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The effect of implementation of accounting information system on efficiency, profitability and productivity of SMEs in Iran

Abstract

Purpose – Organizations are competing in the Information Age where knowledge and information are key resources. Management information systems (MIS) provide information that organizations need to manage themselves efficiently and effectively. The accounting information system (AIS) plays a crucial role in MIS. AIS is a system of collection, storage, and processing of financial and accounting data to be used by decision makers. These systems must correspond to the needs and structure of the organization.

Design/methodology/approach – In this research, the authors examined the information requirements (the ideal condition) of SMEs listed on Tehran Stock Exchange (TSE) and compared it to the information processing (IP) capacity of the existing systems (the current condition) using 19 standard IP indicators. Then, sample SMEs were divided into good and poor AIS performance groups based on their scores, and the effect of implementation of AIS on efficiency, profitability, and productivity of these firms was examined using P/E ratio and Tobin's Q.

Findings – The results indicated that AIS implementation is positively associated with Tobin's Q of TSE-listed firms. However, no significant relationship was observed between AIS implementation and P/E ratio in the poor AIS performance group.

Originality/value – So far, such a study did not conduct about the subject of the study in Iran, so it may lead strength on decision making as well policy making on the SMEs in Iran.

Keywords: management information system, accounting information system, P/E ratio, Tobin's Q.
JEL Classfication: M11.

Introduction

In today's knowledge-based economy, information is essential to the survival and success of organizations (McLeod, 1990). The globalization of products, services, markets, and competition has increased the need for flexibility, quality, cost effectiveness, and timeliness. A key resource for attaining these requirements is information systems (IS). Consequently, IS has revolutionized business practices and now plays a more central part in business strategies (Ortiz de Guinea et al., 2005).

Accounting information systems (AIS) play a crucial role in the strategic position of an organization (Romney and Steinbart, 2011). AIS is a system of collection, storage, and processing of financial and accounting data to be used by decision makers (Mostajeran, 2011). Management information systems (MIS) are responsible for collecting and disseminating information. MIS and its most important component, i.e. AIS, are systematic methods for timely collection, categorization, and analysis of

information for managers and decision makers (Isai Khosh, 2004). Effective use of reliable information systems can help organizations reach an optimal state, as it allows for understanding competitors and provides other competitive advantages (Malian, 2004).

The design and implementation of a strategic system requires macro-allocation of resources, which could last 3 to 5 years (Hall, 2008). Investing in staff training, improving the quality of products and internal processes, and increasing AIS investment will be the leverage for facing continual changes in the environment. Innovation is the mechanism that leads to better firm performance and a reduction in the financial and organizational obstacles, while making it possible to access capital markets (Grande et al., 2011). The main advantages of optimal use of AIS in SMEs include better adaptation to a changing environment, better management of arm's length transactions and a high degree of competitiveness.

The purpose of the present research was to assess the information requirements (the ideal condition) of SMEs listed on Tehran Stock Exchange (TSE) and compare it to the information processing (IP) capacity of the existing systems (the current condition) using nineteen standard IP indicators. Then, the alignment between information requirements and IP capacity in these firms is examined. Finally, the impact of effective implementation of AIS in

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these firms is investigated using P/E ratio and Tobin's Q. The use of these IP indicators to examine firms' AIS performance is supported by theoretical and empirical evidence, and systems designed based on these indicators can improve firms' efficiency, effectiveness, and competitive advantage (Ismail and King, 2007). These indicators provide three types of information: (1) information about outcomes, (2) predictive information, and (3) decision-making information.

1. Review of the literature

The concept of alignment in this study is based on Galbraith's (1973) IP theory, which postulates that the information processing (IP) capacity of an organization must match its information requirements if IP capacity is to have a significant impact on performance (Galbraith, 1973). This study applies IP theory to examine the fit or alignment between AIS requirements and AIS capacity and the effect of AIS on performance in SMEs. While the literature on the effect of AIS on performance is scant, there are several studies that have examined this relationship in different contexts.

Grande et al. (2011) impact of AIS on performance in Spanish SMEs using return on assets (ROA) and return on equity (ROE) as performance measures. They found that there is a positive relationship among the SMEs that use AIS for fiscal and bank management and better performance measures.

Ferrante (2006) examined the effect of shared accounting information on trust and performance in a financial service firm and showed that shared accounting information impacts workers' trust in management and performance.

Eldenburg et al. (2010) examined the behavioral changes following the collaborative development of an accounting information system. They reported changes in practice patterns, where physicians redeployed resources toward more severely ill patients and decreased average length of stay. They also found preliminary evidence of improvement in financial performance.

Ismail and King (2005) measured the alignment of AIS requirements and AIS capacity among SMEs in Malaysia and then investigated the link between AIS alignment and firm performance. AIS alignment was measured using 19 accounting information indicators. The results showed that SMEs with higher AIS alignment achieved better organizational performance.

Ortiz De Guinea et al. (2005) examined the effectiveness of information systems in Canadian small businesses. They showed that vendor support is crucial to the effectiveness of information systems.

Ismail and King (2007) examined the factors influencing the alignment of accounting information systems in Malaysian SMEs. They collected data from 214 firms on nineteen accounting information characteristics for both requirements and capacity. The results suggested that AIS alignment was associated with the firm's level of IT maturity, level of owner/manager's accounting and IT knowledge, use of expertise from government agencies and accounting firms, and existence of internal IT staff.

Elahi and Shokri (2005) examined the effect of accounting information systems on decision making. They argued that financial and accounting reports and disclosures need to adapt to the changing business environment, and AIS provides a reliable framework for providing high quality and timely information to users.

Sajjadi (2006) studied the barriers to implementation of AIS in Iranian manufacturing companies. Three major barriers were identified: lack of support by managers, poor IT capabilities and capacities, and poor AIS knowledge in accountants and computer systems specialists. Similarly, Arab Mazaiyar Yazdi et al. (2007) investigated the reasons for success and failure of AIS implementation. They argued that the main reason for the failure of AIS implementation is managerial support.

Heydari (2010) conducted a comparative study of the current and ideal conditions of AIS in Iranian SMEs. The study showed that firms with stronger IT capabilities, higher accounting and IT knowledge, higher managerial commitment, and large-scale AIS implementation have better performance.

Budiarto (2014) examined the effect of AIS alignment on non-financial performance in Indonesian SMEs. The results showed that AIS sophistication, owner commitment, and external IT expertise had significant effects on AIS alignment. Moreover, AIS alignment had a significant effect on non-financial performance.

Prasad et al. (2013) showed that a dynamic AIS environment contributes to accounting functions of processing transactions, providing information for decision making, and ensuring an appropriate control environment. They also showed that these accounting processes contribute to the firm-level performance of the organization.

2. Methodology

2.1. Population and sample. The population of this descriptive-survey research consisted of all the small and medium enterprises (SMEs) listed on Tehran Stock Exchange. 118 SMEs were randomly selected as the sample. Financial data of these SMEs over the period 2007-2013 were collected.

2.2. Instruments. The instrument used for data collection was the questionnaire developed by Ismail and King (2005). It consisted of four dimensions (i.e. scope, aggregation, integration, and timeliness) and nineteen IP characteristics or indicators: frequency of reporting, summary reports (organization), summary reports (sections), future events, immediate reporting, temporal reports, speed of reporting, sectional reports, decisional models, non-financial (production), non-financial (market), effects of events on functions, sub-unit interaction, automatic receipt, organizational effect, non-economic information, precise targets, what-if analysis, and external information. For each firm and each IP indicator, the AIS alignment was measured by multiplying the rating of an AIS requirement item with the rating of the corresponding AIS capacity item. Thus, a high rating for an AIS requirement item and a high rating for the corresponding AIS capacity item would result in a high alignment score. On the other hand, a low rating for an AIS requirement item and a low rating for the corresponding AIS capacity item would give a low alignment score. Each item was measured using a five-point scale, and, therefore, the individual result of the multiplications would range over all the possible scores from 1 to 25.

2.3. Procedure. First, the information requirements (the ideal condition) of SMEs listed on TSE was measured and compared to the information processing (IP) capacity of the existing systems (the current condition) using the 19 standard IP indicators. Then, sample SMEs were clustered into good and poor AIS performance (aligned and non-aligned) groups based on their scores, and the effect of implementation of AIS on efficiency, profitability, and productivity of these firms was examined using P/E ratio and Tobin's Q.

♦ Price-Earnings (P/E) Ratio: P/E ratio is a common tool for measuring a firm's stock performance. It is calculated by dividing the current market price per share by the earnings per share. P/E ratio is useful for comparing valuation of peer companies in similar sector or group.

♦ Tobin's Q: Tobin's Q is another common measure of firm performance, which is calculated by dividing the market value of a firm by the replacement value of the book equity.

2.4. Model. After calculating the AIS score of firms, P/E ratio and Tobin's Q of the SMEs is extracted and the following models are estimated:

$$P/E = C + \beta_1 X_1, \tag{1}$$

$$Q = C + \beta_2 X_2, \tag{2}$$

where β_1 and β_2 are the coefficients for the effect of AIS implementation on financial performance of TSE-listed SMEs.

2.5. Data analysis. Descriptive statistics (i.e., mean, standard deviation, standard error, kurtosis, skewness, and minimum and maximum), clustering, Pearson correlation coefficient, and ordinary least squares (OLS) regression were used for data analysis. Before estimating the models, the Kolmogorov-Smirnov test was performed to examine the normal distribution of the data, and variance inflation factor (VIF) was used to test for multicollinearity of the data. Statistical operations were done in Eviews, Excel, and SPSS.

2.6. Hypotheses. According to the objectives of the study, the follwing hypotheses are postulated in the study:

H_1: *Effective AIS implementation increases Tobin's Q in TSE-listed SMEs.*
H_2: *Effective AIS implementation increases P/E ratio in TSE-listed SMEs.*

3. Results

The Kolmogorov-Smirnov test was performed to examine the normal distribution of the data. As the significance level of the test was greater than 0.05, the normal distribution of the data was accepted. Consequently parametric tests were used for hypothesis testing.

3.1. Pearson correlation coefficient.

Table 1. The results of Pearson correlation coefficient for the relationship between AIS and Tobin's Q in the aligned group

		Tobin's Q	AIS1
Tobin's Q	Pearson correlation coefficient	1	0.392
	Sig. (2-tailed)	-	0.40
	N	50	50

Table 2. The results of Pearson correlation coefficient for the relationship between AIS and Tobin's Q in the non-aligned group

		Tobin's Q	AIS2
Tobin's Q	Pearson correlation coefficient	1	0.469
	Sig. (2-tailed)	-	0.42
	N	68	68

As shown in the Tables above, the significance level for the relationships between Tobin's Q and AIS1 and Tobin's Q and AIS2 is less than 0.05. Therefore, the null hypothesis is rejected, and there is a significant

positive relationship between AIS and Tobin's Q in the aligned ($r = 0.469$; $p = 0.042$) ($r = 0.392$; $p = 0.040$) and the non-aligned group at the 95% CI.

These coefficients indicate that the relationship between AIS and Tobin's Q is stronger for the aligned group.

Table 3. The results of Pearson correlation coefficient for the relationship between AIS and P/E ratio in the aligned group aligned group.

		P/E ratio	AIS1
P/E ratio	Pearson correlation coefficient	1	0.363
	Sig. (2-tailed)	-	0.0228
	N	50	50

Table 4. The results of Pearson correlation coefficient for the relationship between AIS and P/E ratio in the non-aligned group

		P/E ratio	AIS2
P/E ratio	Pearson correlation coefficient	1	0.10
	Sig. (2-tailed)	-	0.235
	N	68	68

The data in Tables 3 and 4 show that the significance level for the relationships between P/E ratio and AIS1 is less than 0.05. Therefore, the null hypothesis is rejected, and there is a significant positive relationship between AIS and Tobin's Q in the aligned group ($r = 0.363$; $p = 0.0228$) at the 95% CI. However, the relationship is not significant for the non-aligned group ($r = 0.10$; $p = 0.235$).

Table 5. Descriptive statistics of the variables for 68 non-aligned SMEs

	ROA	ROE	P/E	Tobin's Q	AIS2
N	68	68	68	68	68
Mean	15.7825	58.3194	9.3050	1.4501	9.5142
SE	2.66302	19.39884	1.62757	2.3051	2.6666
SD	21.95983	159.96692	13.42127	1.90083	2.19890
Skewness	0.080	0.096	0.078	0.075	0.07
Kurtosis	3.656	3.623	3.496	3.031	3.018
Minimum	-94.93	-469.50	0.00	-1.49	6.01
Maximum	56.80	1159.91	110.89	10.52	13.96

Table 6. Descriptive statistics of the variables for 50 aligned SMEs

	ROA	ROE	P/E	Tobin's Q	AIS2
N	50	50	50	50	50
Mean	13.6856	60.0886	11.2878	1.9926	16.9797
SE	2.81053	14.33160	3.61332	0.30982	0.26208
SD	19.87342	101.33969	25.55000	2.19074	1.85321
Skewness	0.034	0.077	0.033	0.058	0.30
Kurtosis	2.945	3.069	3.014	3.161	3.091
Minimum	-56.23	-151.49	0.00	-0.78	14.01
Maximum	58.09	446.02	181.82	11.61	20.45

3.2. Descriptive statistics. Table 5 provides the descriptive statistics of the variables (number, mean, standard deviation, maximum, minimum, standard error of the mean, kurtosis, skewness).

Since skewness for all the variables is close to zero, the symmetry of the probability distribution of the variables can be accepted. Also kurtosis is approximately 3 for all the variables, indicating that the distribution is normal.

3.3. Test of normality. The Kolmogorov-Smirnov test was used to examine the normality of the variables. If the significance value of the Z statistic is less than 0.05, the variable is normal (Tables 7 and 8).

Table 7. Kolmogorov-Smirnov test for the non-aligned SMEs

K-S test		ROA	ROE	P/E	Q	AIS2
N		68	68	68	68	68
Normal parameters	Mean	15.7825	58.3194	9.3050	1.4501	9.5142
	SD	21,9598	159.96692	13.4212	1.9008	2.1989

Table 7 (cont.). Kolmogorov-Smirnov test for the non-aligned SMEs

K-S test		ROA	ROE	P/E	Q	AIS2
N		68	68	68	68	68
Most extreme differences	Absolute	0.150	0.302	0.271	0.160	0.091
	Positive	0.060	0.270	0.271	0.160	0.091
	Negative	-0.150	0.302	0.266	-0.077	-0.062
K-S Z		1.233	2.488	2.238	1.317	0.752
Asymptotic sig. (2-tailed)		0.096	0.060	0.087	0.062	0.623

Table 8. Kolmogorov-Smirnov test for the aligned SMEs

K-S test		ROA	ROE	P/E	Q	AIS1
N		50	50	50	50	50
Normal parameters	Mean	13.6856	60.0886	11.2878	1.9926	16.9797
	SD	19.87342	101.33969	25.5500	2.19074	1.85321
Most extreme differences	Absolute	0.134	0.245	0.349	0.237	0.093
	Positive	0.134	0.245	0.345	0.237	0.092
	Negative	-0.129	-0.199	-0.349	-0.137	-0.093
K-S Z		0.944	1.734	2.467	1.675	0.656
Asymptotic sig. (2-tailed)		0.334	0.055	0.080	0.097	0.783

The results of K-S test show that the significance level for all the variables is greater than 0.05, indicating the normal distribution of data for all the variables.

3.4. Ordinary least squares. Ordinary least squares (OLS) used to estimate multivariate linear regressions. This method provides the best estimations without bias. The stationarity of the variables was examined before estimating the models and interpreting the coefficients. Stationarity tested using autocorrelation function (ACF) and Dickey-Fuller test. If a variable was not stationary at the 0.05 level, it would be examined at first order and subsequently at second order difference. If the variable was still not stationary, it would be omitted from the model.

The model of P/E ratio and AIS performance in the aligned group is estimated as follows:

$$P/E = C + \beta X_1 + \varepsilon_i, \tag{3}$$

$$P/E = 5.91056 + 0.4392417 X_1. \tag{4}$$

Table 9. Estimation of the model of P/E ratio and AIS performance in the aligned group using OLS

Dependent variable: P/E				
Variable	Coefficient	SE	t-statistics	p-value
AIS1	0.4392417	1.959821	-2.220732	0.0282
C	5.91056	33.47103	1.550910	0.1275
R^2	0.830111	Mean (dependent variable)		11.28780
Adjusted R^2	0.809905	SD (dependent variable)		25.55000
SE of regression	25.42316	Akaike information criterion		9.3448376
Residual sum of squares	31024.17	Schwarz criterion		9.424857
Log-likelihood	-231.7094	Hannan-Quinn criterion		9.377500
F-statistic	14.490187	Durbin-Watson statistic		2.120009
Probability (F-statistic)	0.028150			

These results can be interpreted as follows:

♦ The *t*-values indicate that the relationship between AIS performance and P/E ratio in the aligned group is significant at the 95% CI.
♦ The R^2 statistic indicates that 83 percent of changes in P/E ratio can be explained by AIS performance, suggesting the high explanatory power of the model.
♦ The high F-statistic (1.49) suggests the significance of the regression model.
♦ The Durbin-Watson statistic is equal to 2.12,

therefore, rejecting the assumption of autocorrelation between the components of the model.
♦ The coefficient of the explanatory variable shows that AIS in the aligned group is positively associated with P/E ratio of aligned SMEs. A unit increase in AIS leads to 43% increase in P/E ratio.

The model of Tobin's Q and AIS performance in the aligned group is estimated as follows:

$$\text{Tobin's Q} = C + \beta X_1 + \varepsilon_i, \tag{5}$$

$$\text{Tobin's Q} = 3.235992 + 0.693228 X_1. \tag{6}$$

Table 10. Estimation of the model of Tobin's Q and AIS performance in the aligned group using OLS

Dependent variable: Q				
Variable	Coefficient	SE	t-statistics	p-value
AIS1	0.693228	0.170302	-2.429988	0.0161
Dependent variable: Q				
Variable	Coefficient	SE	t-statistics	p-value
C	3.235992	2.908521	1.112590	0.2714
R^2	0.9113837	Mean (dependent variable)		1.992600
Adjusted R^2	0.9016916	SD (dependent variable)		2.190735
SE of regression	2.209187	Akaike information criterion		4.462304
Residual sum of squares	234.2644	Schwarz criterion		4.538785
Log-likelihood	-109.5576	Hannan-Quinn criterion		4.491429
F-statistic	11.184889	Durbin-Watson statistic		1.935879
Probability (F-statistic)	0.009129			

These results can be interpreted as follows:

♦ The t-values indicate that the relationship between AIS performance and Tobin's Q in the aligned group is significant at the 95% CI.

♦ The R^2 statistic indicates that 91 percent of changes in Tobin's Q can be explained by AIS performance, suggesting the high explanatory power of the model.

♦ The high F-statistic (1.18) suggests the significance of the regression model.

♦ The Durbin-Watson statistic is equal to 1.035, therefore, rejecting the assumption of autocorrelation between the components of the model.

♦ The coefficient of the explanatory variable shows that AIS in the aligned group is positively associated with Tobin's Q of aligned SMEs. A unit increase in AIS leads to 69% increase in Tobin's Q.

The model of P/E ratio and AIS performance in the non-aligned group is estimated as follows:

$$P/E = C + \beta X_2 + \varepsilon_i, \tag{7}$$

$$P/E = 4.859866 + 0.0925487 X_2. \tag{8}$$

Table 11. Estimation of the model of P/E ratio and AIS performance in the non-aligned group using OLS

Dependent variable: P/E				
Variable	Coefficient	SE	t-statistics	p-value
AIS2	0.092548	0.749071	0.623715	0.5350
C	4.859866	7.312014	1.664641	0.0408
R^2	0.5115860	Mean (dependent variable)		9.305000
Adjusted R^2	0.5009203	SD (dependent variable)		13.42127
SE of regression	13.48288	Akaike information criterion		8.069690
Residual sum of squares	11998.02	Schwarz criterion		8.134969
Log-likelihood	-272.3694	Hannan-Quinn criterion		8.095555
F-statistic	0.389021	Durbin-Watson statistic		2.089903
Probability (F-statistic)	0.534964			

These results can be interpreted as follows:

♦ The t-values indicate that the relationship between AIS performance and P/E ratio in the non-aligned group is not significant at the 95% CI.

♦ The R^2 statistic indicates that 51 percent of changes in P/E ratio can be explained by AIS performance, suggesting the low explanatory power of the model.

♦ The low F-statistic (0.389) suggests that the regression model is not significant.

♦ The Durbin-Watson statistic is equal to 2.089, therefore, rejecting the assumption of autocorrelation between the components of the model.

♦ The coefficient of the explanatory variable shows that AIS in the aligned group is not significantly associated with P/E ratio of non-aligned SMEs.

♦ The model of Tobin's Q and AIS performance in the non-aligned group is estimated as follows:

$$Tobin's\ Q = C + \beta X_2 + \varepsilon_i, \tag{9}$$

$$Tobin's\ Q = 2.114924 + 0.5325601 X_2. \tag{10}$$

Table 12. The overall results of the study

Dependent variable: Q				
Variable	Coefficient	SE	t-statistics	p-value
AIS1	0.5325601	0.106054	2.658833	0.0423

Table 12 (cont.). The overall results of the study

Dependent variable: Q				
Variable	Coefficient	SE	*t*-statistics	*p*-value
C	2.114924	1.035235	2.042940	0.0451
R^2	0.866534	Mean (dependent variable)		1.450147
Adjusted R^2	0.848519	SD (dependent variable)		1.900828
SE of regression	1.908907	Akaike information criterion		4.159910
Residual sum of squares	240.4992	Schwarz criterion		4.225189
Log-likelihood	139.4369	Hannan-Quinn criterion		4.185775
F-statistic	12.434061	Durbin-Watson statistic		1.866990
Probability (F-statistic)	0.012295			

These results can be interpreted as follows:

♦ The *t*-values indicate that the relationship between AIS performance and Tobin's Q in the non-aligned group is significant at the 95% CI.
♦ The R^2 statistic indicates that 86 percent of changes in Tobin's Q can be explained by AIS performance, suggesting the high explanatory power of the model.
♦ The high F-statistic (12.43) suggests the significance of the regression model.
♦ The Durbin-Watson statistic is equal to 1.86, therefore rejecting the assumption of autocorrelation between the components of the model.
♦ The coefficient of the explanatory variable shows that AIS in the aligned group is positively associated with Tobin's Q of non-aligned SMEs. A unit increase in AIS leads to 53% increase in Tobin's Q.

Discussion and conclusion

Accounting is one of the key components of information systems within an organization. Accounting information system (AIS) is a system of collection, storage, and processing of financial and accounting data to be used by decision makers. To effectively implement AIS, managers need to adjust their expectations of AIS to the long-term goals of the organization in order to make optimal use of li-mited resources, increase their productivity and profitability, and contribute to the growth of the country's economy. AIS automates and streamlines reporting and provides timely information that can be used for decision-making and financial reporting.

The present results showed that effective implementation of AIS in SMEs listed on the Tehran Stock Exchange is positively associated with performance, productivity, and profitability (measured by P/E ratio and Tobin's Q). The greatest effect of AIS on performance was observed in firms where information requirements matched their IP capacity. However, there was no significant relationship between AIS implementation and P/E ratio in the non-aligned group.

Limitations. The major limitations of this research can be summarized as follows:

♦ Sample bias was a major limitation that may affect the generalization of the results. Our sample consisted of Iranian SMEs, and thus cannot be generalized to all SMEs.
♦ Lack of cooperation by some managers of SMEs made data collection difficult.
♦ The literature on the relationship between AIS alignment and performance was scant.

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