its financial and human capital, and how to effectively allocate these resources to serve customers and generate appropriate returns for investors.

2.3.3.vCritical Elements of Continuous Cost Reduction: For long-term cost reduction, companies need to address their cost reduction efforts and needs through value, velocity, and culture. **Value:** can only be achieved by examining each component of spending, and it is important to recognize and support priorities that will help drive longer-term revenue growth. **Velocity:** Velocity is the flow or timing of cost reductions, which results from a balance of long- and short-term savings. Velocity can be improved by having effective project management and appropriate project location. **Culture:** Changing the culture within

an organization is essential to achieving and maintaining continuous cost reduction, and culture supports the shift of spending to performance-focused activities (Varricchio & Bishop, 2009, p. 5)

2.3.4. Information Systems, Knowledge Management, and Cost Reduction: Cost reduction today takes new forms: for example, the use of data mining improves mail efficiency by selecting a probability reduction rule that is sensitive to the proposed offer, enabling profitability through savings in postal fees. E-commerce companies use their systems to avoid shipping costs for millions of consumers. Another way to reduce costs is the systematic use of internal measurement indicators, which allows for comparison of the performance of the organization's various units. This requires a sophisticated control information system (Delmond, Petit, & Gautier, 2007, p. 119). In a study conducted by (Jayasundara, 2003) on the impact of the human resources information system on cost reduction, it was shown that this system, as a type of functional information system in the organization, contributes to cost reduction by:

Saving time: This is achieved through:

- ✓ Easy access to data
- ✓ Automating administrative process
- ✓ A Self-service for employees
- ✓ sufficient information base that leads to making appropriate decisions, at the appropriate time
- ✓ Quick response to employee inquiries to improve efficiency and productivity.

Reducing costs:

- ✓ Spending less time completing tasks = less money
- ✓ Reducing paperwork
- ✓ Accuracy and timeliness in decision-making, at lower costs.

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In another study conducted by (Broderick & Boudreau, Human resource information systems for competitive advantage: interviews with ten leaders, 1991, p. 22), on the impact of the human resources information system on achieving competitive advantages, the study showed that this information system can contribute to reducing costs, especially by focusing on the advantages of computer applications in this, as follows:

- ✓ Reducing paper usage
- ✓ Standardized reports
- ✓ Increased accuracy in processing
- ✓ Spread of reports across departments
- ✓ Early warning of any deviation from goals
- ✓ Reduced need for HR experts
- ✓ Helping to spread the database of training costs to the organization's employees
- ✓ Increased opportunity for innovation in the field of controlling HR costs.

3. Research Methodology

3.1. Scientific Research Methodology Used

The research adopted the descriptive and analytical research methodology. At the descriptive research level, a desk survey was conducted and theoretical and field studies and research were reviewed. At the analytical field research level, a questionnaire was used to uncover the opinions of managers in both middle and upper management regarding a number of variables and hypotheses that form the basis of this scientific research. All data will be analyzed, and appropriate statistical methods will be used to process them through the program: Statistical Package for the Social Sciences.

3.2. Research community and sample

After the researcher identified the industrial sector organizations in Algeria as the subject of the study, she took a random sample of the managers of these organizations. The research

sample included two administrative levels (senior and middle management) of both genders, with multiple academic qualifications and varying experiences. The sample size to which the researcher distributed the research questionnaires was (125) managers, of which (87) questionnaires were returned, with a return rate of (69.6%), which is a good percentage.

3.3. Research Tool

3.3.1. *Tool Description:* A questionnaire was developed based on previous literature and studies, includes the following:

Part One: Includes information on the personal and functional characteristics of the respondent, which is useful in analyzing the characteristics of upper and middle management employees in the industrial sector organizations in the study sample.

Part Two: This part included a group of paragraphs, the number of which was (20) paragraphs measuring the information system (the first independent variable), where paragraphs (1-10) measured the organizational requirements of the information system in the study sample organizations, while paragraphs (11-20) measured the technological requirements of the information system in the study sample organizations.

Part Three: This part includes (20) paragraphs that measure knowledge management (the second independent variable), as follows: Paragraphs (21-25) measured knowledge creation, paragraphs (26-30) measured knowledge storage, paragraphs (31-35) measured knowledge dissemination, and finally, paragraphs (36-40) measured knowledge application.

Part Four: This part of the questionnaire included paragraphs measuring the cost reduction variable. The questionnaire also included open-ended questions, in case the researcher had any additions that were of interest to the analysis process and were not included in the questionnaire paragraphs.

3.3.2. Instrument Validity: To verify the validity of the instrument's content, the questionnaire was presented to a number of specialized arbitrators for the purpose of arbitrating it and verifying the validity of the content of its paragraphs.

After taking into account the comments and proposed amendments to some paragraphs, the arbitrators approved the questionnaire model.

3.3.3. *Instrument Reliability:* The reliability value was determined through Cronbach's Alpha.

Table .1. Reliability test (coefficient of Cronbach's Alpha)

Variable	Cost reduction	Knowledge management	information system	The overall reliability
reliability coefficient	0.879	0.912	0.947	0.965

Source: SPSS output

It is clear from the table that the reliability coefficients for all research variables are high and appropriate for the purposes of the study, indicating the consolidation of the overall concept of the questionnaire content and the concept of each question in it.

4. Statistical processing

The following statistical methods were used:

Descriptive methods: including numbers and percentages.

Analytical methods: A number of tests were adopted to verify the validity of the research hypotheses, including: (multiple linear regression analysis, interaction test for multi-way analysis of variance, Cronbach's Alpha coefficient)

5. Analysis of research results

5.1. Distribution of sample members according to personal and functional characteristics

The following table No. (2) shows the distribution of research sample members according to gender, age, academic qualification, and years of experience.

Table .2. Distribution of sample members according to the personal and functional characteristics of the sample

Personal and functional variables		Number	percentage	Personal and functional variables		Number	percentage
Type	Male	53	60.9		Vocational trainig	3	3.4
	Female	34	39.1		Master	14	16.1
Total		87	100		Doctorate	2	2.3
Age	less than 30	14	16.1		Other educational level	24	27.6
	From 30 to less than 40	37	42.5	Total		87	100
	From 40 to less than 50	29	33.3	Years of Experience	Less than 5 years	19	21.8
	From 50 to less than 60	07	08		From 5 to less than 10	26	29.9
Total		87	100		from 10 to less than 15	14	16.1
Scientific qualification	Secondary	09	10.3		from 15 to less than 20	09	10.3
	Bachelor	6	6.9		More than 20	19	21.8
				Total		87	100

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In terms of gender:

The number of males was (53) representing (60.9%), and the number of females was (34) representing (39.1%) of the total. Thus, the results reflected the dominance of male participation in holding senior and middle management positions in industrial sector organizations in Algeria.

In terms of age:

More than half of the study sample members are young and able to work, with 58.6% of the sample members being under 40 years of age. The age group (40 to less than 50) constituted 33.3%.

In terms of academic qualifications:

The research sample included different and similar academic qualifications, as most of the sample members hold a bachelor's degree, as the number of those who obtained this degree reached (29) administrators, and the number of those who obtained a master's degree reached (14) administrators, while the number of individuals who obtained a doctorate degree was (2) administrators. This indicates a high academic level of the research sample members as a result of the study sample organizations attracting university degree holders at high rates. It is also an indicator of the orientation of these organizations towards developing their cadres by attracting educated competencies capable of absorbing developments in the business environment, especially if we know that the sample members are general managers and their assistants, as well as managers of key functions and their assistants in these organizations.

In terms of years of experience:

The number of sample members with less than five years of experience was (19) administrators, representing a percentage of (21.8%), followed by the category (from 5 to less than 10 years) (26) administrators, representing (29.9%). Thus, the first and second categories, respectively, constituted (51.7%) of the total number of members of the industrial sector organizations in the research sample. This large percentage of administrators with little experience represents an indicator of the appointment of new workers, and also indicates that there is a wide scope for the organizations under study to adopt an effective development strategy for training and organizational education, in order to prepare the

necessary numbers of highly experienced administrators to perform their role with high efficiency in these organizations. The number of sample members from the category (20 years and over) amounted to (19), representing (21.8%), and the number of individuals whose years of experience were limited to (from 10 to less than 15 years) amounted to (14) administrators, representing (16.1%), and this is an indicator of the cumulative experience of workers and their job stability. The number of administrators whose years of experience were (from 15 to less than 20 years) represented (10.3%).

5.2. Hypothesis Testing

First Effect Hypothesis: There is no significant effect of information system requirements on cost reduction in industrial sector organizations in Algeria.

The effect of information system requirements on cost reduction was measured using a multiple regression method, the steps of which are explained below.

Table. 3. Summary of the multiple regression model to test the impact of information system requirements on cost reduction

Correlation coefficient	Regression coefficient	Regression coefficient Adj	standard error of estimate
0.649	0.421	0.407	0.461

Source: SPSS output

This can be explained by the fact that (42.1%) of the total deviations in the values of the cost reduction variable are explained by a linear relationship, and that (57.9%) of the variances are due to random factors, such as important variables that were not included in the model because they were not the subject of the researcher's study, or due to chance. This value of the regression coefficient constitutes a large and practically important explanation percentage, as nearly half of the variance in cost reduction is due to the information system, which calls for the necessity of using the information system as the most important indicator of cost reduction. This is consistent with the study of (Broderick & Boudreau, Human resource management, information technology, and the competitive edge., 1990). It is noted from the value of the corrected coefficient of determination ($\text{Adj.R}^2 = 0.407$) that it is close to the value of the uncorrected coefficient of determination ($R^2 = 0.421$), and therefore it can be said that the model is a good fit.

Table. 4. Results of the analysis of variance for multiple regression to verify the validity of the model for testing the impact of information system requirements on cost reduction.

Source	Degree of freedom	sum of squares	Mean squares	value of F calculated	Level of significance F
Regression	2	13.021	6.510	30.562	0,000
Error	84	17.894	0.213		
Total	86	30.914			

Source: SPSS output

From the table above, it is clear that the significance level of F, estimated at (0.000), is less than the significance level (5%), which prompts us to reject the null hypothesis, i.e., the regression is significant, meaning that the independent variables combined have a significant effect on the regression, or at least one of the regression parameters differs significantly.

To determine the effect of each independent variable on the dependent variable individually, we resort to the (T) test shown in the following table.

Table.5. Results of multiple regression analysis to test the impact of information system requirements on cost reduction

Variables	B	standard error	Beta	value of T calculated	Level of significance T
Fixed	1.734	0.269		6.439	0.000

organizational requirements	0.542	0.120	0.644	4.522	0.000
technological requirements	0.005	0.110	0.006	0.045	0.964

Source: SPSS output

It is clear from the statistical results shown in Table (5), and from following up the (Beta) coefficients, and the (T) test; that the value of the (Beta) coefficient for the organizational requirements dimension is (0.644), which is statistically significant at the (5%) level. The results indicated that technological requirements have no significant impact on cost reduction.

Hypothesis 2: There is no significant effect of knowledge management processes on cost reduction in industrial sector organizations in Algeria.

The effect of knowledge management sub-processes on cost reduction was measured using multiple regression.

Table.6. Summary of the multiple regression model to test the impact of knowledge management sub-processes on cost reduction

Correlation coefficient	Regression coefficient	Regression coefficient Adj	standard error of estimate
0.637	0.406	0.377	0.473

Source: SPSS output

This can be explained by the fact that 40.6% of the total deviations in the cost reduction variable values are explained by a linear relationship, and 59.4% of the variances are due to random factors, such as important variables not included in the model. This regression coefficient value represents a significant percentage of practical importance, as nearly half of the variance in cost reduction is due to knowledge management, which calls for the need to use knowledge management as the most important indicator of cost reduction. This is consistent with the studies of (Meihami & Meihami, 2014), (Yu, Chang, & Liu, 2006). And It is noted from the value of the corrected coefficient of determination (Adj.R2 = 0.377) that it is close to the value of the uncorrected coefficient of determination (0.406), and therefore it can be said that the model is a good fit.

Table. 7. Results of the analysis of variance for multiple regression to verify the validity of the model for testing the effect of knowledge management sub-processes on cost reduction.

Source	Degree of freedom	sum of squares	Mean squares	value of F calculated	Level of significance F
Regression	4	12.555	3.139	14.020	0.000
Error	82	18.359	0.224		
Total	86	30.914			

Source: SPSS output

From the table above, it is clear that the level of significance of F, estimated at (0.000), is less than the significance level (5%), which prompts us to reject the null hypothesis, i.e., that the regression is significant, or that the independent variables combined have a significant effect on the regression, or at least one of the regression parameters differs significantly.

To know the effect of each knowledge management process on the dependent variable, we resort to the (T) test as follows:

Table. 8. Results of multiple regression analysis to test the impact of knowledge management sub-processes on cost reduction

Variables	B	standard error	Beta	value of T calculated	Level of significance T
Fixed	1.200	0.377	-	3.180	0.002

Knowledge creation	0.165	0.094	0.225	1.758	0.082
Knowledge storage	-0.060-	0.094	-0.073-	-0.635-	0.527
Knowledge dissemination	0.208	0.116	0.235	1.796	0.076
Knowledge application	0.383	0.103	0.363	3.713	0.000

Source: SPSS output

It is clear from the statistical results in Table (8), and from following up the (Beta) coefficients, and the (T) test; that knowledge application has a positive and statistically significant effect at the (5%) level, as the value of the (Beta) coefficient reached (0.363), and that each of the variables related to (creating knowledge, storing knowledge, disseminating knowledge) has no effect on reducing costs, and therefore; they must be excluded from the model when using the model for prediction purposes.

Interaction Hypothesis: There is no significant effect of the interaction of information systems and knowledge management on cost reduction in industrial sector organizations in Algeria.

This hypothesis will be tested through the interaction test of the multi-way analysis of variance (Univariate of Analysis Variance), which is estimated in three stages:

A. Calculating the Base Model: To test the significance of the direct effect of the information system on cost reduction.

B. Calculating the Reduced Model: By introducing the second independent variable (knowledge management), to test the its direct effect in the model.

C. Calculating the Full Model: This model aims to test the effect of the interaction between the information system and knowledge management on cost reduction.

To test the significance of the effect of the second independent variable (knowledge management) on the relationship between information systems and cost reduction, the researcher compared the reduced model with the full model through the coefficient of determination (R^2).

The results of the interaction test for the analysis of variance regarding the effect of the interaction of the information system and knowledge management on cost reduction are shown in Table No. (9)

Table. 9. Results of testing the impact of the interaction of the information system and knowledge management on reducing costs

The model	The source	F	Level of significance F	The significance	Partial effect	Regression coefficient	Regression coefficient Adj
Base Model	Fixed	3335.251	0.000	significant	0.985	0.616	0.340
	information systems	2.232	0.004	significant	0.616		
Reduced Model	Fixed	2046.308	0.000	significant	0.990	0.863	0.441
	information systems	1.197	0.339	Not significant	0.623		
	Knowledge management	1.309	0.264	Not significant	0.644		
Full Model	Fixed	11379.223	0.000	significant	0.999	0.981	0.798
	information systems	3.436	0.037	significant	0.926		
	Knowledge management	3.638	0.031	significant	0.930		
	information systems * Knowledge management	3.866	0.031	significant	0.863		

Source: SPSS output

The first model showed that the information system explains (61.6%) of the variance in cost reduction, at a significant level of (0.05).

When knowledge management was included as a second independent variable alongside the information system in the reduced model, it was found that neither the information system nor knowledge management had a significant impact on cost reduction, with significance levels of (0.623 and 0.644), respectively. The explanatory power of the model increased from ($R^2_{\text{Base}} = 61.6\%$) to ($R^2_{\text{Reduced}} = 86.3\%$) when knowledge management was included in the reduced model, meaning that the explanatory power of the reduced model differed significantly from the base model when the model included only the information system as an explanatory variable.

However, when the interaction between the information system and knowledge management was introduced into the full model, it was found that there was a difference from the results in the reduced model, as there was a significant effect of both the information system and knowledge management on cost reduction, and the information system variable alone explained (92.6%) of the variance in cost reduction, while the knowledge management variable explained (93%) of the variance in cost reduction. The most important result is that the interaction between the information system and knowledge management significantly affects cost reduction at a significance level of (0.05), and explains (86.3%) of the variance in cost reduction, which is a high interpretation result that is not known without using the interaction between the two variables. This is consistent with the study of: (Bentata, 2017), (Yu, Chang, & Liu, 2006). As for the explanatory power of the full model after introducing the interaction, it became ($R^2_{\text{Full}} = 98.1\%$), i.e. an increase of (36.5%) over the basic model, and (11.8%) over the reduced model. This change in the percentage of explanation is a significant change, and of great practical importance, because it exceeds (5%).

It is clear from the above: the rejection of the null hypothesis, and the acceptance of the alternative hypothesis stating that **there is a significant effect of the interaction of information systems and knowledge management on reducing costs in industrial sector organizations in Algeria.**

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6. Research results

6.1. Results describing the research sample members

1. Improvement in the percentage of female participation in upper and middle management positions in industrial sector organizations in Algeria, which constitutes a social transformation in women's assumption of management positions.
2. Most of the age groups working in industrial sector organizations in Algeria are young people capable of working.
3. The high educational level of the study sample members is a result of attracting university degree holders at high rates. It is also an indicator of the orientation of these organizations towards developing their cadres by attracting educated competencies capable of accepting the idea of relying on information systems and knowledge management and benefiting from them to keep pace with modern developments in light of the fierce competition, especially if we know that the sample members are general managers and their assistants, as well as managers of key functions and their assistants in these organizations.
4. The large proportion of administrators with little experience in industrial sector organizations is an indicator of the attraction of new labor, and also indicates that there is ample scope for these organizations to adopt an effective development strategy for training and organizational education, in order to prepare the necessary numbers of administrators.

6.2. Results of testing research hypotheses

The first effect hypothesis of the research states the following: **There is no significant effect of information system requirements on cost reduction in industrial sector organizations in Algeria.** The results revealed the following:

1. It was found that the information system is associated with a significant positive relationship with cost reduction.

2. The information system requirements together explained approximately half of the variance in cost reduction, according to the corrected coefficient of determination.
3. There is a significant effect of organizational requirements on cost reduction.
4. Technological requirements do not significantly affect cost reduction.

The second hypothesis was formulated as follows: **There is no significant impact of knowledge management processes on cost reduction in industrial sector organizations in Algeria.** The results revealed the following:

1. Knowledge management is significantly positively related to cost reduction.
2. Knowledge management processes together explained approximately half of the variance in cost reduction, according to the coefficient of determination.

The results of the multiple regression analysis showed a statistically significant relationship between knowledge application and cost reduction in the business organizations under study at a significance level of (0.05). However, the results did not indicate a significant effect of knowledge management processes (knowledge creation, knowledge storage, and knowledge dissemination) on cost reduction.

4. Despite the varying degrees of influence of both the information system and knowledge management on cost reduction at the overall level, as well as at the level of sub-variables, the results of the current study reinforce the results of previous studies - which were referred to in the text of the study - in a way that reaffirms the importance of understanding the nature of the relationship and impact between the research variables, and of predicting this relationship and impact when investigating the levels of cost reduction that can be achieved through the information system and knowledge management.

Interaction hypothesis: **There is no significant effect of the interaction between information systems and knowledge management on cost reduction in industrial sector organizations in Algeria.** The following findings were found:

1. The information system has an impact on cost reduction.
2. Knowledge management has an impact on cost reduction.
3. The interaction between the information system and knowledge management has a significant impact on cost reduction.

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7. Research Recommendations

1. Focus on databases and knowledge through good design, which enables the collection and accumulation of the organization's knowledge and expertise, and its storage, processing, and distribution to stakeholders with the required quality, while protecting it from errors, intentional and unintentional sabotage, and working to update it continuously, thus forming a repository for generating ideas and knowledge used in solving various problems.

2. Ensure full freedom is granted to employees to create new ideas and knowledge that add to the existing knowledge repository, thus harnessing it to reduce costs.

3. Establishing a knowledge management system in every organization to partner with information systems and technology departments to reduce the organization's cost levels, taking into account the following aspects:

- This department should appear in the organizational structure;
- Its tasks should be defined as creating new knowledge, and storing and sharing that knowledge in a way that enables employees to benefit from it;
- Working to attract and appoint qualified knowledge managers capable of performing their knowledge roles;
- Holding training courses to familiarize the various administrative levels and employees with this branch of knowledge (knowledge management), and these courses should be conducted by experts specialized in this field.

4. Nearly half of the variance in cost reduction is attributed to information systems and knowledge management. This calls for continued attention to developing various types of information systems and enhancing the presence of integrated information systems. It also calls for a sustained focus on managing the knowledge possessed by individuals in various

job capacities, as this knowledge represents the foundation of these organizations' intellectual capital, contributing to cost reductions and expanding market share.

5. Focus on the knowledge application process because it has a significant impact on cost reduction.

6. Adopting a strategy for continuous training of information and knowledge workers, and allocating appropriate allocations for this, in order to create a sufficient balance of skilled human resources in the field of information systems and knowledge management, through:

- Adopting an organizational culture based on the culture of the learning organization.

- Training information systems administrators and users on information technology and operating systems by sending them to specialized courses and subjecting them to tests on the systems they were trained on, to ensure the effectiveness of their training on those systems. This training process should not be limited to how to use the systems alone, but should also include an understanding of the capabilities of the hardware and software used.

- Benefit from and utilize programs, training courses, and conferences held globally related to information systems and knowledge management, especially those held by study and research centers and various universities.

7. **Increase senior management support for information system users and administrators by:**

- Encouraging them to use the system, understanding their various needs, and surveying their opinions on the problems they encounter when using the system until these are overcome.

- Deepening the participation of system users, including administrators at various levels and specializations, and beneficiaries in the information system development process. This is to integrate the administrative and technical aspects of the information system. This is achieved by periodically surveying their suggestions and considering them as feedback to evaluate the effectiveness of the information system. This ensures the accurate identification of their information needs and reduces the time, effort, and costs incurred by the organization during the system development process.

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