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# The effectiveness of management accounting systems: evidence from financial organizations in Iran

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## Abstract

**Purpose** – The purpose of this paper, as an empirical investigation of a contingency theory, is to examine the relationship between technology (as a contingent variable) and management accounting system (MAS) characteristics on managerial performance. The main focus of this study is on the four information characteristics of MAS – scope, integration, aggregation and timeliness.

**Design/methodology/approach** – Based on the MAS characteristics defined by Chenhall and Morris, a contingency-based "intervening" model is proposed in which MAS plays a significant intervening role between technology (TECH) and managerial performance. Using survey data from managers in Iranian financial organizations and PLS–structural equation model analysis, the MAS characteristics are collectively analyzed in relation to technology and managerial performance.

**Findings** – The study uncovered the existence of direct relationships between technology and MAS, and between MAS and managerial performance. The study also confirmed that the relationship between technology and managerial performance is mediated by MAS. The findings provide valuable insight to guide managers in financial organizations to improve their performance through suitable MAS by applying new technologies and considering internal and environmental factors. Recommendations on how to improve MAS and managerial performance are provided accordingly.

**Originality/value** – Previous research studies show that there is no unique and universal MAS for all organizations, since this depends on internal firm characteristics and environmental features. However, there has been a lack of empirical evidence on MAS research studies in the service organizations.

**Keywords** Iran, Technology, Managerial performance, Financial organizations, Management accounting system

**Paper type** Research paper

## Introduction

In the recent years, the rapid technological changes and increasing pressure of competition have changed external environment of organizations, which consecutively influence their internal processes like management accounting system (MAS) (Mat *et al.*, 2010; Urquidi and Ripoll, 2013). These changes may influence the MAS characteristics in a company and also may lead to the need for the company to re-evaluate its current design and strategies to cope with the changes in the environment. In this situation, the role of MAS is to supply useful information to assist management in decision making, and to persuade users to initiate organizational changes (Bouwens and Abernethy, 2000; Chung *et al.*, 2012).

This relationship between the changes in environment and MAS is identified through contingency theory, which assumes that organizations are able to operate efficiently if they apply and employ MAS that fits their environmental factors (Otley, 1980; Chenhall and Morris, 1986; Mia, 1993; Abernethy and Guthrie, 1994; Nimtrakoon and Tayles, 2015). However, the findings of these research studies were rarely replicated by

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other researchers (Tillema, 2005; Bouwens and Abernethy, 2000). In other words, MAS is accepted to assist organizations to endure in highly technological environment and compete with other firms when supply helpful information by considering organizational and environmental factors. (Brandau *et al.*, 2013; Ismail and Isa, 2011; Hoque, 2011; Mayr, 2012; Soobaroyen and Poorundersing, 2008). In this study, likewise previous studies, contingency theory is used on MAS to investigate the relationship between the technology and MAS characteristics and to explore whether the MAS with sophisticated information (broad scope, timely, integrated and aggregated) causes enhancement in managerial performance in organizations.

While previous MAS research studies have studied the relationships among environmental factors, organizational characteristics, MAS and performance (e.g. Abdel-Kader and Luther, 2008; Ashraf and Uddin, 2015; Bouwens and Abernethy, 2000; Cheng, 2012; Chong and Eggleton, 2003; Erserim, 2012; Jermias and Gani, 2004; Mat, 2010; Soobaroyen and Poorundersing, 2008; Tsui, 2001), there has been little systematic empirical examination of whether managerial performance is influenced by technology and changes in MAS characteristics. Gerdin (2005) and Tillema (2005) call for more research to understand the organizational and environmental factors that influence MAS. In addition, the importance of technology, which is particularly obvious in the financial sector, cannot be underestimated in ensuring that MAS is relevant to the technical core of the organization (Chenhall, 2003). Furthermore, more research in this area is needed as Bouwens and Abernethy (2000) and Hammad *et al.* (2010) assert that the understanding of the antecedent conditions that influence MAS characteristics and managerial performance is still very limited. This study makes five important contributions to the literature.

First, financial industry is important in every country and can have a significant effect in supporting economic development through efficient financial services. They are also facing a dynamic environment due to deregulation and globalization (Salehi and Alipour, 2010). To thrive in this dynamic, uncertain and complex environment, financial organizations must enhance their competitive edge. The ability of management to make informed decisions is linked to the quality of management information available to them and accurate information arises from a reliable MAS (Rezaee, 2005). However, MAS for the financial service sector has received limited attention like most previous literature on other service sectors. The lack of MAS studied on the financial service sector has also been acknowledged (Hussain, 2005; Rasid *et al.*, 2011, 2014).

Rasid *et al.* (2011) studied the difference in the MAS of conventional and Islamic financial organizations in Malaysia. Their findings showed that Islamic financial organizations use broad-scope MAS than conventional financial institutions. Rasid *et al.* (2014) investigated the linkages between MAS, enterprise risk management and organizational performance by examining MAS characteristics in financial organizations of Malaysia. That was the only study that specifically focused on MAS characteristics. These empirical studies on MAS in financial organizations show that the financial organizations use MAS in a changing environment for risk-control and long-term success of the organization (Hussain, 2005; Rasid *et al.*, 2014). Whilst there are now some emerging findings on the existence or absence of MAS in the financial service sector (Hussain, 2005; Rasid *et al.*, 2011, 2014), there is relatively little evidence on how MAS is actually perceived by managers in those organizations and how these influence managerial performance. In addition, there is a need to consider the impact of contextual factors like technology on MAS, using more rigorous statistical analysis in financial service sector (Hussain, 2005).

Second, managerial performance has been found to differ across different countries, both in terms of perceptions of what determines management performance and in terms of managerial practices. Neither the prevalence nor the substance of organizations' managerial performance is uniform across countries (Smith *et al.*, 1997; Mueller, 2004; Hopper *et al.*, 2009).

Similarly, modern MAS may not be as effective as in different countries (Etemadi *et al.*, 2009). According to Endenich *et al.* (2016), management accounting is shaped by its respective context and differs traditionally between countries. Especially, Iran, which is categorized as a developing country, provides an interesting cultural contrast to western countries because of the new emphasis on Islamic laws and values after its political revolution in 1979 (Etemadi *et al.*, 2009). Iran is a country with a mixed-economy (in which both the private sector and the state direct the economy) and transitional economy (which is changing from a centrally planned economy to a free market) with a large public sector. Around 50 percent of the economy is centrally planned and dominated by oil and gas production. Iran is the world's 18th country by purchasing power parity and 32nd by nominal gross domestic product (IMF, 2017).

The environmental factors for business in a developing country like Iran are different from those in an advanced country. Importing modern management accounting methods and techniques and using them in a developing country may not be as effective as in advanced countries because of different national and organizational conditions (Etemadi *et al.*, 2009; Helden and Uddin, 2016). However, most of the studies on MAS and managerial performance (Abdel-Kader and Luther, 2008; Abernethy and Guthrie, 1994; Agbejule, 2005; Bouwens and Abernethy, 2000; Emsley, 2005; Erserim, 2012; Stergiou *et al.*, 2013; Susanto, 2010; Tsui, 2001) have concentrated on firms in the USA, Singapore, Australia, Finland and Turkey with lack of evidence on how MAS changes in Iranian firms' perspective (Etemadi *et al.*, 2009). Therefore, empirical evidence from Iran provides significant insights into the role of contingent variables in the implementation of MAS and managerial performance across national boundaries.

Third, the current study adopted the prospective that MAS can be conceptualized in terms of a continuum from traditional to sophisticated. In determining the kind of MAS, the four characteristics should be combined and measure to attain one indicator of MAS sophistication. Hence, in this study changes in the four characteristics of MAS and effects of these changes on the performance are studied. There have been little empirical studies focused on the four information characteristics of MAS (Hammad *et al.*, 2010; Rasid *et al.*, 2014; Soobaroyen and Poorundersing, 2008). Most of them concentrated on one or two characteristics of MAS mostly on the broad-scope dimension. For instance, Cheng (2012) conducted a research to investigate the interaction effect of budgetary participation and broad-scope MAS on management performance in Taiwan. A moderated multiple regression model was used to examine the interaction effect among MAS, budgetary participation and management performance. His findings showed the presence of a non-monotonic interaction relationship between budgetary participation and management performance over the range of the extent of broad-scope MAS. The findings confirmed that a high (low) level of broad-scope MAS is correlated with management performance in situations of high (low) budgetary participation. Even though the broad scope is the most important dimension among the MAS characteristics, it is better to consider other characteristics and this must be determined that the provided information is in a timely manner and integrated and aggregated to use by decision makers and managers in an organization.

Fourth, this study provides additional insights into our understanding of the mediating effects of MAS characteristics on the relationship between technology and performance. This issue is not well developed in the current management accounting research literature. Most of the previous studies considered MAS as an independent variable (Gul, 1991; Mia and Chenhall, 1994; Tsui, 2001; Mia and Patiar, 2001; Chong and Eggleton, 2003; Agbejule, 2005; Susanto, 2010) or dependent variable (Emsley, 2005; Abdel-Kader and Luther, 2008; Mat, 2010; Erserim, 2012; Stergiou *et al.*, 2013). Only a few of them (Cheng, 2012; Jermias and Gani, 2004; Jusoh, 2008; Mia and Clarke, 1999; Soobaroyen and Poorundersing, 2008) studied the mediating role of MAS.

Soobaroyen and Poorundersing (2008) carried out a study to examine the availability and effectiveness of MAS for managers in manufacturing companies in Mauritius with considering the intervening role of MAS on the relationship of task uncertainty and decentralization on managerial performance. Based on the MAS characteristics, a contingency-based "intervening" model was proposed. They found a significant positive relationship between all MAS characteristics and managerial performance. However, only decentralization proved to be a situational variable of interest, in that decentralization policies appear effective only via the availability of MAS with broad scope, timeliness, aggregation and integration.

Fifth, for practitioners, the findings of this study may be used as an additional guideline for the development of more effective MAS. An increase in the ability to develop a reliable, effective MAS may increase management's confidence about the usefulness of the system. This allows management to spend less time on scanning activities and more on strategic planning activities, which will be followed by an improvement in competitiveness and performance.

This study is presented as follows: the second section provides an overview of the relevant literatures and develops the hypotheses. The third section describes details of the research design and data collection. The fourth section presents the research findings and the empirical evaluation of the research model. The fifth section addresses the conclusions and limitations of the research and directions for future research.

## Literature review

This research utilizes the mediating or intervening notion of contingency theory (Cheng, 2012; Jusoh, 2008; Jermias and Gani, 2004; Yigitbasioglu, 2016; Ghasemi *et al.*, 2015) to examine whether MAS mediates the association between technology and managerial performance. The research model of this study is presented in Figure 1 showing the change in MAS characteristics as the mediating variables, while technology and performance are the independent and dependent variables, respectively. The expected relationship among the independent, mediator and dependent variable are offered in turn.

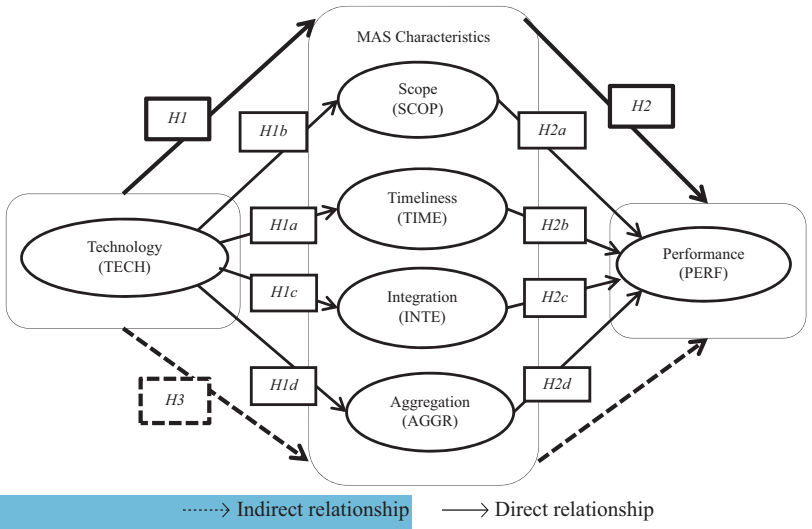



**Figure 1.**
Conceptual model

*Financial organizations and MAS implication*

During the past few decades, the service activities have experienced significant growth as they represent the majority of the economies weight (Ahmad, 2012). Specially, financial institutions, which play an important role in the economy, act as intermediaries between the surplus and deficit units and this intermediary role is crucial for the efficient allocation of resources in the modern economy (Rasid *et al.*, 2011). Behind this development, the main catalysts are the post-industrial effects, deregulation of service sector and globalization (Amir *et al.*, 2010). However, in emerging economies, with low levels of economic development and growth, the financial system is underdeveloped and is more inclined toward financial crises. On the other hand, foreign subsidiaries of the multinational banks from the relatively developed countries may benefit from the underdevelopment of the host country financial system (Sufian, 2012).

The financial crisis of 2007–2008 rocked the financial markets. It appeared that the banks were either unable to manage their risk exposure or were unaware of it until assets started to turn sour. Firm risk has two main components. The first concerns the assets that a firm chooses to invest in. The second is the uncertainty of the environment that a firm operates. The first risk is endogenous and the second is exogenous to the firm. A good MAS tracks both risks. It provides managers with information about how to hedge or balance the risk of their asset portfolio and track the environment to provide managers with timely information about changes in the environment (Rasid *et al.*, 2014; Sufian, 2012; Ghasemi *et al.*, 2016).

Therefore, financial institutions trade a complex and extensive range of financial assets. They also face a diverse customer base and are exposed to a wide variety of risks. To cope with these complexities they must have an efficient MAS to provide information on managing and monitoring the performance of their traded assets. For example, asset securitization (the process of taking a liquid asset, or group of assets, and through financial engineering, transforming them into a security) is currently one of the major activities among financial institutions. Bank management, investors and rating agencies require that the performance of security pools be reported accurately and timely. The parent companies have difficulty pooling loans from various affiliates with different processing and reporting systems. Thus, efficient reporting is unattainable without an integrated information system (Rasid *et al.*, 2014).

In the context of Iran, after political revolution in 1979, banking system became nationalized, and in 1984, Iran decided to replace its conventional banking system with an Islamic banking system (interest free). Recently, the number of private-owned banks is increasing and currently there are more than 18 private banks in the Iranian banking sector (CBI, 2018). Increases in service business opportunities and liberalization in the banking and financial system have increased potential opportunities and the competition in the service market of Iran. To thrive in this dynamic, uncertain and complex environment, Iranian financial institutions must enhance their competitive edge. The ability of management to make informed decisions is linked to the quality of management information available to them and accurate information arises from a reliable MAS (Rezaee, 2005).

*Relationship between technology and MAS characteristics*

Nowadays, development in science and techniques has resulted in advanced technologies, new markets and higher competition. These changes in the environment and development of technologies cause changes in organizations and give them new possibilities for modeling organizational operations, integrating organizational activities and managing the firm in real time (Berry *et al.*, 2009; Pornpandejwittaya, 2012). Advances in technology could significantly shape ways of doing business (Zawawi and Hoque, 2010). An organization's MAS is an important aspect of its structure and the specific characteristics of a suitable system will depend upon the conditions surrounding the organization (Berry *et al.*, 2009). As advances in information and communication technology could significantly shape ways of doing business

(Zawawi and Hoque, 2010), the MAS characteristics may change as varying aspects of a firm become integrated via information technology (IT). The advances in technologies like IT and computerization have also made flows of management accounting information in organizations be more integrated, timely, accurate and relevant (Granlund, 2011). Likewise, previous studies show that technology significantly influences scope and aggregation of MAS by supplying aggregated financial or non-financial information from different parts of organization, information from inside or outside and information related to historical or current events in a timely manner (Granlund, 2011; Mia and Winata, 2008; Zawawi and Hoque, 2010). In other words, technology may influence MAS characteristics (scope, timeliness, integration and aggregation) in an organization in order to fit with the changing business operation.

In addition, the advances in technologies like IT and computerization have also made flows of management accounting information in organizations be more valuable, timely, accurate and relevant (Granlund, 2011). In other words, technology may influence the selection of management accounting in a business organization in order to fit with the changing business operation. Hence, technology-based systems have tended to be the essential carriers of MAS and the most important driver of recent changes to it (Sanchez-Rodrıguez and Spraakman, 2012). In this perspective, technology is considered as an exogenous factor which significantly determines or restricts MAS characteristics (Azan and Bollecker, 2011). As technology advances, current MAS needs to be replaced with new methods that can cope with the changes in operational processes and cost structure. Therefore, technological contingency suggests that organizational changes result from technology-related features. Organizations are inevitably subject to technology, and organizational changes are conditioned by technological evolutions (Azan and Bollecker, 2011).

The financial service sector differs in important ways from sectors such as manufacturing or retailing, and its use of technology, IT and e-business technologies reflects those differences. Financial organizations are linked to customers and each other in an extensive network of interrelationships that is more complex, reciprocal and less linear than traditional manufacturing and retailing industries (Mulligan and Gordon, 2002). There is a primary market in which customers interact with financial organizations such as retail banks, insurance agencies, real state agencies and stockbrokers (Zhu *et al.*, 2004). There is also a large secondary market in which those organizations interact with each other and with others such as mortgage brokers, commercial banks, insurance companies and investment banks. These industry characteristics influence the use of IT. In manufacturing and retailing, IT is used mainly to coordinate the processing and movement of physical goods, to manage supporting functions such as human resources, accounting and sale and marketing, in some cases to buy and sell goods. By contrast, in financial services, there are no inherently physical goods; even cash, checks, contracts and other documents are just forms of information that can be represented digitally. IT is used directly to store, process and transport the financial services (Mulligan and Gordon, 2002).

The nature of IT in the financial industry is complex and heterogeneous. On the frontend, IT is used to execute and record customer transactions, whether they are handled by person, by phone, by electronic fund transfer or on the internet. On the backend, funds are transferred among organizations via electronic transfer system, such as Fedwire, CHIPS and Swift, which handled hundreds of trillions of dollars in transactions yearly. Financial EDI systems are used to support information flows among organizations. Internal IT systems include a mix of packaged and costume applications that maintain account records and support internal financial and managerial functions. There is little standardization within and among firms' internal systems, and limited use of enterprise resource planning (ERP) systems that are rather common in manufacturing and retailing industries. Some financial firms use ERP modules in narrow functional areas such as human resources, financial ledgers and non-financial asset management (Zhu *et al.*, 2004).

The financial service sector already has benefited from network-enabled connectivity and interactivity for more efficient information exchange and has experienced enhancement in operating efficiencies and reduction in operating costs (Zhu *et al.*, 2004). In addition, significant cost savings are demonstrated, owing to electronic business in services providing process and operational activities such as billing and document processing, for a variety sectors ranging from brokerage, mortgage and insurance to credit cards, while adoption of new technologies like e-business practices has been gradually limited by security concerns, lack of standards, regulations and very complexity of the industry's network structure (Zhu *et al.*, 2004). Information on market share, pricing and product mix strategies has become more significant to the financial organizations, because of the deregulation in financial industry and the quick progresses in technologies, and this information will be obtainable via the MAS in a financial organization (Rasid *et al.*, 2011).

Therefore, the effectiveness of accounting information system is reliability, relevant and timeliness which can be supported by technology. Therefore, technology is important for MAS for proving high-quality information for decision makers in financial organizations. As a result, based on the above arguments, there is a positive relationship between technology and MAS characteristics. As a result, the above discussion results in the following hypotheses:

*H1.* There is a direct and positive relationship between technology and MAS characteristics.

*H1a.* There is a direct relationship between technology and broad-scope MAS.

*H1b.* There is a direct relationship between technology and timely MAS.

*H1c.* There is a direct relationship between technology and integrated MAS.

*H1d.* There is a direct relationship between technology and aggregated MAS.

*Relationship between MAS characteristics and managerial performance*

Managerial performance accounts for the manager's capability of planning, investigation, coordination, appraisal, supervision, employment, negotiation and representation. Managerial performance may have to be distinguished from the economic performance of the unit for which the manager is responsible. Laitinen (2008) argues that the nature of managerial work (e.g. negotiating, recruiting, training, innovating and contacting individual managers) strongly affects the importance of information because each managerial work has specific information needs and there is no ordered or systematic way to carry out these works. These expectations derive from economic models of decision making state that, in uncertain conditions, the provision of better information results in improved resource allocation and increased the likelihood of an enhanced positive outcome (Baines and Langfield-Smith, 2003). In other words, a conditional association assumes that better information facilitates more effective managerial decisions, which leads to enhanced performance (Baines and Langfield-Smith, 2003; Chenhall, 2003).

Management accounting scholars argue that the organizations operate more effectively when they apply and use MAS that cope with their organizational and environmental condition (Etemadi *et al.*, 2009; Hoque, 2011). In this condition MAS helps organizations to survive in a competitive and changing environment by supplying helpful information for planning, controlling, monitoring and decision making (Ismail and Isa, 2011; Soobaroyen and Poorundersing, 2008).

The main role of MAS is to support managers in decision making, planning and control. This prospect originates from economic model of decision making and states that, in uncertain environments, the achievement to useful information leads to enhanced resource allocation and raises the possibility of an improved positive outcome (Hammad *et al.*, 2010). In other words, a conditional association presumes that useful information helps managers

in making effective decisions, which improves managerial performance (Baines and Langfield-Smith, 2003; Chenhall, 2003; Hammad *et al.*, 2010). Well-designed and sophisticated MAS is likely to supply managers with information suitable for setting performance objectives, performance assessment standards and feedback on performance leading to enhanced managerial performance. An MAS is considered sophisticated when it generates information that is broad in scope, high timeliness, high aggregation and high integration (Rasid *et al.*, 2011; Moores and Yuen, 2001).

Financial liberalization and technological revolution intensify the competitive pressures among the financial organizations. Globalization forces financial organizations to be stronger in order to compete internationally better. This highly competitive environment prompts financial organization's managers to meet their customers' expectations much more closely to ensure the survival and success of the business. Within this uncertain environment, the managers need more information for decision making. An appropriate information system can help managers satisfy their customers' expectations and, thus, improve managerial performance (e.g. Chung *et al.*, 2012; Chong and Eggleton, 2003; Hammad *et al.*, 2010). Hence, the complexity of the business environment in financial organizations requires that MAS be able to provide information related to financial, non-financial, past performance, future performance and internal as well as external from the organization. To be more effective in decision making, MAS should be integrated, aggregated and provide in a timely manner.

MAS assists financial organization's managers to be more effective in decision making which then helps organizations to improve their efficiency and remain competitive in the ever challenging environment. In order to meet the challenges of globalization and liberalization, the addition of managerial accounting concepts and techniques to the existing financial reporting structures enhances the competitive edge among financial organizations (Rezaee, 2005). However, most of the previous research studies on MAS are biased toward the manufacturing sector (e.g. Arroteia *et al.*, 2012; Hill, 2000; Hussain *et al.*, 1998; Jauhari, 2012; Mia and Patiar, 2001; Waweru *et al.*, 2004), because service industry has special characteristics (for instance, direct customer interaction, intangibility and perish ability of outputs) and is so important to the new economy. Therefore, due to the lack of research on MAS in the service sector, particularly the financial services sector, which is acknowledged by previous research studies (Hussain, 2005; Rasid *et al.*, 2011, 2014), the aim of this study is to examine the relationship between MAS characteristics and managerial performance in financial organizations.

This study treats managerial performance at a macro (organization) level, as a management-related outcomes corresponding to the entire organization. The reason for treating management performance at the macro level reflects that MAS usage is rarely personalized to specific individual user requirements. Rather, in the design of MAS for an organization, some common denominator is chosen to allow multiple purpose use of MAS information and data by all interested management users (Colson, 1980). Realizing the usefulness of MAS, the current study also hypothesizes the positive relationship between the MAS characteristics and performance. Hence, the above discussion results in the following hypotheses:

*H2.* There is a direct relationship between MAS characteristics and managerial performance.

*H2a.* There is a positive relationship between broad-scope MAS and managerial performance.

*H2b.* There is a positive relationship between timely MAS and managerial performance.

*H2c.* There is a positive relationship between integrated MAS and managerial performance.

*H2d.* There is a positive relationship between aggregated MAS and managerial performance.

*The effects of MAS on the relationship between technology and managerial performance*

In light of the arguments made in the context of *H1* and *H2*, this paper adopts, and plans to empirically test for, an intervening/mediating model and approach whereby MAS acts an intervening variable between technology and managerial performance. Indeed, when the relationship between two variables exists at least partly through a third variable, then this third variable plays this mediating role between the other two variables (Chenhall and Brownell, 1988; Mia, 1993). There is generally an expectation that the direct relationships between the antecedent variables and managerial performance are minimal, if not insignificant (Mia and Clarke, 1999).

Chang *et al.* (2003) in their study hypothesized that, if, decentralization and task uncertainty are correlated with MAS and MAS is correlated with performance, then decentralization and task uncertainty affect performance acting through MAS. In other research, Ismail and Isa (2011) hypothesized that advanced manufacturing technology is correlated with MAS and MAS are correlated with performance, then there is an indirect effect of advanced manufacturing technology acting through MAS on performance. Mia and Clarke (1999) concluded that, if, the perceived intensity of market competition is correlated with MAS and MAS is correlated with performance, then there is an indirect relationship between perceived intensity of market competition and performance through MAS. Hence, following these researchers this can be mentioned that there is a direct effect of technology on MAS and MAS on managerial performance and, therefore, there is an indirect effect of technology on managerial performance acting through MAS, which results in the following hypothesis:

*H3.* There is a positive indirect relationship between technology and managerial performance, acting through the mediating role of MAS.

## Methodology

Data were collected using self-administrated questionnaires. A pilot study was conducted to refine the measurement scales. A sample of 30 financial organizations was chosen to pre-test and complete the questionnaire. The test of Cronbach's $\alpha$ was used to check the questionnaire reliability which was above 0.7, indicating that the variables and dimensions of the study had acceptable reliabilities; the questionnaire always received reliable and consistent answers (Hair *et al.*, 2011).

The questionnaires were personally addressed to finance managers, chief accountants, chief controllers or chief financial officers (CFOs) of financial organizations in Iran, from July 2014 to October 2014. These financial organizations were listed on the websites of Central Bank, Central Insurance and Securities and Exchange Organization. This study considered the whole population of 185 financial organizations in Iran as the subject of study to avoid low response rate. Because the size of the target population is small, this study used Census approach that involves examining the entire population. For the first step, each firm secretary was phoned to collect the name and contact details of the finance manager, chief accountant, chief controller or CFO. Each respondent was then invited via telephone to participate in the study. A total of 155 firms expressed interests in participating in the study and requested the details about the study in writing along with a copy of the survey instrument. Second, for the participating firms, the respondents were contacted mostly through direct visit to the firm to deliver the survey package followed by either a phone call or e-mail to ask for their assistance in gathering the essential information. The survey package included a copy of the survey and a cover letter, addressed personally to the respondents in each organization, explaining the purpose of the study, and a tear-off section allowing respondents to provide their name and address for a copy of the survey results, while ensuring anonymity.

Among the 185 questionnaires distributed, 146 were successfully completed and returned, achieving an effective response rate of 78 percent. This high response rate was because of two main reasons: first, all of these organizations are located or at least have a central office in Tehran city and mostly concentrated in several streets in the city. Therefore, contacting with them was easy and time saving. Second, researcher personally referred to these organizations and all questionnaires were hand delivered to respondents.

A non-response bias analysis was performed through the $\chi^2$ test to compare the responses of the early and late waves of the returned questionnaires. The $\chi^2$ statistic was calculated to determine whether the distribution of the responses from the two groups into respondent's job position, experience, age and gender, type and size of organization differed significantly. Using the $\chi^2$ test and $p > 0.01$, the results show that no significant differences were found between the two groups in those demographic variables. These results collectively suggest that non-response bias may not be a serious problem between the first-wave and the second-wave responses.

The organizations' profiles are with regard to their type of activity, their size and job position of the respondent. The summarized demographic profile of the respondents is presented in Table I. Data were collected from three different types of financial organizations, including: banking, insurance and investment. Among all surveyed organizations, banks and insurances account for 34.2 percent (both 25 organizations equally) and investment organizations account for 65.8 percent (96 organizations). The size of organizations was measured by the number of employees. The respondent worked primarily for small and medium organizations (less than 500 employees) (56 percent). A total

| Demographic variable | Frequency | Percentage |
|---|---|---|
| *Type of organization* | | |
| Banking | 25 | 17.1 |
| Insurance | 25 | 17.1 |
| Investment | 96 | 65.8 |
| *Size of organization* | | |
| Less than 100 employees | 26 | 17.8 |
| 100–499 employees | 56 | 38.4 |
| 500–999 employees | 44 | 30.1 |
| More than 1,000 employees | 20 | 13.7 |
| *Job position of respondent* | | |
| Finance managers | 18 | 12.3 |
| Chief accountants | 49 | 33.6 |
| Chief controllers | 54 | 37.0 |
| Chief financial officers (CFOs) | 25 | 17.1 |
| *Experience of respondent (years)* | | |
| Less than 5 | 22 | 15.1 |
| 5–10 | 80 | 54.8 |
| More than 10 | 44 | 30.1 |
| *Gender of respondent* | | |
| Male | 106 | 72.6 |
| Female | 40 | 27.4 |
| *Age of respondent* | | |
| Less than 30 | 26 | 17.8 |
| 30–45 | 74 | 50.7 |
| More than 45 | 46 | 31.5 |

**Table I.**
Profile of respondents

of 44 organizations (30.1 percent) and 20 organizations (13.7 percent) have numbers of employees between 500 and 999 and more than 1,000, respectively. With regard to respondent in companies, the final sample included 18 managers of the finance department (12.3 percent), 49 chief accountants (33.6 percent), 54 chief controllers (37 percent) and 25 CFOs (17.1 percent). The majority of respondent were chief accountant or group controller who are specialists in the management accounting context.

*Measurement of main variables*

The present study adopted and aligned the measurement of the main variables from previous studies in accordance. Next, a pilot study was conducted to refine the measurement scales. The questionnaire of this study was tested through pre-testing and taking the opinion of experts and academicians. In this section the measurements of main variables of the study are presented.

*Technology*. The instrument of technology used in this study was an adaptation of the scale developed by Zhu *et al.* (2004), Mia and Winata (2008) and Zhu and Kraemer (2002). The selection of the scales was for three reasons. First, these scales have demonstrated considerable sensitivity and validity in other studies (e.g. Zhu *et al.*, 2004; Mia and Winata, 2008; Zhu and Kraemer, 2002). Second, these scales comprise the criteria of the technology readiness and adoption that have been determined as an important part of this study. Third, these scales encompassing the technology readiness criteria can be applied to service firms which were the focus of this study. The three dimensions of technology construct (i.e. technologies in use, frontend website functionalities and backend integration) were measured using 19 items.

*MAS characteristics*. MAS characteristics were measured based on Chenhall and Morris (1986) and widely used by other MAS researchers (e.g. Agbejule, 2005; Bouwens and Abernethy, 2000; Cheng, 2012; Chong and Eggleton, 2003; Chung *et al.*, 2012; Susanto, 2010). In this study, the aim was to measure the extent of use of all the dimensions of MAS. Managers are asked to rate the "extent of use" of MAS information in their daily decision-making activities by considering these information characteristics (scope, integration, timeliness and aggregation) on a five-point Likert scale. In this study, the instrument is changed in several ways. First, following Bouwens and Abernethy (2000) slight changes were made to the wording to make sure that the instrument was applicable to the context of the current research. Second, a dimension in relation to departmental costs was inserted to the instrument for measuring integration appropriately. These changes characterize a different approach from previous use (Chenhall and Morris, 1986) (Table II).

*Managerial performance*. Managerial performance is measured by an instrument using a self-evaluation questionnaire which has been applied widely and found to be applicable in the MAS research studies (Agbejule, 2005; Chong and Eggleton, 2003; Etemadi *et al.*, 2009; Tsui, 2001). Performance on eight items relates to different managerial activities including planning, investigating, coordinating, evaluating, supervising, staffing, negotiating and representing, plus one overall performance dimension. Respondents were asked to rate on a five-point Likert scale their own perceived performance on eight items relating to different managerial activities plus one overall performance dimension. In this study, following Chong and Eggleton (2003) one more dimension in relation to overall performance was inserted to the instrument for measuring managerial performance properly. These changes characterize a different approach from previous use (Etemadi *et al.*, 2009; Tsui, 2001).

## Results

*Descriptive statistics*

Table III summarizes the descriptive statistics for all constructs. Generally it is found that there are relatively above moderate level of technology implementation related to technologies

| Construct | Item | Measurement items | References |
|---|---|---|---|
| Frontend functionalities | TECF1 | Website that supports online services (filing application, claims) | Mia and Winata (2008), Zhu *et al.* (2004), Zhu and Kraemer (2002) |
| | TECF2 | Website that supports online transaction (payment, transfer) | |
| | TECF3 | Website that supports account management | |
| | TECF4 | Website that provides online tools such as research and planning | |
| Backend integration | TECB1 | Web applications are integrated with back-office systems | |
| | TECB2 | Company databases are integrated with suppliers and partners | |
| | TECB3 | Company databases are integrated with customers' information system | |
| Technologies in use | TECI1 | Intranet | Zhu *et al.* (2004), Mia and Winata (2008), Zhu and Kraemer (2002) |
| | TECI2 | Extranet | |
| | TECI3 | Electronic data interchange (EDI) | |
| | TECI4 | Electronic fund transfer (EFT) | |
| | TECI5 | Internet banking/insurance | |
| | TECI6 | Wireless/mobile banking (using PDA, SMS, etc.) | |
| | TECI7 | XBRL (Extensible business reporting language) | |
| | TECI8 | Electronic cards | |
| | TECI9 | Financial management software | |
| | TECI10 | Call center | |
| | TECI11 | Website accessible to public | |
| | TECI12 | E-mail | |
| Scope | SCOP1 | Information which relates to possible future events | Cheng (2012), Chenhall and Morris (1986), Chung *et al.* (2012), Etemadi *et al.* (2009), Susanto (2010) |
| | SCOP2 | Qualification of the likelihood of future events occurring | |
| | SCOP3 | Non-economic information such as customer preferences, employee attitudes, labor relations | |
| | SCOP4 | Information on broad factors external to the organization | |
| | SCOP5 | Non-financial information that relates to the productivity | |
| | SCOP6 | Non-financial information that relates to market information | |
| Timeliness | TIME1 | Information that is provided immediately upon request | Agbejule (2005), Chenhall and Morris (1986), Etemadi *et al.* (2009), Susanto (2010) |
| | TIME2 | Information that is given automatically as soon as processing is completed | |
| | TIME3 | Reports that are provided frequently on a systematic, regular basis (daily, monthly, etc.) | |
| | TIME4 | Relevant information that is reported without delay after occurrence of certain event | |
| Integration | INTE1 | Information on precise targets for the activities of all departments within organization | Agbejule (2005), Bouwens and Abernethy (2000), Chenhall and Morris (1986) |
| | INTE2 | Information that relates to the impact of different departments' decisions on performance of organization | |
| | INTE3 | Cost and price information of the departments | |
| | INTE4 | Information on the impact of decisions on organization, and the influence of other departments' decisions on area of responsibility | |
| Aggregation | AGGR1 | Information provided in the different sections or functional areas in organization | Agbejule (2005), Bouwens and Abernethy (2000), Chenhall and Morris (1986) |
| | AGGR2 | Information on the effect of events on particular time periods | |
| | AGGR3 | Information which has been processed to show the influence of events on different functions | |
| | AGGR4 | Information on the effect of different departments' activities on summary reports | |
| | AGGR5 | Information on formats suitable for input into decision models | |
| | AGGR6 | Information in forms which enable managers to conduct "what-if" analysis | |

(*continued*)

**Table II.**
Measures and items

| Construct | Item | Measurement items | References |
|---|---|---|---|
| Managerial performance | PERF1 | Planning | Agbejule (2005), Chong and Eggleton (2003), Etemadi *et al.* (2009), Tsui (2001) |
| | PERF2 | Investigating | |
| | PERF3 | Coordinating | |
| | PERF4 | Evaluating | |
| | PERF5 | Supervising | |
| | PERF6 | Staffing | |
| | PERF7 | Negotiating | |
| | PERF8 | Representing | |
| | PERF9 | Overall performance, e.g. growth of revenue, profit, market share | |

**Table II.**

| Variables (factored items) | Mean | SD | Actual range | Potential range[a] | Cronbach's $\alpha$ |
|---|---|---|---|---|---|
| SCOP | 3.4760 | 0.54280 | 2.33–5.00 | 1–5 | 0.874 |
| TIME | 3.4110 | 0.67130 | 1.50–5.00 | 1–5 | 0.855 |
| INTE | 3.4418 | 0.63248 | 1.75–5.00 | 1–5 | 0.858 |
| AGGR | 3.3562 | 0.59677 | 1.80–4.80 | 1–5 | 0.858 |
| TECH | 3.2494 | 0.53637 | 2.08–4.50 | 1–5 | 0.855 |
| PERF | 3.4909 | 0.49652 | 2.44–5.00 | 1–5 | 0.867 |

**Table III.**
Descriptive statistics

**Note:** [a]From low to high for all items/variables

in use, frontend functionality and backend integration (mean score 3.249). This result ties in with the recent evidence that the Iranian financial organizations have invested in new technologies, and IT is becoming an important factor in the future development of the financial services industry – probably in a bid to increase functionality, improve accuracy, speed up processing and enhance external reporting (Ghasemi *et al.*, 2011). In addition, in prior studies in Iran, the technology "score" over the last six years or so for service sector was higher than average level. For instance, Farhanghi *et al.* (2013) found a higher level of IT adoption in consultant engineer firms in Iran (0.74; rated 0/low to 1/high to allow some comparison). In the same way, the findings of Salehi and Alipour (2010) showed a higher level of average (0.75) for e-banking usage in the Iranian banking service sector. The technology score for this study was 0.65. This suggests an increasing availability of advanced technologies in the financial service sector and suggests that the new IT is becoming a vital factor in the future development of the financial services sector (Zhu *et al.*, 2004).

In regard to MAS, it is found that there is relatively high level of MAS information related to its different characteristics: scope, timeliness, integration and aggregation (mean scores between 3.356 and 3.476). This result is consistent with the recent evidence (Abbasi *et al.*, 2014) that the local firms have invested in new ERP systems and other financial software to acquire broader, timely and aggregated information to improve decision-making processes, increase the need to access real-time data and to keep up with the increase in their competition. As an illustration, and purely on an indicative basis, the scope "score" over the last ten years or so (rated 0/low to 1/high to allow some comparison) was 0.48 for Sharma *et al.* (2006) in Australia, 0.75 for Mia and Winata (2008) in Australia, 0.64 for Cheng (2012) in the Taiwan sample and 0.60 for Hammad *et al.* (2013) in Egypt. The timeliness, integration and aggregation scores for this study (0.68, 0.69 and 0.69, respectively) were close to the results of Hammad *et al.* (2013) (0.63, 0.58 and 0.66, respectively). Therefore, this suggests an increasing availability of quality and sophisticated MAS on a cross-national basis, thus lending some credence to the prediction of an increasing convergence of sophisticated MAS in the business world.

It is found that there is above moderate level of managerial performance in organizations. It illustrates that management in financial organizations could make and perform effective decisions and managerial activities by using available information and by considering environmental situations. In addition, Cronbach's $\alpha$ coefficients for the internal reliability for all the measured variables were all at an acceptable level (0.60 or above).

*Model testing*

To verify the theoretical research model and hypotheses, SmartPLS 2.0 (Ringle *et al.*, 2014) was used in the analysis of the structural equation model (SEM). PLS is an SEM tool that uses a component-based approach for estimation, so it places minimal restrictions on sample size and residual distribution, and is especially useful in areas where there is weak theory and limited understanding of relationships among variables. PLS model is analyzed and interpreted in two stages: measurement model (outer model) that displays the relationships between the constructs and the indicator and assesses the reliability and validity of the measurement model; and structural model (inner model) that represents the constructs and displays the relationships (paths) between the constructs (Hulland, 1999).

The indirect relationship (*H3*) was tested using multiple mediation analyses grounded in the use of bootstrapping methods (Preacher and Hayes, 2008). Preacher and Hayes describe an SPSS macro they developed that is available online to calculate the total, direct and indirect effect using bootstrapping, which is used in the present analyses. Bootstrapping, a nonparametric resampling procedure, is an additional method advocated for testing mediation that does not impose the assumption of normality of the sampling distribution. Bootstrapping is a computationally intensive method that involves repeatedly sampling from the data set and estimating the indirect effect in each resampled data set.

*Step 1: analysis of measurement model*

To assess the measurement model, relationships among observed variables and latent constructs were drawn, and the PLS algorithm with the path weighting scheme was used (Esposito *et al.*, 2010; Chin, 2010). This study assessed the measurement model by examining for: individual item reliability; matrix of loadings and cross-loadings; internal consistency; convergent validity; and discriminant validity. Internal consistency considers two elements for evaluation: Cronbach's $\alpha$ and composite reliability. Composite reliability assumes that indicators have different loadings and prioritizes indicators that have high reliability to the latent variable, unlike Cronbach's $\alpha$ that assumes that all indicators are equally reliable to the latent variable (Chin, 2010). The composite reliability and Cronbach's $\alpha$ values for the measures must be greater than 0.70 cut-off point (Hair *et al.*, 2014). The results indicate acceptable values for both composite reliability (0.91–0.95) and Cronbach's $\alpha$ (0.89–0.93). All constructs show internal consistency reliability.

To establish convergent validity, the outer loadings of the indicators, as well as the average variance extracted (AVE), were evaluated. Higher outer loadings indicate that the associated indicators have much in common. AVE is defined as the grand mean value of the squared loadings of the indicators associated with the construct. An AVE value of 0.50 and higher indicates a sufficient degree of convergent validity, meaning that the latent variable explains more than half of its indicators' variance (Hair *et al.*, 2014). Outer loadings are expected to be 0.70 or higher and AVE results in Table IV are above 0.50, ranging from 0.61 to 0.85. On both outer loadings and AVE, the all constructs show convergent validity.

Discriminant validity is typically assessed by two measures, the Fornell–Larcker criterion and cross-loadings. The Fornell–Larcker criterion assesses whether a latent construct shares more variance with its assigned indicators than with another latent variable in the structural model (Hair *et al.*, 2011, 2012). In statistical terms, if the square root of AVE for a construct is higher than the correlations between it and any other construct in the model, discriminant

validity is established (Fornell and Larcker, 1981). For the second criterion of discriminant validity, an indicator's loading with its associated latent construct should be higher than its loadings with all the remaining constructs (i.e. cross-loadings) (Hair *et al.*, 2011, 2012).

As shown in Table VI, all cross-loadings for each of the constructs are indeed greater than all of its loadings on other constructs. The square root of each construct's AVE is indeed greater than its highest cross correlation. The results obtained for the cross-loadings and the Fornell–Larcker criterion show that all constructs have discriminant validity (see Tables V and VI). Based on the above analysis, the measurement model of the study has high reliability and validity.

*Step 2: analysis of structural model*

The structural model analyzes the relationships between latent variables. In the analysis of the structural model, the paths' significance was determined by evaluating the *t*-statistic using the bootstrapping technique with 1,000 samples. All constructs were reflective. The bootstrap approach is a nonparametric approach for estimating the precision of the PLS estimates (Chin, 2010). In addition, to assess the predictive power of the structural model, $R^2$ values of the endogenous constructs were examined. This represents the amount of variance in the construct explained by the model (Chin, 2010) (Table VII).

Concerning the path between TECH construct and SCOP construct (*H1a*), the $\beta$ coefficient is positive and statistically significant at *p*-value $< 0.05$ ($\beta = 0.237$, $t = 2.47$). The paths from TECH construct to TIME and INTE constructs (*H1b* and *H1c*) were also found to be significant at *p*-value $< 0.001$. The $\beta$ path coefficients show positive and direct relationships ($\beta = 0.413$, $t = 5.13$ and $\beta = 0.499$, $t = 6.32$). Similarly, a significant $\beta$ path coefficient (significant at *p*-value $< 0.001$) was found on the relationship between TECH and AGGR ($\beta = 0.471$; $t = 5.09$). The above findings (significant relationships in *H1a–H1d*) give evidence of further and full support of a direct and positive relationship between the TECH construct and MAS construct (*H1*).

The $\beta$ coefficient from SCOP construct to PERF construct (*H2a*) is positive and statistically significant at *p*-value $< 0.001$ ($\beta = 0.275$, $t = 3.48$). The path linking TIME construct to PERF construct (*H2b*) is also positive and very significant at *p*-value $< 0.001$ ($\beta = 0.419$ $t = 4.07$). In addition, *H2d* predicated a positive and direct relationship between AGGR construct and PERF construct was also supported at *p*-value $< 0.05$ ($\beta = 0.139$ $t = 2.49$). Only the path from INTE

**Table IV.**
Item loading, composite reliability and AVE

| Construct | Communality | $R^2$ | Cronbach's $\alpha$ | Composite reliability | AVE |
|---|---|---|---|---|---|
| TECH | 0.842750 | n/a | 0.905586 | 0.941305 | 0.842750 |
| SCOP | 0.641825 | 0.056595 | 0.890984 | 0.914597 | 0.641825 |
| TIME | 0.797649 | 0.171356 | 0.916003 | 0.940292 | 0.797650 |
| INTE | 0.851914 | 0.249910 | 0.938913 | 0.958020 | 0.851914 |
| AGGR | 0.784060 | 0.222651 | 0.928265 | 0.947302 | 0.784060 |
| PERF | 0.616217 | 0.595574 | 0.923022 | 0.935097 | 0.616218 |

**Table V.**
Fornell and Larker criterion results

| | AGGR | INTE | PERF | SCOP | TECH | TIME |
|---|---|---|---|---|---|---|
| AGGR | *0.88547* | | | | | |
| INTE | 0.670450 | *0.92299* | | | | |
| PERF | 0.539101 | 0.505799 | *0.78499* | | | |
| SCOP | 0.508363 | 0.384378 | 0.685229 | *0.80113* | | |
| TECH | 0.471859 | 0.499910 | 0.302485 | 0.237896 | *0.91801* | |
| TIME | 0.545565 | 0.620196 | 0.735144 | 0.765962 | 0.413952 | *0.83311* |

| | AGGR | INTE | PERF | SCOP | TECH | TIME |
|---|---|---|---|---|---|---|
| AGG1 | *0.833225* | 0.557312 | 0.671651 | 0.479272 | 0.347139 | 0.487189 |
| AGG2 | *0.956589* | 0.634795 | 0.425961 | 0.444209 | 0.461032 | 0.495839 |
| AGG3 | *0.945685* | 0.613742 | 0.393830 | 0.414324 | 0.425941 | 0.453077 |
| AGG4 | *0.940239* | 0.610507 | 0.398502 | 0.441437 | 0.416554 | 0.465175 |
| AGG5 | *0.729796* | 0.535540 | 0.429320 | 0.444349 | 0.434666 | 0.490086 |
| INTE1 | 0.665433 | *0.961608* | 0.388387 | 0.352383 | 0.517650 | 0.583411 |
| INTE2 | 0.665093 | *0.971058* | 0.395006 | 0.356533 | 0.501421 | 0.597290 |
| INTE3 | 0.488407 | *0.773811* | 0.661079 | 0.344305 | 0.325101 | 0.500537 |
| INTE4 | 0.648975 | *0.970170* | 0.387348 | 0.355169 | 0.499948 | 0.596968 |
| PER1 | 0.399113 | 0.365799 | *0.774951* | 0.738205 | 0.301581 | 0.896832 |
| PER2 | 0.350774 | 0.344605 | *0.808580* | 0.691361 | 0.259168 | 0.742437 |
| PER3 | 0.528593 | 0.611951 | *0.775114* | 0.412104 | 0.277783 | 0.447771 |
| PER4 | 0.569232 | 0.536561 | *0.746400* | 0.353274 | 0.283855 | 0.430771 |
| PER5 | 0.372311 | 0.296043 | *0.850481* | 0.574892 | 0.240214 | 0.580990 |
| PER6 | 0.318026 | 0.295543 | *0.773911* | 0.421738 | 0.055956 | 0.419572 |
| PER7 | 0.418785 | 0.318818 | *0.846897* | 0.539396 | 0.196354 | 0.510768 |
| PER8 | 0.347618 | 0.276265 | *0.769344* | 0.438590 | 0.044471 | 0.422717 |
| PER9 | 0.544630 | 0.571671 | *0.708741* | 0.454222 | 0.388262 | 0.449323 |
| SCOP1 | 0.405385 | 0.365799 | 0.774406 | *0.754752* | 0.299874 | 0.893840 |
| SCOP2 | 0.315351 | 0.247657 | 0.607923 | *0.888266* | 0.102075 | 0.604692 |
| SCOP3 | 0.409911 | 0.311037 | 0.463946 | *0.775195* | 0.146534 | 0.493126 |
| SCOP4 | 0.431920 | 0.287891 | 0.374526 | *0.749339* | 0.207871 | 0.461118 |
| SCOP5 | 0.518913 | 0.355325 | 0.417556 | *0.844180* | 0.270442 | 0.545166 |
| SCOP6 | 0.381013 | 0.238386 | 0.434902 | *0.785625* | 0.042951 | 0.435975 |
| TECB | 0.509142 | 0.330527 | 0.185587 | 0.150398 | *0.871428* | 0.284367 |
| TECF | 0.310472 | 0.525814 | 0.302825 | 0.224107 | *0.898865* | 0.419088 |
| TECI | 0.486899 | 0.504067 | 0.329703 | 0.268265 | *0.980257* | 0.423514 |
| TIM1 | 0.564915 | 0.692171 | 0.523005 | 0.611533 | 0.393648 | *0.871921* |
| TIM2 | 0.600383 | 0.773250 | 0.516813 | 0.592844 | 0.460560 | *0.852026* |
| TIM3 | 0.404872 | 0.393377 | 0.769135 | 0.755753 | 0.316755 | *0.919032* |
| TIM4 | 0.422135 | 0.433652 | 0.769660 | 0.751218 | 0.333986 | *0.927245* |

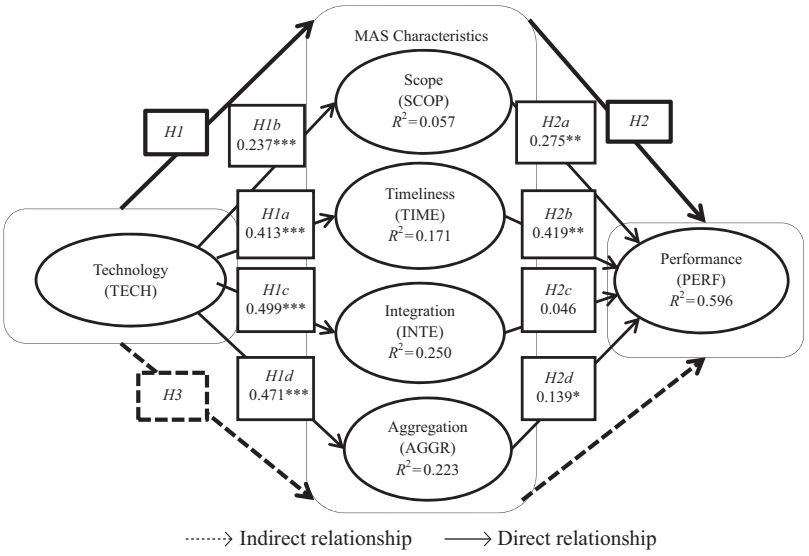
**Table VI.**
Measurement items loading and cross-loadings – all constructs

| Relevant hypothesis | Relevant path | Path coefficient | SE | *t*-value | *p*-value | Result |
|---|---|---|---|---|---|---|
| *H1a* | TECH→SCOP | 0.237896 | 0.096304 | 2.470255 | 0.014661 | Supported |
| *H1b* | TECH→TIME | 0.413952 | 0.080543 | 5.139504 | 0.000001 | Supported |
| *H1c* | TECH→INTE | 0.499910 | 0.079059 | 6.323281 | 0.000000 | Supported |
| *H1d* | TECH→AGGR | 0.471859 | 0.092695 | 5.090420 | 0.000001 | Supported |
| *H2a* | SCOP→PERF | 0.275287 | 0.078952 | 3.486750 | 0.000647 | Supported |
| *H2b* | TIME→PERF | 0.419549 | 0.102991 | 4.073657 | 0.000076 | Supported |
| *H2c* | INTE→PERF | 0.046555 | 0.074803 | 0.622363 | 0.534681 | Not supported |
| *H2d* | AGGR→PERF | 0.139051 | 0.055801 | 2.491913 | 0.013832 | Supported |

**Table VII.**
Results of hypotheses testing – direct effects

construct to PERF construct (*H2c*) was not supported ($\beta = 0.46$, $t = 0.62$). Therefore, the above findings (significant relationships in *H2a*, *H2b* and *H2d*) give evidence of further support of a direct and positive relationship between the MAS construct and PERF construct (*H2*).

The conceptual model produces acceptable $R^2$ values: SCOP (0.057), TIME (0.171), INTE (0.250), AGGR (0.223) and PERF (0.596) (see Figure 2). The amounts of variance in endogenous constructs explained by all exogenous constructs are satisfactory and indicate model's predictive accuracy. As most of these $R^2$ are larger than the recommended levels, it is appropriate to examine the significance level of the paths associated with these variables.




**Notes:** *$p<0.05$; **$p<0.01$; ***$p<0.001$

**Figure 2.**
Research model results

Because the hypothesized relationship between TECH construct and PERF construct were based on mediation (*H3*), it was tested using the bootstrapping method as a nonparametric mediation analysis to determine the significance of the mediation relationship. For analysis mediation, the bootstrapping method is recommended to overcome potential problems caused by unmet assumptions (Preacher and Hayes, 2008). Thus, bootstrapping procedure was used to obtain estimates of the indirect effect and to test their significance by using confidence intervals (CIs). Bootstrapping is a method that is based on a resampling of data and has several advantages, including no distributional assumptions and the possibility to analyze multiple mediators at one and the same time. The SPSS macro created by Preacher and Hayes (2008) for bootstrap analyses with multiple mediators was employed. In Table VIII, for *H3* a summary of the mediation analysis results obtained from the bootstrapping method is presented.

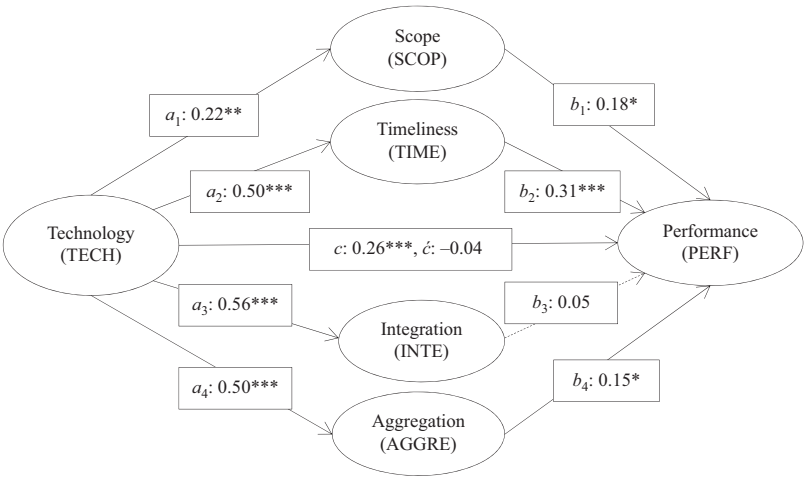
| | Path coefficients ($p$-value in parentheses) | | | | | Indirect effects | | |
|---|---|---|---|---|---|---|---|---|
| | To PERF | To SCOP | To TIME | To INTE | To AGGR | Estimate | SE | Bootstrap 95% CI |
| From TECH | $c=0.264$ (0.000) | $a_1=0.221$ (0.0059) | $a_2=0.500$ (0.0000) | $a_3=0.564$ (0.0000) | $a_4=0.504$ (0.0000) | | | |
| From SCOP | $b_1=0.187$ (0.021) | | | | | | | |
| From TIME | $b_2=0.319$ (0.000) | | | | | | | |
| From INTE | $b_3=0.051$ (0.463) | | | | | | | |
| From AGGR | $b_4=0.151$ (0.033) | | | | | | | |
| Total | | | | | | 0.3064 | 0.077 | [0.169, 0.478] |
| TECH→SCOP→PERF | | | | | | 0.0339 | 0.025 | [0.006, 0.115] |
| TECH→TIME→PERF | | | | | | 0.1636 | 0.063 | [0.054, 0.302] |
| TECH→INTE→PERF | | | | | | 0.0264 | 0.034 | [−0.037, 0.099] |
| TECH→AGGR→PERF | | | | | | 0.0765 | 0.036 | [0.017, 0.166] |

**Table VIII.**
Results of hypotheses testing – indirect effect (bootstrapping)

*Indirect relationship between technology and performance*. The results show that technology significantly affected both scope ($a_1 = 0.22$, $p < 0.01$) and performance ($c = 0.26$, $p < 0.001$). In addition, the results indicated that the mediator, timeliness, was positively associated with performance ($b_2 = 0.31$, $p < 0.001$). Because both the *a*-path and *b*-path were significant, mediation analysis was tested using the bootstrapping method. Bootstrapping procedure points at the mediational role of scope, demonstrating that the 95% CI for the indirect effect using 5,000 bootstrap samples did not include zero (CI: 0.006, 0.115) (Preacher and Hayes, 2008). Therefore, scope mediates the relationship between technology and performance. In addition, the results indicated that the direct effect of technology on performance become non-significant ($\acute{c} = -0.04$, $p > 0.05$) when controlling for MAS, thus, this result suggests full mediation effect of scope on the relationship between technology and performance (Figure 3).

In addition, technology was positively associated with performance ($c = 0.26$, $p < 0.001$). It was found that technology was positively related to timeliness ($a_2 = 0.50$, $p < 0.001$). At last, the results indicated that timeliness was positively associated with performance ($b_2 = 0.31$, $p < 0.001$). Because both the *a*-path and *b*-path were significant, mediation analysis was tested using the bootstrapping method. In the present study, the 95% CI of the indirect effects was obtained with 5,000 bootstrap resamples. The results of the mediation analysis confirmed the mediating role of timeliness in the relationship between technology and performance ($\beta = 0.015$, CI: 0.054, 0.302). In addition, the results indicated that the direct effect of technology on performance become non-significant ($\acute{c} = -0.04$, $p > 0.05$) when controlling for timeliness, thus, suggesting full mediation.

Similarly, technology was positively associated with performance ($c = 0.26$, $p < 0.001$) and aggregation ($a_4 = 0.50$, $p < 0.001$). In addition, the results indicated that the mediator, aggregation, was positively associated with performance ($b_2 = 0.29$, $p < 0.001$). Because both the *a*-path and *b*-path were significant, mediation analysis was tested using the bootstrapping method. A bias-corrected bootstrap 95% CI indicated that the indirect effect through aggregation was significant, $a_4 \times b_4 = 0.14$, 95% CI: [0.017, 0.166] (CI did not include zero). In addition, the direct effect of technology on performance ($\acute{c}$-path) when controlling for aggregation was not significant ($\acute{c} = -0.04$, $p > 0.05$). These results suggest full




**Notes:** The numbers = path coefficients. $c = X \rightarrow Y$ without $M$ (mediator); $\acute{c} = X \rightarrow Y$ with $M$. *$p$<0.05; **$p$<0.01; ***$p$<0.001

**Figure 3.**
The bootstrapping estimated multiple mediation model

mediation effect of aggregation on the relationship between technology and performance. This finding indicates that part of the relationship between market technology and managerial performance can be attributed to an increase in aggregation of MAS.

At last, because the path of "TECH→INTE→PERF" ($b_3$-path) was not significant, mediation analysis was not tested using the bootstrapping method. Therefore, integration did not mediate the relationship between technology and performance.

These findings indicated that scope, timeliness and aggregation of MAS mediated fully the link between technology and managerial performance. These findings provide further support for *H3* and were consistent with the findings of previous studies (e.g. Mia and Winata, 2008; Ismail and Isa, 2011) that MAS characteristics mediate the relationship between technology and managerial performance. Technology influences the MAS characteristics (scope, timeliness and aggregation) in organizations in order to fit with the changing business operation and results in improved managerial performance. The development of technologies causes changes in organizations and give them new possibilities for modeling organizational operations, integrating organizational activities and managing the firm in real time (Mia and Winata, 2008; Zhu *et al.*, 2004; Granlund, 2011; Mat *et al.*, 2010; Berry *et al.*, 2009).

MAS is an important aspect of organization's structure and the characteristics of a suitable system depend upon the environmental conditions like advanced in technologies (Zawawi and Hoque, 2010). MAS may change as varying aspects of a firm become integrated through technology (Berry *et al.*, 2009). In addition, the reliability, relevance and timeliness of MAS information can be supported by technology, and MAS can provide high-quality information for decision making by the help of technology which results in high managerial performance.

## Discussion and conclusion

In line with prediction, the findings indicate that the higher use of advanced technology, the greater use of MAS. Consistent with previous research studies, the implementation of advanced technologies which support IT, frontend functionality and backend integration in organizations may make flows of MAS information in organizations be more valuable, timely, accurate and relevant (Granlund, 2011; Mia and Winata, 2008; Zhu *et al.*, 2004). Hence, technology may influence MAS characteristics in organization in order to fit with the changing business operation. In other words, the efficiency of MAS information is reliability, relevance and timeliness which can be supported by advanced technology. The different characteristics of MAS were also explored in greater detail. Relating to the four MAS characteristics, the findings of the relationship connecting technology to scope, timeliness, integration and aggregation provided full support for direct relationship between technology and MAS. This finding is also consistent with the findings of prior management accounting studies that there is a positive relationship between technology and MAS characteristics (Granlund, 2011; Mia and Winata, 2008; Sanchez-Rodrıguez and Spraakman, 2012; Zawawi and Hoque, 2010; Zhu *et al.*, 2004).

Zawawi and Hoque (2010) asserted that advances in information and communication technology could significantly shape ways of doing business. The practice of management control and MAS may change as varying aspects of a firm become integrated via IT. The advances of technologies like IT and computerization have also made flows of management accounting information in organizations be more valuable, timely, accurate and relevant (Granlund, 2011). Hence, technology-based systems have tended to be the essential carriers of MAS and the most important driver of recent changes to management accounting (Sanchez-Rodrıguez and Spraakman, 2012).

The financial service sector already has benefited from network-enabled interactivity for more efficient information exchange and has experienced enhancement in operating

efficiencies and reduction in operating costs (Zhu *et al.*, 2004). According to Ghasemi *et al.* (2011), the Iranian financial organizations have invested in new technologies, and IT is becoming an important factor in the future development of the financial services industry – probably in a bid to increase functionality, improve accuracy, speed up processing and enhance external reporting. However, in Iranian financial organizations adoption of e-business technologies and practices has been gradual, limited by security concerns, lack of standards, regulations and the very complexity of the financial industry's network structure. Nevertheless, in Iran the role of the financial industry needs to change to keep up with the globalization movement, both at the procedural level and at the informational level.

*H2* proposed that MAS has a positive direct influence on managerial performance. In research model, this relationship was found to be significant. This result indicates that the use of sophisticated MAS causes improvement in managerial performance. This finding is consistent with previous research studies in management accounting (Baines and Langfield-Smith, 2003; Etemadi *et al.*, 2009; Hammad *et al.*, 2010; Hoque, 2011; Ismail and Isa, 2011; Rasid *et al.*, 2011). Relating to different MAS characteristics, the findings of the relationship between scope and performance (*H2a*), between timeliness and performance (*H2b*) and between aggregation and performance (*H2d*) provide further support for *H2*. The results indicate that scope, timeliness and aggregation of MAS significantly influence managerial performance. The direct and positive association between MAS and managerial performance suggests that the use of sophisticated MAS by managers can help them in making more correct decisions, which will cause enhancement in performance (Baines and Langfield-Smith, 2003; Hammad *et al.*, 2010). This means a conditional association presumes that useful information helps managers in making effective decisions, which improves managerial performance (Baines and Langfield-Smith, 2003; Chenhall, 2003; Hammad *et al.*, 2010). Therefore, in Iranian financial organizations MAS can assist managers to survive in a competitive and changing environment by providing helpful information for planning, controlling, monitoring and decision making.

In line with the prediction, MAS was found to mediate the link between technology and managerial performance. This result concurs with that of similar studies by Mia and Winata (2008) and Ismail and Isa (2011), namely that MAS mediates the relationship between technology and managerial performance. According to Mia and Winata (2008), Zhu *et al.* (2004) and Granlund (2011), technology may influence the MAS characteristics in organizations in order to fit with the changing business operation. Managers' use of new technologies increases volume, speed and capacity of their data handling; and improves information exchange and communication across functions, parties, geographical locations and time zones. Mia and Winata (2008) stated that managers' use of the MAS and IT are positively associated, as IT helps managers in effectively using the information. In addition, the effectiveness of MAS is reliability, relevance and timeliness of information, which can be supported by technology. Hence, technology is important for MAS for proving high-quality information for decision making which results in improved managerial performance (Zawawi and Hoque, 2010).

In Iran, financial organizations have invested in the new technologies to increase functionality, improve accuracy, speed up processing and enhance reporting (Ghasemi *et al.*, 2011). Therefore, using advanced technologies by these organizations facilities MAS functions and information flows and leads to higher level of profitability and efficiency and higher managerial performance. The findings support Farhanghi *et al.*'s (2013) assertion that IT has an impact on performance in Iranian consultant engineers firms. Similarly, an empirical study by Mia and Winata (2008) revealed that the application of new technologies such as Just-in-Time (JIT) is positively associated with managers' use of broad-scope information provided by the MAS. Therefore, managers in a JIT environment use broad-scope MAS information for decision making and improving managerial performance.

This study provides a better understanding of the relationships between technology, MAS and managerial performance within the context of financial organizations. The results provide financial organizations' managers with some useful aspects relating to the function of MAS, which can be used to enhance their managerial performance. The results may provide Iranian policy makers with some information in terms of reorganizing Iranian financial organizations and identifying the importance of MAS as an internal reporting function that supports transparency in external reporting in the financial organizations. For practitioners, the findings of this study may be used as an additional guideline for the development of more effective MAS. As an increase in the ability to develop a reliable, effective MAS may increase management's confidence about the usefulness of the system.

Consistent with calls by previous studies (Hammad *et al.*, 2013; Chung *et al.*, 2012) to conduct more research on factor influencing MAS, this study provides evidence of the impact of technology on MAS that were not widely examined in previous MAS studies in the service sector. The findings highlight the critical role of technology in facilitating MAS and improving managerial performance. Applying new technologies can lead to a greater emphasis on MAS with sophisticated information (broad scope, timely, integrated and aggregated). Moreover, technology can influence managerial performance indirectly through MAS. The results of the study provide empirical support and hence rationale for the implementation of advanced technology. It can be concluded that applying new technology may provide sustainable competitive advantage for organizations in today's competitive environment. This is valuable finding and consistent with the contingency theory framework. The findings of this study assures practitioners that applying advanced technologies supports them in developing MAS, integrating activities and managing the firm in real time and does have a strong impact on managerial performance.

Furthermore, Asian country's culture emphasizes the values that are diametrically opposed to western values. This means that MAS, although effective in western countries, may not be generalizable to the eastern environment (Tsui, 2001; Cheng, 2012). Therefore, in this study, empirical evidence from Iran provides significant insights into the role of contingent variables in the implementation of MAS across national boundaries. Most of previous studies on management accounting have concentrated on firms in the USA, Singapore, Australia, Finland and Turkey with little evidence on how management accounting changes in Iranian firms (Etemadi *et al.*, 2009). Therefore, for local practitioners, the findings of this study may be used as an additional guideline for the development of more effective MAS. An increase in the ability to develop a reliable, effective MAS may increase management's confidence about the usefulness of the system. This allows management to spend less time on scanning activities and more on strategic planning activities, followed by an improvement in competitiveness and performance.

This study contributes to both practical and theoretical knowledge, but the results contain several potential limitations. First, the sample population of this study was narrowly focused on Iranian financial organizations and may not be a true representation of all Iranian industries. Second, this study uses only one construct as a contingent variable. It is possible that there are other important constructs that can affect MAS and managerial performance. Third, the data were collected from a single informant in each financial organization. In addition, some of the respondents who did not enough job experience (two years or less) may not have had sufficient knowledge of MAS or technology which might be a possible source of response bias.

Future research directions are discussed to mitigate the effect of the limitations. First, future research should revalidate the measurement scales developed through this study and expand the sample size by including other service sectors. Second, future study can examine the impact of other factors such as organizational culture, firm size on MAS. Third, future research should collect survey information from multiple respondents from each participating organizations using the instrument developed in this study to enhance the reliability of the research findings.

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## Further reading

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