

## EVALUATING MANAGEMENT SYSTEMS AND THE INTANGIBLE PERFORMANCE OF ORGANIZATION INFLUENCED BY THE ENTERPRISE RESOURCE PLANNING

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**Abstract:** This study investigates the effects of enterprise resource planning systems adoption on Intangible performance of a firm. Specifically, the role of informal management control systems is investigated as mechanisms which mediate the effect of enterprise resource planning systems adoption on intangible performance of a firm. The empirical analyses of this study are based on survey data drawn from 4 companies that were collected by questionnaire. This study test our structural equation model using the multivariate statistical method Partial Least Squares (PLS). The findings of this study demonstrate that informal types of management control

systems do not mediate the positive effect between enterprise resource planning systems adoption and Intangible performance. These results are very important because the evidence on the joint roles of enterprise resource planning systems and management control system on improving the firm performance is very limited in prior literature. The results of this study show that the use of enterprise systems results in improved firm performance in the long run, and that more formal than informal types of management controls help firms achieve future performance goals.

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## 1- Introduction

Organizations are met with increasing demands for being in strategic control. To live up to these demands, numerous efforts have been undertaken, including the design and implementation of management information systems. These systems, as epitomized in Enterprise Resource Planning (ERP) systems, seek to bring the organization under strategic control by creating a unified infrastructure for collecting and analyzing data from virtually all fields of organizational operations to enable planning and monitoring of activities (Kallinikos, 2006).

ERPSs are organization-wide and integrated information systems that can be used to manage and coordinate all the resources, information, and functions of a business from shared data stores. As ERPSs are intended to integrate all corporate information into one central database, they allow all information to be retrieved from many different organizational positions and to make any organization object visible (Dechow and Mouritsen, 2005).

Regarding to the point that investment is for implementation and operation from macro-ERP systems and

infrastructures, does not perform its influence over the short period. So, some of managers conclude that the project has not prospered after a short while and applying this system has not been effective.

But the fact is that ERP systems firstly influence on intangible performance factors and show its effects after a long time. On the face of it, important factors of enterprise intangible performance should be recognized in order to exact assessment of ERP systems effects on enterprise function. Therefore, managers should consider intangible performance aspects while evaluating of ERP systems.

On the other hand, When ERPS are used in tandem with an efficient portfolio of controls, they may achieve an organization's objectives and lead to improvements in performance (Kallunki et al., 2010). So the evaluation of the role of management control systems on the relationship between organizational performance and ERP systems would be important and essential.

MCS is a system which gathers and uses information to evaluate the performance of different organizational resources – human, physical, financial and also of the organization as a whole –

considering the organizational strategies (Kallinikos, 2006). The main purpose of MCS is to provide information useful for decision making, planning and evaluation (Merchant and Otley, 2006), so as to control decisions throughout the organization and guide behavior in desirable ways in order to help organizations achieve their objectives (e.g. Anthony and Govindarajan, 2007; Bhimani et al., 2008).

## **2- Literature review and hypotheses development**

### **2-1 Enterprise Resource Planning Systems**

ERP systems will create central oversight by giving managers constantly up-dated, highly detailed and easily accessible data on operations (Clemmons & Simon, 2001). This means that ERP implementations often place increased demands for accountability and self-control on lower level managers, as the system enables everyone to see, plan and manage their own spending and production (Caglio, 2003).

Some of the capabilities of the enterprise resource planning's systems

are as follows (Adel Azar and Jahanian, 1390):

- Enterprise resource planning system, will facilitate the establishment of integrated information system across the entire company, so that covers all functional areas such as manufacturing, sales and distribution, receivable and payable accounts, inventory, human resources and procurement.
- Enterprise resource planning system runs the main business activity of the enterprise and increases customer service that ultimately leads to improving the image of the organization to customers.
- Enterprise resource planning system fills the information gap across the organization.
- Enterprise Resource Planning systems, provides system integration, not only for the organization units but also for a variety of companies that have the same management.
- Enterprise resource planning system is one of the possible solutions to better project management.
- Enterprise resource planning system enables the automatic application of the latest technologies, such as electronic funds transfer, cash, electronic

data interchange, Internet, intranet, video conferencing and e-commerce.

- Enterprise resource planning systems, settle most of the business problems like Material shortages, improving productivity, quality and timely delivery failure of orders.

- Enterprise resource planning system, considers not only the current needs but also opportunities for continuous improvement of business processes.

Enterprise resource planning systems, provides intelligent business tools such as decision’s support systems, information systems of senior managers, reporting, data mining and early warning systems (robots). These are provided to help people make better decisions and thus improve their work processes.

The benefits of ERP systems are listed in Table 1.

**Table 1: Advantages of ERP systems (Mohammad A. Rashid et al.,2002)**

NO.	benefit	How
1	Reliable information access	Common DBMS, consistent and accurate data, improved reports.
2	Avoid data and operations redundancy	Modules access same data from the central database, avoids multiple data input and update operations.
3	Delivery and cycle time reduction	Minimizes retrieving and reporting delays
4	Cost reduction	Time savings, improved control by enterprise wide analysis of organizational decisions.
5	Easy adaptability	Changes in business processes easy to adapt and restructure.
6	Improved maintenance	Vendor-supported long-term contract as part of the system procurement.
7	Global outreach	Extended modules such as CRM and SCM.
8	E-Commerce, e-business	Internet commerce, collaborative culture.

Table 2 summarizes the researches done on the relationship between enterprise resource

NO.	Result of research	Researches name
1	The quantitative criteria for the expected return of an IT project are not only commonly used. Primarily because they are not capable to perform of many expected functions and quality.	Farbey et al., 1992
2	Failure of ERP projects has been effective at organizations bankruptcy like FOX.	Bulkeley ,1996
3	In a competitive market, organizations are forced to provide intangible benefits to remain on the market.	Jolfsson, 1996
4	Evaluating of ERP projects is challenging. It is not because it cannot be justified, But also because they cannot be justified while a short period that accountants and senior executives are expected to return in.	Gunton T. ,1988
5	7% reduction in production costs after ERP implementation in the CARA aviation services company.	Stedman ,1999
6	The cost reduction to the average value of 1.5 million \$ due to ERP implementation after research from 63 companies	META Group Survey,1999
7	ERP systems are a long-term strategic investment, and their implementation is long-term affecting processes on entire organization. The impact of ERP systems on organization's future performance, requires examination beyond of the adoption process and examination for a multi-year periods.	Kallunki et al., 2010
8	Enterprise resource planning systems, is investing on infrastructure of organizations that require a long time to return on investment. So if there is no return on investment in the short term, it should not be considered as a defeated one.	Adel Azar and Jahanian ,1390

planning systems with organization's performance.

Table 2: the researches done on the relationship between enterprise resource planning systems with organization's performance.

## 2-2 Management Control System

MCS is a system which gathers and uses information to evaluate the performance of different organizational resources – human, physical, financial and also of the organization as a whole – considering the organizational strategies (Kallinikos ,2006 ).

MCS can be defined as a tool designed to assist the manager's decision-making consisting of both formal and informal forms of controls (Chenhall ,2003 ) Formal control consists of contractual obligations and formal organizational mechanisms and can be subdivided into outcome and behavior control mechanisms; informal or social control, on the other hand, relates to informal cultures and systems influencing members and is essentially based on mechanisms inducing self-regulation (Ouchi, 1979).

A management Control System (MCS) is a set of interrelated communication structures that facilitates the processing of information to assist managers in coordinating the parts and attaining the purpose of an organization

on a continuous basis. Therefore, management control system is an interdisciplinary subject as it requires contribution from all branches concerned with the management in achieving a high level of quality, productivity and innovation (Chandra Das, 2011).

The following functions are involved in the management control system:

- Planning the activities of the firm
- Coordinating the activities of the firm
- Communication information to various levels of organization structure
- Evaluating information and deciding the course of action.
- Influencing people to change their style of functioning

The purpose of MCS is to compare the actual results with the set standards in order to ensure that the work of each section of the firm is harmoniously accomplished with the

works of the other section. A firm implements MCS to ensure that appropriate strategies are implemented to attain its goals. They also ensure that prompt actions are taken in case of emergency and uncertainly as well. They

also help the management in decision-making process. Table (3) shows done researches on the relationship between enterprise resource planning systems with management control systems.

Table 3: Done researches on the relationship between enterprise resource planning systems with management control systems.

NO.	Result of research	Researcher name
1	Organizational processes can be divided into three levels: strategic planning, management control and operational control	Anthony , 1965
2	Informal Controls with informal cultures and influenced systems of members are connected.	Ouchi , 1979
3	The main purpose of management control systems is to supply useful information for decision-making, planning and evaluation.	Merchant and Otley ,2006
4	Analysis of four decades of management control systems and its division into six sections: planning, control, cybernetic, reward and compensation, cultural and administrative controls	Malmi and Brown ,2008
5	The main purpose of management control systems, are displaying solutions throughout the organization and guiding employee behaviors toward designable methods In order to achieve organizational goals.	Bhimani et al.,2008
6	Introduction of formal and Informal indicators of management control	Kallunki et al., 2010
7	Management control system is a set of formal and informal systems that in order to achieve a high level of quality, productivity and innovation will require participation from all sectors.	Chandra Das, 2010

**2-3 Intangible performance**

David Norton (2012) reported that one of the reasons why organizations

fail to implement their strategy, is to create change in the world, that the market share of tangible assets is changing to intangible assets. In this respect, considering the organization's intangible assets has the higher value for daily strategic planning. And neglecting that leads to the failure in achieving the goals of organization. If companies fail at applying intangible benefits, their profits have not been widely considered (Murphy & Simon, 2002). Intangible assets are different with tangible assets. The first obvious difference is that tangible assets are such as money, machines and equipment. However intangible assets are such as the competence and management philosophy.

And Secondly, owners of tangible assets are usually specified; however, in the case of intangible assets,

the matter is different (Edvinsson and Maloe,1997).

Machines and devices can be controlled by the organization. However, the organization cannot take the merits of their own employees or corporate culture, if any of the employees have decided to leave the organization.

The third difference is that tangible assets can be bought and sold. However, intangible assets are not necessarily like that (Edvinsson and Maloe,1997).

The fourth difference is that tangible assets can only be used for one purpose at the same time. However, intangible assets can be used for multiple purpose (Leo, 2001).

Table 4 shows done researches on the benefits of the intangible performance.

Table 4: Done researches on the benefits of intangible performance

NO.	Result of research	Researcher name
1	Taking seriously the importance of benefits direction of IT from the intangible toward tangible is increasing day by day.	Dehning et al.,2003
2	All intangible assets of an organization accounts its intellectual capitals.	Lev and Schwartz ,1971

3	<p>Two main intangible benefits of IT investment are:</p> <ul style="list-style-type: none"> <li>- present-based intangible benefits which include internal improvements (the processes, decisions, and knowledge) and customer relationships (quality of service, support, warehouse and trade names).</li> <li>- future-oriented intangible benefits, including foresight and opportunities (in cases like markets, value chain integration and participation) and the flexibility and adaptability (in products, timely information and speed of re-engineering).</li> </ul>	Hares and Royle, 1994
4	<p>The benefits are divided into two sections:</p> <ul style="list-style-type: none"> <li>- tangible assets: cash, receivable accounts and properties and equipment</li> <li>- intangible assets: external and internal structure and competence of staff</li> </ul>	Sveiby ,1997
5	<p>Creating interest and value at the organization is indirect.</p> <ul style="list-style-type: none"> <li>- intangible assets include learning new, improved competence, improving business processes and customer satisfaction.</li> <li>- tangible benefits include revenue increment</li> </ul>	Norton 2012
6	<p>Success factors in the institutions performance are investigated by the four aspects: financial, non-financial, tangible and intangible.</p>	Lonnqvist ,2002
7	<p>According to the being more complicated of economic relations, corporations reliance on mere financial measures, to evaluate the pale performance and failure of these measures, pale has been detected than recent time.</p>	Zendehdel,1386

**2-4 Conceptual model**

In this paper, this is aimed that the impact of ERP systems are evaluated on management controlling systems organization's intangible performance.

Secondly, the impact of formal and informal systems of management control are assessed, as a mediator variables can effect on the relationship between intangible organizational ERP systems.

Such careful assessment requires an identification of criteria ,

interaction and the amount of impressionability by each other. Hence the below conceptual model derived from the research of Kallunki et al. (2011) is provided to clearly define the relationships between variables.

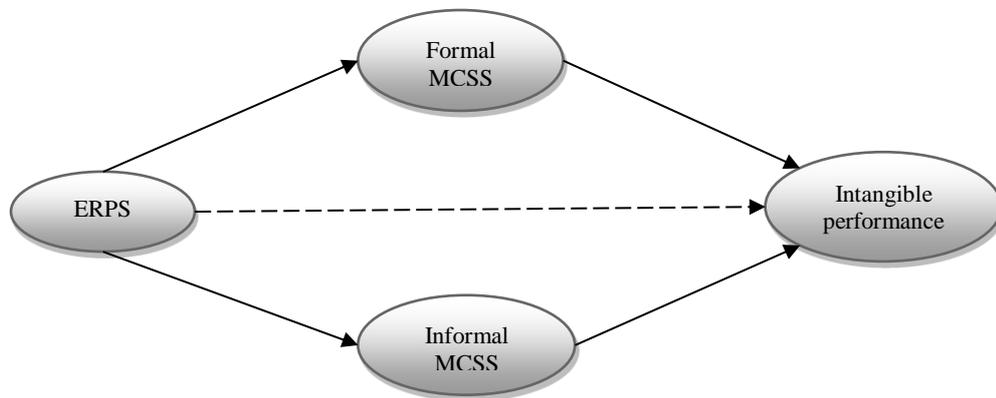


Figure 1 : Conceptual model

According to the above conceptual model, ERP systems have been considered as independent variables, and intangible Performance of Organizations has been considered as the dependent variable and formal and informal systems of management control have been considered as the mediator vvariables.

Hypothesis :

- 1 - There is significant relationship between ERP systems and intangible performance of organization.
- 2 - There is a significant relationship between ERP systems and formal management control systems.
- 3 - There is a significant relationship between ERP systems and informal management control systems.
- 4 - There is a significant relationship between the organization's

intangible performance and the formal management control systems.

5 - There is a significant relationship between the organization's intangible performance and the informal management control systems.

6- Informal systems of management control mediate the relationship between ERP systems and the organization's intangible performance.

7- Formal systems of management control mediate the relationship between ERP systems and the organization's intangible performance.

**3- Data and research design**

This paper has an objective application, and since this research is seeking to identify relationships between variables, analysis between variables is conducted based on the Correlation research. And descriptive statistics are used to examine the characteristics of the

population and demographics of respondents.

And structural equation modeling with using method of the Partial Least Squares and PLS software, are applied to test the validity of the assumptions and models.

Samples are operational, middle and senior managers of Iran Khodro company (Hall of L90 body), Saipa (Hall of Tyba body), Mapna Turbine Manufacturing and Engineering Company (Tuga) and Mapna engineering company of construction of turbine blades (Parto).

According to the investigations on the organizational structure and several company executives outlined above, the research community was estimated 180 people. The resolution is specified in the following table; and the number of sample is obtained 60 using Cochran formula. Table (5) performs the number of research community according to the surveyed companies:

Table 5: Number of research community according to the surveyed companies

Company	Iran Khodro (Hall ofL90 body)	Saipa (Hall Tyba body)	Tuga	Parto	Sum

Number of research community	62	54	41	23	180
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The data used in the study were collected by questionnaire. The questionnaire included items measuring the extent of the use of ERPS, formal and

informal controls and the performance of the firm. A response scale is constructed with one to six Likert scale, as follows:

Table 6: Questionnaire rating based on Likert

The overall shape	Very much	High	Average	Low	Very little	Unused
Rating	6	5	4	3	2	1

**Research Indicators:**

- Module used for enterprise resource planning systems based on Kallunki et al. (2011) and Liagat Hossain et al.( 2002) respectively.
- Effective Indicators at applying of formal and informal systems

of management control was derived from Kallunki et al. (2011).

- 6 factors in evaluating the intangible performance was derived from Lonnqvist research (2002) .

Table 7: Research Indicators

Formal MCS		ERP	
Items	Indicators	Items	module
B1	Activity-Based Costing	A1	Sales and marketing
B2	Documenting of processes and procedures	A2	Procurement

B3	Performance or operational evaluation by outside auditors	A3	Supply chain management (SCM)
B4	Statistical quality control of production	A4	Inventory management
B5	Inventory control and production scheduling by means of operations research techniques	A5	Project management
B6	Regular evaluation of staff	A6	Production management
B7	Regular evaluation of managers	A7	Service and maintenance
B8	Use of internal rate of return/present value in evaluating investments	A8	Quality control management
	-	A9	Customer relationship management(CRM)
	-	A10	Human resource management (HRM)
	-	A11	Financial management
	-	A12	Research and development management
	-	A13	Budgeting and planning
	-	A14	Management of Performance Assessment
<b>Performance</b>		<b>InFormal MCS</b>	
Items	Indicators	Items	Indicators
V1	Competencies	C1	An emphasis on consensus-seeking, staff participative decision making

V2	Customer satisfaction	C2	Open channels of communication and free flow of information
V3	Customer retention	C3	Easy informal access to senior managers
V4	Innovation	C4	Managers share information with colleagues
V5	Motivation	C5	Fast reaction to take advantage of unexpected opportunities
V6	Personnel satisfaction	C6	Current corporate culture encourages informal signaling of potential problems Composite reliability

**4 - Analysis of data**

In this study, to ensure the validity of the survey questionnaire, this questionnaire reviewed by experts, and finally with applying the required changes, the validity of the questionnaire was approved.

After validation, a total of 30 questionnaires were distributed to pilots. The reliability was achieved by using SPSS software and the *Cronbach's Alpha* giving rise to the level of 0.838 indicating to the high reliability rate, as follows:

Table 8: *table of Cronbach's Alpha*

Variabl e	Indicators	<i>Cronbach's Alpha</i>	<i>Cronbach's Alpha-total</i>
<b>ERPS</b>		0.781	0.863
	Formal MCS	0.824	

	Informal MCS	0.889
MCS		0.904
	Competencies	0.7
	Customer satisfaction	0.701
	Customer retention	0.731
	Innovation	0.693
	Motivation	0.72
	Personnel satisfaction	0.728
Intangible performance		0.838

**4.1 The measurement model test**

In order to achieve convergent validity and correlation factor, the compound reliability test and mean-variance root were assessed. The reliability Higher than 0.8 with the average root of variance of 0.5 ,at least, are two necessary conditions for convergent validity and correlation of a structure. As shown in the table below,

the reliability for all structures are between 0.819 to 0.94, which indicates a high convergence validity.

Factor Loadings Larger than 0.5 indicates to have proper reliability; according to the table it can be seen that all structures have factor loadings between 0.50 and 0.86 showing a high correlation.

Table 9: The structural model test

mean-variance root	compound reliability	Factor Loading	Items	variable	mean-variance root	compound reliability	Factor Loading	Items	variable
0.8	0.937	0.7839	B1	Formal-MCS	0.78	0.940	0.792	A1	ERP
		0.8216	B2				0.772	A3	

		0.793 5	B3				0.737	A4	
		0.734 5	B4				0.778	A5	
		0.826 1	B5				0.703	A6	
		0.869 7	B6				0.780	A7	
		0.818 9	B7				0.736	A8	
		0.805 0	B8				0.754	A9	
0.8	0.919	0.844 2	C1	Informal-MCS			0.779	A10	
		0.83	C2				0.825	A11	
		0.786	C3				0.793	A12	
		0.828 9	C4				0.746	A13	
		0.820 1	C5				0.758	A14	
		0.736 1	C6				0.808 6	V1	
				-	0.66	0.819	0.723 3	V2	Performance
				-			0.580 5	V3	
				-			0.717 0	V4	
				-			0.579 7	V5	
				-					

				-			0.501	V6	
							1		

**4.2 Assessment of the structural model**

control systems on the intangible performance has been completely examined.

In this model, effect of ERP and formal and informal management

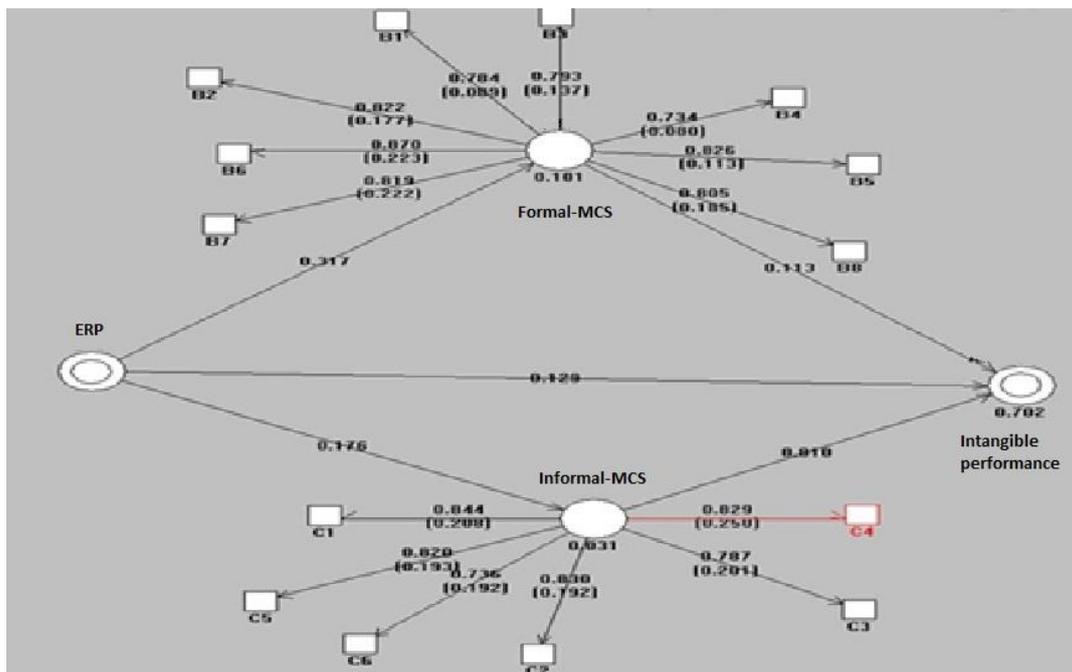


Figure 2 : Structural model results

In below table the values of the path coefficients and their significance for each hypothesis is reviewed.

coefficients. it will be considered significance, provided that the coefficient is bigger than 1.96.

T statistic values are considered to assess the significance of the path

Table 10: the values of the path coefficients and their significance for each hypothesis

Hypothesis			Path coefficients	T statistic value	Result
ERP	→	Intangible performance	0.129	1.99	confirmed
ERP	→	Formal-MCS	0.317	2.338	confirmed
ERP	→	Informal-MCS	0.176	1.746	Not confirmed
Formal-MCS	→	Intangible performance	0.113	14.576	confirmed
Informal-MCS	→	Intangible performance	0.810	1.057	Not confirmed
Informal-MCS	→	mediate the relationship between ERPs and intangible performance	* Direct effect :0.810 * Indirect effect:0.976	-	confirmed
Formal-MCS	→	mediate the relationship between ERPs and intangible performance	* Direct effect :0.113 * Indirect effect :0.43	-	confirmed
*If the indirect effect is larger than the direct effect hypothesis is confirmed.					

**According to the above table:**

1- There is a relationship between ERP system and the intangible performance of an organization. Because the Obtained T statistic value was 1.99 that is greater than 1.96.

2- There is a relationship between ERP system and formal management control systems. Because

the Obtained T statistic value was 2.33 that is greater than 1.96.

3- There is not a relationship between ERP system and informal management control systems. Because the Obtained T statistic value was 1.74 that is greater than 1.96.

4- There is a relationship between formal management control

systems and intangible performance of an organization. Because the Obtained T statistic value was 14.57 that is greater than 1.96.

5- there is not a relationship between informal management control systems and intangible function of an organization. Because the Obtained T statistic value was 1.057 that is greater than 1.96.

6- Informal management control systems mediate the relationship between ERP systems and intangible organizational performance. Because the informal system of management control due to greater non-indirect impact factor of 0.976 than the direct impact factor of 0.810 implies on intermediary of above relationship.

7- Formal management control systems mediate the relationship between ERP systems and intangible organizational performance. Because the formal system of management control due to greater indirect impact factor of 0.43 than the direct impact factor of 0.113 implies on intermediary of above relationship.

## **5 - Conclusion**

### **5.1 Evaluation of the results of the**

#### **PLS software:**

1- The first hypothesis of the study examines the relationship between ERP systems variables and the organization's intangible performance. The results of the analysis of data indicate impact of ERP systems on organizational intangible performance with respect to the significance level of T (1.99). The research hypothesis's findings were in good agreement with (Marcus and Robbie, 1998), (O'Leary,2000), (Grabski and Leech, 2007) and (Kallunki et al.,2010).

2- The second hypothesis of the study examines the relationship between ERP systems variables and the formal management control systems. The results of the analysis of data indicate impact of ERP systems on the formal management control systems with respect to the significance level of T (2.38). The research hypothesis's findings were in good agreement with (Kallunki et al.,2010), (Chenhall and Morris,1995) and (Khandwalla, 1972).

3- The third hypothesis of the study examines the relationship between ERP systems variables and the informal management control systems. The results of the analysis of data do not indicate impact of ERP systems on the

formal systems of management control with respect to the significance level of T (1.746).

4- The fourth hypothesis of the study examines the relationship between variables of formal management control systems and organization's intangible performance. The results of the analysis of data indicate impact of formal management control systems on organization's intangible performance with respect to the significance level of T (14.576). The research hypothesis's findings were in good agreement with (Kallunki et al.,2010), (Simons ,2000) and (Widener ,2007).

5- The fifth hypothesis of the study examines the relationship between variables of informal management control systems and organization's intangible performance. The results of the analysis of data do not indicate impact of informal systems of management control on organization's intangible performance with respect to the significance level of T (1.057).

6- The sixth hypothesis of the study examines the effect of intermediary of informal management control systems on the relationship between ERP systems and the organization's intangible performance.

The results of the analysis of data indicate impact of intermediary of informal management control systems on the relationship between ERP systems and the organization's intangible performance with respect to direct and indirect regression coefficient of 0.810 and 0.976 respectively.

7- The seventh hypothesis of the study examines the effect of intermediary of formal management control systems on the relationship between ERP systems and the organization's intangible performance. The results of the analysis of data indicate impact of intermediary of formal management control systems on the relationship between ERP systems and the organization's intangible performance with respect to direct and indirect regression coefficient of 0.113 and 0.43 respectively. The research hypothesis's findings were in good agreement with (Kallunki et al.,2010), (Chapman, 2005) and (Chapman and Kihn, 2009).

### **5-2 research proposals:**

As regards formal management control systems expressed in this research include activity-based costing,

documenting of processes and procedures, operation or performance evaluation by the auditors outside the organization, Statistical quality control of production , Inventory control and production scheduling by means of operations research techniques ,Regular evaluation of staff and managers, using rate of return or present value of capital assets. Therefore, operational managers and senior supervisors of researched company are recommended to improve any of the aforementioned factors , organization's intangible performance in the areas of competency, customer satisfaction, customer retention , creativity , motivation of employees, and employee satisfaction .

According to the observed effects of intermediary of Informal systems of management control on the relationship between ERP systems and organization's intangible performance, operational managers and senior supervisors of researched company are recommended that Given the emphasis on consensus criteria, Employee participation in decision making, open channels of communication and the free flow of information, unofficial easy access to senior managers, Sharing information with colleagues and

managers, rapid response to unexpected opportunities and encouraging managers to develop new ideas, even if it is outside the scope of their responsibility, take action to improve these components through improving informal management control systems, improving the relationship between ERP systems on intangible organizational performance.

### **5.3 Recommendations for Future Research**

1- evaluation of organizational performance through Financial and intangible aspects with respect to the model of Long West (2002)

2- evaluation of organizational performance through tangible and non-financial aspects with respect to the model of Long West (2002)

3- evaluation of organizational performance through tangible and financial aspects with respect to the model of Long West (2002)

4- evaluation of applying this study at one organization or organizations more resembling together culturally.

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