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A balanced scorecard approach

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Abstract

Purpose – The purpose of this paper is to present a holistic approach regarding evaluation of knowledge management (KM) practices on organizational performance. The effects of seven critical success factors (CSFs), namely leadership role, organizational culture, KM strategy, processes and activities, training and education, information technology, and motivation and rewarding system, on organizational performance in the framework of four perspectives of balance scored card (BSC) approach were surveyed.

Design/methodology/approach – The research hypotheses were raised based on the four perspectives of this approach, namely, growth and learning, internal processes, customer and financial. By literature review, CSFs of KM and organizational performance along with their items were identified in the framework of BSC's perspectives. Based on these constructs and their items an instrument was designed and distributed among managers and employees of the subsidiary firms of Iran National Petrochemical Company (INPC). Reliability of the instrument was calculated by Chronbach's α for the two sections of the instrument i.e. KM practices and organizational performance. Also, using factor analysis the construct validity of the questionnaire was approved. Finally, based on the hypotheses of the study and using structural equation modeling the impacts of KM practices on organizational performance were investigated.

Findings – The results revealed that KM practices positively and meaningfully (though weak) impact overall organizational performance. This impact is significant only regarding growth and learning dimension and on the other dimensions is insignificant. Also, as customer and financial constructs were loaded on one factor based on the entity of their indicators we considered these two constructs as stakeholders construct. In addition, among the above mentioned seven CSFs, motivation and rewarding system obtained the lowest rank among the survey organizations.

Research limitations/implications – The sample is restricted to only three companies, so gathering data from various parts of Iran including both manufacturing and service industries could increase the generalizability of the results obtained. Also, as in this study the data gathered were cross-sectional, a longitudinal study could help gain deeper understanding of the cause-and-effect relationship among the variables.

Originality/value – The most significant gap in the literature is the lack of enough application of statistical and comprehensive methods like BSC that KM makes a difference to organizational performance. This study contributes to the field of KM by empirically investigating the impact of KM practices on various measures of organizational performance in order to prove the suitability of a comprehensive approach like BSC.

Keywords Balanced scorecard, Knowledge management, Critical success factors, Organizational performance, Iran national petrochemical company

Paper type Research paper

1. Introduction

In the last two decades, organizations have actively been in search of competitive advantages such as product leadership, cost leadership, and making differentiation from their competitors. Knowledge management (KM) has generated considerable interest in management circles due to its capability to deliver to organizations, strategic results relating to profitability, competitiveness and capacity enhancement (Oluikpe, 2012). Many leading KM researchers and practitioners have now reached a consensus that a critical source of competitive advantage in this era of knowledge economy is the knowledge asset of an organization (Teece, 1982). The business organizations are more concerned about building the knowledge assets for their competiveness. KM effort is no longer merely an option but rather a core necessity for organizations anywhere in the world, if they have to compete successfully (Singh and Kant, 2008).

Darroch and McNaughton (2002) defined KM as the management function that creates or locates knowledge, manages the flow of knowledge within the organization and ensures that the knowledge is used effectively and efficiently for the long term benefit of the organization. KM is a process that through creating, accumulating, organizing and utilizing knowledge helps achieve objectives and enhance organizational performance. KM also consists of strategy, cultural values and workflow. In order to maximize its value a change in strategies, processes, organizational structures and technologies needs to be made (Rašul *et al.*, 2012). Singh and Kant (2008) by literature note that KM is the deliberate and systematic coordination of an organization's people, technology, processes and organizational structure in order to add value through reuse and innovation. This coordination is achieved by creating, sharing and applying knowledge as well as through feeding the valuable lessons learnt and incorporating the best practices into corporate memory in order to foster continued organizational learning.

As evidence of its maturity as an area of academic study, an increasing number of journals devoted to KM and intellectual capital management have been created (Zack *et al.*, 2009). We found by our literature review that most of researchers have a conceptual and the theoretical framework. Although this body of work contains valuable and insightful concepts and frameworks that have helped to define and shape the KM discipline, it is time to being testing and advancing this work using more precise methods. Perhaps the most significant gap in the literature is the lack of enough application of statistical and comprehensive methods like balanced scorecard (BSC) that KM makes a difference to organizational performance. While survey research is beginning to appear in KM journals, the bulk is descriptive. Of the few survey studies that examine relationships between KM and other factors only a few articles empirically examine the relationship between KM and organizational performance (Zack *et al.*, 2009; Rašul *et al.*, 2012). It should be noted that only performance is not enough. While performance itself is a useful metric, the ultimate measure of value is the ability to support an organization's competitive strategy. This especially applies to KM, as knowledge has been considered an organization's most strategic resource (Zack, 1999). Therefore, it is essential to use a tool to comprehensively measure organizational performance, and also identify KM role on the strategy. As BSC is a comprehensive approach considering an organization's performance criteria both form financial and non-financial perspective. A strong metrics program can quantify efforts of different business units and departments, and then roll them up to show impacts to overall business performance.

The BSC system considers the traditional financial key performance indicators (KPIs) as well as leading KPIs of future performance. In this way, it provides key

information about the activities of the managers. The BSC is a PMS theorised by Kaplan and Norton who was first created as a performance measurement tool, then it has evolved into a PMS, and subsequently becoming a comprehensive strategic management system (Janes, 2013). Therefore, in this research in order to study the effects of KM implementation on organizational performance BSC approach was adopted.

Despite the differences between public and private sector organizations, all public organizations, like private organizations, now realize the necessity of assessing their KM capabilities within agencies and in governmental networks (Bouthillier and Shearer, 2002; OECD, 2003). Iran as developing country during the past couple years due to deregulation policy of the government and the increase of competition among various manufacturing and services organizations has witnessed a growing interest toward KM implementation. In order to fill the existing gap, this research attempts to construct a comprehensive conceptual framework based on BSC approach to examine the effects of KM practices on organizational performance in Iran National Petrochemical Company (INPC) as a pioneer pubic organization in KM implementation. So, the main question of this study is raised as follows:

• Is there any relationship between KM practices implementation and organizational performance based on various perspective of BSC?

The remainder of this paper is structured as follows. Section 2 presents an over view of critical success factors (CSFs) of KM .Section 3 presents conceptual model of the research, followed by research methodology in Section 4. Section 5 presents discussion and conclusions and finally Section 6 wraps up the paper with limitations and direction for further research.

2. Literature review on the CSFs of KM

KM implementation is one of the major attractions among the researchers and practitioners (Singh and Kant, 2008).While organizations try to start KM, one of the major concerns that emerge is how to accomplish it. Many companies that are attempting to initiate KM are unsure of the best approach to adopt. There seems to be general agreement in the literature that a combined social and technological approach is ideal. So the way forward will be paved if organizations are aware of the key factors that will make its adoption successful (Wong and Aspinwall, 2005).

There is a broad range of factors that are able to affect the success of KM implementation. Some researchers identify CSFs as critical areas of management planning and practices that must be addressed to achieve effectiveness. However, as Lwoga (2011) by studying nine KM models argues all these models and their related practices focus on business and organizational settings. So, in line with this discussion and according to the researches and surveys done before some of the practices which are more important will be explored in more detail as follows.

2.1 Leadership role

The introduction of a KM program can be a major organizational change, and therefore the backing and involvement of the organization leaders is imperative. Commitment of high level executives means a better chance of higher resource allocation, and more allowance in terms of time spent on the project (Strategic Direction, 2007). Also they establish conditions in self-directed learning on individual level and organizational learning throughout the organization (Anantatmula, 2008). Leaders should include organizational knowledge as a key issue in organizational strategy, also employ and

assess people to help knowledge development and allocate rewards to the duties. And finally define specified indicators to assess employees based on KM practices (American Productivity & Quality Center and Andersen (APQC), 1995).

2.2 Organizational culture

Ferraro defined organizational culture as everything that people have, think, and do as members of their society. It is the basic criteria of social behavior and integrated action. Organizational cultures represent the character of an organization, which directs its employees' day-to-day working relationships and guides them on how to behave and communicate within the organization, as well as guiding how the company hierarchy is built (Tseng, 2010). Rai (2011) by literature notes that organizational culture plays a pivotal role in knowledge creation and KM in organizations because it effects how members learn, acquire, and share knowledge. Schein defined organizational culture as a set of learned responses where "basic assumptions and beliefs that are shared by members of an organization (Rai, 2011). Schein (1984) argues that organizational culture can be analyzed at several different levels, starting with the visible artifacts, constructed environment of the organization, its architecture, technology, office layout, manner of dress, visible and audible behavior pattern, and public documents such as charters, employee orientation materials, stories.

Almost KM execution always involves a cultural change – not a complete evolution – and this makes culture an important subject (Lang and Fahey, 2000). Culture is perhaps the most influential factor in promoting or inhabiting the practice of KM. Because of importance and position of culture, organization culture analysis is one of serious steps on KM activities. Once we should discuss about a knowledge-friendly culture that people have positive tendency to the knowledge, not to prevent knowledge sharing, learning is being done inside and outside of work areas. Experience, expertise and innovation substitute for organizational hierarchy and company recruits knowledge-based individuals (Gottsachalck, 2005). Trust in knowledge sharing is a fundamental aspect. Under the shadow of the trust, change acceptance and tendency to adaptation with new terms and collaboration will be come into existence. Collaborative culture is another important terms in order to happen knowledge transfer between individuals and groups because knowledge transferring requires individuals to come together to interact, change ideas and share knowledge to each other (Valmohammadi, 2010).

2.3 KM strategy

All the academic literature agrees that for a concept to be implemented into an organization there must be a strategy, and commitment to implementation (Strategic Direction, 2007). Zack (1999) has divided knowledge in three categories including core knowledge, advanced knowledge, and innovative knowledge. He has also recommended organizations to describe their strategic knowledge map according to the knowledge category and also in comparison with competitors, to define the gap between what it must be done for competitiveness and what is really being done (strategic gap), and to adopt a knowledge strategy such as exploration, exploitation, aggressive, and conservative or a combination of them. A KM strategy should create an understanding of the organization's knowledge resources and where they reside; articulate the role of knowledge in value creation; comprise a number of integrated projects or activities phased over time including quick wins as well as long-term benefits (Du Plessis, 2007). It is essential to define knowledge strategy to ensure KM efforts is directed and supported by company's competitive strategy (Zack, 1999).

2.4 Processes and activities

Processes and activities designate a set of practices that must be done during KM implementation. These processes also involve knowledge life cycle. Many researchers have presented some related models pointing at creating, storing/ retrieving, transferring, and exploiting to describe it (Dalkir, 2005). According to Nonaka and Takeuchi a KM process can be implemented by a technology-centered strategy for explicit knowledge and by a people-centered strategy for implicit knowledge (Valmohammadi, 2010). Some of the actions that could be used to do KM processes and activities are as follows: transferring of best practices including documentation and lesson learned, identification of knowledge gaps systemically, and using well-defined processes to bring them together. Resources allocation to acquire external knowledge and transfer into the organization, participation of employees in project groups with other organization's employees, knowledge obtained from competitors, customers, suppliers and research centers.

2.5 Training and education

KM training and awareness workshops are essential. Training on the importance of knowledge sharing, training on the importance of KM for knowledge organizations are additional examples those companies must be done. Since KM involves the use of information system infrastructure to capture important information, training on how to use the repository is extremely critical. Employees need to be trained in terms of writing, editing and formatting skills in order of them to input items to a knowledge repository, as information has to be presented in a standardized fashion (Valmohammadi, 2010). Training and education include many practices. Some of them are as follows: setting formal training courses on collaboration and participation methods, learning by peers, teambuilding skills development, creative thinking, problem solving, documentation, persuading experienced employees to transfer their knowledge to newcomers, training out of organization (American Productivity & Quality Center and Andersen, 1995). Training and education is a factor deals with human dimension of KM, so it can fulfill a crucial role on KM implementation.

2.6 Information technology

KM is interlinked with IT, as one seems to lead the creation of the other. It's widely accepted that databases, intranets, knowledge platforms and networks are the fundamental supporting blocks of KM. They make the recording of knowledge much easier to search for and to use (Valmohammadi, 2010). Duffy sees IT as managing the storage and access of documents. IT usually maintains the databases, hardware and software access points, survivability of information. However, any KM project can fail when IT techies see only the technical side. They must be aware and educated in KM processes to gain a better appreciation. Once this is accomplished, IT will be a major player in the companies' ongoing KM efforts (Ray, 2008). On the contrary, the lack of technology in a KM initiative makes it difficult to measure activities when the KM initiative is faced with the question about its ROI (Mohamed *et al.*, 2006). The key to achieving harmony between KM and IT is to understand the very basic principles: there are things that computer and technology do well, and there are things that humans do well. Many of the failures of IT and KM, and much of the tension between the two, are the result of repeated attempts to force one paradigm to operate within the realm of the other (Mohamed *et al.*, 2006).

IT has been shown to increase the speed of knowledge flow and potentially lower the cost of information usage. There is a broad collection of information technologies that supports KM which can be applied and integrated into an organization's technological platform. They can be grouped into one or more of the following categories: business intelligence, knowledge base, collaboration, content and document management, portals, customer relationship management, data mining, work flow, search and e-learning (Luan and Serban, 2002). Given the dependence of KM on information technology, KM is still perceived as information management by many organizations. As a result, it is often associated with technological solutions such as intranets and databases, organizations should recognize that IT is only a tool and no an ultimate solution (Wong and Aspinwall, 2005).

2.7 Rewarding and motivation

All KM programs involve change and in order to provoke change individuals must be motivated sufficiently to be willing to suffer the stress of the change process to find benefit and subsequent commitment. These items can be categorized in four titles namely social rewards, financial rewards, further security, and further opportunity/risk as motivator tools. Of course in a comprehensive view, in order to motivate individuals we can use new strategies such as quality of work life that improve organizational behavior of members (Salmani, 2005).

Based on another view, the reward and incentive system of KM should consist of push and pull rewards, e.g. rewarding people as part of their performance appraisals according to participation in the program (push) and incentivizing people to use the knowledge base to provide a platform for their innovative ideas i.e., providing them and their ideas with visibility in the organization (pull) (Du Plessis, 2007).

3. Literature review of organizational performance and measurement

Enhancing organizational performance is the focus of every manager in every enterprise. In order to succeed at enhancing organizational performance, it is crucial for an organization to establish a comprehensive measurement index that provides managers and staff with clear directions and goals set by the enterprise(Tseng and Lee, 2014). Organizational performance is an indicator which measures how well an organization accomplishes its objectives (Ho, 2008). For all organizations the question of the management of the organization depends on the ability to measure performance and then evaluate and report upon that performance (Crowther and Aras, 2008). Performance measurement has been defined as a systematic process of effectively and efficiently quantifying a concept or an action (Neely *et al*, 1997). Therefore, performance measurement systems are required to make the benefits and the performance of KM initiatives transparent. Especially in times of scarce budgets the usefulness of KM is in doubt, as the business impact of such initiatives often can be hardly quantified or is only indirectly measurable (Resatsch and Faisst, 2004). Whatever the company's unique strategic advantage, effective performance measurement begins by linking metrics to top-level corporate goals.

3.1 BSC approach

As was mentioned, in order to measure the effects of KM on organizational performance a comprehensive performance measurement system i.e. BSC has been employed. Robert Kaplan and David Norton developed the BSC in 1990 (Niven, 2005).

They set forth a hypothesis about the chain of cause and effect that leads to strategic success. The effectiveness of the Framework depends on issues like how systematically data are collected, in what way inter-relationships among objectives and measures are understood, and how these objectives are correlated to the mission and vision of organization (Kaplan and Norton, 1996). It works from four perspectives (or quadrants):

(1) financial;

(2) customer;

(3) business process; and

(4) learning and growth.

The BSC approach provides a comprehensive framework that translates a company's strategic objectives into a coherent set of performance measures. The biggest strength of the BSC, compared to other frameworks, lies in its ability to link performance among different classes of business performance – financial and non-financial, internal and external. The BSC is a tool to communicate and control the implementation of strategy (Valmohammadi and Servati, 2011). The link to strategy is subtle, but powerful. Measures that are aligned with strategy not only provide information on whether the strategy is being implemented, but also encourage behaviors consistent with the strategy, and also support progress against pre-determined objectives, without sub-optimization (Neely, 1998; Amaratunga *et al.*,2002).

In Table I some related researches on KM and corporate performance are shown.

4. Conceptual model and research hypotheses

If KM, as it claims, focuses on building the successful link between knowledge and performance (Kalling, 2003), then it is logical to assume KM activities will help to produce valid organizational knowledge, which is justified by its ability to perform (Mouritsen, 2004). A performance measurement framework is therefore required to determine how successful KM activities have been in attaining organizational objectives (Chen and Chen, 2006). On the other hand, as Andriessen (2004) points out the BSC intends to create insights into the value drivers, which are the vital intangible assets that determine future success and form the basis for formulating resource-based strategies. Through measuring organizational business performance across four balanced perspectives (financial, customer, internal business processes and learning), the BSC not only retains an emphasis on achieving financial objectives, but also includes:

- the performance drivers of these financial objectives (e.g. "business processes" and "learning"); and more importantly;

- hypotheses about the causal relationship between non-financial assets and performance (Kaplan and Norton, 1996).

The causality between the four perspectives of the BSC provides a "strategic map" to establish a cause-and-effect logic mapping between performance measures and strategy outcomes (Wongrassamee *et al.*, 2003). The BSC has been used to evaluate the KM performance from an internal performance measurement perspective, focusing on process efficiency and goal achievement efficiency. Therefore, the conceptual framework of this research is based on the model shown in Figure 1. The model includes two parts: KM part and organizational performance (PR) part. Also KM practices part is structured based on seven CSFs in KM field, namely leadership

Table I.
An overview of some
researches on KM
and organizational
performance

No.	Researcher(s), year	Research nature/method	Important finding(s)
1	Allard and Holsapple (2002)	Empirical/case study	Taking a KM view, a knowledge chain model is suggested to gain competitive advantage in e-commerce
2	Berawi (2004)	Conceptual	KM affects competitive advantage through its effect on quality management
3	Bose and Thomas (2007)	Empirical/case study	Positive effect was reported on implementing performance appraisal system with BSC approach and financial performance was increased in Foster's in Australia
4	Chareonsak and Chansa-ngavej (2008)	Empirical/case study	Causal relationship between intangible assets and organization financial performance with indicators from a BSC view and obtaining performance improvement and competitive advantage were reported
5	DeTienne and Jackson (2001)	Empirical/conceptual	KM will provide performance benefits only if organizations develop strategies for filtering knowledge, strengthening corporate philosophy, and facilitating effective communication
6	Gold et al. (2001)	Empirical/survey	A capability model of KM is built and it is shown that knowledge infrastructure capabilities and knowledge processes capabilities impact organizational performance
7	Lee and Choi (2003)	Empirical/survey	The study shows that KM enablers effect KM processes, which in turn effect organizational performance through intermediate impacts
8	Ho (2008)	Empirical/survey	Self-directed learning has positive effect on organizational learning and KM capabilities but it doesn't directly affect organizational performance. The effect isn't direct. There is an indirect effect via organizational learning and KM capabilities
9	Liu et al. (2004)	Empirical/survey	KM is positively correlated to performance
10	Marques and Simon (2006)	Empirical/survey	Positive effects of KM practices on organizational performance in biotechnology and telecommunication industries in Spain was reported
11	Pietrantonio (2007)	Empirical/case study	KM systems assessment via a BSC methodology was done. There wasn't found positive significant effect that was created by KM systems on organizational performance
12	Schulz and Jobe (2001)	Empirical/survey	The paper develops four strategies for KM – codification, taciteness, focused and unfocused. The results suggest that focused strategy results in superior firm performance

(continued)

| No.	Researcher(s), year	Research nature/method	Important finding(s)
13	Starns and Odom (2006)	Conceptual	Most of the literatures on KM focus on what it is but on how to do it. It is almost as if KM just happens. In practice, the installation of a viable KM capability must be integrated into an organization's management structure and business strategy
14	Sveiby (2007)	Conceptual	Meanwhile introduction of various methods including BSC to assess intellectual capitals and enumeration of their strength and weakness points. It recommends selecting suitable method for intellectual assets assessment
15	Weifeng and Huihuan (2008)	Conceptual	By using BSC and adding the fifth perspective (risk management) to the four-mentioned perspectives, proposes a solution to the commercial bank regulatory commission for a comprehensive performance evaluation and develops a fuzzy hierarchy analysis for financial firms ranking
16	Zack et al. (2009)	Empirical/survey	There was no direct relationship found between KM practices and financial performance in North America and Australia

Table I.
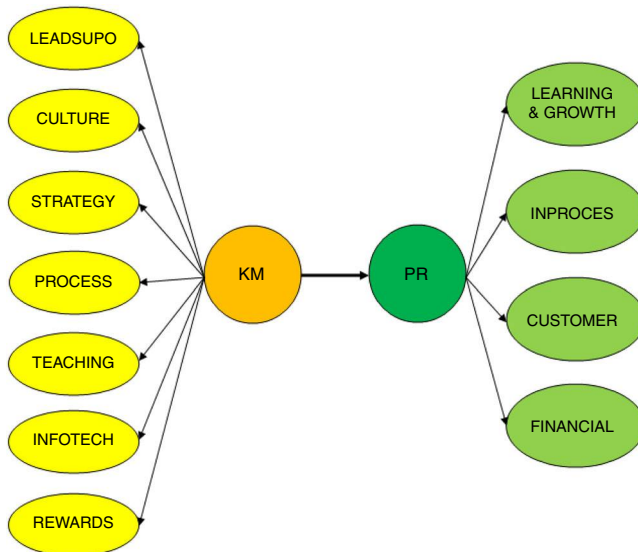
Figure 1.
Conceptual model

direct and support (LEADSUPO), Organizational culture (CULTURE), organization strategies (STRATEGY), processes and activities (PROCESS), information technology (INFOTECH), training and education (TEACHING), and rewards and motivation (REWARDS). Likewise PR part is structured based upon the four perspectives of BSC, i.e., learning and growth (LEARNING), internal processes (INPROCESS), customer (CUSTOMER), and financial (FINANCIAL) perspectives. Based on the review of KM literature discussed above and the research question a main hypothesis and four sub-hypotheses were posited as follows:

H1. KM practices affect positively and significantly organizational performance.

H1a. KM practices affect positively and significantly learning and growth perspective of organizational performance.

H1b. KM practices affect positively and significantly internal processes perspective of organizational performance.

H1c. KM practices affect positively and significantly customer perspective of organizational performance.

H1d. KM practices affect positively and significantly financial perspective of organizational performance.

4. Research methodology
4.1 Data collection and analysis
Based on the literature review and instruments such as Knowledge management assessment tool (KMAT) and Organization for economic co-operation and development (OECD) assessment tools, and scholarly researches mentioned in Table I, indicators of KM and organizational performance were identified and the conceptual model was

developed which is shown in Figure 1. Then, an administered questionnaire was designed consisting four perspectives of BSC and their related items. The questionnaire included 52 questions (26 for KM and 26 for organizational performance. For the 26 KM practices, using Likert scale respondents were asked to indicate the extent to which each item of KM is practiced in their organizations ranging from 1 (not at all) to 5 (fully implemented). Also, for the organizational performance, based on the four perspectives of BSC 26 questions were used to measure the performance of the three companies based on the perception of respondents. Ranging from, no impact (1) to high impact (5). The questionnaire was pre-tested with 15 managers and employees of the three subsidiaries of INPC to ensure that the wording and format of the questions were appropriate which yielded a standard division of 0.44. As the statistical population in this study is limited (in sum the three subsidiaries hold 370 employees) we used the formula below to determine the sample size:

$$n = \frac{NZ^2_{\alpha/2}\sigma^2}{\varepsilon^2(N-1) + Z^2_{\alpha/2}\sigma^2}$$

$$n = \frac{370 \times 1.96^2 \times 0.444}{0.06^2(370-1) + 1.96^2 \times 0.444} \approx 208$$

where n is the sample size; N the statistical population; ε the maximum error of mean population estimation; and confidence level is 95 percent.

The questionnaire was distributed via email and postal mail for organizations requesting them to response within one month, after the end of the deadline as Baruch and Holtom (2008) argue in order to increase the response rate via the aforementioned communications channels a reminder letter was sent to those firms who had not responded, asking them to response the questionnaire and send it back within one week. In order to minimize self-report bias in the data, the respondents were informed that their names and the organizations' name are not needed for the survey (Chong *et al.*, 2011). Based on the recommendation of Baruch and Holtom (2008) non-response bias test (wave analysis) was done. We compared the responses of early and late waves of returned surveys based on the assumption that the opinions of late respondents are representative of the opinions of non-respondents. Student's *t*-tests yielded no statistically significant differences between early-wave and late-wave groups, suggesting that non-response bias was not a problem (Prajogo and McDermott, 2011). Also, based on the steps taken by Arendt and Brettel (2010) and in order to minimize the possibility of common method variance first, multiple-item scales were used to measure the constructs and scattered questions pertaining to the independent and dependent variables throughout the questionnaire. Second, Harman's single-factor test was conducted and found that no single factor or a general factor accounted for the majority of the variance in the measures. Third, the effects of a single unmeasured latent method factor added to our measurement model were analyzed by loading all items originating from the same informant onto both the method variable and its respective latent variable. The comparison of standardized parameter estimates with and without the method variable showed that the significance of the substantive relationship was not affected. Therefore based on the results, common method bias is not a concern.

Finally after about two months of 230 distributed questionnaires 207 were returned. In total nine out of 207 returned questionnaires were disregarded due to incomplete

answers. In total 198 statistically useful questionnaires were returned, resulting in a response rate of 86 percent. Table II shows demographics of the respondents.

4.2 Construct validity and reliability
Discriminant validity is the extent to which a construct is truly distinct from other constructs. A high degree of discriminant validity provides evidence that a construct uniquely captures the propensity of the represented concept that other constructs do not (Shi and Liao, 2012).

Divergent (discriminant) validity and convergent validity were tested by exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). Also, Cronbach's α coefficient was used to assess the reliability of the two parts of the questionnaire i.e. KM and organizational performance items which are shown in Table III. The Cronbach's α coefficients exceeded the 0.70 threshold considered acceptable for internal scale reliability (Nunnally, 1978).

4.3 EFA
EFA with Varimax rotation was performed on KM and organizational performance practices in order to extract the dimensions underlying each construct. Table IV shows some requirements for EFA and also some results of EFA briefly.

Tables V-VII show the result of EFA in detail. SPSS software (version 16) was used for analyses. According to the Table IV, two indicators i.e., KMO[1] (sampling sufficiency indicator) and Bartlett's test (significance indicator) achieved sufficient

Demographics variables	Level	Frequency (%)
Gender	Male	69
	Female	31
Educational background	Secondary education	2.9
	Under graduate	54.1
	Graduate	541.5
	PhD	1.5
Position	Expert	77.3
	Master expert	19.8
	Manger	2.9
Age	25-35	22.7
	36-45	63.8
	Above 46	13.5

Table II.
Demographics of the respondents

Cronbach's α coefficient PR			KM	
LEARNING	0.868		LEADSUPO	0.805
			STRATEGY	0.832
INPROCES	0.819		CULTURE	0.904
			PROCESS	0.793
STAKHOLD	0.841		TEACHING	0.875
			INFOTECH	0.821
			REWARDS	0.891

Table III.
Cronbach's α coefficients for each component of both parts

Part	Analysis method	KMO index	Bartlett's Test	No. of extracted factors	No. of components after Varimax rotation	Remaining variables in analysis process	Omitted variables from analysis continuation
KM	First-order exploratory	0.753	2,326	0.000	8	7	23	stratgy1 process 2/4
	Second-order exploratory	0.892	780	0.000	1	No rotation	7	–
PR	First-order exploratory	0.896	3,611	0.000	5	3	17	Learn 1/2/4 inproces4 customr1/5 finance1/2/7
	Second-order exploratory	0.717	205	0.000	1	No rotation	3	–

Table IV.
Overview of EFA
results in brief

Variables	Principal Components (first- order)							
	STRATEGY	–	PROCESS	REWARDS	LEADSUPO	INFOTECH	CULTURE	TEACHING
LEADSUP1	−0.001	0.190	0.104	0.057	0.783	0.040	0.215	−0.120
LEADSUP2	−0.065	0.104	−0.162	0.020	0.725	−0.033	0.157	0.226
LEADSUP3	0.142	0.068	0.033	0.078	0.850	0.079	0.043	−0.049
LEADSUP4	−0.020	−0.023	0.010	0.160	0.680	−0.039	0.470	0.030
CULTUR1	−0.004	0.275	0.094	−0.060	0.184	−0.006	0.771	0.099
CULTUR2	−0.020	0.027	−0.131	0.185	0.202	−0.006	0.783	−0.018
CULTUR3	0.030	0.141	−0.006	0.022	0.110	0.053	0.887	−0.015
CULTUR4	−0.065	0.234	−0.113	−0.169	0.118	0.002	0.683	0.113
STRATGY1	−0.119	0.769	0.031	0.010	0.085	0.049	0.237	0.152
STRATGY2	0.777	−0.065	0.118	−0.053	0.021	0.201	−0.115	0.086
STRATGY3	0.851	0.028	0.079	−0.016	0.044	−0.077	0.065	0.156
PROCES1	0.030	−0.103	0.636	−0.019	0.061	0.079	0.065	0.478
PROCES2	−0.107	0.605	−0.099	0.048	0.208	0.156	0.204	0.033
PROCES3	0.013	−0.057	0.760	−0.053	−0.045	0.206	−0.091	0.242
PROCES4	0.162	0.657	0.056	0.158	0.033	−0.058	0.119	−0.039
PROCES5	0.176	0.111	0.714	−0.115	0.001	0.018	−0.088	−0.094
TEACH1	0.174	0.066	0.311	0.057	−0.022	0.117	0.111	0.781
TEACH2	0.045	−0.020	0.164	0.142	−0.006	0.331	0.147	0.733
TEACH3	0.065	0.057	−0.018	−0.149	0.098	0.140	−0.061	0.854
TEACH4	0.060	0.094	−0.039	0.053	−0.045	0.345	0.009	0.767
INFOTEC1	−0.079	−0.039	0.108	−0.002	0.192	0.787	0.011	0.333
INFOTEC2	0.035	0.171	−0.034	0.063	0.093	0.722	−0.006	0.096
INFOTEC3	0.096	0.072	0.090	−0.047	−0.072	0.808	−0.073	0.178
INFOTEC4	0.055	−0.118	0.164	−0.009	−0.113	0.812	0.121	0.209
REWARD1	−0.059	0.100	−0.081	0.910	0.101	0.069	0.029	0.015
REWARD2	−0.011	0.099	−0.087	0.879	0.112	−0.047	−0.020	0.026

Table V.
First-order EFA
for KM part

Components (second order)	
Variables / Factors	KM
LEADSUPO	0.738
STRATEGY	0.817
CULTURE	0.813
PROCESS	0.815
TEACHING	0.846
INFOTECH	0.737
REWARDS	0.799

Table VI.
Second-order EFA
for KM part

value (⩾0.6 better for KMO and sig < 0.05 for Bartlett's test) (Brace *et al.*, 2009; Momeni, 2007) for the next analytical process. The outcomes of first-order EFA on 26 variables of KM was led to seven principal components (factors) extraction (Table V) and the second one was led to one factor, called KM (Table VI). Variables with sufficient factor

Variables	Principal Components (first-order)				
	LEARNING	–	–	INPROCES	STAKHOLD
LEARN1	0.062	−0.456	0.159	0.111	0.075
LEARN2	−0.070	0.667	0.262	0.210	0.239
LEARN3	0.498	−0.017	0.321	0.352	0.322
LEARN4	0.401	0.350	0.396	0.115	0.042
LEARN5	0.660	0.018	0.120	0.163	0.221
LEARN6	0.713	0.141	−0.029	0.315	0.313
INPROCE1	0.100	0.214	0.123	0.814	0.167
INPROCE2	0.448	0.035	−0.015	0.708	0.029
INPROCE3	0.175	0.209	0.059	0.765	0.181
INPROCE4	0.547	0.399	0.379	0.195	0.079
INPROCE5	0.162	0.155	0.068	0.630	0.482
INPROCE6	0.200	0.165	0.116	0.588	0.525
CUSTOMR1	0.245	0.292	0.503	0.005	0.196
CUSTOMR2	0.125	−0.124	0.344	0.299	0.579
CUSTOMR3	0.074	0.070	0.361	0.365	0.658
CUSTOMR4	0.038	0.020	0.291	0.446	0.712
CUSTOMR5	−0.014	0.170	0.586	0.178	0.171
CUSTOMR6	0.080	0.044	0.275	0.322	0.690
FINANCE1	0.137	0.173	0.823	−0.009	0.214
FINANCE2	0.056	0.409	0.650	0.068	0.242
FINANCE3	0.018	0.118	0.133	0.278	0.762
FINANCE4	0.234	0.170	0.159	0.026	0.803
FINANCE5	0.220	0.220	0.118	0.006	0.819
FINANCE6	0.158	0.338	0.041	0.290	0.683
FINANCE7	0.134	0.778	0.201	0.153	0.231
FINANCE8	0.263	0.209	0.057	−0.105	0.817

Table VII.
First-order EFA
for PR part

loading (more than 0.5 value in gray cells) remain for the next analyses, and others
(in red cells) with insufficient value (< 0.5) were eliminated (Momeni, 2007).

Similarly, in PR part, three principal components were extracted (instead of four,
according to Kaplan and Norton's BSC model) in first-order EFA (Table VII) and one in
the second one, called PR (Tables VIII). Since the indicators related to the customer and
financial perspectives had suitable factor loading only on one extracted component,
this new one was called "organizational stakeholders" (STAKHOLD). Because this
factor is related to customers, shareholders/owners, and employees rights and also
financial return criteria, at this stage, nine variables had no enough factor loading on
extracted factors, so they were eliminated (in the red cells). The results are shown in
Table VIII briefly (also see Appendix for further information).

Components (second order)	
Variables / Factors	PR
LEARNING	0.848
INPROCES	0.869
STAKHOLD	0.853

Table VIII.
Second-order EFA
for PR part

The new approach changed the research sub-hypothesis. A new hypothesis was replaced *H1c* and *H1d*, as follows:

H1e. KM practices affect positively and significantly stakeholders perspective of organizational performance.

4.4 CFA

CFA, a particular analysis of structural equations modeling, was undertaken to check the goodness-of-fit of the measurement scales; this method also provides the correlations between factors or dimensions and the construct of interest (Fornell and Larcker, 1981). In this study first- and second-order of CFA on KM factors were done. The analysis is shown in Figure 2. In total, 23 observable variables with seven latent variables (factors) shaped first-order CFA on KM and the seven previous factors (as observable variables) with one latent variable formed second-order CFA. All of variables had a suitable factor loading on their own factors in the two parts of diagram to define how much the models are protected by collected experimental data. Most of indicators (except χ^2) have a range between 0 and 1. Some of them explain "badness of
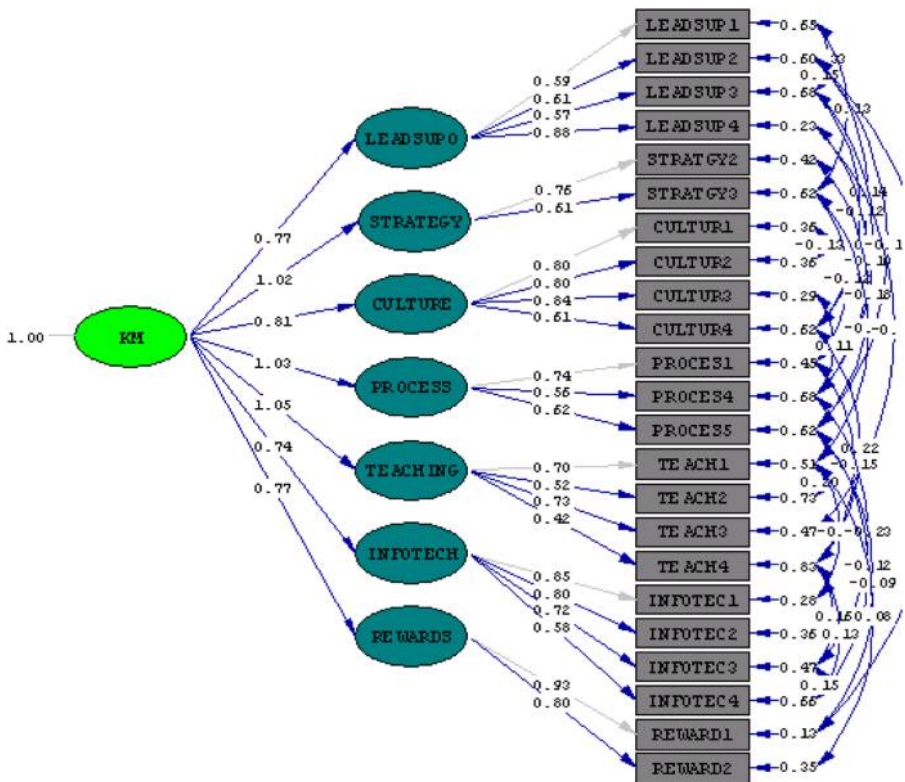

Figure 2.
First and
second-order
of CFA on KM

Notes: Indices of the model fitness are as follows: degrees of freedom=192;
normal theory weighted least squares χ^2=312.85 (p=0.05);
root mean square error of approximation (RMSEA)=0.056;
root mean square residual (RMR)=0.046; goodness-of-fit index (GFI)=0.91

model fitness" and whatever being less, fitness of model is higher (e.g. χ^2, RMSEA, and RMR), another indicate "goodness of model fitness" and whatever being more, fitness of model is higher (e.g. GFI). For an appropriate fitted model, these indicators should have a changing range about RMR$\leqslant$0.05, 0.05$\leqslant$RMSEA$\leqslant$0.08 and GFI$\geqslant$0.9. None of these is superior in all respects to others. Because a certain fitness indicator depending on sample size, estimation methods, the complexity of the model, and the assumptions of normality or a combination of these conditions, acts differently (Kalantari, 2010). In this research LISREL software (version 8.54) was used for structural equations modeling analyses.

Indices in two models have suitable value to continue the next analysis processes and since variables have sufficient factor loading on their factors, none of them have been eliminated. So the collected data confirm these research models.

K-S test was used to ensure whether data distribution were normal. Data distribution was important because in the next steps we need know which one of estimators was suitable for covariance matrix estimation. For example we should use an estimator which is not sensitive to data normality (e.g. GLS[2] estimator). Table IX shows the results of K-S test and mean and standard deviation of CSFs.

4.5 Path analysis

In order to test research hypotheses, it is important to use path analysis. We used two types of output; Standard estimation for model confirmation and significance coefficient to test hypotheses. Also we use two methods of path analysis; the effect of KM practices on each of performance dimensions separately and the effect of KM practices on the whole of organizational performance (Figures 3-7).

Fitness indices in all of the presented models have relatively appropriate values; experimental data support the research models. So, it is possible to test research hypotheses. The outcomes of data analysis related to hypotheses test are briefly presented in Table X.

5. Discussion and conclusions

As it is shown in Table IX, mean and standard deviation of variables indicate medium level for leadership role, KM strategy, organizational culture, processes and activities, and information technology in KM discussion. Also, rewarding and motivation factor is ranked in the lowest level with mean 2.81. This is a critical issue because this variable is directly related to the employees' engagement in the implementation of KM projects.

Variable name	Mean	SD	Low limit	High limit	K-S statistics	Significance	Variable status
LEADSUPO	3.38	0.83	−0.14	0.117	1.98	0.001	Medium
STRATEGY	3.39	0.76	−0.17	0.148	2.39	0.000	Medium
CULTURE	3.32	0.81	−0.11	0.068	1.53	0.018	Medium
PROCESS	3.34	0.78	−0.12	0.083	1.71	0.006	Medium
TEACHING	3.48	0.72	−0.10	0.110	1.55	0.017	Medium
INFOTECH	3.69	0.78	−0.12	0.069	1.68	0.007	Medium
REWARDS	2.81	0.87	−0.13	0.132	1.86	0.002	Medium
LEARNING	3.53	0.77	−0.11	0.128	1.81	0.003	Medium
INPROCES	3.61	0.79	−0.13	0.116	1.88	0.002	Medium
STAKHOLD	3.34	0.71	−0.11	0.112	1.58	0.013	Medium

Table IX.
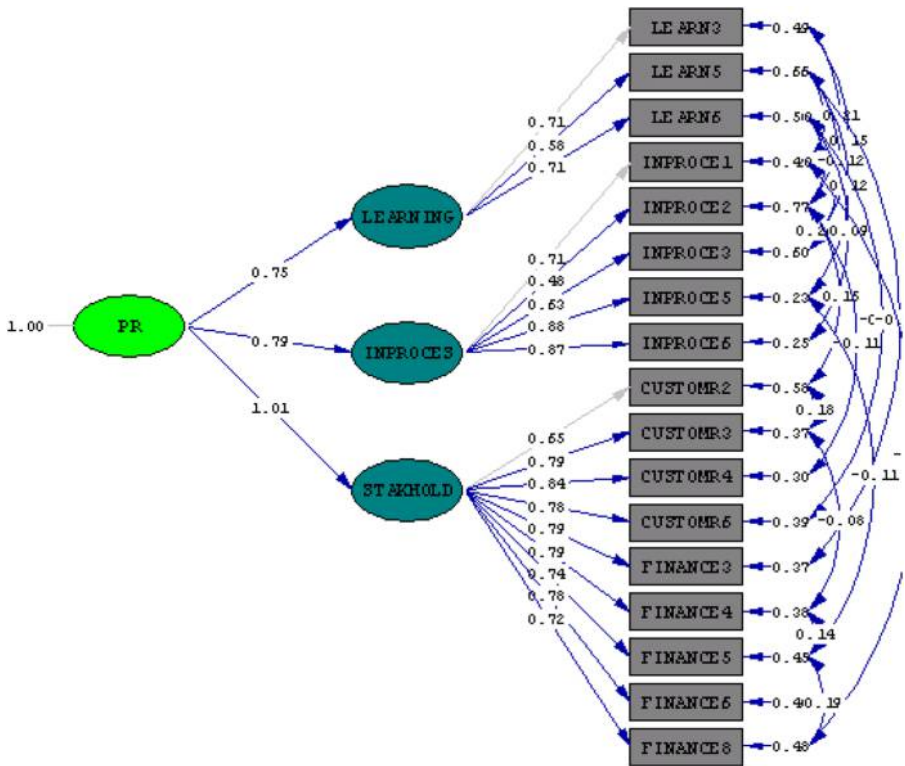K-S results related to
data distribution

Figure 3.
First and
second-order
of CFA on PR

Notes: Indices of model fitness are as follows: degrees of freedom=98; normal theory
weighted least squares χ^2=203.90 (p=0.06); RMSEA=0.058; RMR=0.041; GFI=0.92

Owing to fact that mean of rewarding and motivation ranked lowest among CSFs by
the respondents, it could be inferred that people of the surveyed companies are
not satisfied with the rewarding and motivation system of their companies. Therefore,
as Valmohammadi (2010) notes, since human resource is a critical factor in KM
implementation, top managers of these organizations should attempt to pay more
attention in order to improve this system which will increase the level of satisfaction
of the employees and eventually the successful implementation of KM in their
organizations. Also, as Goel *et al.* (2010) point out appropriate rewards and recognition
programmes is necessary. This framework encourages both bottom-up and top-down
approaches to accelerate culture change. Based on the BSC view, organizational
performance was perceived and evaluated at the medium level by the respondents.
This is not surprise because it cannot be expected from a set of medium practices of KM
an excellent or even good performance to be emerged.

Based on the results obtained from exploratory and CFA, two out of four dimensions
of performance appraisal i.e. customer and financial dimensions were incorporated and
a new and more comprehensive dimension was created. Given the constituted measures
of this new dimension which comprises measures such as customer, shareholder,
people and return of investment (ROI) and etc., it was named organizational
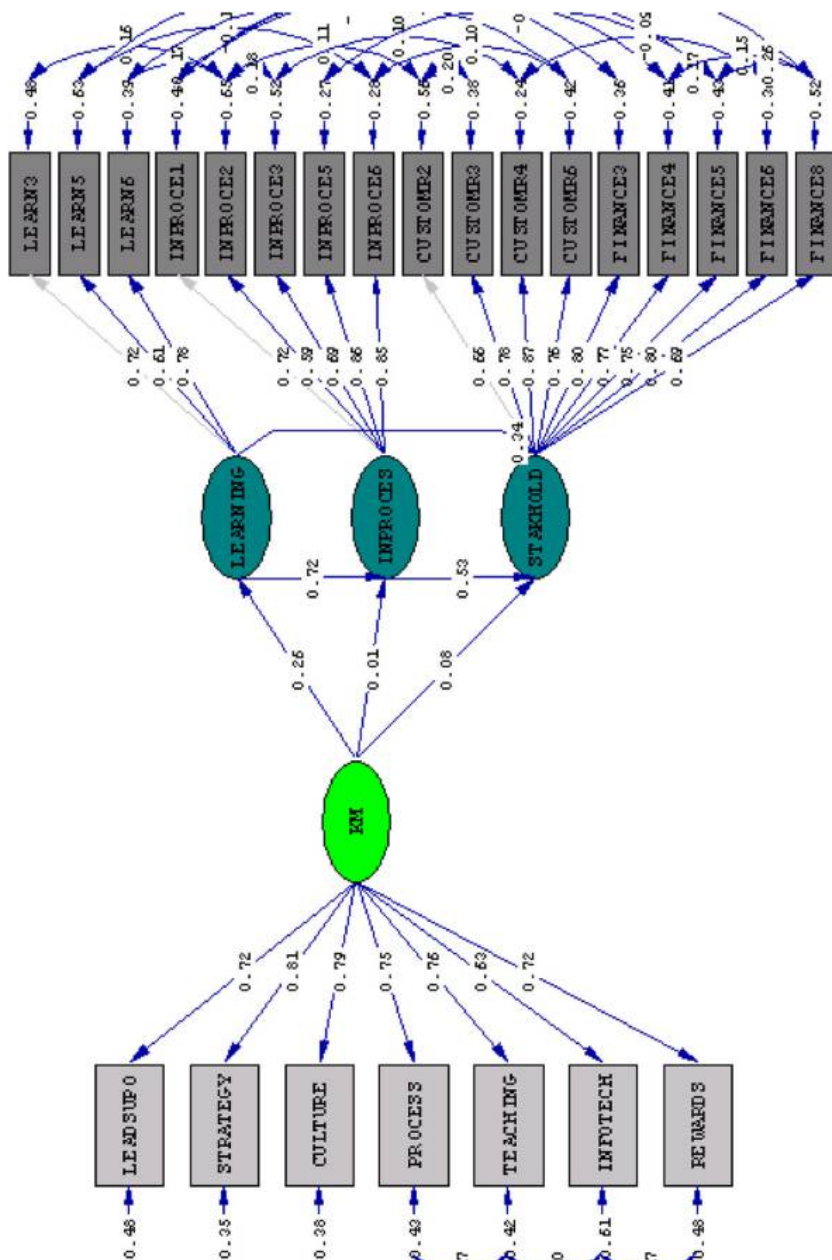stakeholders. And therefore, a new sub-hypothesis was substituted for the before

Figure 4.
The effect of
KM practices on
learning & growth,
internal processes,
and organizational
stakeholders
dimensions (standard
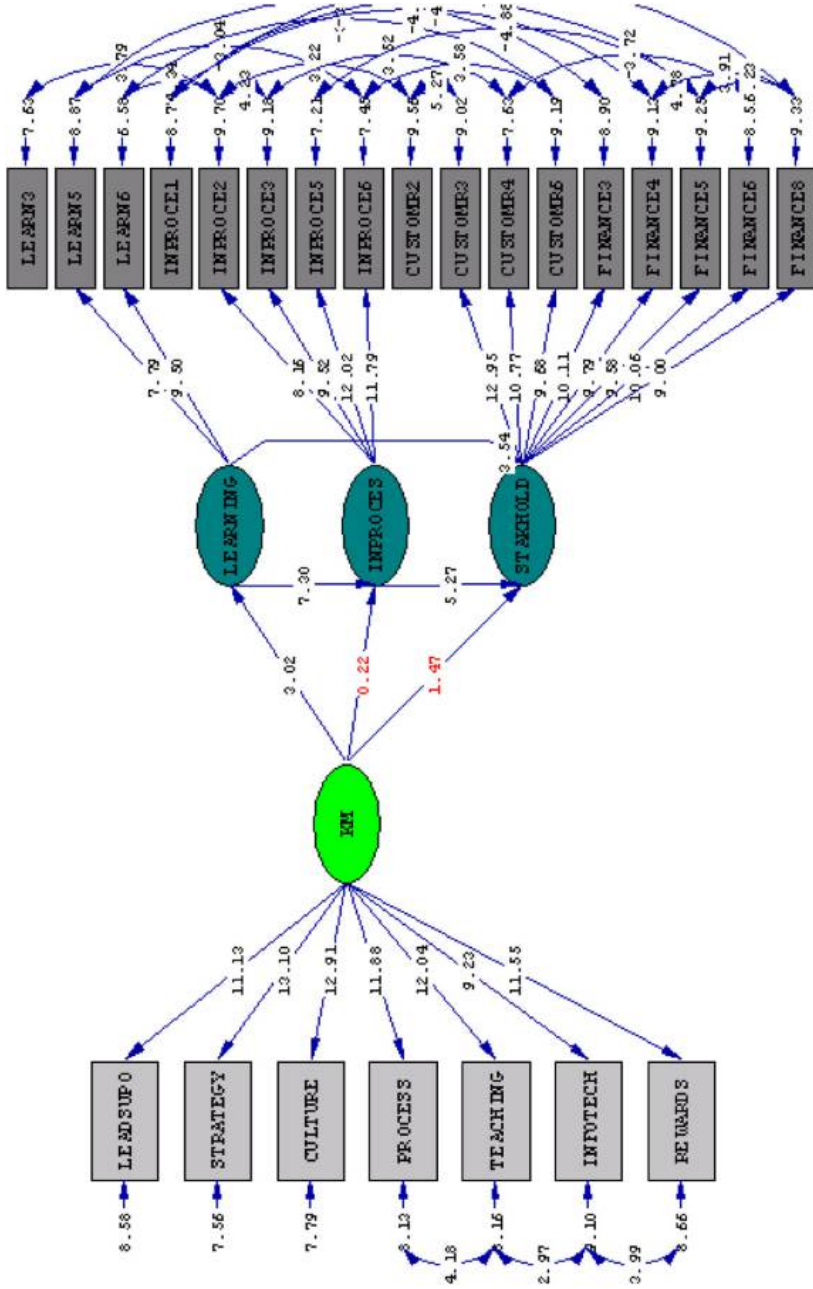estimation
coefficient)

Figure 5.
The effect of KM practices on learning & growth, internal processes, and organizational stakeholders dimensions (significance coefficient)

Notes: Indices of model fitness are as follows: degrees of freedom=222 normal theory weighted least squares χ^2=376.39 (p=0.0324); RMSEA=0.051; RMR=0.037; GFI=0.94
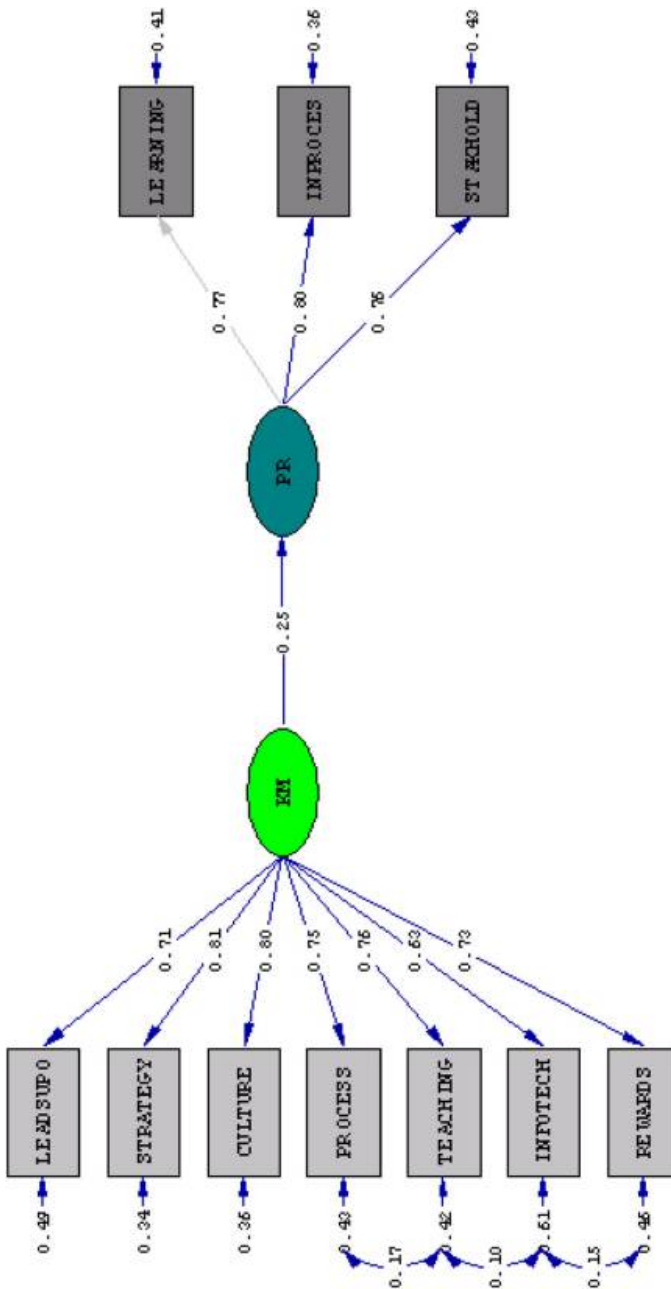
Figure 6.
The effect of
KM practices on
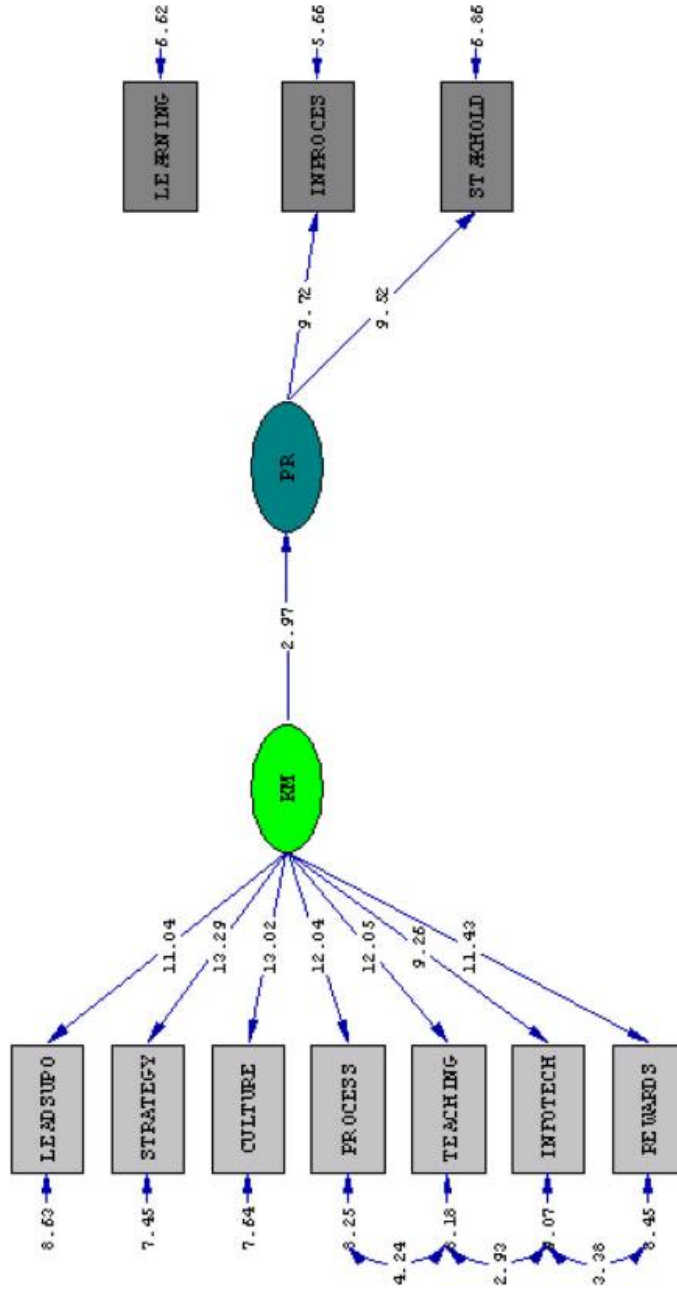overall organizational
performance
(standard estimation)

Figure 7.
The effect of
KM practices on
overall organizational
performance
(significance
estimation)

Notes: Indices of model fitness are as follows: degrees of freedom=30; Normal theory weighted least squares χ^2=53.42 (p=0.0534); RMSEA=0.053; RMR=0.027; GFI=0.95

mentioned sub-hypotheses regarding customer and financial dimensions which is
shown in Table IX. According to the results shown in Table IX it could be concluded
that KM practices have a significant effect on growth & learning dimension of
organizational performance, but the effects of KM practices on the other two
dimensions i.e. internal processes and organizational stakeholders were not confirmed .
Based on the theory of Kaplan and Norton there is a causal relationship between the
four perspectives of performance and also, as the related data analysis shows the effect
of growth and learning dimension on internal processes ($\gamma = 0.72$; $t = 7.3$), the effect of
internal processes on organizational stakeholders ($\gamma = 0.53$; $t = 5.27$), and finally the
effect of growth and learning on organizational stakeholders is significant ($\gamma = 0.34$;
$t = 3.54$) thus, the same effects could weaken the direct impact of KM practices on
internal processes and organizational stakeholders measures. If a significant number (t)
lies out of the interval -1.96 to $+1.96$ it could be inferred that there is a significant
relationship between two variables. It should be noted when we considered the dimensions
independently, the effects of KM practices on each of these dimensions were significant.
Therefore, this may has occurred due to the KM practices and its effects on learning and
growth measures. So, organizations involved in KM implementation should pay more
attention to this soft dimension of KM i.e. human capital in order to increase the chances of
successful KM implementation. Because, concentration on only a part of the initiative, for
example the system usage of knowledge tools, would neglect financial indicators.

Indeed, the theoretical implication of this study is the empirical support and
confirmation of the argument of Walsham (2001) where he suggests that the best
approach for successful implementation of KM is human centered view of KM. This
approach emphasizes the complex sense-reading and sense giving processes which
human beings carry out in communicating with each other and 'sharing' knowledge
(Walsham, 2001). Although machinery is still important in knowledge-based economy
and technology undertakes a considerable and critical role, but the main tool of
production is still human mind (Al-Ali, 2003). Because knowledge is only shaped in
individuals mind. Money can speak and simplify decision making, but never can think
instead of human. Machinery can do works but they are not able to innovate (PSB:
Singapore National Productivity and Standards Council, 1999). Therefore, the biggest
challenge of managers in the future is to increase the productivity of knowledge
employees. This challenge is the work instruction of managers in the next decades and
also is the ultimate determinant on competitive performance of companies (Drucker,
1995). In addition, Walsham (2001) argues that information and communication
technologies (ICTs) are not the answer to improved knowledge sharing within and
between people and organizations. They do not replicate or replace the deep tacit

Hypothesis	γ/β	t	Test result
H1e: KM practices affect positively and significantly growth & learning perspective of organizational performance	0.25	3.02	Accepted
H1b: KM practices affect positively and significantly internal processes perspective of organizational performance	0.22	0.01	Rejected
H1c: KM practices affect positively and significantly stakeholders perspective of organizational performance	0.08	1.47	Rejected
H1d: KM practices affect positively and significantly the overall organizational performance	0.25	2.97	Accepted

Table X.
The results of
hypotheses test

knowledge of human beings which lies at the heart of all human thought and action. So, the implementation of knowledge strategy is successful while to align with human resource management procedures. For example Figure 8 in a model shows human resource management is being involved in knowledge strategy and organization performance and this is another definition of human resource (Bierly and Daly, 2002).

The other finding of this study is that, the effect of KM practices on the four organizational performance dimensions of the survey organizations, though weak, is meaningful. It is obvious that the obtained result ($\gamma = 0.254$; $t = 2.97$) is not satisfactory for the managers of the survey organizations. But they should not be disappointed, as it is not the case of Iranian organizations involved in KM implementation, whereas many research in the organizations of the developed countries even members of G8 group indicate that these organizations particularly at the early stages of KM implementation have encountered various difficulties (Pietrantonio, 2007; Zack *et al.*, 2009). Therefore, may be the most important suggestion for the top managers of organizations in general and INPC's in particular is to exactly monitor the indicators of four BSC perspectives offered in this research to implement KM in a holistic and balanced manner, so they would hopefully be able to fully reap the benefits of this approach. This is in line with the argument of Ragab and Arisha (2013) who point out that a general opinion among scholars and practitioners are forming that single-approach KM system have proved futile, and so future KM system designs should adopt a holistic approach that amalgamates technology-based and people-oriented practices. Indeed this study contributes to the field of KM by empirically investigating the impact of KM practices on various measures of organizational performance in order to prove the suitability of a comprehensive approach like BSC.

Based on the calculated coefficients (see Figures 4 and 6) the ranking of CSFs are as follows; KM strategy, organizational culture, processes and activities, training and education, IT, leadership role, and rewarding and motivation. This finding broadens the informational horizon of top managers of the surveyed companies to better prioritize and plan necessary measures. Also, the survey organizations should give high priority to value added activities related to customer satisfaction and also strategic processes, which support the overall goals of the organizations. In other words they should strategically align their business strategy, with structure, processes and human resources in order to be fully successful in implementing KM projects.

6. Limitations and recommendation for future research
There are several limitations in this study. First, the time sequence of the association between the variables could not be concluded given that cross-sectional data were used. A future study is suggested to conduct a longitudinal research design to present the

Figure 8.
The moderating effect of human resource management procedures on the relationship between knowledge strategies and performance
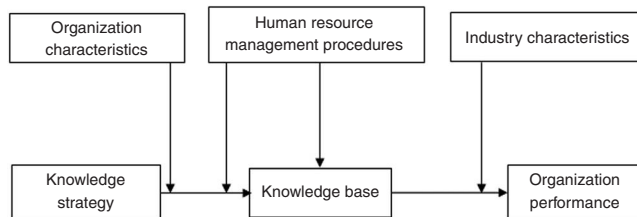
Source: Adapted from Bierly and Daley (2002)

evidence of causation which cannot be achieved through cross-sectional designs. Second, this study was limited to only three Iranian organizations. Hence the findings and conclusions drawn from this research are representative of the Iranian context only. So, final results should be considered with caution. Finally, as we could not confirm the third and fourth sub-hypotheses and due to proximity and similarities of the indicators of these two constructs which led us to accumulate in one construct called stakeholders, it is recommended in order to increase the external validity and generalizability of this approach and also for comparison purposes specifically regarding the third and fourth sub hypotheses, similar researches in other countries particularly in organizations of developed countries which are more likely to be mature in KM implementation to be carried out. Also, Because INPC scenario can be considered a benchmark for developing economies characterized by continued change, diversity and even elements of silent intolerance and conflict, this study may be viewed as a "pilot study" to provide a baseline and insight into future research of KM for enabling organizational performance.

Notes

1. Kaiser-Mayer-Olkin index

2. Generalized least square

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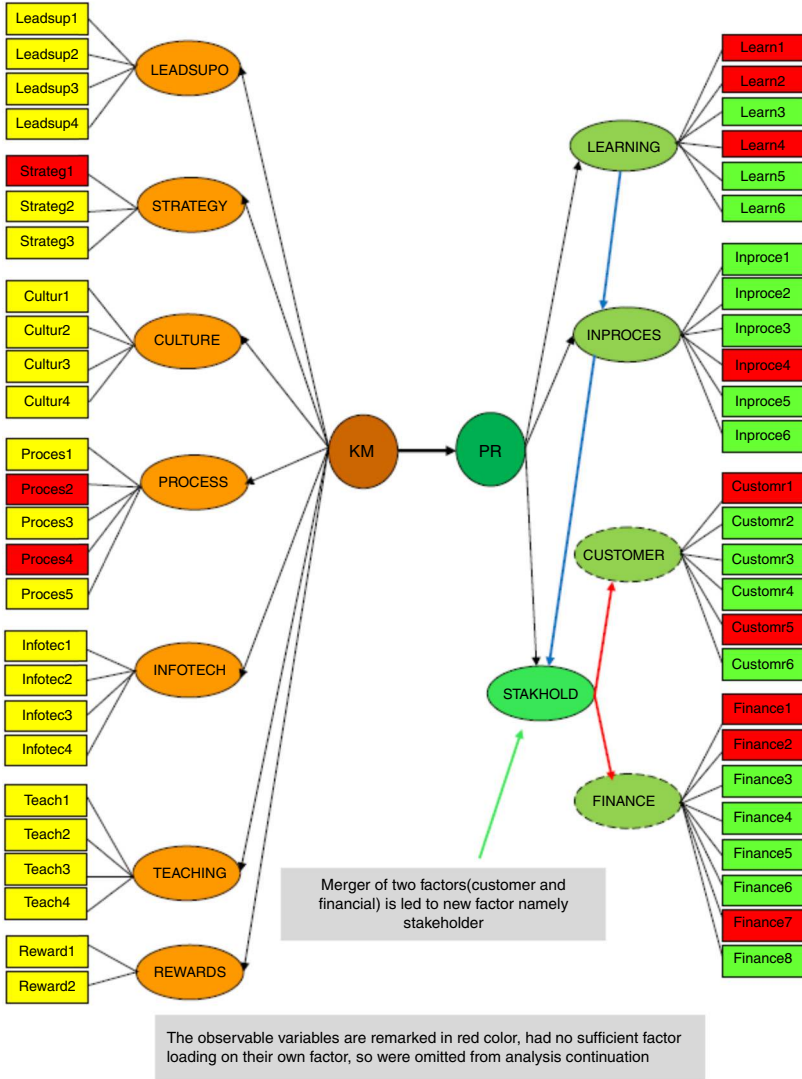
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Appendix

26 observable variables for principal components(factors) in each of two parts of KM and PR in conceptual model

Merger of two factors(customer and financial) is led to new factor namely stakeholder

The observable variables are remarked in red color, had no sufficient factor loading on their own factor, so were omitted from analysis continuation

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