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EVALUATING PERFORMANCE OF ACCOUNTING INFORMATION SYSTEMS USING A FUZZY LOGIC APPROACH

Abstract:

The study constructs an approach based on the fuzzy logic approach (analytic hierarchy process (AHP) and analytic network process (ANP)) and balanced scorecard (BSC) for evaluating (AISs) performance in the government financial management information system (GFMIS) in Jordan. The (BSC) concept is applied to define the (AHP) and (ANP) with four major perspectives (i.e. financial, customer, internal business process, and learning and growth), and key performance indicators (KPIs) are selected for each perspective. A fuzzy logic approach is then proposed in order to tolerate vagueness and ambiguity of information. A fuzzy logic approach (AISs) is finally constructed to facilitate the solving process. The results provide guidance to (AISs) in the (GFMIS) in Jordan regarding strategies for improving (AISs) performance. The constructed approach is suggested to be a good tool for solving other multiple-criteria decision-making problems.

Keywords:

Accounting Information Systems (AISs), Fuzzy Logic Approach

JEL Classification: M41, E11, M49

Introduction

The accounting system is considered one of the oldest types of systems. It is a main source of economic information that has a great importance in the administrative processes of planning, organizing, control, and decision-making (Romney and Sreinbart, 2015). As the government activity is one of the most important activities in the countries of the world, relying on an accounting system, which provides appropriate information in order to take the decisions that are reflected on the citizens of these countries. One of the first priorities of the Jordanian government was to set up a governmental accounting system that generates the reports serving the decision makers. As well, since the Jordanian government is seeking to improve its financial position, it has developed its accounting system to comply with the economic conditions and technological growths taking place in the world on the one hand, and to provide accurate information in a timely manner to decision makers on the other hand. In the light of growths witnessed by the world, the (AISs) have witnessed in recent years a remarkable growth in the governmental enterprises and departments in Jordan. An integrated computerized governmental management and financial accounting system has been installed to link all financial and accounting operations of the ministries, government departments and financial centers with the Ministry of Finance. This system is called the (GFMIS) (www.mof.gov.jo) It consists of specialized and ready software that has the ability to be adapted and adjusted in a way that serves the functions and areas of the (GFMIS) to the its various businesses varying from payments and receipts management, cash management, procurement management, projects management, preparing the general budget and the general ledger. In 2006, the council of Ministers in Jordan has approved the commencement of establishing (GFMIS), which leads to improve the mechanisms for dealing with the public fund and raising the level of service provided to the ministries and government departments in Jordan. This system was used based on the recommendations of the International Monetary Fund (IMF) and the World Bank in their joint report for the financial management in Jordan in March 2004, because of its importance in obtaining accurate and comprehensive information in a timely manner (www.mof.gov.jo). Based on the aforementioned, the present study evaluated the performance of the accounting system in the Jordanian government using the fuzzy logic approach as a method used to make multi-criteria decision-making.

The Problem of the Study

Having reviewed the government accounting system in Jordan through the Ministry of Finance bulletins and considering the studies presented on (AISs) in the Jordanian government such as the study of Jibreel (2014), the study of Al-murtada and Hamdan (2016), which recommended to conduct further studies that resolve the problems of the Jordanian government accounting system. The researchers found a few study of the presented studies on the evaluation of accounting system in the Jordanian

government, and shortcomings in finding specific standards and criteria used to evaluate the performance of (AISs) for the Jordanian government. Accordingly, **the study problem aims in answering the following questions:**

- Is it possible to develop an integrated and comprehensive model to be used in evaluation the performance of (AISs) in the Jordanian government by using the fuzzy logic approach?
- Is it possible to find a tool to evaluate the performance of (AISs) in the Jordanian government based on the vision and strategy of the system?
- Is it possible to reach a standard that evaluate the percentage of contribution for each indicator of (AISs) performance indicators in achieving the goals of the system?

Objectives of the Study

This study aimed to achieve the following goals:

- Dveloping an integrated and comprehensive model based on other model, to be used to evaluation the performance of (AISs) in the Jordanian government by using the fuzzy logic approach.
- Finding a tool to evaluation the performance of (AISs) in the Jordanian government based on the vision and strategy of the system.
- Reaching a standard that evalute the percentage of contribution for the performance indicators of the (AISs) in the Jordanian government in achieving the goals of the system.

Literature review

The Study of Al Murtada and Hamdan (2016) The Role of (GFMIS) in Raising the Effectiveness of the Preparation of Government Budgeting, the study aimed to measure the role of the (GFMIS) in raising the effectiveness of the preparation of government budgeting. The Study of Yuksel and Dagdeviren (2010) Using the Fuzzy Analytic Network process (ANP) for Balanced scorecard (BSC)The study aimed to evaluate and measure the performance level of business in industrial plants using a model that combines the balanced scorecard (BSC) and the analytic network process (ANP). The study used the balanced scorecard (BSC) and the analytic network process (ANP) to determine the level of performance in industrial companies based on its goals and strategies.other study is The Study of Hamdan (2013) Improving the Performance of (AISs) of Commercial Banks in Jordan by using the Balanced Scorecard Approach The study aimed to Improving the Performance of (AISs) of Commercial Banks in Jordan, The study found many results, where the most important results were as follows: facilitate the establishment of a comprehensive (AISs) strategy intended to achieve, and maintain a competitive advantage, provide the attributes that produce comprehensive information for different stakeholders, improve and maintain the internal control systems. The study concluded that all of

these elements together lead to the growth and improvement of (AISs) performance in the commercial banks in Jordan, thereby improving (AISs) operational performance with different materiality determined by the relationship between the target elements and objectives. This study was utilized to increase knowledge in the (ANP) and (AHP) when combined with the balanced scorecard.

AISs

Accounting, as an information system, is considered one of the most important systems used by enterprises to measure its economic and financial situation, the competitive position, and the relationship of the enterprise with the surrounding environment (Romny and Steinbart, 2013). As well, accounting, as an information system, is considered an essential product for the information required by the management, which mainly contributes to the decision-making process. The existence of a close correlation between (AISs) and the management decision-making process has increased the importance of these systems, because the information produced by the system plays a major role in management functions, especially with regard to planning and decision-making process, which made the interest in improving (AISs), its evaluation and measurement of its effectiveness as the most important issued addressed by researchers. Besides, the existence of effective and high-efficient (AISs) contributes to help the management in making wise decisions and in solving the problems facing the enterprises (Romney and Steinbart, 2006).

BSC for GFMIS

The Jordanian Ministry of Finance defined (GFMIS) as a government and administrative financial accounting system that lease all financial and accounting operations of all government ministries, departments and centers with the Ministry of Finance. It consists of specialized and ready software that that has the ability to be adapted and adjusted in a way that serves the functions and areas of the (GFMIS) to the its various businesses varying from payments and receipts management, cash management, procurement management, projects management, preparing the general budget and the general ledger (www.mof.gov.jo). Vision of (GFMIS): Support the management of financial decisions through the application of an integrated government financial system (www.mof.gov.jo). Mission of (GFMIS): Providing an integrated computerized financial system for the management of the financial operations of all government departments, which ensures: (Website Jordanian Ministry of Finance). Kaplan and Norton presented BSC in 1992, the balanced scorecard approach consists of four perspectives: financial, customer, internal process, and learning and growth (Kaplan & Norton, 2006).BSC It links strategies and processes to achieve a balance between the needs of the parties concerned in organizing businesses. From a strategic perspective, (BSC) is a performance measurement comprehensive system, whereby the business strategy is converted into

strategic targets, targeted standards and values, and strategic initiatives (Kaplan and Norton, 2005). In the field of applying the (BSC) in government institutions, it has been defined as: is a performance measurement comprehensive system from a strategic perspective, whereby the business strategy is converted into strategic targets, targeted standards and values, and procedural steps. It is also a tool that is used for transferring and delivering the institution's strategy to the different management units and levels, to measure the implementation of this strategy in the various management units and levels (www.mopsd.gov.jo). Based on the above-mentioned, the researchers note that the (BSC) focused on the financial and non-financial performance. This is unlike the traditional performance metrics, which focus on the financial scale. On the contrary, the non-financial standards focus on the current and future success, which is unlike financial measure that is considered a historical scale. Kaplan and Norton (2005) clarifies that the financial aspect in the business enterprises is one of the most important aspects that cannot be ignored, because the accurate and timely financial statements contribute to the good performance. On the side, it also highlights the importance of customer satisfaction and meeting their requirements, because the competitive environment has offered to customers multiple choices, leading to their movement into other competitive entities. Therefore, it was necessary give this perspective an importance that reflects the future performance of the business organizations (Huemann, 2007). With respect to the internal processes perspectives, Kaplan (1992) adds that this perspective indicates to the managers how the conduct of operations is going on, and whether the product or service meets the requirements of the beneficiaries or not, which constitutes in turn an added-value to the organization and leads improve its financial position. As for the growth and growth perspectives, it is involved in the staff training and education, and in the growth of their personalities to become major and important resources in the organization in light of the technological growth witnessed by the world. The non-financial perspectives of (BSC) not only contribute to positive changes on the short term, but also in the long run. This is opposed to the financial perspective, which contributes to increased seasonal returns. Hence, this would make managers focus on the long term, which contributes to the verification of the strategic vision of the organization, based on the fact that short-term financial evaluation criteria does not contribute to the verification of the vision and mission of the organization (Johnson, 2007). (BSC) converts the vision and strategy of the organization into goals. It also identifies the market share of the organization, as well as it identifies the quality of the beneficiaries' customers. The organization shall determine the appropriate goals and standards for each perspective of (BSC) perspectives.

key performance indicators (KPIs) of (BSC) Based on (GFMIS)

the following table summarizes the performance indicators that are used by the researchers in evaluating the performance of the (AISs) in the Jordanian government.

Table (1): key performance indicators (KPIs) of (BSC) Based on (GFMIS)

BSC performance	KPIs
financial	The liquidity ratio The economic added value The profit margin and the financial stability The debt Ratio
internal processes	The rapidity in accomplishing transactions The existence of errors in the completion of work The employee's productivity The risk reduction
citizen and the service recipient's	The citizens' satisfaction about the quality of service provided to them The citizens' satisfaction about the manner of deal with them The ratio of complaints submitted to the management The period of transactions' completion
Learning and growth	Paying attention to train the system's staff The existence of incentives for the system's staff that are related to developing their competence Using computer and modern techniques in the completion of transactions The satisfaction of the system's staff

Fuzzy Logic Approach (AHP & ANP)

The fuzzy logic approach includes the selection of an alternative within a group of multi-criteria alternatives, with the existence of uncertainty conditions in the environment of these alternatives. It is divided into (AHP & ANP). (ANP) differs from (AHP). There is an overlap and interaction between the main criteria and the sub-criteria during the selection of an alternative. On the other side, such interventions do not exist in (AHP) (Saaty, 2006). The fuzzy logic approach can be defined as: the concept of the system, methods and principles to deal with the closest logic to the accuracy. Since it is allowed to represent intermediate correlation values between the right and the wrong in the classical logic approach, this approach can be applied in the areas of humanitarian activities (Vanti and Soltero, 2005). (AHP) was first introduced by Al Saati (1971). He used this process in the process of making various decisions, and in selecting an alternative from among several available alternatives. (AHP) is based on selecting an alternative from among several multi-criteria alternatives, in case that any of the main criteria is not dependent on the sub-criteria, so that the criteria are to be classified hierarchically (Yuksel and Dagdevirn, 2010). Al Saati believes that (AHP) is a framework of logic to solve problems, where data is arranged hierarchically, according to its relative importance in terms of its impact on the decision's outcomes, which helps decision-makers to select the most important criteria depending on its relative weights. Al Saati (1980) introduced (ANP) as a new stage for the decision-making process. (ANP) is considered a generalization for the (AHP), as the network analysis allows overlapping the relationships between the levels of decision, unlike the hierarchical analysis, which only allows the existence of unilateral hierarchical relationship between the levels of decision (Ravi and Shankar, 2005). (ANP) differs from (AHP) by the existence of complex interactions between the key

decision criteria and sub-criteria decision. Therefore, the hierarchical formation of these criteria is difficult, which results in forming these criteria in the form of a complex network. For this reason, (ANP) is used to resolve the problems of mutual influence between the major criteria together, the sub-criteria to each other and between the main and sub-criteria. This is unlike (AHP), which is used to resolve the problems that do not depend on the presence of overlap between its criteria (Ali, 2012). Accordingly, the researcher conclude that (ANP) is only a generalizing the (AHP). It represents a framework for the complex interventions of decisions, which is unlike the analytic hierarchy process that represents a framework for unilateral relations. Therefore, the hierarchy form is replaced by a complex network form.

Methodology

The study relies on the qualitative approach to collect information by using the method of personal interviews to gather the preliminary data to evaluate the performance of (AISs) in (GFMIS)

Data Collection

In order to achieve the aim of the study, the descriptive and analytical approach was utilized. The study relied on two main sources for data collection: for the collection of secondary data: the study utilized the previous studies, books, periodicals, scientific journals, and publications related to the subject of study. As for the primary data, the study utilized the method of personal interviews with the working team of the Directorate of (GFMIS) at the Ministry of Finance in Jordan. It also benefited from the practical experience of the team in the field of the study.

Using (BSC) as a tool for Evaluating (AISs)

The study utilized (BSC) as a tool used to evaluate (AISs) in the Jordanian government by linking the objectives of the study with the strategies set by (GFMIS). The study develops the balanced scorecard to fit with achieving the objectives of the study.

Table (2): Linguistic values and mean of fuzzy numbers. (Yuksil and dagdeviren, 2010)

Linguistic values	The mean of fuzzy numbers
Very high (VH)	1
High (H)	0.75
Medium	0.5
Low (L)	0.25
Very low (VL)	0

Table (3): Linguistic scales for difficulty and importance (Yuksel and Dagdevirn, 2010)

Linguistic scale for difficulty	Linguistic scale for importance	Triangular fuzzy scale	Triangular fuzzy reciprocal scale
Just equal (JE)	Just equal (JE)	(1, 1, 1)	(1, 1, 1)
Equally difficult (ED)	Equally important (ED)	(1/2, 1,	(2/3, 1, 2)
Weakly more difficult (WMD)	Weakly more important (WMI)	3/2)	(1/2, 2/3, 1)
Strongly more difficult (SMD)	Strongly more important (SMI)	(1, 3/2, 2)	(2/5, 1/2, 2/3)
Very strongly more difficult (VSMD)	Very strongly more important (VSMI)	(3/2, 2,	(1/3, 2/5, 1/2)
Absolutely more difficult (AMD)	Absolutely more important (AMI)	5/2)	(2/7, 1/3, 2/5)

Formulating the Vision of the Organization

Kaplan and Norton (2007) believe that the organization's vision and mission must be identified, so the (BSC) is based on a comprehensive and shared vision that fits with the whole business entity and with clients. The vision of the organization is determined by conducting interviews with the senior management. This study has obtained the vision of (GFMIS), which is as follows: Support the financial decisions' management through implementing an integrated government financial system

Strategies Identification

Conducting interviews with (GFMIS) management, the study has obtained the system's strategies, namely:

- a) Enabling ministries and government departments implementing the functions of the financial, accounting and regulatory management effectively
- b) Achieving the principle of transparency during and beyond the execution of the state budget
- c) Raising the efficiency of the regulatory processes against the public money and issuing the financial reports

Forming the (BSC)'s Hierarchical Model: The vision is situated at the top of the pyramid, then strategies, (BSC) perspectives, and finally the performance indicators, which are distributed by each (BSC) perspectives. The following figure illustrates the (BSC)'s hierarchical model that is applied to (GFMIS).

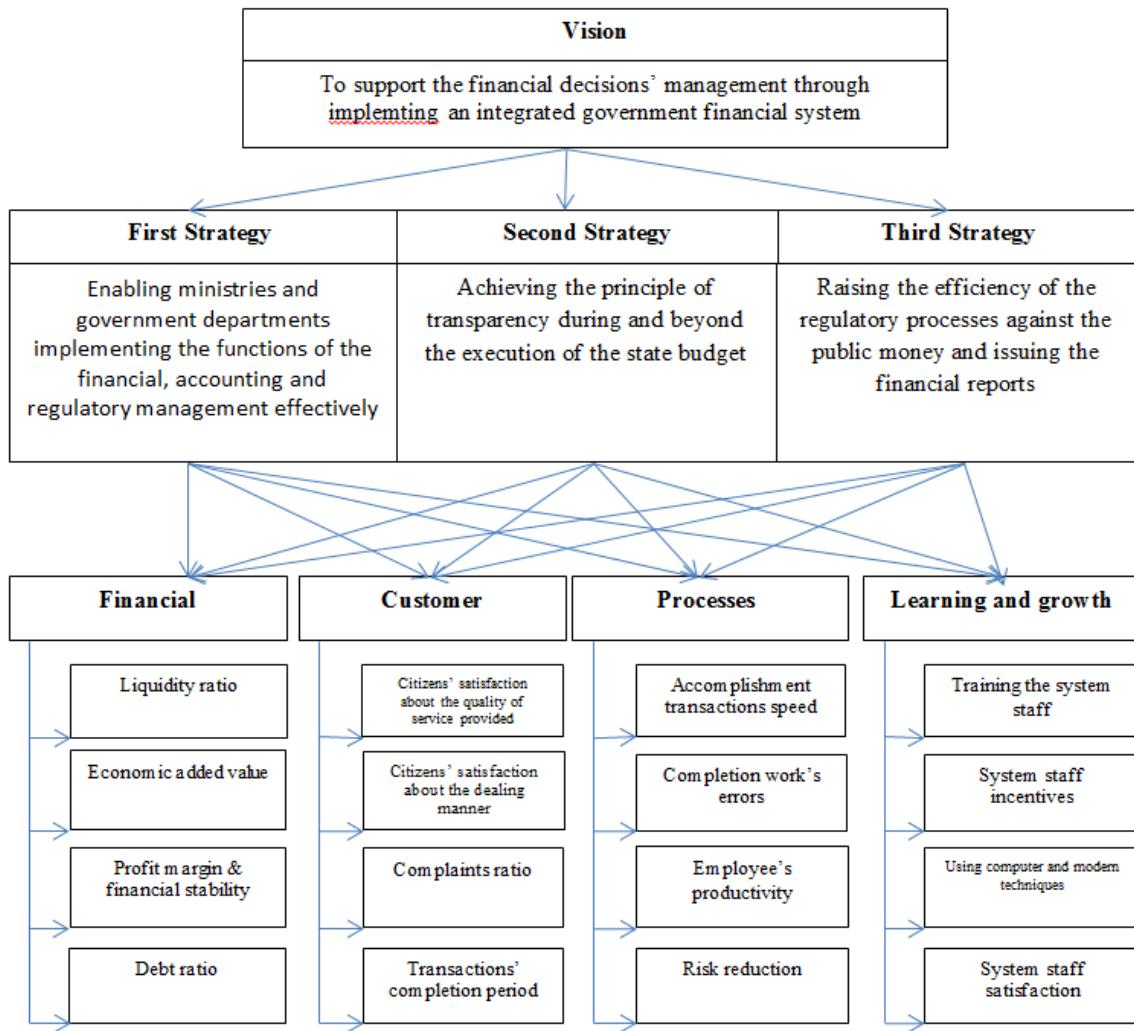


Figure (1): The (BSC)'s Hierarchical Model (the researchers based on Yuksel 2010)

From the previous figure, it can be seen that the configuration of the (BSC) hierarchical model is consisted of four levels: the first level: It includes the vision of the government's accounting system. The second level: It includes the strategies that will achieve the vision of this system. The third level: It includes the (BSC) perspective. Finally, the fourth level: It includes the performance indicators. The researchers formed comparison matrices, with the help of the interview team in the (GFMIS) Directorate. Then, the local weights of the strategies, the (BSC) perspectives and performance indicators are calculated using the Table (3-5). For instance: The Strategy (1) is compared with the Strategy (2) using the following question: what is the extent of importance to the Strategic (1) when it is compared with the Strategy (2)? The answer might be: Weakly more important (WMI). So, we put the appropriate linguistic scale to answer triangular figures through the Table (5). This figure in the previous example is (1, 3/2, 2). All matrices are evaluated in the same way. It can be calculated the local weights for each of the (BSC) perspectives, performance indicators, and calculating the global weights to the performance indicators by multiplying the local weights of performance indicators with the interdependence

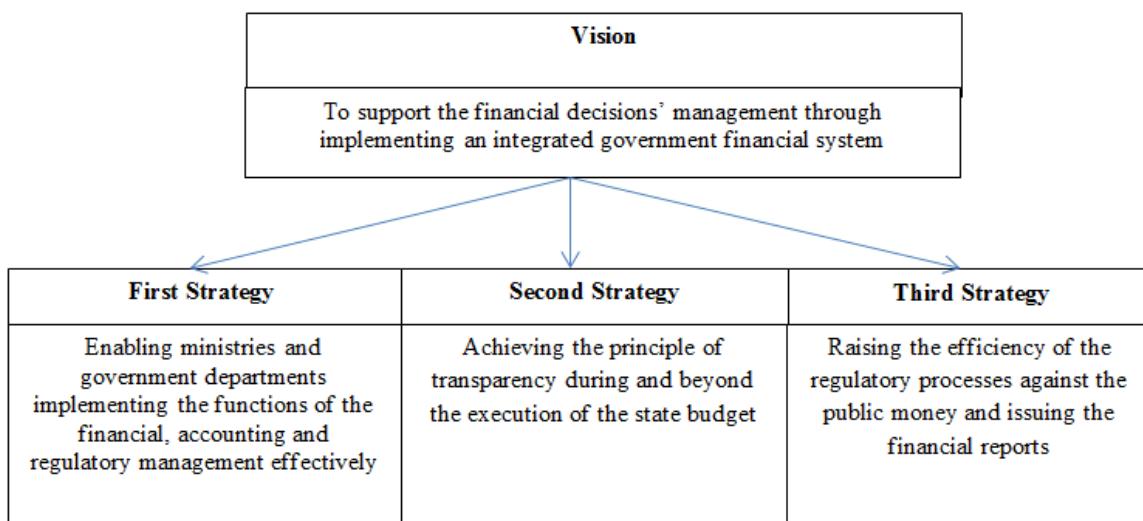
weight to which it belongs. Finally, the performance evaluation of the system is performed using the performance values of the global weights.

Qualitative data analysis: The fuzzy analysis process (AHP) / (ANP) is used to determine the local weights of strategies, (BSC) perspectives and performance indicators, by the following steps:

1. Calculating the local weights of the strategies that are used in information systems.
2. Calculating the local weights of the (BSC) perspectives that realize the (AIS's) strategies.
3. Calculating the local weights of the performance indicators based on the (BSC) perspectives.
4. Using the (ANP) to determine the interdependence weights of the (BSC) perspectives.
5. Calculating the global weight of the performance indicators.

Calculating the Local Weights of the Strategies Used in Information Systems

Based on the following figure, it can be see that there are three strategies that contribute to achieving the vision of the government (AISs). These strategies contribute to achieving the entire vision of the organization, but it does not have the same proportion of contribution. As for the fuzzy relationship between the strategies, it is used to determine the percentage's contribution of each strategy in achieving the vision of the government's accounting system using the pairwise comparison matrix.



The following table indicates the local weights of the strategies' pair wise comparison:

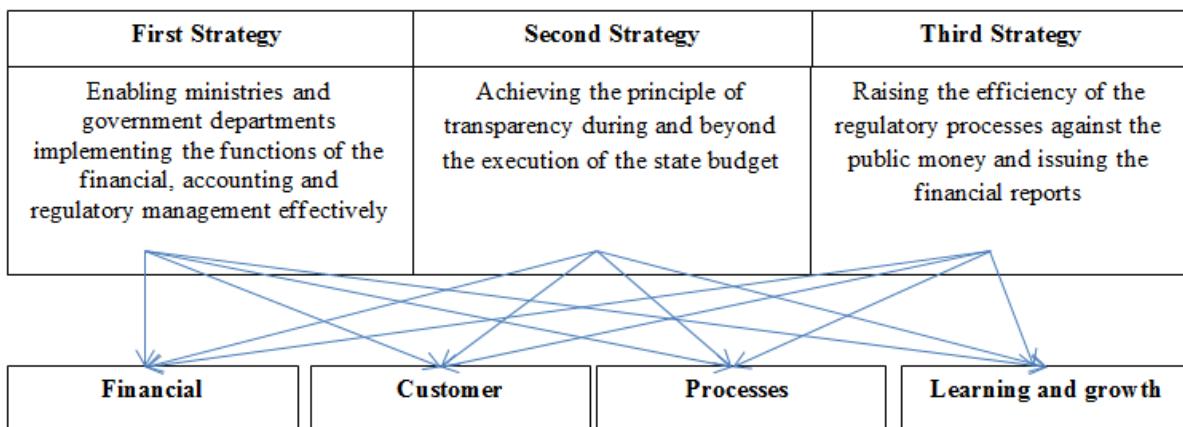
Table (4): The local weights and the strategies' pair wise comparison

Vision	Strategy One	Strategy Two	Strategy Three	Weight
Strategy One	1 , 1 , 1	1/2 , 1 , 3/2	1 , 3/2 , 2	0.367
Strategy Two	2/3 , 1 , 2	1 , 1 , 1	1/2 , 1 , 3/2	0.330
Strategy Three	1/2 , 2/3 , 1	2/3 , 1 , 2	1 , 1 , 1	0.301

As shown by the table above, the first strategy achieved the highest weight, with a rate of 36.7%. The second strategy comes second, with a rate of 33% and finally the third strategy with a rate of 30% of achieving the vision of the (AISs). The first strategy for (AISs) of government “enabling ministries and government departments implementing the functions of the financial, accounting and regulatory management effectively” it the most contribute to the achievement of the vision system, and the second strategy “Achieving the principle of transparency during and beyond the execution of the state budget” it the least contribution to the achievement of the vision system.

Calculating the Local Weights of the (BSC) Perspectives Realizing (AISs) Strategies

By this step, we determine the local weights of the (BSC) perspectives, based on the previous strategies. The following figure shows the pair wise comparison's matrix of the (BSC) perspectives:

**Figure (3): (BSC) perspectives based on the strategies of government's (AISs)**

The following table indicates the local weights and the pair wise comparison of the (BSC) perspectives:

Table (5): The local weights of the (BSC) perspectives realizing the strategy one

Strategy One	Financial	Customers	Internal processes	Learning and growth	Weight
Financial	1 , 1 , 1	2/5 , 1/2 , 2/3	1/3 , 2/5 , 1/2	2 , 5/2 , 3	0,215
Customers	3/2 , 2 , 5/2	1 , 1 , 1	2 , 5/2 , 3	1/3 , 2/5 , 1/2	0,309
Internal processes	2 , 5/2 , 3	1/3 , 2/5 , 1/2	1 , 1 , 1	1 , 3/2 , 2	0,273
Learning and growth	1/3 , 2/5 , 1/2	2 , 5/2 , 3	1/2 , 2/3 , 1	1 , 1 , 1	0,201

Customer's perspective contributes for the most in achievement the first strategic, while contributing learning and growth perspective to least achieved it.

Table (6): The local weights of the (BSC) perspectives realizing the strategy tow

Strategy Two	Financial	Customers	Internal processes	Learning and growth	Weight
Financial	1 ,1 , 1	1/2 , 2/3 , 2	1/2 , 2/3 , 1	2/3 , 1, 2	0,202
Customers	1, 3/2 , 2	1 , 1 , 1	1 , 1 , 1	1, 3/2 , 2	0,305
Internal processes	2, 3/2 , 2	1 , 1 , 1	1 , 1 , 1	1, 3/2 , 2	0,305
Learning and growth	1/2, 1 , 3/2	1/2 , 2/3 ,1	1/2 , 2/3 , 1	1 , 1 , 1	0,187

Customer's and internal process perspectives contributes for the most in achievement the second strategic, while contributing learning and growth perspective to least achieved it.

Table (7): The local weights of the (BSC) perspectives realizing the strategy three

Strategy Three	Financial	Customers	Internal processes	Learning and growth	Weight
Financial	1 ,1 , 1	1 , 1 , 1	2/5 ,1/2 ,2/3	2/3 , 1, 3/2	0,316
Customers	1 ,1 , 1	1 , 1 , 1	1/2 ,3/2 , 2	1/2 , 1 , 3/2	0,151
Internal processes	3/2 ,2 , 5/2	2/3 , 1 , 3/2	1 , 1 , 1	1, 3/2 , 2	0,344
Learning and growth	1/2, 1 , 3/2	1/2 , 2/3 , 1	1/2 , 2/3 , 1	1 , 1 , 1	0,187

Financial perspective contributes for the most in achievement the first strategic, while contributing customer's perspective to least achieved it. The obtained results in the previous tables (5,6,7) show that the customers' perspectives achieves a local weight of 31.9% in the achievement of the first strategy. It also shows that the customers' perspectives and the internal processes perspectives have a weight of 30% in achieving the second strategy, and that internal processes perspectives has a weight of 34% in the achievement of the third strategy.

Calculating the Local Weights of the Performance Indicators Based on the (BSC) Perspectives: The following Figure shows the performance indicators of the accounting system based on the (BSC) perspectives:

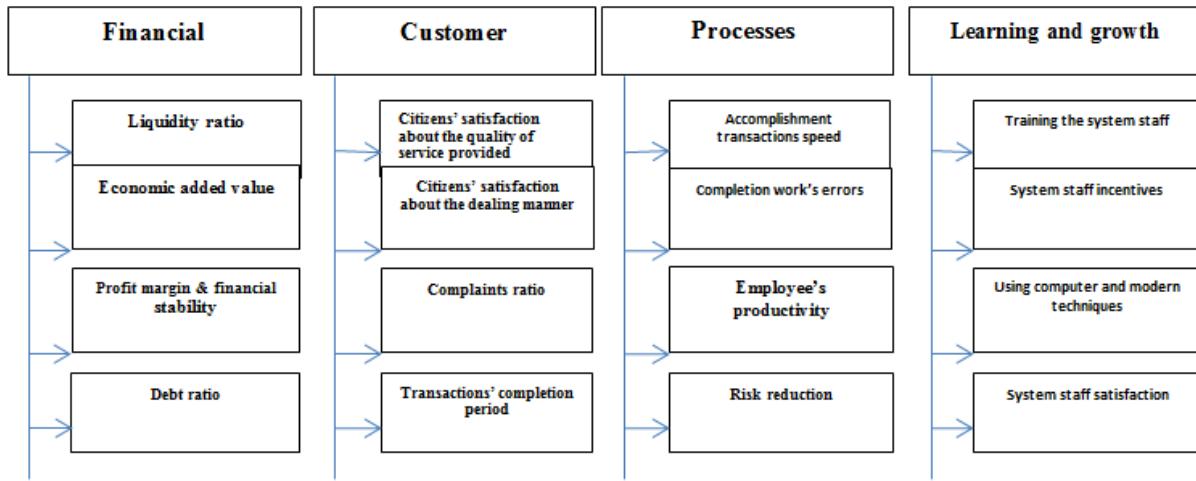


Figure (4): The performance indicators of the accounting system based on the (BSC) perspectives

The following tables show the local weights of performance indicators for the government accounting system:

Table (8): The local weights of performance indicators for the government accounting system based on financial perspective

Financial	Liquidity ratio	Economic added value	Profit margin	Debt ratio	Weight
Liquidity ratio	1 , 1 , 1	1/2 , 1 , 3/2	1 , 3/2 , 2	1/2 , 1 , 3/2	0,263
Economic added value	2/3 , 1 , 2	1 , 1 , 1	1 , 1 , 1	3/2 , 2 , 5/2	0,295
Profit margin	1/2 , 2/3 , 1	1 , 1 , 1	1 , 1 , 1	2 , 5/2 , 3	0,306
Debt ratio	2/3 , 1 , 2	2/5 , 1/2 , 2/3	1/3 , 2/5 , 1/2	1 , 1 , 1	0,134

Table (9): The local weights of performance indicators for the government accounting system based on customer perspective

Customers	Citizens' satisfaction about the quality of service	Citizens's satisfaction about how to deal with customers	Proportion of complaints that are addressed to the management	Transactions completion period	Weight
Citizens' satisfaction about the quality of service	1 , 1 , 1	5/2 , 3 , 7/2	2/7 , 1/3 , 2/5	3/2 , 2 , 5/2	0,353
Citizens's satisfaction about how to deal with customers	2/7 , 3/1 , 2/5	1 , 1 , 1	2 , 5/2 , 3	1 , 3/2 , 2	0,269
Proportion of complaints that are addressed to the management	5/2 , 3 , 7/2	1/3 , 2/5 , 1/2	1 , 1 , 1	2/5 , 1/2 , 2/3	0,219
Transactions completion period	2/5 , 1/2 , 2/3	1/2 , 2/3 , 1	3/2 , 2 , 5/2	1 , 1 , 1	0,157

Table (10): The local weights of performance indicators for the government accounting system based on Growth and growth perspective

Growth and growth	Attention to staff training	The existence of employees' incentives	Using computers	System's staff satisfaction	Weight
Attention to staff training	1 , 1, 1	2/5 ,1/2 ,2/3	2/3 ,1 , 2	1/2 , 2/3 , 1	0,172
The existence of employees' incentives	3/2 , 2 , 5/2	1 , 1, 1	1 , 1, 1	1 , 1, 1	0,314
Using computers	1/2 , 1 , 3/2	1 , 1, 1	1 , 1, 1	2/3 ,1 , 2	0,240
System's staff satisfaction	1 , 3/2 , 2	1 , 1, 1	1/2 , 1 , 3/2	1 , 1, 1	0,272

Table (11): The local weights of performance indicators for the government accounting system based on Internal processes perspective

Internal processes	transactions completion Rapidity	Work's completion errors	Employee's productivity	Risk reduction	Weight
transactions completion Rapidity	1 , 1, 1	1 , 1, 1	2/5 ,1/2 ,2/3	1/2 , 2/3 , 1	0,136
Work's completion errors	1 , 1, 1	1 , 1, 1	2/3 ,1 , 2	1 , 3/2 , 2	0,211
Employee's productivity	3/2 , 2 , 5/2	1/2, 1 , 3/2	1 , 1, 1	1 , 3/2 , 2	0,240
Risk reduction	1 , 3/2 , 2	2/5 ,1/2 ,2/3	1/2 , 2/3 , 1	1 , 1, 1	0,213

The results appeared in the previous tables show that the contribution and financial stability margin index is the highest weight, with a rate of 30% in achieving the financial perspectives. As well, the citizens' satisfaction index about the quality of service is the highest weight in achieving the customers or citizens's perspectives. Moreover, the employee's productivity index contributes to the weight of 35% in achieving the internal processes perspectives. Finally, the existence of employees' incentive contributes to the highest rate accounting 31% of achieving the growth and growth perspectives. Based on the above-mentioned, the local weights of strategies, performance perspectives and performance indicators have been identified using the analytical hierarchy process (AHP). The analytical network process (ANP) will be used to determine the correlation and interdependence between the (BSC) perspectives.

Using (ANP) to determine the Interdependence Weights of the (BSC) Perspectives

The following figure represents the correlation between the (BSC) perspectives:

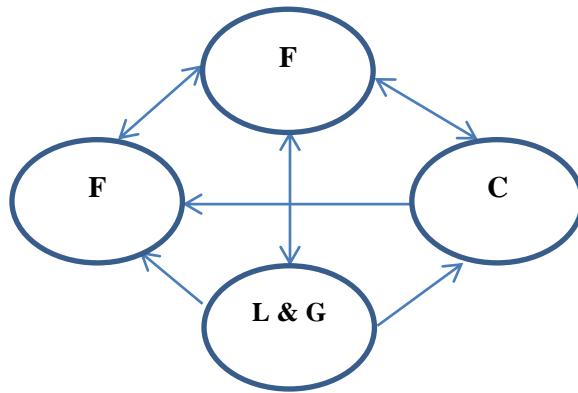


Figure (2): The correlation between the (BSC) perspectives, (Yuksel and Dagdeviren, 2010)

Figure (2) shows the correlation between (BSC) perspectives. It can be seen that the financial perspective affects and is influenced by the customers perspective, the internal processes perspective and the learning and growth perspective. As well, the customers' perspective affects and is influenced by the financial perspective. It is only affected by the internal processes perspective and the learning and growth perspective, whereas the internal processes perspective has a reciprocal impact with the financial perspective. Besides, it affects the customers' perspective, and is influenced by the perspective of learning and growth. Finally, the learning and growth perspective has a mutual effect on the financial perspective. It affects the internal processes perspectives and the customers' perspective, but it is not affected by them. This method is used to indicate the correlation between the (BSC) perspectives. The following tables indicate the interdependence matrix of (BSC) perspectives that are influenced by each other:

Table (12): The interdependence matrix of (BSC) perspectives that are influenced by the financial perspective

Financial	Customers	Internal processes	Learning & growth	The relative weight
Customers	1, 1, 1	1, 3/2, 2	1, 3/2, 2	0,466
Internal processes	1/2, 2/3, 1	1, 1, 1	1/3, 2/5, 1/2	0,043
Learning & growth	1/2, 2/3, 1	2, 5/2, 3	1, 1, 1	0,490

Results shown in Table (12) indicate that the highest proportional weight that contributes to achieving the financial perspective is the Learning & growth perspective that has a weight of 49%.

Table (13): The interdependence matrix of (BSC) perspectives that are influenced by the customer perspective

Customers	Financial	Internal processes	Learning &growth	The relative weight
Financial	1 ,1 , 1	1 , 3/2 , 2	1 ,1 , 1	0,417
Internal processes	1/2 , 2/3 , 1	1 ,1 , 1	3/2 , 2 , 5/2	0,452
Learning &growth	1 ,1 , 1	2/5 , 1/2, 2/3	1 ,1 , 1	0,130

Results shown in Table (13) indicate that the highest proportional weight that contributes to achieving the customer perspective is the internal processes perspective that has a weight of 45%.

Table (14): The interdependence matrix of (BSC) perspectives that are influenced by the internal processes perspective

Internal processes	Financial	Learning &growth	The relative weight
Financial	1 ,1 , 1	1/2 , 1 , 3/2	0,5
Learning &growth	2/3 , 1 , 2	1 ,1 , 1	0,5

Results shown in Table (14) indicate that the highest proportional weight that contributes to achieving the internal processes perspective is IBP-perspective and L&G-perspective; each has a weight of 50%

Calculating the Global Weights of the (BSC) Perspectives

It can calculate the global weights of the (BSC) perspectives by multiplying the local weights indicated in Table (5,6,7) with the strategies weights extracted from Table (4), using the matrix method as follows:

Matrix (1): The global weights of the (BSC) perspectives

$$\begin{array}{l}
 F \quad \left[\begin{array}{ccc} 0.21 & 0.21 & 0.31 \end{array} \right] \\
 C \quad \left[\begin{array}{ccc} 0.30 & 0.30 & 0.15 \end{array} \right] \\
 IBP \quad \left[\begin{array}{ccc} 0.27 & 0.30 & 0.34 \end{array} \right] \\
 LD \quad \left[\begin{array}{ccc} 0.20 & 0.18 & 0.18 \end{array} \right]
 \end{array}
 \times
 \left[\begin{array}{c} 0.36 \\ 0.33 \\ 0.30 \end{array} \right] =
 \left[\begin{array}{c} 0.24 \\ 0.26 \\ 0.30 \\ 0.19 \end{array} \right]$$

Matrix (1) indicates that the internal processes perspectives (30%) are the most important, followed by the customers' perspectives (26%), the financial perspectives (24%), and finally the learning and growth perspectives (19%).

Calculating the approved weights of the (BSC) perspectives

At this step, we multiply the result of the Matrices (1) with the interdependence matrices that are shown in the Tables (12,13,14) that are based on the (ANP) shown in Figure (2) as indicated in the following Matrices:

Matrix (2): The approved weights of the (BSC) perspectives

$$\begin{array}{c}
 F \quad \left[\begin{array}{cccc} 1.0 & 0.41 & 0.5 & 1.0 \\ 0.46 & 1.0 & 0.0 & 0.0 \\ 0.04 & 0.45 & 1.0 & 0.0 \\ 0.49 & 0.13 & 0.5 & 1.0 \end{array} \right] \\
 C \quad \left[\begin{array}{cccc} 0.24 & & & \\ 0.26 & = & 0.34 & /2= \\ 0.30 & & 0.46 & \\ 0.19 & & 0.16 & \end{array} \right] \\
 IBP \quad \left[\begin{array}{cccc} 0.73 & & & \\ 0.17 & & & \\ 0.23 & & & \\ 0.08 & & & \end{array} \right] \\
 LG \quad \left[\begin{array}{cccc} & & & \\ & & & \\ & & & \\ & & & \end{array} \right]
 \end{array}$$

Calculating the Global Weights of Performance Indicators

At this step, we calculate the global weights of the government's accounting system performance indicators. To do this, we multiply the interdependence weights of (BSC) perspectives, which are extracted from the Matrix (2), with the local weights of the performance indicators that are extracted from the Table (8,9,10,11) as shown in the following table:

Table (13): The global weights of the government's accounting system performance indicators

(BSC) perspectives	interdependence weights	KPIs	Weights	Global weight
Financial	0.73	Liquidity ratio	0.263	0.192
		Economic added value	0.295	0.216
		Profit margin	0.306	0.223
		Debt ratio	0.134	0.098
Customers	0.17	Citizens' satisfaction about the quality of service	0.353	0.061
		Citizens's satisfaction about how to deal with customers	0.269	0.047
		Proportion of complaints that are addressed to the management	0.219	0.038
		Transactions completion period	0.157	0.027
Internal processes	0.23	transactions completion Rapidity	0.136	0.032
		Work's completion errors	0.291	0.068
		Employee's productivity	0.357	0.083
		Risk reduction	0.213	0.050
Learning & Growth	0.08	Attention to staff training	0.172	0.014
		The existence of employees' incentives	0.314	0.026
		Using computers	0.240	0.020
		System's staff satisfaction	0.272	0.022

Global weights in Table (13) have been calculated by multiplying each perspective indicators weight (Tables (8, 9, 10, and 11) by the results of perspectives results' weights in Matrix (2).

Evaluation the performance of (AISs)

At this step, by which they have been assessing the government (AISs) have been evaluated, we adopted the (2007) base year, according to Yuksel and Dagdeviren (2010).

Table (14): Performance evaluation of the Jordanian government (AISs)

KPIs	Global weight	2007 base year	Scale value	Performance evaluation
Liquidity ratio	0.192	M	0.5	0.096
Economic added value	0.216	L	0.25	0.010
Profit margin	0.223	H	0.75	0.167
Debt ratio	0.098	M	0.5	0.049
Citizens' satisfaction about the quality of service	0.061	H	0.75	0.046
Citizens's satisfaction about how to deal with customers	0.047	M	0.5	0.023
Proportion of complaints that are addressed to the management	0.038	M	0.5	0.018
Transactions completion period	0.027	H	0.75	0.020
transactions completion Rapidity	0.032	M	0.5	0.016
Work's completion errors	0.068	H	0.75	0.051
Employee's productivity	0.083	VH	1.0	0.083
Risk reduction	0.050	H	0.75	0.037
Attention to staff training	0.014	M	0.5	0.007
The existence of employees' incentives	0.026	L	0.25	0.006
Using computers	0.020	L	0.25	0.005
System's staff satisfaction	0.022	M	0.5	0.011
Performance evaluation of the Jordanian government (AISs)				%65

Finally, the results of Table (14) is the evaluate the performance of (AIS) in the government of Jordan, appear after multibling the global weights for performance indicators with the base year, which was adopted to show the whole of this evaluation, which appeared (56%), that's meaning the evaluation performance of (AIS) as a whole is (65%).

Conclusion

The study aimed to evaluation the performance of (AISs) by using the fuzzy logic approach. For the purposes of this study the researchers collected data from working team in (GFMIS) by conducting an interview with the accounting system working team in (GFMIS) Directorate. The researchers analyzed this data by using the fuzzy

analysis process and using the balanced scorecard (BSC) as a tool for the analysis process. The study results appear in evaluation the (AISs) in the Jordanian government, It showed the extent of contribution of the financial and non-financial dimensions in achieving the vision and strategies of the system, and showed that the financial dimension of the system represents the largest contribution to achieve its vision, and that the productivity of the system staff as one of the performance indicators contributes in the highest proportion to the realization of the vision and strategies. The study also found that contribution of the internal processes indicator is the lowest the rate in realizing the vision of the government accounting system. Accordingly, the study concluded a number of recommendations, including: strengthening the financial dimension to remain one of the important dimensions in achieving the vision of the government's accounting system; improving the dimension of internal processes to increase its contribution to achieving the vision of the government's accounting system; concentrating on the staff's productivity of the government's accounting system, as this effectively contributes to achieving the vision and strategies of the system, and that all financial and non-financial dimensions shall be taken into account in the performance evaluation process, as all these dimensions contribute to realizing the vision of the system.

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