Strategic Evaluation of Applied Management Information Systems of BSC Method

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Abstract: The main purpose of this research is to strategically test the management information systems of the organization (applied by BSC method). The main data collection tool of the present study was a researcher-made questionnaire based on key indicators of strategic evaluation of information management systems of the organization by four dimensions of balanced scorecard technique based on review of internal and external research. They examined the appropriateness or disproportion of the indicators related to the four dimensions according to the mean scores obtained and considering the 5-point Likert scale. Findings showed that after reviewing and reviewing similar local and foreign research, 19 indicators as key indicators of strategic evaluation of management information systems in the four dimensions of the balanced scorecard technique and then approved by experts. Meanwhile, in the customer dimension, the customer growth rate index through the implementation of the organization's management information system, in the internal processes dimension, the index of facilitating the sharing of project information at the organization level, in the growth and learning dimension, the improvement and promotion index.

Keywords: Evaluation, Strategic, Information Systems, BSC.

Introduction

In most organizations today, fast and timely access to comprehensive and integrated information is a key to success. Research shows that employing and implementing organizational management information systems can be of great contribution to management of timelines, and execution and implementation of various processes and actions of the organization. These systems collect various data entries at the organizational level and store them in a database for timely and facilitated access when required. These systems can also be employed to leave a great effect on managing executive activities, managing goods and items, collecting and categorizing financial information, and maintaining them for reporting purposes (Lu et al., 2006). In the meantime, the evaluation of information, particularly in the context of strategic management information systems, is met with less enthusiasm within the academic sphere. In evaluating the management information systems of any organization, a wide range of information sources should be examined. Such Information resources are generated primarily to facilitate the processes of collecting, processing and disseminating information at different levels of the organization, and may include systems for collecting, storing,

and retrieving organizational data, as well as systems for integrating, storing, and applying organizational knowledge. According to (Lima et al., 2009), evaluation is performed primarily to determine the strengths and adequacy of the system in offering services and also to detect its weaknesses and provide general suggestions for corrective measures to improve system performance.

In general, the significance of reviewing and evaluating the management information system of the organization can be discussed from various perspectives: First, the existence of a proper, up-to-date and efficient management information system at the organization level, and awareness of critical success factors and optimal evaluation thereof will lead to managers from different levels of the organization being more focused on strengths and more inclined to eliminate potential weaknesses. Therefore, supporting managers by enhancing the drivers and weakening the restraints in the design, implementation or development of information systems and the provision of hardware and software infrastructure is pivotal to the success of an information system. Second, considering the importance of successful and consistent implementation of management information systems on the one hand and the high failure rate of these projects, as evidenced by the literature – as (Bokari, 2015) argues that 75% of projects related to system design and implementation Management information systems are tagged as a failure at some point - its assessment at certain intervals is of paramount importance. Third, the development of information systems and the costs involved in designing, deploying, and employing them are often bordering on the excessive, while the overall project is time consuming. Therefore, considering the aforesaid three perspectives and given the scarcity of domestic studies within the literature, the author has sought to strategically evaluate the management information systems of the organization using the balance score card (BSC) method to propose practical solutions and suggestions for the corresponding policy-makers. Therefore, the present study seeks to examine the strategic evaluation of management information systems of the organization using the BSC method.

Theoretical foundations and research background
Organizational management information systems

In the modern era, information is a critical organizational resource that entails efficient management and its purpose is to fulfill the information needs of employees and managers at different levels. As a means of performing activities and achieving assigned missions, information systems have a significant role in increasing the efficiency and effectiveness of the organization (Al-adaileh, 2009).

Researchers believe that information systems have the highest importance in achieving competitive advantage for organizations. In a general sense, management information systems are defined as systems that provide the necessary information for managers in making and adopting decisions (Aghaei et al., 2016). Information systems generally collect, process, store, analyze, and disseminate information for a specific purpose. Every information system, like any other system, deals with a plethora of inputs and outputs. This system uses technologies such as computers to process inputs and sends the outputs to users or other systems through electronic networks (Ramezanian & Basagh-Zadeh, 2011).

As one of the branches of the systems science, the literature on the information management system of the organization has a history of less than 40 years, which, in contrast to related sciences such as information and communication technology, artificial intelligence and cognitive sciences, still has a long academic road ahead its development. The overall purpose of such a system is to process information, to receive data, to process various forms of operational data of the organization and prepare summary reports. Conventionally, the role of management information systems in the organization has been to design, build and deploy systems to enhance organizational preferences with the aim of improving the productivity of the organization through the acquisition and processing of information (Kamali et al., 2020).

One of the more essential subjects regarding organizational management information is the evaluation of such systems. Evaluation is often perceived to be a critical element of the system development process. Formal evaluation methods are means for ensuring the consistent development of the system and are used to receive feedback from the system, through which the judgments and decisions related to the development of the system are enhanced. Consequently, assessment is thought of as a control mechanism that preserves the information system development process. Several studies have mentioned the evaluation of the success of information systems in as one of the most important elements of the information management systems of the organization, as the output quality of these systems are perceived to be heavily involved in the optimization of the performance of the organization (Al-adaileh, 2009).

The BSC Method

The performance organization must be evaluated at specific intervals in a pre-devised timetable to be able to achieve its organizational goals in an ever-increasing competitiveness of the market. However, in the past decades, such evaluations were oftentimes based on financial metrics, but gradually researchers realized that more

comprehensive evaluations are required to holistically assess the strategy of the organization, hence the development of more modern and comprehensive systems (Namazi, 2003). Various methods and techniques have been proposed in the last 3 decades, among which the balanced scorecard (BSC) is one of the multidimensional performance evaluation systems that was introduced in 1992 by David Norton and Robert Kaplan. BSCs includes financial and non-financial criteria, outputs and incentives that fall into four categories, namely financial perspective, customer perspective, internal perspective, and learning perspective, and evaluates the organization's performance from these four perspectives. As such, this method assists managers in improving the performance of the relevant unit by graphically depicting the level of performance of organizations.

The BSC is a means for converting strategies into practices, for which it provides a framework for measuring financial aspects and customer satisfaction as well as the capabilities of the organization and processes. Today, these cards have become a full-fledged management tool in addition to being a performance appraisal technique for financial and non-financial criteria. (Shabahang & Ebrahimi Sarvolia, 2005) argue that BSC evaluates the organization in four perspectives of growth and learning, internal processes, customers and finances to provide a comprehensive tool for assessing the overall of the organization. This method of measuring performance appraisal simultaneously employs financial and non-financial, quantitative and qualitative, and retrospective and prospective inputs assess the achievement of the short-term, medium-term and long-term goals of organizations. A schematic view of the BSC technique is provided in (Figure 1).
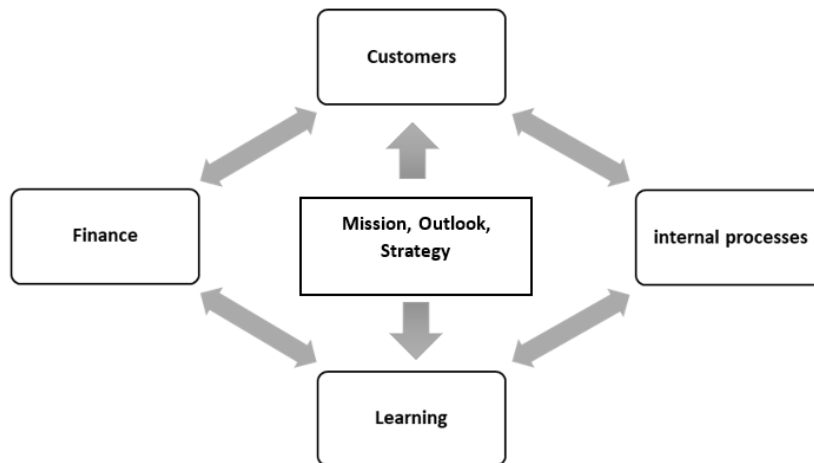

Figure 1. Four aspects of BSC method technique

Literature Review

Findings of (Meskell et al., 2015) indicate that information sharing is one of the important functions of organizational management information systems. The authors provide a comprehensive classification of the factors influencing the success of information systems, in which six dimensions involved in the success of information systems are discussed, namely, system quality, information quality, application, user satisfaction, individual effect and organizational effect.

(Gable, 2008) argue that a comprehensive framework for evaluating information systems should include dimensions that consider both the past (effects) and the future (quality). As such, they presented the model of information systems effect as a comprehensive framework. This model has two halves in four dimensions of information quality, system quality, individual effect, and organizational effect with 37 indicators.

(Robinson, 2007) considers effective group leadership, efficient communication, detailed implementation roadmap, measurable goals and human resource training as element contributing to the success of the implementation and deployment of management information systems.

(Lu et al., 2006), examined the critical success factors of inter-organizational information systems (IOS) using a case study of Cisco and Xiao Tong in China. The results suggested seven critical success factors for the IOS, namely (1) intensive stimulation, (2) shared vision, (3) cross-organizational implementation team, (4) high integration with internal information systems, (5) inter-organizational business process re-engineering, (6) advanced legacy information system and infrastructure and (7) shared industry standard.

(Golderman, 1998) conducted a meta-analysis of management information systems, the findings of which revealed that 27 systems considered user satisfaction, 17 measured the performance of system and 13 systems

employed other dependent variables to measure success. The author has studied two criteria in his meta-analysis, namely (1) the performance of information systems and (2) user satisfaction. Finally, he states that user satisfaction is the most appropriate measure of the success of information systems.

(Masihabadi, 2016) states that the barriers facing organizations in the field of factors affecting the success of management information systems in organizations can be studied in three main categories, namely, human barriers, organizational barriers and environmental barriers. The author employed the recognized factors to provide suggestions for users, designers and administrators of management information systems.

(Aghaei et al., 2016) reported that the key elements influencing the management of information systems of MAPNA Group are support of the high-ranking managers, alignment of strategic information and systems of the organization, redesign and management of business processes, quality of input data, employment, maintenance and training of human resources specialists in the field of information systems, effective use of information resources, data and information security, Internet security, and reliability of software packages. Furthermore, findings revealed that the support of the high-ranking managers is the most influential element, while the reliability of the software packages was the most influenced element.

(Barkhordar & Shiraviehzad, 2016) examined a study to identify and evaluate the key factors for the success of the implementation of management information systems in project-based organizations. The findings indicate that the factor support of senior management before and after the implementation is the most important factor, while the technical factors are the most important key factors for the success of the implementation of management information systems in project-based organizations. Considering the existing challenges, the results of this research can be used in all organizations that design or employ similar systems systems, especially in project-based organizations.

Methodology

In the present study, descriptive-exploratory method was used. To achieve the research goal of strategic evaluation of organizational management information systems, the author used content analysis and reviewed international and domestic literature to extract the indicators related to the four dimensions of the BSC. Then, the author used a questionnaire to inquire the opinion of academic and industrial experts to measure the importance of the discovered indicators. Therefore, the statistical population of the research included academic and industrial elites familiar with the subject of research. The author used snowball sampling for the purposes of the research, based on which 14 experts were selected for study. The main tool for collecting the data of the present study was a researcher-made questionnaire based on key indicators of strategic evaluation of organizational management information systems. The questionnaire was sorted by four dimensions of balanced scorecard technique based on review of international and domestic literature research (Table 1). After conducting a survey with experts and collecting their opinions, the items were rated using a 5-point Likert scale, based on which a mean score of higher than 2.5 was selected to represent the relevance of the indicators. The scale was quantified as follows: 1 for completely irrelevant, 2 for irrelevant, 3 for partially relevant, 4 for relevant, and 5 for completely relevant.

Findings

Identifying the indicators

Based on the review of similar domestic and foreign research, the key indicators of strategic evaluation of management information systems of the organization were identified using the balanced scorecard technique as follows (Table 1).

Table 1. Key indicators of strategic evaluation of organizational management information systems grouped by four dimensions of the BSC method according to the review of similar domestic and foreign literature

Row	Dimension in the BSC	Indicator	Extracted from
1	Customers	The rate of customer growth through the implementation of the organization's management information system	(Meskell et al., 2015)
2		Improvement of the market share through the implementation of the organization's management information system	(Lu et al., 2006), (Lima et al., 2009)
3		Improvement of customer trust and cooperation through the implementation of the organization's management information system	(Aghaei et al., 2016), (Meskell et al., 2015)

4		Customer satisfaction	(Golderman, 1998), (Meskell et al., 2015)
5	Internal process	Improvement of coordination and coherence between the organization and suppliers	(Lu et al., 2006), (Lima et al., 2009)
6		Facilitating the sharing of project information at the organization level	(Lu et al., 2006)
7		Improving the reliability of different stages of project implementation at the organization level	(Gable, 2008)
8		Enhancement of material flow throughout the organization's project supply chain	(Lu et al., 2006)
9		The success of the organization in the alignment of information systems and the strategy of the organization	(Aghaei et al., 2016)
10		Enhancement of the security of data and information of the organization	(Aghaei et al., 2016), (Lima et al., 2009)
11	Growth and learning	Number of trained people	(Aghaei et al., 2016), (Robinson, 2007)
12		Satisfaction of managers of the organization with the implementation of management information system	(Golderman, 1998), (Meskell et al., 2015)
13		Improvement of the level of added value created in the project	(Gable, 2008)
14		The effective and efficient use of information resources	(Aghaei et al., 2016), (Lima et al., 2009)
15		Improving the motivation of the organization's employees	(Lu et al., 2006), (Robinson, 2007)
16	Finance-related	Rate of return on investment in the implementation of the organization's management information system	(Aghaei et al., 2016), (Meskell et al., 2015), (Lu et al., 2006)
17		The net profit obtained through the implementation of the organization's management information system	(Lu et al., 2006), (Golderman, 1998)
18		The sales obtained through the implementation of the organization's management information system	(Lima et al., 2009), (Meskell et al., 2015)
19		Predictable rates of fluctuations and unpredictable costs at the organization level	(Gable, 2008), (Meskell et al., 2015), (Lu et al., 2006)

Evaluation of indicators based on the opinions of the experts
The findings obtained from scoring of the interviews of experts are presented as follows (Table 2).

Table 2. Table of opinions obtained from experts regarding the key indicators of strategic evaluation of management information systems of the organization, sorted by four dimensions of balanced scorecard technique

Row	Dimension in the BSC	Indicator	Weighted mean of opinions
1	Customers	The rate of customer growth through the implementation of the organization's management information system	4.300
2		Improvement of the market share through the implementation of the organization's management information system	3.780

3		Improvement of customer trust and cooperation through the implementation of the organization's management information system	3.650
4		Customer satisfaction	4.100
5	Internal process	Improvement of coordination and coherence between the organization and suppliers	4.100
6		Facilitating the sharing of project information at the organization level	4.300
7		Improving the reliability of different stages of project implementation at the organization level	4.005
8		Enhancement of material flow throughout the organization's project supply chain	4.123
9		The success of the organization in the alignment of information systems and the strategy of the organization	3.650
10		Enhancement of the security of data and information of the organization	3.745
11	Growth and learning	Number of trained people	4.300
12		Satisfaction of managers of the organization with the implementation of management information system	4.150
13		Improvement of the level of added value created in the project	4.333
14		The effective and efficient use of information resources	3.345
15		Improving the motivation of the organization's employees	3.567
16	Finance-related	Improvement of the level of added value created in the project	4.100
17		The net profit obtained through the implementation of the organization's management information system	3.650
18		The sales obtained through the implementation of the organization's management information system	3.650
19		Predictable rates of fluctuations and unpredictable costs at the organization level	4.005

The results of the above table show that all the 19 indicators of strategic evaluation of management information systems extracted from the literature were approved by the experts, as evidenced by the mean scores obtained using the 5-point Likert scale. The results further indicate that the indicator of the rate of customer growth through the implementation of the organization's management information system in the customer perspective, the indicator of facilitating the sharing of project information at the organization level in the internal processes dimension, the indicator of the improvement of the level of added value created in the project in the growth and learning dimension, and the indicator of improvement of the level of added value created in the project in the financial dimension were scored higher by the experts.

Therefore, the final model proposed by the researcher for strategic evaluation of management information systems of the organization based on the application of BSC method is as follows (Figure 2).

Fincance	Customers	Internal processes	Learning
• Capital return rate • The amount of net profit obtained • The amount of sales obtained • The ratio of system implementation costs to revenue generated	• Customer satisfaction • Increased customer trust and cooperation • Increased market share • Customer growth rate	• Strategic alignment of information systems and organizational strategy • Reliability of different stages of project implementation • Improvement of the material flow throughout the project supply chain • Facilitating the sharing of project information • Improvementi the security of data and information of the organization • Improve coordination between the organization and suppliers	• Satisfaction of managers of the organization • Improvement of the motivation of the organization's employees • Effective and efficient use of information resources • Upgrading the level of added value • Number of trained people

Figure 2. Strategic evaluation of management information systems of the organization using the balanced scorecard method

Discussion

In the current study, similar domestic and international researches were reviewed to determine the criteria for the strategic evaluation of the management information systems of the organization based on the four dimensions of the BSC method. hence, the identified indicators were presented to the experts in the form of a questionnaire to comment on their importance. The findings showed that all 19 criteria identified for the strategic evaluation of the management information systems of the organization using the four dimensions of the BSC was approved by experts. Furthermore:

1. Customer dimension: In the present study, this dimension included 5 indicators, among which the indicator of the rate of customer growth through the implementation of the organization's management information system was scored higher. In this dimension, the purpose of implementing organizational management information systems is to pay attention to the organization's customers, pursuant to which managers need to identify market segments and customers in which organizational units compete and be able to master its information evaluation.

2. Internal processes dimension: In the present study, this dimension included 6 indicators, among which, the indicator of facilitating the sharing of project information at the organization level was scored higher by experts. It should be noted that this dimension requires that the management information system of the organization be evaluated to extract the important and effective processes, according to which criteria should typically focus on the processes that have the greatest impact on customer satisfaction and achieving financial goals of the organization. In an organization management information system, monitoring and evaluating the whole process, which begins with an order from the customer and ends with the delivery of products or services to the customer, is of utmost importance

3. Growth and learning dimension: In the present study, this dimension included 4 indicators, among which, the indicator of the improvement of the level of added value created in the project in the growth and learning dimension was scored higher by the experts.

Here, the purpose of the evaluation is to identify the factors that are important for the current and future success of the organization's information system. However, it seems unlikely that organizations with current technologies and capabilities can meet their long-term goals of the success of organizational management information systems in closely monitoring customers and internal processes, and therefore, the purpose of growth and learning perspective is to identify infrastructures that the organization needs, and hence must create, for long-term growth and improvement.

4. Financial dimension: In the present study, this dimension included 4 indicators, among which, the indicator of improvement of the level of added value created in the project in the financial dimension was scored higher by the experts. It is noteworthy that one of the evaluation criteria of any system is its financial aspect, which determines the success of the performance of different systems of the organization in realizing long-term goals of the organization. This approach can link the organization's management information system to its customers and stakeholders.

Conclusion

Given the importance of management information systems in the current era, it is of paramount importance to strategically evaluate these systems using a comprehensive and holistic view to be able to justify the huge investment made in the creation and development of these systems. Therefore, the purpose of this study was to present a strategic evaluation of management information systems of the organization. Considering that currently the BSC method is one of the most important tools for performance evaluation which can typically evaluate the strategies of companies and organizations, this study sought to examine the evaluation of management information systems using the aforementioned method. The success of the BSC model in the last three decades is owing to its broad and comprehensive approach using four perspectives of financial approach, customer, the internal processes and growth and learning. Therefore, the implementation of the proposed model based on the BSC approach has the potential to properly assess the value of the intangible assets of any organization and to establish a strong link between its tangible and intangible assets.

Recommendations

The authors propose the following recommendations based on the results of the study.

1. The managers of the organization are recommended to take the necessary measures holding training courses to inform employees, with the ai, develop the culture of using information management systems.

2. During the process of designing, deploying and using project management information systems, managers of organizations should pay due attention to the behavioral aspects of the organization's employees, especially system managers, and hence involve them in the formation process.

3. Understanding the information needs related to projects is of particular importance when analyzing and designing information systems and the consequent evaluation thereof, and hence anticipating sufficient opportunity to this end is pivotal.

4. System designers should envisage optimal training routines according to the characteristics of managers of information systems in the organization to achieve higher levels of efficiency and satisfaction.

Considering that this research has only presented a model based on the BSC approach for strategic evaluation of management information systems of the organization, future researchers are suggested to evaluate this system by combining the present model with other evaluation models and those of various organizational systems such as DEA, 360 degrees, among others. Moreover, different methods and techniques for weighting indicators such as Shannon entropy and AHP can be used to achieve more comprehensive models.

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