Original Research

Developing a Model of Return on Investment in Knowledge Management

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Abstract

The importance of knowledge management as a competitive advantage is evident to everyone, and it is considered one of the critical factors of successful organizations. The capitalist view of knowledge management has led to the measurement of the return on investment resulting from it, and the return on investment has been recognized as a financial indicator for measuring knowledge management. What are the main components of knowledge management? Have components the same coefficients? The impact of the components is different and has different values. In order to achieve this importance, the present study was conducted to develop a return on investment model in knowledge management. This Practical research is mixed method, and in the form of exploratory schema in three stages, qualitative (using grounded theory and the use of interview tools), quantitative (using a descriptive method, a survey using questionnaire tool), quantitative (using a descriptive method, a survey using questionnaire tool) has been done. Each method is analyzed using, respectively, MAX QDA and SPSS software. The findings of the first stage of the study include identifying the benefit and costs of knowledge management. Then, the components validity is obtained, and then in the third stage, a coefficient is assigned to each of them. Identifying costs and benefit Components is a first stage achievement. Experts measured the validity of each component to identify components accurately. Furthermore, finally, in the third stage, each of these components was assigned a coefficient. The development of a new formula, taking into account each of these coefficients, is considered research innovation.

Introduction

Although KM resources and capabilities have recently become entrenched concepts in the business ecosystem, empirical evidence that support their longitudinal value has been sparse (Lee, Choi & Lee, 2020). In the present century, the factors of competition in organizations have changed from the past significantly, and considerable efforts have been made to understand and emphasize the role of knowledge in providing a competitive advantage (Silvi

& Cuganesan, 2006). To this end, knowledge management (KM[1]) is used to describe how to acquire and create knowledge inside and outside the organization and how to access, create, encrypt, and use knowledge (Shujahat, Sousa, Saddam, Nawaz, Wang & Umer, 2019) based on this hypothesis. Knowledge is one of the critical factors in organizations' success (Europe, H. I. M. S. S, 2013). The purpose of KM is to use the entire knowledge base of the organization along with "individual skills, competencies, thoughts, innovations and ideas" to create a more efficient organization (Dalkir, 2017). Since the late 1990s, KM has become a part of corporate business. They find that machinery and equipment may not be the most crucial feature of organizations anymore; rather, knowledge and effective management will create organizational competence and beat competitors (Akhavan, Jafari & Fathian, 2005). KM resources and capabilities also impact performance over time and include long-term returns (Lee, Choi & Lee, 2020). There are many reasons why an organization measures the rate of Return on Investment in KM. One important reason is the responsibility of the work that needs to be financially, and that activity should have a positive impact on the organization's cash flow directly or indirectly (Branes, 2013). For more than a decade, most businesses have tried and mostly failed to calculate ROI in KM (Cohen, 2006). All KM organizations, consultants, and professionals know that calculating ROI is not a simple task and poses obstacles. Some also believe that there is no accurate way to measure ROI in KM or indirectly measure ROI. At the same time, this (ROI) is the basis of corporate strategic development and management decisions (Cohen, 2006; Zimmermann, 2003; Cohen, 2017; Lopez, 2001; Kankanhalli & Tan, 2005; Iske & Boekhoff, 2002; Massingham & Massingham, 2014; Turner & Minonne, 2010; Resatsch & Fiasst, 2003; Group of BEI Consulting, 2003; Wickhorst, 2002).

In other cases, such as the "Harvard Computing Group Report", it seems easy to make ROI calculations merely as a quantitative combination of numbers. However, often the most challenging aspect of calculating ROI is to put the numbers together in a way consistent with the organization's financial policies and budget (Harvard Computing Group Report, 1998). Also, a case study with leading construction companies shows two significant problems: first, the relationship between KM and business performance is not clearly understood; second, frequently the lack of appropriate tools to measure the effects of KM and knowledge asset. Therefore, it is not surprising that there are significant problems in proving the benefits of KM. Many organizations have recognized this, but the proper methods are not always used to evaluate the performance of knowledge assets and projects, programs, or KM initiatives. At the moment, there is no global standard for measuring or evaluating knowledge assets and KM programs (Robinson, Carrillo, Anumba & Al-Ghassani, 2005). In order to embed KM in an organization, its value development and fulfillment need to be institutionalized in the business needs and all its contexts and incorporated as part of the organization's DNA, culture, and process (Hawley, 2013).

To decide on investing in KM, managers must first examine the value of the plan and then the availability of the budget. The standard method for assessing is ROI. Despite learning the global formula for ROI globally, it is difficult to calculate the ROI of KM. This is because ROI becomes apparent to managers if KM can directly improve financial performance (Massingham & Massingham, 2014). There are questions about classifying these components and does each component have the same coefficient in the formula? However, there is no comprehensive method for calculating ROI. The general formula for calculating the widely used ROI is not adequately precise; therefore, the final number obtained is not sufficiently accurate. This study

is aimed to developing a comprehensive formula for measuring ROI in KM. Identifying the cost and benefit components of KM accurately and then assigning coefficients of each of them are among the features of the proposed formula. However, in the general formula of ROI, all the components have equal value, and their priority in organizations is ignored. This formula can be the commencement point for extensive research in precisely calculating ROI in KM.

Method

The researcher has done this Practical research with a mixed method and in the form of exploratory schema in three stages: qualitative, quantitative, and quantitative. The first stage of research, qualitative approach: The research method was done using the "Grounded Theory" (GT) method. In this stage, to obtain more information about cost and benefit components in knowledge management, interviews with experts in this field were conducted. The study population, at the first stages, were knowledge management specialists and experts. For the sample, ten people from the study population were interviewed. Moreover, due to saturation, the interview was stopped at the same rate.

The second stage of research, quantitative approach: The second research stage is descriptive and surveys in data collection. At this stage, the study's statistical population is all companies, governmental and non-governmental organizations in which knowledge management is implemented. A questionnaire was developed using the components extracted in the first stage. According to the experts in this field and the supervisor, the validity of the questionnaire used has been confirmed. For reliability, Cronbach's alpha value was calculated using SPSS software, which is equal to 0.88. Cronbach's alpha value above 0.7 is acceptable. The questionnaire was sampled and collected from 30 companies on the Make Iran[1] list.

The third stage of research, quantitative approach: After collecting the data in the second stage of the research, it is time to assign a certain coefficient to each of those components through which the weight of each of them can be determined in the relevant formula (ROI). The study population is the same experts in knowledge management in the first stage of research. To this end, another questionnaire was developed to collect the required information. We determined the number assigned to each component in the cost and benefit components in the numerical range of 1 to 3.

Chart 1. Research methodology outline

Results
Identified components in the qualitative study stage

After the interview and data first stage analysis of the qualitative approach, the data entered into the MAXQDA software to code. Furthermore, each meaningful word with a special relationship to the research is coded and assigned a specific concept. After coding, the desired components of the research are extracted and used to perform the following steps of the research. The findings were divided into cost and benefit components. KM cost components generally contain ten components (Table 1), and benefit components include 15 components (Table 2).

Table 1
Cost Components of Knowledge Management

1	ICT tools and infrastructure
2	Software purchase, deployment and support
3	Knowledge Management Consulting
4	Holding workshops
5	Knowledge Management Studies
6	Standardization of knowledge in the organization
7	Miscellaneous Wages
8	Employee rewards
9	Time spent by managers
10	Time spent by employees

Table 2
Benefit Components of Knowledge Management

1	Increasing stock value
2	Savings by eliminating the processes repetition
3	Saving by error reduction
4	Savings by reduced human resource training time
5	Time-saving managers
6	Savings by staff sharing knowledge
7	Create added value for the organization
8	Increase the quality of work
9	Customer and Client Satisfaction
10	Motivate employees
11	Satisfaction of stakeholders and partners
12	Increase organizational learning
13	Increasing organizational innovation
14	Development of organizational communication
15	Development of organizational competition

According to Table 1, costs are divided into tangible and intangible costs, and Table 2 shows that return on investment can be financial or non-financial.

Validation of components with a quantitative approach

The data were entered in SPSS software and tested by inferential statistics using the T-sample test. Based on the results of these tests, the average value obtained from the average, which is 3, was higher. This means that the items of cost and income mentioned in the organizations in question are considered expenses and income.

Table 3
One-sample t-test for the average of all components of cost and benefit

	Number	Average	Standard deviation
Average total cost components	30	3.423	0.61906
Average total benefit components	30	3.9	0.6156

The average score in this test is 3. The average total income is 3.9, which is higher than our average. From the organizations' point of view, the income items mentioned are considered income in the organizations.

Determine the coefficient to the components

At this stage of the research, after collecting the data through the questionnaire, the data entered the SPSS software. This stage of the research involves describing the data. After describing the data, the meanings for each component were determined.

Table 4

Description cost and benefit components of knowledge management

	Number of components	Number of respondent	Min	Max	Average
Cost Components	ICT tools and infrastructure	10	2.91	3	2.10
	Software purchase, deployment and support	10	1.50	3	2.70
	Knowledge Management Consulting	10	2	3	2.25
	Holding workshops	10	1	3	2.20
	Knowledge Management Studies	10	1	3	1.88
	Standardization of knowledge in the organization	10	1	3	2.42
	Miscellaneous Wages	10	1	3	2
	Employee rewards	10	1	3	2.49
	Time spent by managers	10	1	3	2.35
	Time spent by employees	10	1	3	2.40
Benefit Components	Increasing stock value	10	1	3	2.20
	Savings from eliminating duplicate processes	10	1.50	3	2.65
	Saving from error reduction	10	2	3	2.75
	Savings from reduced manpower (human resource) training time	10	1	3	2.55
	Time-saving managers	10	2	3	2.60
	Savings from staff sharing knowledge	10	2	3	2.90
	Create added value for the organization	10	2	3	2.67
	Increase the quality of work	10	2	3	2.70
	Customer and Client Satisfaction	10	1.90	3	2.49
	Motivate employees	10	1.80	3	2.73
	Satisfaction of stakeholders and partners	10	1	3	2.15
	Increase organizational learning	10	2	3	2.90
	Increasing organizational innovation	10	1	3	2.33
	Development of organizational communication	10	1	3	2.55
	Development of organizational competition	10	1	3	2.54

We first convert averages of the components to a range of zero to one, then add the number 1 to calculate the coefficient of each of these components.

Table 5

Coefficients of cost and benefit components

Cost components	Coefficient	Benefit components	Coefficient
ICT tools and infrastructure	1.97	Increasing stock value	0.73
Software purchase, deployment and support	1.9	Savings from eliminating duplicate processes	0.88
Knowledge Management Consulting	1.75	Saving from error reduction	0.91
Holding workshops	1.73	Savings from reduced manpower (human resource) training time	0.85
Knowledge Management Studies	1.62	Time-saving managers	0.86
Standardization of knowledge in the organization	1.806	Savings from staff sharing knowledge	0.96
Miscellaneous Wages	1.66	Create added value for the	0.89

		organization	
Employee rewards	1.83	Increase the quality of work	0.9
Time spent by managers	1.8	Customer and Client Satisfaction	0.83
Time spent by employees	1.78	Motivate employees	0.91
		Satisfaction of stakeholders and partners	0.71
		Increase organizational learning	0.96
		Increasing organizational innovation	0.77
		Development of organizational communication	0.85
		Increase the competitiveness of the organization	0.84

According to Table 5, in benefit components, stakeholder satisfaction and partners have the highest coefficient, and the increase in organizational learning has the lowest coefficient. Concerning cost components, the lowest coefficient is allocated to studies and research dedicated to knowledge management, and the highest coefficient is allocated to information technology tools and infrastructure.

Scenarios for calculating the return on investment in knowledge management

Considering the quantitative components of knowledge management as direct costs and benefits and qualitative components as indirect costs and benefits in knowledge management projects has divided the return on investment into two categories, easy and difficult. The quantitative components include the cost and benefits of dealing with numbers and can be calculated directly. However, the hardest part is the qualitative components, including the indirect costs and benefits that make it difficult to calculate the return on investment. Identifying each of these components separately and assigning a coefficient to them has dramatically reduced this difficulty. It shows the importance of these coefficients and their fundamental role when calculating the amount of return on investment and determining its final number. The general formula for return on investment is as follows:

$$ROI = \frac{Benefit - Cost}{Cost} \; 100$$

The way of numbering and calculating the return on investment with the mentioned formula may be shown as follows:

Calculate without details: These calculations generally calculate the return on investment. The costs and benefits obtained from it are expressed as a general number and are included in the desired formula. For example, the senior manager of an organization asks knowledge management consultants the final number of return on investment. The consultant will provide the final report as follows:

The total cost spent on knowledge management: 1,800,000,000 Rial
The amount of benefit from knowledge management: 3,000,000,000 Rial

$$ROI = \frac{3{,}000{,}000{,}000 - 1{,}800{,}000{,}000}{1{,}800{,}000{,}000} \; 100$$

ROI = 66.66 %

The return on investment is 66.66 percent.

Calculation in Detail: This calculation is based on the components identified in the first phase of the research. In this way, the amount of money allocated to each component is quite clear. The sum of the amounts of cost and benefit components put in the formula. Furthermore, the final percentage of the return on investment is obtained.

Total amounts spent on cost components: 966,000,000 rial

Total amounts spent on income components: 6,110,000,000 rial

$$ROI = \frac{6110000000 - 966000000}{966000000} \; 100$$

ROI = 532 %

The return on investment is 532 percent.

Calculation by Weight: The third category of calculations is devoted to the weight of each of these components. This innovative formula is multiplying each component by its weight and its placement in the main formula. This formula is called ROIHD[3].

The sum of the multiplications of cost components in its weight: 1,730,268,000 Rial

The sum of the multiplications of benefit components in its weight: 5,369,100,000 Rial

CV^4 (W) = C1W1 + C2W2+ C3W3+ . . . + CnWn

BV^5 (W) = B1W1+ B2W2+ B3W3+ . . . + CnWn

$$ROI_{HD} = \frac{BV - CV}{CV} \; 10$$

$$ROI_{HD} = \frac{5{,}369{,}100{,}000 - 1{,}730{,}268{,}000}{1{,}730{,}268{,}00}$$

ROI_{HD} = 210.3 %

The return on investment is 210.3 percent.

Table 6
Applied coefficient of cost components

	cost components	Coefficient	Assumed amount	Multiply the hypothetical sum by the coefficient
1	Knowledge Management Consulting	1.75	168,000,00	294,000,000
2	ICT tools and infrastructure	1.97	150,000,000	295,000,000
3	Time spent by employees	1.78	120,000,000	213,600,000
4	Knowledge Management Studies	1.62	115,000,000	186,300,00
5	Time spent by managers	1.8	100,000,000	180,000,000
6	Holding workshops	1.73	90,000,000	155,700,000
7	Standardization of knowledge in the organization	1.806	78,000,000	140,868,000
8	Software purchase, deployment and support	1.9	70,000,000	133,000,000
9	Employee rewards	1.83	45,000,000	82,000,000
10	Miscellaneous Wages	1.66	30,000,000	49,800,000

As shown in Table 6, miscellaneous wages are the least costly, and knowledge management consulting is one of the most costly components.

Table 7
Applied coefficient of benefit components

	benefit components	Coefficient	Assumed amount	Multiply the hypothetical sum by the coefficient
1	Increase organizational learning	0.96	900,000,000	864,000,000
2	Savings from reduced manpower (human resource) training time	0.85	720,000,000	612,000,000
3	Savings from eliminating duplicate processes	0.88	600,000,000	528,000,000
4	Saving from error reduction	0.91	540,000,000	491,400,000
5	Savings from staff sharing knowledge	0.96	500,000,000	480,000,000
6	Time-saving managers	0.86	420,000,000	361,200,000
7	Increasing organizational innovation	0.77	400,000,000	308,000,000
8	Create added value for the organization	0.89	370,000,000	329,300,000
9	Development of organizational communication	0.85	350,000,000	297,500,000
10	Increase the quality of work	0.9	320,000,000	288,000,000
11	Customer and Client Satisfaction	0.83	270,000,000	224,100,000
12	Motivate employees	0.91	230,000,000	209,300,000
13	Increase the competitiveness of the organization	0.84	200,000,000	168,000,000

	benefit components	Coefficient	Assumed amount	Multiply the hypothetical sum by the coefficient
14	Satisfaction of stakeholders and partners	0.71	170,000,000	120,700,000
15	Increasing stock value	0.73	120,000,000	87,600,000

Table 7 also illustrates the application of the proposed coefficients of each income component. The components are in the order of validity of each of them from the point of view of experts. As it turns out, increasing the organization's learning has the most benefit, and increasing the value of the stock has the least revenue.

Conclusion

As can be seen from the ROI calculation in the three categories, none of the results obtained from the above three categories are equal. However, it generally can be claimed that the accuracy of the first category is less than the second, and the second category is less than the third. Considering the weight of each component in the formula has added a process to the formula that is part of the innovation resulting from this research. The research aims to identify two crucial and essential components in KM and ROI and determine the coefficient of each of them, and then based on them, a model has been created. The first component is cost. When implementing a KM plan in the organization, expenses are also spent that are necessary for the implementation of the plan. Consultants and experts identify these costs in KM, and after estimating the desired amount, a budget is allocated to it. It is noteworthy that only the things are regarded as costs for which an amount has been paid. This view is minimal and superficial. After interviewing and identifying the cost components, consultants and experts have witnessed the cost, in addition to the obvious costs. It is clear to everyone that there is another hidden category of expenses, for which no money has been paid, and no budget has been considered. However, the lack of attention to it in the organizations has caused much damage. This category is called intangible costs for which no amount is paid and is far from the eyes of many managers. Many managers focused on the budget and are concerned about its return. Nevertheless, there are managers who, in addition to managing obvious costs, also care about invisible costs. These managers have a coherent plan for their time and their employees, requesting a detailed report of their daily activities.

Managers who have invested in KM and budgeted for it also expect an ROI and benefits. In other words, it can be said that a plan is implemented in an organization when it is economically viable for the managers and has benefits. The same is true of KM. KM consultants and experts have explicitly stated that managers request a performance report and request a profit and ROI after implementing KM and a few months after it. There are two types of ROI. The ROI can be financial or non-financial. The financial ROI is when the return is made financially and based on money. Managers, for example, want to return 2$ if they spend 1$. However, the other category of non-financial ROI is by no means small. In other words, it cannot be expressed in terms of money. These benefits are qualitative and are acquired in exchange for the implementation of KM. Customer satisfaction can be considered one of these benefits. Mere attention to financial benefits in the organization alone, as an indicator of performance, at best is misleading and leads to short-term benefits for the organization. In other

words, it is the understanding of the critical scales of knowledge (spiritual capital or intangible assets) that affects financial performance. A survey of North American, European, and Asian companies found that 89 percent of sample organizations agreed with the statement that measuring intellectual capital is critical to an organization's ability to succeed in business Robinson, Carrillo, Anumba & Al-Ghassani, 2005). Each of these components of cost and benefit in KM includes subcategories. These are some of the most widely used and documented topics mentioned by literature review and experts and pundits. As mentioned, the managers of the organizations will implement KM, if they receive a regular and written report that indicates the return of their capital. Calculating the ROI is one of the most challenging issues that KM professionals face in a project. The apparent costs and financial revenues are quantitative and challenging to identify.

Nevertheless, the most challenging part of calculating the ROI is when intangible costs and non-financial income must be identified. In other words, they must be quantified and assigned a number that was the most challenging part of calculating the ROI. After identifying the components, their validity was measured by experts. Moreover, finally, in the third stage of the study, the coefficient of each of these components was determined. These coefficients are considered the weight of components. Moreover, play a crucial and fundamental role in determining the rate of return on investment. We have allocated a sum to each component and multiplied by their weight to calculate the rate of return on investment. The sum of multiplying each item of cost by their weight with multiplying each item of income by their weight, then divided by multiplying each item of expenditure by 100, gives us the return on investment in the hypothetical organization.

Endnotes

1. Knowledge management
2. http://km.sharif.ir
3. HD = Hasanzadeh & Daj
4. Cost Value
5. Benefit Value

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