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THE MEDIATING ROLE OF INFORMATION QUALITY ON THE RELATIONSHIP BETWEEN KNOWLEDGE MANAGEMENT PROCESSES AND EFFECTIVENESS OF MANAGEMENT INFORMATION SYSTEMS CASE STUDY OF CENTRAL BANK OF SUDAN

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Abstract

The study aims to investigate the mediating role of information quality on the relationship between knowledge management processes and the effectiveness of information systems at central bank of Sudan, the study used descriptive and analysis methods, The study used survey to data collection, (229) questionnaires were distributed, (177) questionnaires are returned and valid for analysis about (%77.29) of the sample size, Several statistical methods have been used. The study found that there information quality (accurate and currently) dimension mediates the relationship between knowledge management ((creation& storage), and (distribution& application)) dimensions and effectiveness of management information systems. These findings demonstrate the importance of knowledge management processes in driving the effectiveness of management information systems. For future, the study recommends to apply difference dimensions of (IQ) to mediate difference dimensions of (KM) with difference dimensions of (MIS) in other sectors.

Keywords: Knowledge management (KM), information quality (IQ), and Effectiveness (EMIS)

1. INTRODUCTION AND BACKGROUND

Banks of all kinds from local and large multinational banks rely on MIS advantages to guide their operations, simplify their operations, and keep the level of services in all, and provide stable level of services in all economic changes or during the periods of prosperity or crises. The success of organizations often depends on their ability to keep up with developments and face challenges, which requires them to adapt the rapid environmental changes. These changes give rise to many crises that threaten their survival and hinder their growth and progress. Solving these problems often involves knowledge management and leveraging experience to make appropriate decisions. In order to confront these crises, organizations must have an effective management information system that provides them with high-quality information to help them make decisions to solve problems. This information should be accurate, up-to-date, completeness, and relevant to the decision at hand. In recent times, information technology has provided capabilities to improve the performance of information systems and make them more effective, which positively impacts organizations' abilities to confront these crises.

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Sudan banking system faced many problems started since three years ago, the problem developing in unstable environment tile the war has broken out, and the banking system in Sudan has been directly affected by destruction, with banks, branches, and banking equipment being targeted. (ACAPS Thematic report: Sudan, 2023)[1]. This has led to the disruption of banking services and difficulties in financial transactions. This study suggests that the information quality reflects the relationship between knowledge management and the effectiveness of management information systems in the banking administration.

2. OBJECTIVE OF THE STUDY

The main objective of this study is to evaluate how information quality mediates the relationship between knowledge management processes and the effectiveness of information systems at central bank of Sudan

1. To evaluate how information quality factors influenced on the relationship between knowledge management factors effectiveness of management information system in the Sudanese system banks.
2. To know the relationship between knowledge management and effectiveness of management information system requirement.
3. To measure the information quality and on knowledge management and its impact on management information system.
4. To investigate that the banks manager respect knowledge management implementation and effectiveness of management information system.
5. To provide top management of banks with knowledge management which concerned with the effectiveness of management information system methods.

3. STATEMENT OF THE PROBLEM

As a result of wars in Sudan, System were rendered inoperable and subject to widespread acts of vandalism and looting. Additionally, e- payment applications and direct banking activities came to a standstill. Consequently, an acute liquidity crisis unfolded, exacerbated by opportunistic “brokers” who took advantage of the prevailing wartime circumstance (Ahmed Younes,2023)[2]. This problem has impacted on the banking system through the loss of important bank documents. It has highlighted the need to develop a knowledge society capable of providing professional banking services that meet customer needs through effective information systems and quality information. This study has been conducted to provide suggestions for solving this problem. Therefore, the aim of this research is to determine the mediating role of information quality in the relationship between the impact of knowledge management and the management information systems of central bank of Sudan.

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4. RESEARCH QUESTIONS

In order to fill some of the above research gaps, this study addresses the following question, and the one specific research question for the individual articles are:

1. Does the information quality (IQ) mediates the relationship between knowledge management process (KM) factors and effectiveness of management information system (MIS)?
2. Does the Knowledge management (KM) impact on information quality (IQ)?
3. Does the information quality (IQ) impact on effectiveness of (MIS)?

5. RESEARCH MODEL

This model was prepared depended on previous studies, as their independent variable study dealt with different points of view and different dimensions. Also showed of Information quality as the (mediates variable) on the relationship between knowledge management process as (independent variable) and effectiveness of management information system as (dependent variable) of this study.

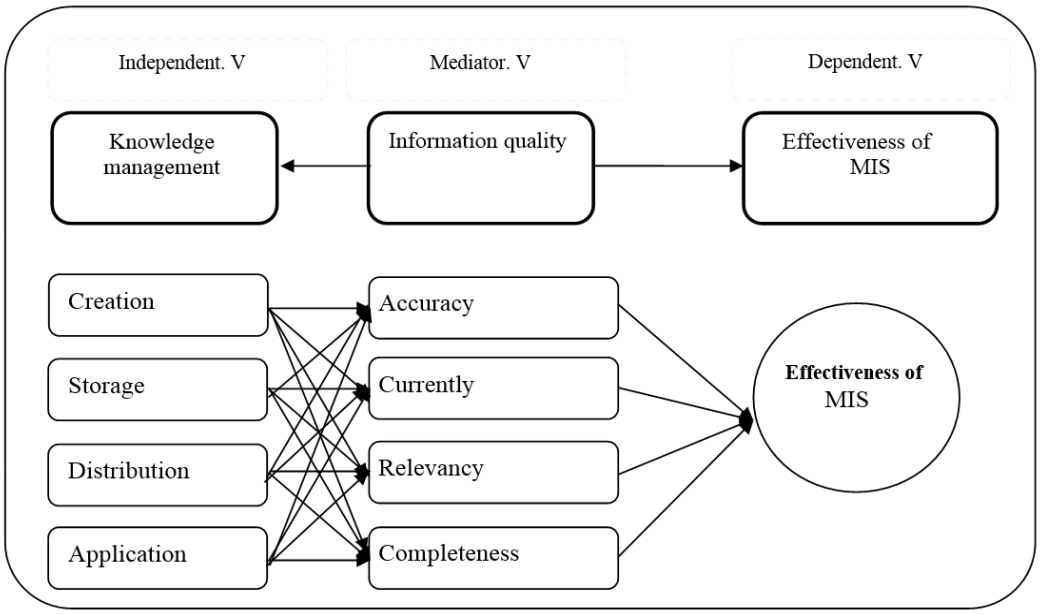

Figure 1

Source: prepared by researcher according to the previous studies, 2023

6. RESEARCH HYPOTHESES

According to the research model in figure (1), the model showed the main hypothesis; Information quality (accuracy, currently, relevancy, and completeness) mediates the

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relationship between knowledge management (creation, storage, distribution, and application) and effectiveness of management information system of central bank of Sudan sub-hypotheses can be configured as follows:

H_1 IQ- (accurate) mediates the relationship between KM- (creation, storage, distribution, and application) dimension and EMIS.

H_2 IQ- (currently) mediates the relationship between KM- (creation, storage, distribution, and application) dimension and EMIS

H_3 IQ- (relevancy) mediates the relationship between KM- (creation, storage, distribution, and application) dimension and EMIS

H_4 IQ- (completeness) mediates the relationship between KM- (creation, storage, distribution, and application) dimension and EMIS

7. REVIEW OF LITERATURE

7.1. Knowledge management

Knowledge management is the process of capturing, organizing, storing, and utilizing an organization's knowledge assets to enhance productivity, innovation, and decision-making. It involves creating, acquiring, sharing, and managing knowledge within the employees of an organization. Knowledge management is the process of gathering and collecting, organizes, shares and analyzes the knowledge and experiences between the employees in an organizations internal environment by; Chauvel, D., & Despres, C. (2002).[3]. Knowledge management (KM) is the collection of methods relating to creating, sharing, using and managing the knowledge and information of an organization. It refers to a multidisciplinary approach to achieve organizational objectives by making the best use of knowledge (Abubakar, et al, 2019)[4]. Knowledge management, decision-making style and organizational performance, knowledge management (KM) is the process of identifying, organizing, storing and disseminating information within an organization[5].

Knowledge management process:

The majority of literature and concepts dealt with knowledge management as a process, and most researchers in the field of knowledge management pointed to this. Knowledge derived from information and its internal and external sources does not mean anything without those processes that enrich it and enable access to it, participation in it, storage, distribution, preservation and retrieval with the intent of application. or reuse. Researchers and theorists in the field of knowledge management differed in the number, arrangement and names of these processes, although most of them referred to the core processes of knowledge management, which are knowledge generation, knowledge storage, knowledge distribution, and then knowledge application by Chauvel, D., & Despres, C. (2002)[6]

Also (Suleiman, A. A. M., & Abdel-Khair, A. Y. A. H. (2021)[7] believes that the diagnosis of knowledge is one of the important matters in any knowledge management program, and in the light of this diagnosis, policies and programs for other operations are put in place, because one

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of the results of the diagnosis process is determining the type of knowledge available and comparing it with what is required to know in order to determine the gap. The knowledge and effort that the organization needs to continue the new knowledge investment process, as well as among the results of the diagnostic process, discovering the organization's knowledge and identifying the people who hold it and their locations. While (Qi Yu, et al, 2022)[8] show " knowledge management processes operate sequentially and integrate with each other, if each process depends on, integrates and supports the other, the researcher found that knowledge management processes classified according to the previous studies and arranged as follows:

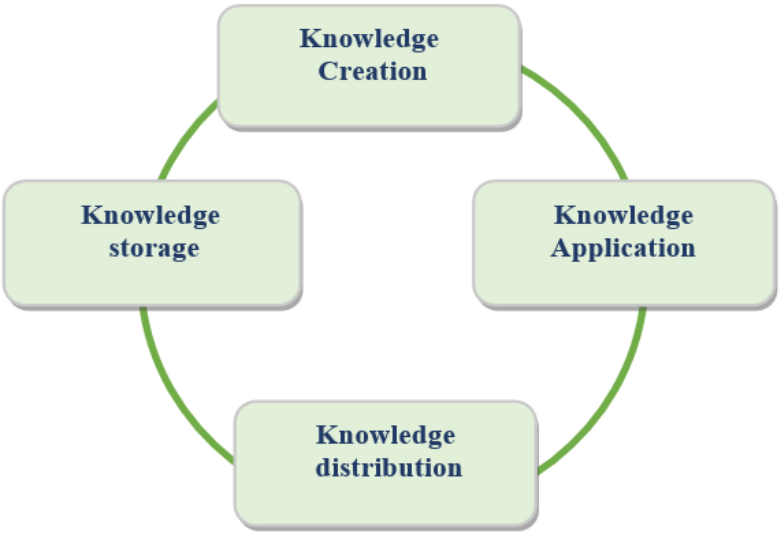

Figure 2: The basic core operations of knowledge management:

Source: The researcher from previous studies, (2023)

1. Knowledge creation:

Knowledge creation refers to the process of generating new knowledge or insights that were not previously known or understood. It involves transforming information, data, and existing knowledge into new ideas, concepts, or theories that have value and relevance (Tajpour, et al, 2022)[9].

2. Knowledge Storage:

Knowledge storage refers to the methods and systems used to store and preserve knowledge within an organization. It involves capturing and organizing knowledge assets in a way that ensures easy retrieval, accessibility, and long-term preservation. Effective knowledge storage is crucial for knowledge management and facilitates the sharing, reuse, and application of knowledge across individuals and teams (Al-Tit, A, et al, 2022)[10].

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3. Knowledge distribution:

Knowledge as an asset increases by use and participation, and by exchanging ideas, experiences and skills between people, it grows and maximize in each of them, so organizations have sought to encourage participation, and the process of distributing knowledge includes the following processes: distribution, publication, participation, flow, transfer and movement (Alavi, M., & Leidner, D. E. ,2001)[11].

4. Knowledge Application:

Knowledge is an old and renewed field, and interest in it has emerged for thousands of years, and today the modern organization views knowledge as an effective basis for achieving competitive advantage and for creativity and innovation processes, as knowledge is defined as one of the basic elements within an integrated chain that begins with signals and progresses to data, then to information, then to knowledge, then to wisdom, which is an effective basis for innovations. It is clear that effective, sound, and sufficient knowledge is the essence of wisdom, creativity, and innovations. One stereotypical framework classifies knowledge into explicit or apparent knowledge (Explicit Knowledge) and tacit knowledge- not clear (Tacit Knowledge) by Kucharska, W., & Rebelo, T. (2022)[12]. In turn, the researchers see that the practice of knowledge management processes helps to apply the concept of the emerging university in universities.

7.2. Information Quality

Concepts of Information quality;

There are various definitions for information quality provided by reviewing literature; "Information quality" is a measure of the value which the information provides to the user of that information. (Mohammed, E. M, et al, 2022)[13] and (Xie, D., et al., 2022)[14] propose a list of dimensions or elements used in assessing information quality as; (completeness, accuracy, format, currently, and relevancy), as follows:

1. Completeness; It assesses whether all the necessary and relevant information has been included and whether there are any gaps or missing elements.
2. Accuracy; It means that information should be free from mistakes, errors &, clear Accuracy means that the information is free from bias.
3. Currently; It refers to its timeliness or how up-to-date the information is. It indicates whether the data, facts, or details are current and reflect the most recent developments or changes in a given subject or topic.
4. Relevancy; It is information that is pertinent, meaningful, and applicable to the context in which it is being considered. Relevant information is typically sought after or utilized to gain understanding, make informed decisions, solve problems, or support arguments or clai.

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7.3. Effectiveness of management information system

MIS stands for management information System is a collection of systems, tools, network, procedures, store to produce useful information for every organization (Awan, A. G., et al 2016)[15]. The important of MIS is to get the most out of the management information system, you must exploit all its capabilities. Information systems gain their importance by processing data from an organization's inputs to generate useful information for managing your operations. To increase the effectiveness of the information system, you can either add more data to make the information more accurate or use the information in new ways, and perhaps the knowledge management operations department is the source of this data (Awan, A. G., et al 2016)[16] .The effectiveness of MIS is also influenced by other factors such as cost, integration with organizational processes, user acceptance, top management support, and compliance with laws and regulations.

In general, when MIS is well-designed and implemented, aligns with the organization's needs, and supports effective decision-making, it can contribute to increased efficiency, productivity, and overall performance improvement of the organization.

8. RESEARCH GAP IDENTIFIED

Previous studies have suggested that organizations need to study knowledge management process as independent variable in many different studies, knowledge Management variable found a great significant from the researcher according to Hayaeian, S., & Hesarzadeh, R. (2023).)[17] study analyze the mediating role of the KM process in turning intellectual capital (IC) and social capital (SOC) into innovation capability (INC) and sustainable performance (SUP) in SMEs, the sty found that the role of open innovation in the relationship between IC and SOC for KM, the relationship between KM, INC, and SUP, the relationship between INC and SUP, and the mediating role of INC in the relationship between KM and SUP, While (Mohammed, E., et al, 2023)[18] study the measure the impact of information quality on marketing strategic orientation, as descriptive study with different dimensions, this research found that the information quality dimensions impact on marketing strategic orientation dimensions, Also (Elhassan, R. A., et al, 2021)[19] show assessment of knowledge management application in banking sector of Sudan at farmer's commercial bank, The study found that the degree of application of knowledge management was medium in the field of knowledge creation and acquisition, (Abuaddous, H. Y., et al, 2018)[20] study the impact of knowledge management on organizational performance and the study found that KM including knowledge process and infrastructure capabilities affect positively in a huge manner on all aspects of organizational performance directly or indirectly. (Torabi, F., & El-Den, J., 2017)., 2017) [21]study the impact of knowledge management on organizational productivity, they demonstrated that not only productivity as result of sharing of knowledge management but also innovative contributions increased as a result of others' knowledge, expertise, or experiences. Also (Gonzalez, R. V. D., & Martins, M. F., 2017)[22] try to explain the knowledge management process: as a theoretical-conceptual research, this research aims to conceptualize this process, analyzing the main approach that guides the study of each stage, The results of this study

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indicate that the KM process consists of four stages: acquisition, storage, distribution, and use of knowledge. Also (Al-Ghazi, L. 2014)[23] study the role of knowledge management technology on improving outputs quality of higher education Institutions, the study aimed to explain the role of knowledge management processes in improving the quality outputs the higher education institutions applied in some Sudanese universities in Khartoum State, The study found there is significant statistical relation-ship between knowledge management processing and improving the overall outputs quality, while Al-Ghazi, L., 2014)[24] showed that there was a significant statistical effect of knowledge management (Creation, Storage and Application) on organizational performance using the balanced scorecard perspectives, From other way . Also (Kumar, P., 2023)[25] study the effects of in-store information quality and store credibility on consumer engagement in green retailing through difference dimensions.

Management information systems variable found a great significant from the researcher according to Al-Ahmad, N. M., & Alnajjar, F. J. (2009).)[26] investigate the impact of management information systems (MIS): (technological factors, structural factors and people) and organizations performance: (effectiveness, and efficiency) from the academic point of view at the Jordanian universities that have a business college, While (Esperanza, S. E., & Pribadi, S. A., 2020)[27] try to assessment and measurement of effectiveness and efficiency information systems in the field of government service through many items, Also (Jerry and William, 2005) [28]measuring the performance of information systems, their study model consists of three system output dimensions (systems performance, information effectiveness), this research study the mediating role of information quality on the relationship between knowledge management processes and effectiveness of management information systems at central bank of Sudan.

9. DATA PRESENTATION AND ANALYSIS

9.1. Measurements:

Identify the items that used to measure the study in the questionnaire used by previous studies in refereed journals and periodicals. The researcher adopted the questionnaire (closed) which determined the responses at central bank of Sudan allowed for each question, Bertram, D. (2007)[29] were rated on five-point Likert-type scales, from (strongly disagree to strongly agree), the measurement in this study will be five items evaluating on five -point scale where (1≡ strongly disagree), (2≡ disagree), (3≡ Not certain), (4≡ agree), and (5≡ strongly agree).

Measures were adapted from previously studied scales. Revisions were completeness d to appropriately adjust for the context of this study. A pretest was undertaken to determine specific dimensions used to measure knowledge management and to measure management information system details of the anticipated dimensions are discussed in the following section.

Also the previous study show effectiveness of information systems Measurements: (Esperanza, S. E., & Pribadi, S. A., 2020)[30] try to assessment and measurement of effectiveness and efficiency information systems in the field of government service through many items, they use Likert 5 scales, Also (Chang, J. C. J., & King, W. R. (2005)[31] measuring the performance of information systems, their study model consists of three system output dimensions (systems

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performance, information effectiveness), the study used the measurement which is mentioned in the table below in table (1):

Table 1: Dimensions measurements

Variables	Dimension	Items	Measured by
Knowledge Management	Creation	4	(Suleiman, A. & Abdel-Khair, A., 2021).
	Storage	4	(Suleiman, A. & Abdel-Khair, A. (2021).
	Distribution	4	(Tajpour, M., et al., 2022).
	Application	4	(Tajpour, M., et al., 2022).
Information Quality Dimensions	Accuracy	5	(Mohammed E. M., et al, 2022)
	Currently	5	((Xie, D., et al., 2022)
	Relevancy	4	(Mohammed E. M., et al, 2022)
	Completeness	5	(Mohammed E. M., et al, 2022)
Effectiveness of MIS	Effectiveness of MIS	5	(Sala and Subriadi, (2020)

Source: The researcher, 2023.

9.2. Reliability of the study tool:

Table: (9): Reliability Test for the pilot sample

Type	Variables	Dimension	items	Cronbach's Alpha
Independent	Knowledge Management	Creation	4	0.660
		Storage	4	0.808
		Distribution	4	0.778
		Application	4	0.707
Mediator	Information Quality	Accuracy	4	0.803
		Currently	4	0.763
		Relevancy	4	0.811
		Completeness	4	0.781
Dependent	Effectiveness of MIS	Effectiveness of MIS	5	0.856

Source: The researcher, 2023.

The results contained in Table (9) indicate that the reliability coefficients for the dimensions of knowledge management dimensions ranged between ranged between (0.660 - 0.808), while the reliability coefficients for information quality (0.763- 811) and management information system dimensions were (0.856),These values are considered acceptable for the purposes of this study.

9.3. Factor Analysis:

Factor analysis (FA) is a simple variate technique for analyzing the structure of interrelationships among a large number of variables by defining sets of variables that are highly interrelated (Al-Kubaisi, A. K. M. R., & Al-Shaher, M. I. A. M. (2023)[32].

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9.3.1. Factor analysis for dependent variable;

Table (4) showed that the matrix appeared in (2) factors and values of the second rotation contributions more than (0.5), the saturation greater than (0.5), The factor analysis of the terms of the independent variables was performed three times, and the (cut off point) was used less than (0.475), Some of variables items with (cross loading) were also deleted. This process resulted in the deletion of a number of items for each variable.

Factor analysis for independent variable (KM);

The knowledge management (KM) used as independent variable and its dimensions are (creation, storage, distribution, &application). Statistical analysis program (SPSS V.23) and obtained the rotation matrix shown in the table (2).

Table (4) shown all the remaining items has more than recommended value of at least 0.5 in measure of sample adequacy (MSA) with (KMO) (above the recommended minimum level of (0.60), and Bartlett's test of sphericity is significant ($p<.05$). Thus, the items are appropriate for factor analysis. The matrix showed that the primary analysis process divided the independent variables in (2) factors, which is known in the study model instead of (4) as it is known in the preliminary study variables (before the factor analysis process was done).

Table (2) also showed the items that used in the measurement of variables and the name of the corresponding variable when entering the data and whether it omitted or not. As result of this process (factor analysis) has omitted some of items for each variable. Where the first factor includes names of variables (KM1, KM3, KM4, KM5, KM6, KM8), the second factor it includes names of variables (KM10, KM11, KM13, KM15, KM16), According to the literatures, the researcher naming the first factor is (knowledge creation and store) with measured of the reliability of value of the Cronbach's alpha score over (0.822), and the second factor naming (knowledge distribution and application) with measured of the reliability of value of the Cronbach's alpha score over (0.788), The measured of reliability of the respondents and the value of the Cronbach's alpha, after the factor analysis and values are considered acceptable for the purposes and highly reliable of this study.

Also the table (2) showed that the factor analysis process has (omitted) some items of measuring the factors of knowledge management (KM), and the item that deleted is the name of the corresponding variables (KM2, KM7, KM9, KM12, QM14).The items of the questionnaire and the names of the corresponding variables in the analysis of the variable knowledge management.

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Table 2: Factor analysis for independent variable (*Knowledge management*) dimensions

Vr	Code	Items		Fact1	Fact2
Creation	KM1	Knowledge is gained from the experiences and expertise of the bank's employees	Not omitted	**0.862**	0.348
	KM2	The bank employees convert the knowledge latent in their minds into explicit knowledge	Omitted	0.397	0.362
	KM3	The bank is care with new ideas and suggestions proposed by employees.	Not omitted	**0.687**	0.323
	KM4	The bank uses experts and specialists to transfer their knowledge and experience to employees	Not omitted	**0.647**	0.363
storage	KM5	The bank has enough an electronic storage	Not omitted	. **857**	0.393
	KM6	The bank has an adequate database and it available for all employees	Omitted	**0.624**	0.486
	KM7	The bank cares about retaining knowledge and converting it from tacit to explicit	Omitted	0.279	0.136
	KM8	The bank uses expert systems in preserving knowledge	Not omitted	**0.932**	0.378
distribution	KM9	The information that employees need at work is available to them	Omitted	0.377	0.413
	KM10	The bank conducts training to develop staff skills to transfer and exchange new ideas	Not omitted	0.343	**0.767**
	KM11	The bank uses an effective information system in transferring and exchanging information	Not omitted	0.398	**0.822**
	KM12	The Bank has a professional communication system help to sharing the knowledge	Omitted	0.382	0.439
Application	KM13	The bank works to remove the difficulties that faced employees to apply knowledge	Not omitted	0.378	. **932**
	KM14	The bank works to transform knowledge into action plans	Omitted	0.439	0.387
	KM15	The bank has a strategic knowledge management plan	Not omitted	0.398	**0.68**
	KM16	The bank uses explicit knowledge in all of the bank's activities	Not omitted	. 399	**0.716**
Eigen value				**7.143**	**7.013**
Variance Explained (%)					
Total Variance Explained (%)					14.156
Kaiser- Meyer O1Kin (KMO)					.777
Bartlett,s Test of Spherecity					1.156E
Sig					0.000

Extraction Method: Principal Component Analysis. a. 5 components extracted. Component Matrix[a]

Note. n = 177.

Source: prepared by researcher, 2023

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9.3.2. Factor analysis for mediator variable (IQ);

The information quality (IQ) used as mediator variable and its dimensions are (*accurate, current, relevant, and completeness*). Statistical analysis program (SPSS V.23) and obtained the rotation matrix shown in the table (3).

Table (4) shown all the remaining items has more than recommended value of at least 0.5 in measure of sample adequacy (MSA) with (KMO) (above the recommended minimum level of (0.60), and Bartlett's test of sphericity is ($p<.05$). Thus, the items are appropriate for factor analysis. The matrix showed that the primary analysis process divided the mediator variables in (2) factors, which is known in the study model instead of (4) as it is known in the preliminary study variables (before the factor analysis process was done) .Table (3) also showed the items that used in the measurement of variables and the name of the corresponding variable when entering the data and whether it omitted or not. As result of this process (factor analysis) has omitted some of items for each variable. Where the first factor includes names of variables (IQ2, IQ3, IQ5, IQ6, IQ8, IQ17), According to the literature and theories we naming the first factor is (accurate and current) with measured of the reliability of value of the Cronbach's alpha score over (0.866), the second factor includes names of variables (IQ1, IQ10, IQ11, IQ12, IQ14, IQ16), According to the literature and theories we naming the second factor is (Relevant, and completeness) with measured of the reliability of value of the Cronbach's alpha score over (0.902),The measured of reliability of the respondents and the value of the Cronbach's alpha, after the factor analysis and values are considered acceptable for the purposes and highly reliable of this study. Also the table (3) showed that the factor analysis process has (omitted) some items of measuring the factors of Information Quality (IQ), and the item that deleted is the name of the corresponding variables (IQ4, IQ7, IQ9, IQ13). The items of the questionnaire and the names of the corresponding variables in the analysis of the variable information quality dimensions.

Table 3: Factor analysis for mediator variable (*information quality*) dimensions:

Vr	Code	Items		Fact1	Fact2
Accurate	IQ1	You use correct information.	Not omitted	0.112	**0.703**
	IQ2	You use a few errors information	Not omitted	**0.644**	0.301
	IQ3	You use accurate information	Not omitted	**0.836**	0.307
	IQ4	You use non-contradictory information	Omitted	0.39	0.423
Current	IQ5	You use most recent information.	Not omitted	**0.636**	0.322
	IQ6	You use a current information.	Not omitted	**0.701**	0.307
	IQ7	You always use up-to-date information	Omitted	0.361	0.392
	IQ8	You use information delivered rapidly.	Not omitted	**0.666**	0.244
Relevant	IQ9	You use applicable information for decision-making.	Omitted	0.304	0.404
	IQ10	You use helpful information for decision-making.	Not omitted	0.372	**0.599**
	IQ11	You use provides most relevant information	Not omitted	0.274	**0.736**
	IQ12	You use interesting information for decision-making.	Not omitted	0.367	**0.866**
	IQ13	You use useable information for decision-	Omitted	0.304	0.384

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		making.			
Completeness	IQ14	You use a completeness set of information.	Not omitted	0.048	**. 862**
	IQ15	You use produced comprehensive information.	Not omitted	0.193	**. 807**
	IQ16	You use corresponds information to the needs	Not omitted	0.297	**. 713**
	IQ17	You use provided useful information	Not omitted	0.647	0.197
Eigen value				**7.152**	**6.185**
Variance Explained (%)					
Total Variance Explained (%)					13.337
Kaiser- Meyer O1Kin (KMO)					.801
Bartlett,s Test of Spherecity					1.124E
Sig					0.000

Extracion Method: Principal Component Analysis.

a. 5 components extracted. Component Matrix[a]

Note. n = 177.

Source: prepared by researcher, 2023

9.3.3. Factor analysis for dependent variable effectiveness of MIS;

Effectiveness of information systems (EMIS) were used as an dependent variable, factor analysis was conducted for the first time on the field study data statistical analysis program (SPSS V.23) and obtained the rotation matrix shown in the table (4). Maximum likelihood was used, the summary of results was showed in table (5) and the SPSS output attached in appendix.

As shown in Table (4) below all the remaining items has more than recommended value of at least 0.5 in measure of sample adequacy (MSA) with (KMO) (above the recommended minimum level of (0.60), and Bartlett's test of sphericity is significant ($p<.05$). Thus, the items are appropriate for factor analysis. The matrix showed that the primary analysis process showed the dependent variable in one factors, which is known in the study model as same one factor (1) as it is known in the preliminary study variables before the factor analysis process was done.

Table (4) showed that the matrix a appeared in (1) factors and values of the first rotation contributions more than (0.5), the saturation greater than (0.5), The factor analysis of the terms of the dependent variables was performed one times, and the (cut off point) was used less than (0.475), Some of variables items with (cross loading) were also deleted. This process resulted in the deletion of a number of items for each variable.

Table (4) also showed the items that used in the measurement of variables and the name of the corresponding variable when entering the data and whether it omitted or not. As result of this process (factor analysis) has remained (Not omitted) any of items for each variable. Where the first factor includes names of variables (MIS1, MIS2, MIS3, MIS4, MIS5), According to the literature and theories the researcher naming the first factor is (Effectiveness of information systems- MIS) with measured of the reliability of value of the Cronbach's alpha score over (0.841), The measured of reliability of the respondents and the value of the Cronbach's alpha, after the factor analysis and values are considered acceptable for the purposes and highly

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reliable of this study. Also the table (4) showed that the factor analysis process has (remained) all items of measuring the factors of effectiveness of information systems (EMIS), The items of the questionnaire and the names of the corresponding variables in the analysis of the variable (Effectiveness of MIS) dimensions, as follows:

Table 4: Factor analysis for dependent variable (Effectiveness of MIS) dimensions

Vr	Code	Items	Fact1	Fact2
MIS Effectiveness	MIS1	MIS provides accurate, reliable, and relevant information to users.	Not omitted	0.856
	MIS2	MIS helps in analyzing data and generating reports as needed.	Not omitted	0.792
	MIS3	MIS facilitates the efficient storage, retrieval, and management of large volumes of data.	Not omitted	0.782
	MIS4	MIS enables quick access to information when needed.	Not omitted	0.679
	MIS5	MIS used to meets the needs of the users	Not omitted	0.904
Eigen value				**4.013**
Variance Explained (%)				
Total Variance Explained (%)				4.013
Kaiser- Meyer O1Kin (KMO)				.688
Bartlett,s Test of Spherecity				1.134E
Sig				0.000

Extraction Method: Principal Component Analysis. a. 5 components extracted. Component Matrix[a]

Note. n = 177.

Source: prepared by researcher, 2023

Reliability of variable after the factor analysis:

Table (5) showed the reliability of the respondents and the Alpha-Cronbach's value, after the factor analysis process, we found that it was appropriate, acceptable and highly reliable.

Reliability of the study tool:

Table 5: Reliability coefficients for each variable after the factor analysis

Type	Variables	Dimension	items	Cronbach's Alpha
Independent	Knowledge management	Creation and storage	6	0.822
		Distribution and application	5	0.788
Mediator	Information quality	Accurate and currently	6	0.866
		Relevancy and completeness	7	0.902
Dependent	Effectiveness of MIS	Effectiveness of MIS	5	0.841

Source: The researcher, 2023.

Note. n = 177.

Figure (3) Study conceptual framework after factor analysis;

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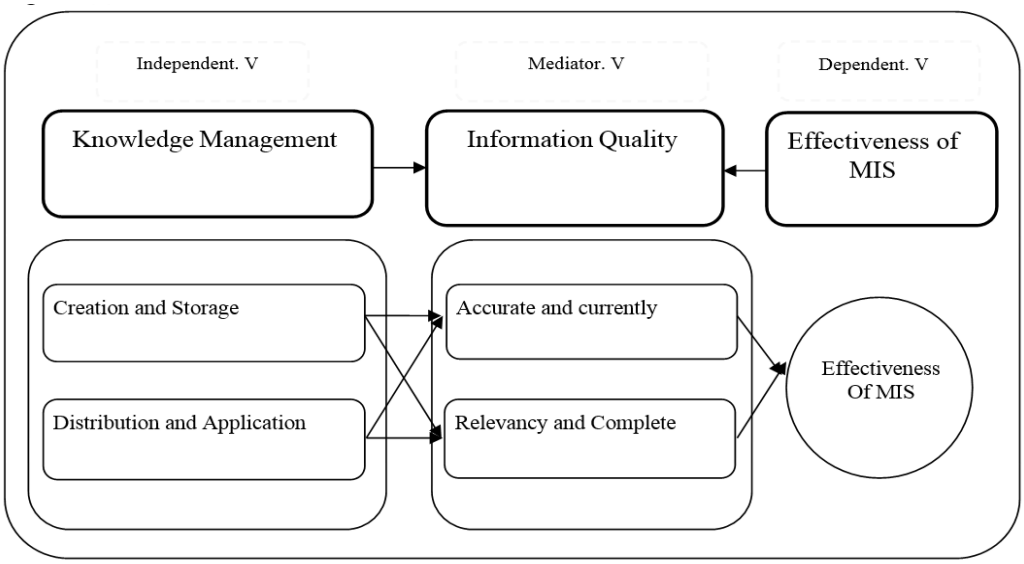

Figure 3:

Source: The researcher, after the factor analysis, 2023.

9.4. Research hypotheses after the factor analysis process:

Figure (3) showed that the model of the research was changed, according to the new moderated model of the study, The research model tested to set up to investigate of research hypothesis which are: The main hypothesis of the research was that:

Information quality (*accurate & currently), and (relevancy & completeness*) mediate the relationship between knowledge management (creation and storage, distribution and application) and effectiveness of management information system as follow:

1. Information quality (*accurate and currently*) dimension mediates the relationship between knowledge management (*creation and storage*) dimension and effectiveness of management information system.
2. Information quality (*accurate & currently*) dimension mediates the relationship between knowledge management (*distribution & application*) dimension and Effectiveness management information system.
3. Information quality (*relevancy & completeness*) dimension do not mediates the relationship between knowledge management (*creation & storage*) dimension and effectiveness of management information system.
4. Information quality (*relevancy & completeness*) dimension do not mediates the relationship between knowledge management (*distribution & application*) dimension and effectiveness of management information system.

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9.5. Mathematical averages & St. Deviations:

Based on the study model as shown in figure (3), the following hypotheses formulated:

Table (6): Mathematical averages and standard deviations of the perceptions of workers at the Sudanese banks about the dimensions of variable:

Table (6) shows that the overall average of knowledge management dimensions amounted to (3.89) and the standard deviation of (0.81). This means that the perceptions of workers at the central bank of Sudan about knowledge management are high. followed by (*creation & storage*) with a mathematical average of (3.78) and a standard deviation of (0.86), followed by (*distribution & application*) with a mathematical average of (3.69) and a standard deviation of (0.76), followed by (*accurate & currently*) with a mathematical average of (4.22) and a standard deviation of (0.81), followed by (*relevancy & completeness*) with a mathematical average of (3.93) and a standard deviation of (0.79), average of (effectiveness of MIS) dimensions amounted of (3.85) and the standard deviation of (0.92). This means that the perceptions of workers at the Sudanese banks about effectiveness of MIS are high which all contribute to the achievement of bank goals desired.

Table 6: Mathematical averages & St. deviations before factor analysis

Variable	Type	Mean	Level of mean	Standard deviation
Creation and storage	Independent	3.78	High	0.86
Distribution and application	Independent	3.69	High	0.76
Accurate and currently	Mediator	4.22	High	0.81
Relevancy and completeness	Mediator	3.93	High	0.79
Effectiveness of MIS	Dependent	3.85	High	0.92

Source: The researcher, Spss. V. 23, (2023).

9.6. Pearson's Correlation Coefficient:

Pearson correlation coefficient used to show the correlations between the variables of the study, and to measure the level of correlation between the study variables and to ascertain the extent to which independent variables exploited. Table (7) shows the correlation of study variables among them.

Table 7: Correlation Analysis between study variables;

Variables	Cr	m1	m2	m3	m4	m5
Creation and storage	m1	1				
Distribution and application	m2	-.081	1			
Accurate and currently	m3	-.090	.811**	1		
Relevancy and completeness	m4	.766**	-.735	.750**	1	
Effectiveness of MIS	m5	.636*	.808**	-.723	.603*	1

* Correlation is significant at the 0.05 level (2-tailed.)

**Correlation is significant at the 0.01 level (2-tailed.)

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9.7. Conditions of mediates of variables the relations:

Bennett, J. A. (2000)[33] Show the Conditions of mediates of variables the relations as follow:

1. The relation between dependent variable and independent variable must be positive and significant (β1).
2. The relation between dependent variable and mediates variable must be positive and significant (β2).
3. The relation between mediates variable and independent mediates variable must be positive and Significant (β3).

Figure (4) study conceptual framework, showed the types of between variables if it is (positive or negative) and the level of if it is (significant or non- significant) to approve the research hypnoses.

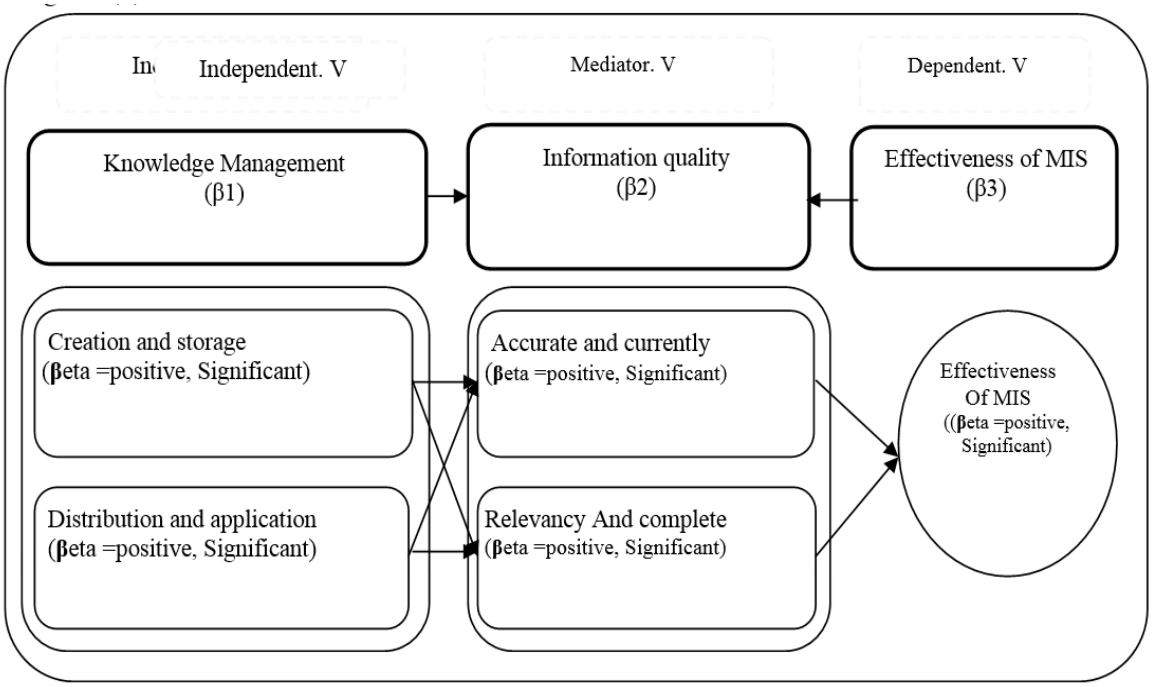

Figure 4:

Source: The researcher, after results of regression analysis, 2023

10. TESTING OF HYPOTHESES AND FINDS:

Test of relationship between independents and mediates variables:

Information quality (*accurate & currently*), (*relevancy & completeness*) mediate the relationship between knowledge management (*creation & storage*), (distribution and application) and effectiveness of management information system.

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Simple regression has been used in this study hypotheses to test the relationship levels (weak and strong), type of relationship (negative and positive), and significant level, standardized coefficient (**β**eta) value, un-standardized coefficient (**β**), Adjusted **R** Square ($\mathbf{R}^2$) Change **R** Square, Durbin-Watson **(D.W),** and F-Test value.

10.1. Test of relationship between dependents and independents variables:

There is positive and significant relationship between knowledge management (*creation & storage*), (*distribution & application*) and information quality (accurate& currently), (relevancy& completeness) as flow:

Table (8) showed the test and results of simple regression of relationship between knowledge management (*creation & storage*), (*distribution & application*) and information quality (accurate& currently: there is positive and significant relationship between (KM- creation and storage) and (IQ- accurate and currently), standardized coefficient of (**β**eta= 0.789, Sig 0.000), there is positive and significant relationship between KM- Creation and storage and IQ- accurate and currently, standardized coefficient of (**β**eta= 0.812, Sig 0.000), there is negative and significant relationship between KM- distribution and application and IQ- accurate and currently, and **R** square ($\mathbf{R}^2$ =0.692), that mean the impact and the change in the IQ- accurate and currently variable was explained by KM- knowledge management dimensions variables of (70%) percentage and the remain of percentage returned to other factor as result on random mistake, **F-test** value (82.793) showed that the simple regression model is (0.000), Durbin-Watson **(D.W**) was used with at the (0.05) level **(D.W**=1.133) it explain that there is no-significant relationship between mistake random of using Durbin-Watson, the result of regression showed that the (first, second factors) are significant according to showed results the model approve that the impact factors on the IQ- accurate and currently variable are (*creation & storage*), and (*distribution & application*).

Table 8: Test of simple regression between (KM) dimensions and (IQ- accurate and currently):

Variables	**accurate and currently**	
	βeta	**Sig**
Creation and storage	.789	.000
Distribution and application	.812	.000
Statistic percentage;		
R Square ($\mathbf{R}^2$)	.692	
Adjusted **R** Square ($\mathbf{R}^2$)	.625	
Change **R** Square (R^2 **Δ**)	.692	
Durbin-Watson	1.133	
F-value	82.793	
Sig.	.000[a]	

Note: at the (0.05) level is (0.000)

Source: The researcher, Spss. V. 24, (2023).

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10.2. Test of relationship between dependents and independents variables:

There is positive and significant relationship between knowledge management (*creation & storage)*, and (*distribution & application*) and information quality (*accurate &currently*), (relevancy & completeness) as flow:

Table (9) showed the test and results of simple regression of relationship between knowledge management (*creation& storage*) and (*distribution & application*) and information quality (*relevancy & completeness*):

There is positive and significant relationship between KM- Creation and storage and IQ- relevancy and completeness , standardized coefficient of (**β**eta= 0.688, Sig 0.000), there is positive and significant relationship between KM- Creation and storage and IQ- accurate and currently, standardized coefficient of (**β**eta= 0.706, Sig 0.000), there is negative and significant relationship between (KM- distribution and application) and (IQ- relevancy and completeness), and **R** square (**R**^{2} =0.692), that mean the impact and the change in the IQ- accurate and currently variable was explained by KM- knowledge management dimensions variables of (69%) percentage and the remain of percentage returned to other factor as result on random mistake, **F-test** value (83.274) showed that the simple regression model is (0.000), Durbin-Watson **(D.W**) was used with at the (0.05) level **(D.W**=1.158) it explain that there is no- significant relationship between mistake random of using Durbin-Watson, the result of regression showed that the (first, second factors) are significant, according to showed results the model approve that the impact factors on the IQ- relevancy and completeness variable are (creation & storage), and (*distribution & application*).

Table 9: Test of simple regression between (KM) dimensions and (IQ-relevancy & completeness):

Variables	**Relevancy and completeness**	
	βeta	**Sig**
Creation & storage	.688	.000
Distribution & application	.706	.000
Statistic percentage;		
R Square (**R**^{2})	.586	
Adjusted **R** Square (**R**^{2})	.535	
Change **R** Square (R^2 **Δ**)	.586	
Durbin-Watson	1.158	
F-value	83.274	
Sig.	.000[a]	

Note: at the (0.05) level is (0.000)

Source: The researcher, Spss. V. 24, (2023).

10.3. Test of relationship between dependents and independents variables:

There is positive and significant relationship between information quality (*accurate & currently*), (*relevancy & completeness*) and effectiveness of management information system. as flow:

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Table (10) showed the test and results of simple regression of relationship between information quality (accurate & currently), (relevancy & completeness) and effectiveness of management information system:

There is positive and significant relationship between information quality (*accurate & currently*) and (*relevancy & completeness*) and effectiveness of management information system:

Standardized coefficient of (**β**eta= .733, Sig 0.000), there is positive and significant relationship between information quality (accurate & currently) and effectiveness of management information system, standardized coefficient of (**β**eta= -.514, Sig 0.005), there is negative and significant relationship between information quality (accurate & currently) and effectiveness of management information system and **R** square ($\mathbf{R}^2$ =0.73), that mean the impact and the change in the effectiveness of MIS variable was explained by information quality (accurate& currently), and (relevancy& completeness) dimensions variables of (73%) percentage and the remain of percentage returned to other factor as result on random mistake, **F-test** value (80.011) showed that the simple regression model is (0.000), Durbin-Watson **(D.W**) was used with at the (0.05) level **(D.W**=1.155) it explain that there is no- significant relationship between mistake random of using Durbin-Watson, the result of regression showed that the (first factors) are significant according to showed results the model approve that the impact factors on the effectiveness of MIS variable are information quality (*accurate& currently*).

Table 10: Test of simple regression between (IQ) dimensions and effectiveness of MIS:

Variables	Effectiveness of MIS	
	βeta	**Sig**
Accurate & currently	.733	.000
Relevancy & completeness	.514-	.005
Statistic percentage;		
R Square ($\mathbf{R}^2$)	.725	
Adjusted **R** Square ($\mathbf{R}^2$)	.545	
Change **R** Square (R^2 **Δ**)	.725	
Durbin-Watson	1.155	
F-value	83.011	
Sig.	.000[a]	

Note: at the (0.05) level is (0.000)

Source: The researcher, Spss. V. 24, (2023).

Table (11) showed the results of the relationship between knowledge management (*Creation and storage), (Distribution, and application*) and effectiveness of management information system factors as flow:

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Table 11: Results of test the relationship between (KM) dimensions and EMIS

Item	Statement of Hypothesis: There is positive and significant relationship between:	Result
H_1	KM- (Creation and storage) and (Accurate and currently)	Supported
H_2	KM- (Distribution and application) and (Accurate and currently)	Supported
H_3	IQ- (Accurate and currently) and effectiveness of MIS	Supported
H_3	IQ- (Relevancy And completeness) and effectiveness of MIS	Not Supported

Source: The researcher, Spss. V. 23, (2023).

11. RESULTS BETWEEN VARIABLES ACCORDING TO CONDITIONS OF MEDIATES

1. There is positive and significance relationship between (*KM- Creation & storage*) and (effectiveness of MIS).
2. There is positive and significance relationship between (*KM- distribution & application*) and (effectiveness of MIS).
3. There is positive and significance relationship between (*IQ-accurate &currently*) and (effectiveness of MIS)
4. There is negative and significance relationship between (*IQ-relevancy & completeness*) and (effectiveness of MIS).

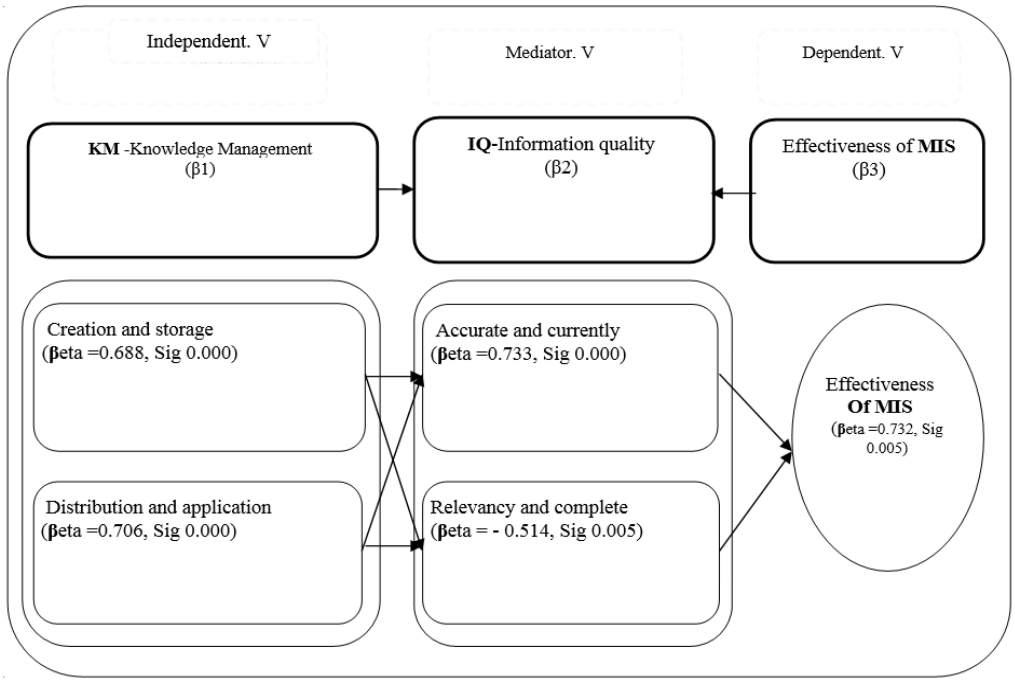

Figure 4: Result between variables

Source: The researcher, after results of regression analysis, 2023.

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12. THE RESEARCH FINDINGS:

According to the primary data that has been analyzed a the findings can be summarized as follow:

1. Information quality (*accurate & currently*) dimension mediates the relationship between knowledge management (creation and storage) dimension and effectiveness management information system.
2. Information quality (*accurate & currently*) dimension mediates the relationship between knowledge management (*distribution & application*) dimension and effectiveness management information system.
3. Information quality (*relevancy & completeness*) dimension do not mediates the relationship between knowledge management (*creation & storage*) dimension and effectiveness management information system.
4. Information quality (*relevancy & completeness*) dimension do not mediates the relationship between knowledge management (*distribution& application*) dimension and effectiveness management information system.

13. RESEARCH RECOMMENDATIONS

- According to the survey study that was conducted to central bank of Sudan, it was observed that, KM is the most important factor along with effectiveness of management information system.
- This result pointed out that the majority of respondents of central bank of Sudan believe that the MIS is an effective tool in light of the IQ and will help managers make the MIS at the bank is more effectiveness at the right time to solve the current crisis and problem facing the monetary system in Sudanese banks.
- For future, the study recommends to apply in difference dimensions of (IQ) to mediate new (KM) with difference dimensions of (MIS) dimensions in other sectors.

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