Investigation of knowledge management and firm competitiveness: core competence as a mediator [version 1; peer review: awaiting peer review]

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Abstract

Background: The objective of the current study is to empirically investigate interrelationships among three variables; knowledge management (KM), core competence (CC), and firm competitiveness (FC), and to develop a framework based on empirical evidence for developing countries in South Asia.

Methods: This is a cross-sectional quantitative study using the Pakistan stock exchange (PSX) enlisted manufacturing and service organizations having a sample size of 136 companies. A questionnaire was self-administered to the respondents by executing a comprehensive strategy to get a high response rate. A total of 201 valid and complete responses from four manufacturing (automobiles, food & cosmetics, textile, and pharmaceutical) and one service organization (banks) were received using a Likert scale of five points in the questionnaire to examine the subject agreement level against statements. All hypothesized relationships were analyzed by employing SEM using AMOS ver. 20.

Results: Results of the study confirmed the positive and significant influence of four constructs of knowledge management processes on four constructs of firm competitiveness (innovation, delivery, quality, and financial performance). Further, knowledge management significantly impacts the firm's competitiveness through the mediation of technology, organization and people (TOP) core competence. The findings also supported that managing the intangible resource of the organization can influence the firm's competitiveness and resource-based TOP competence.

Conclusions: The SEM analysis confirmed all hypothetical relationships and supported the knowledge management's direct and indirect effects through core competence on firm competitiveness. The findings showed that the effectiveness of knowledge management will increase the organizations' competitiveness in developing countries' research perspective.
Keywords
Knowledge management (KM), TOP competence (CC), Firm competitiveness (FC)

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Introduction

Globally the fast-changing business environments and uncompromising competition for innovative products and services has evolved high in domestic and international markets. Competition based on uniqueness has become requisite to business success. Organizations are looking for new strategic ways to strengthen their economies and extend their agility (Teece et al., 2016). In such a scenario, modern organizations change their directions from faded philosophies to lasting management approaches. Therefore, knowledge management (KM) and building core competence are becoming new management attitudes in the knowledge era. Organizations’ particular knowledge stock and capability differentiate them over rivals (Grant, 1996). Moreover, KM is a firm strategic process, taking a central pace for firms' competitiveness either through managing and utilizing existing knowledge or integrating existing knowledge with new knowledge (Chetty et al., 2021; Bloodgood, 2018). In other words, competitiveness can only be accomplished when a firm manages its knowledge processes effectively.

While going through the academic literature, many scholars considerably investigated the impact of varied KM processes on firm performance. However, among these, several studies observed either no effect of KM processes on firms' performance (Sahibzada et al., 2022; Ferraresi et al., 2012) or mixed results (Obeso et al., 2020; Dzenopoljac et al., 2018; Wang et al., 2014; Zack et al., 2009). Consistently, in an issue of frequent conflicting and ambiguous findings, scholars now agree that KM has not remained a sufficient direct contributing strategic factor to increase organizational performance without influencing the intervention of competence or capabilities (Migdadi, 2020; Obeso et al., 2020; Shahzad et al., 2016; Wu & Chen, 2014; Wang et al., 2014; Villar et al., 2014). Therefore, scholars stressed the role of the mediator variable to increase the effectiveness of KM on firm performance (López-Nicolás & Meroño-Cerdán, 2011; Hsu, 2008).

Moreover, in a similar vein, a stream of studies also observed the significant effect of KM on organizational performance in varied economic contexts. Among these findings are from high financially stable countries (Kassou, 2019; Tan & Wong, 2015), developed and economic countries (Tubigi & Alshawi, 2015; Kiessling et al., 2009; Tseng & Lee, 2014), and non-industrialized or low-income countries (Migdadi, 2020; Al-Sa’di et al., 2017). Since, KM has been verified as a socially embedded phenomenon that varies from country to country (Hussinki et al., 2017; Andreeva & Kianto, 2012). The universality of KM could be affected by other contexts, like managerial, institutional, and cultural (Hussinki et al., 2017). Based on the fact many scholars limited their empirical evidence of the significant and insignificant impact of KM in developed and developing countries to another social, economic, and geographical context.

Continually, the high pressure of competition stressed companies to develop and identify unique and distinctive competencies and core competence (Mahdi et al., 2019). The factors like technology, organization, and people (TOP) have been identified as core competence and supported the influence on firm competitive advantages (Hafercz et al., 2019; Hafeez et al., 2010; Hafeez et al., 2006; Hafeez et al., 2002). In KM literature, enormous studies examined the role of TOP factors using terms like knowledge infrastructural capabilities or knowledge assets as an antecedent to KM processes to influence competitive performance (Kassou, 2019; Nguyen et al., 2018; Pérez-López & Alegre, 2012; Donate & Guadamillas, 2011; Lee & Choi, 2003). However, mediation of TOP-enabled core competence or capabilities has not yet been viewed as a necessary intervention condition for the KM to achieve high competitive success.

Firm success can be depicted by its unique functional and operational capabilities (Eldridge, 2019). Therefore, KM's relationship with competitiveness carries a growing interest. Indeed, four dimensions of competitiveness are generally involved in the extent of KM literature for operational performance (non-financial), such as cost, quality, flexibility, and delivery (Mohamad & Zin, 2019; Al-Sa’di et al., 2017; Aboelmageed, 2014). However, innovation is argued as a non-financial indicator (Jalil et al., 2017) and has not frequently been used in KM literature besides the four components of competitiveness. Alongside dimensions, i.e., cost, quality, delivery, and flexibility, firm innovation also are among the primary sources of competitive advantages and a crucial part of international competitiveness (Laosirihongthong et al., 2015). On the flip side, studies employed multiple performance measures, including firm financial performance, to comprehend the full benefits of KM implementation. Such as Migdadi (2020) studied the firms' performance through operational, financial, and product quality. Andreeva & Kianto (2012) suggested two performance outcomes from the role of effective KM practices, including competitiveness and financial performance. The financial benchmarks determine the firm quantifiable competitiveness.

Particularly in the context of KM in Pakistan, scholars focused on varying performance measures. For example, the research work of Shujahat et al. (2019) examined the impact of KM processes on organizational performance through the mediation of knowledge worker productivity in the IT industry. Shahzad et al. (2016) studied the manufacturing and service firms listed on the Lahore stock exchange and analyzed the knowledge creation process capabilities and their relationship with organizational creativity and performance. Abbas et al. (2020) empirically investigated the KM impact.
on sustainable innovation in the garment industry. Iqbal et al. (2020) explored the KM effect on the innovation capability of the banking sector. However, these studies do not give sufficient information on the extent of KM on firm competitiveness in larger manufacturing and service organizations.

Therefore, the main focus of the study is to provide empirical evidence on the interrelations between the KM process, core competence (TOP), and firm competitiveness. Further, the study will bridge gaps, add value to the existing KM literature, and address the empirical spectacle in the developing country context of Pakistan.

Literature review and development of research hypothesis
In this research paper, KM is defined by four constructs, using four items to measure knowledge creation (KC), three variables for knowledge sharing (KSH), two measures for knowledge application (KAPP), and two for knowledge storage (KST). This study formulated a research model to establish at first a direct KM relationship with firm competitiveness (FC) using four (operational and financial) constructs such as innovation (IN), delivery (D), quality (Q), and financial performance (FP). The second relationship is between KM and TOP core competence (CC), and the third is the relationship between CC and FC. The fourth is knowing about the effect of KM on FC through the mediation of CC. Using the underpinning of the knowledge-based view (KBV), we argue that KM processes of manufacturing and service organizations in Pakistan have considerable direct and indirect capacity to increase the firm competitiveness.

Knowledge management and firm competitiveness
According to the knowledge-based view (KBV), the knowledge possessed by a firm is a strategic intangible asset and critical to long-term success (Grant, 1996). The effective management of knowledge leads organizations to perform better than competitors (Martín-de Castro et al., 2011). That means the existence of resources (employees) is not remained enough without managing knowledge through processes at the firm level (Kiessling et al., 2009). Creation, sharing, storage, and application determine common KM abilities to create and capture value (Martelo-Landroguez & Cepeda-Carrón, 2016). Under the theoretical pinning of KBV, previous studies suggest that KM processes can significantly impact competitive advantages and performance (Kassou, 2019; Al-Ahbabi et al., 2019; Tan & Wong, 2015; Kiessling et al., 2009; Gold et al., 2001).

Mohamad & Zin (2019) have shown a positive association between KM and competitiveness in the service context (innovation, cost, quality, and flexibility). Ali et al. (2019) indicated a significant impact of knowledge-sharing practices on firm competitive tangible (cost reduction, organization growth) and intangible advantages. Investigating the manufacturing firms, Liu et al. (2004) also revealed significant connections between KM process capabilities and competitiveness. Aboelmaged (2014) found a positive linkage with firm operational competitive measures (cost, quality, delivery, and flexibility) through KM capabilities. In line with the above, here this study postulates,

H1. Knowledge management processes are positively related to the firm competitiveness.

Knowledge management and core competence (TOP factors)
Knowledge is the critical source of distinctive tangible and intangible competence, competencies, and capabilities (Tseng & Lee, 2014; Momeni et al., 2011). Many empirical studies have also shown a positive relationship between KM processes and intellectual capital as an organization intangible competence (Wang et al., 2014; Hsu, 2008). KM studies argue that tacit and explicit knowledge sharing influences human (people-based skills, expertise, training, teamwork), structural (organizational factors and processes and technology), and relational (external) competence (Wang et al., 2014).

It has also directed that organizational competency development in terms of learning (internal and external competence) highly depends on knowledge integrating, converting, creating, acquiring, exchanging (Cooper et al., 2016), dissemination, and storage (Villar et al., 2014), or generation, storage and flow (Obeso et al., 2020). Kassou (2019) empirically estimated that the generation of competency (employee satisfaction, skills, and staff retention) is mainly attributed to KM activities.

Empirical research on achieving resources, capabilities, core competence, and competencies attained less attention from KBV literature. Studies established that acquisition, conversion, application, and protection are the knowledge management process that positively and significantly influence the types of core competencies (marketing, technological, and integrative) in the corporate sector context (Momeni et al., 2011). While examining the service sector, Mahdi et al. (2019) confirmed the impact of knowledge management processes (generate, store, share, and apply) on sustainable competitive advantages involving resources, capabilities, competencies, and core competence. So, it is also important to propose that,
**H2:** There is a positive relationship between knowledge management processes and core competence.

**Core competence (TOP factors) and firm competitiveness**

Firm competence offers a capacity to benchmark other organizations generating high profits, innovation, and competitive advantages (Brown et al., 2019; Hafeez et al., 2002). According to Hafeez et al. (2019), the TOP competence should be flexible enough to meet the changing demands. In the notion of TOP-associated factors, technological capabilities are empirically revealed mostly as the prominent predictors of organizational performance (financial and non-financial) relative to the organization and people in many studies (Hafeez et al., 2010; Hafeez & Essmail, 2007; Hafeez et al., 2006).

Furthermore, in the wake of the knowledge economy, companies are retaining core knowledge infrastructure capabilities through developing an understanding of the management of technology (tangibles), culture, structure, and people (intangibles) practices for competitive performance outcomes (Nguyen et al., 2018; Andreeva & Kianto, 2012; Pérez-López & Alegre, 2012; Mills & Smith, 2011; Chen & Huang, 2009; Lee & Choi, 2003; Gold et al., 2001). Others emphasized intellectual capital and human resources practices (Hafeez & AbdelMeguid, 2003). Under a similar view, the studies of Hsu (2008) and Andreeva & Kianto (2012) empirically reported human resource practices and people competencies as a prominent source to increase firm competitiveness. Therefore, in line with the significant consequences of TOP on competitive advantages, the proposed hypothesis is that:

**H3:** There is a positive relationship between TOP-associated core competence and firm competitiveness.

**Knowledge management, core competences (TOP factors) and firm competitiveness**

Villar et al. (2014) argued that without companies’ dynamic capabilities like internal and external learning competence, knowledge management practices do not provide sufficient conditions for firm performance. Many studies empirically validated that the measurements of knowledge management are insufficient to generate competitive advantages and firm performance (Obeso et al., 2020; Durmuş-Ozdemir & Abdulkhoshimov, 2018; Tubigi & Alshawi, 2015). Recently, Aghaegbuna & Ukoha (2020) empirically show that not all knowledge processes contribute directly to firm performance.

Correspondingly, using operational and financial performance outcomes, studies observed mixed results, such as Zack et al. (2009) performed a significant direct relationship between knowledge management practices and operational performance relative to financial performance. Wang et al. (2014) also found two different results that reported the positive effect of tacit knowledge sharing on financial performance, while an insignificant relationship between explicit knowledge sharing and operational performance.

Therefore, prior research confirmed the successful role of knowledge management on competitive advantages and firm performance incorporated through building internal and external competencies such as learning and innovation capability (Migdadi, 2020; Obeso et al., 2020; Villar et al., 2014; Aboelmaged, 2014). Wang et al. (2014) noted a full mediation effect of intellectual competence (structure, culture, and relation) on the relationship between explicit knowledge sharing and operational performance than financial performance, while intellectual capital has shown a full mediation between tacit knowledge sharing and financial performance. Cooper et al. (2016) exhibited the impact of knowledge management on organizational performance through competence such as learning culture and human capital. The hypothesis generated as,

**H4:** There is a positive mediating role of core competence (TOP) between knowledge management and competitiveness.

**Methods**

The researchers have employed a cross-sectional survey strategy and a deductive quantitative research method to perform a cause and effect analysis of the hypothesized relationships. Close-ended structured questionnaires were manipulated with predetermined options on a multi-item instrument using 5 points Likert scale (strongly disagree-strongly agree) to gather first-hand information for this particular study issue. Respondents were from the manufacturing and service sectors enlisted in PSX. For the generalizability issue of the study, it has tried to collect data from different departments like quality, R&D, production, human resource, finance, sales & marketing, procurement, and others. Respondents were requested to participate with at least 2-5 responses from different departments in each firm to reduce the respondents’ bias.

The reliability and validity of the questionnaire is the fundamental aspect and established related to their respective constructs in variables through SPSS ver.20. In the following steps, a detailed descriptive analysis provided on the sample profile of the respondents, which included the respondents’ demographic information like gender, job position, sector, experience etc. Convergent and discriminant validity was also conducted by using MS Excel for the reconfirmation of latent constructs. Confirmatory factor analysis (CFA) was executed for the measurement and structural model. Towards
Total PSX listed companies (n=544)

Additional record identified through other sources (n=0)

Manufacturing and service sectors potentially found eligible (n=418)

195 records were excluded. (Less R&D practices and less number of products and services)

After screening manufacturing and service sectors on convenience (n=418)

Selected companies (n=223)

Companies excluded for time constraints (n=13)

210 manufacturing and service companies were left

Total sample size of companies under study (n=136) divided into 5 strata:

- n=14
- n=13
- n=14
- n=87
- n=8

Figure 1. Flow diagram exhibiting selection of participant companies.
the end, the outcome of structural equation modelling (SEM) has integrated with the research model alongside model fit indices using AMOS ver.20. SEM analysis was used to test the proposed research hypothesis.

**Ethical considerations**

Written informed consent was taken before filling the questionnaire. The study was sent for ethical approval to the Institute of Quality & Technology Management (IQTM), University of the Punjab, Lahore, Pakistan and got waiver IRB (Ref. No: D/218/IQTM) dated 17-08-2020. Therefore, we are thankful to all the volunteer respondents and their organizations who helped us without any conflict of interest and supported the industry academia relationship.

**Data collection and sample size**

The target population for the current study was the managers or senior officers of manufacturing and service organizations listed on the Pakistan stock exchange (PSX). PSX-listed companies, which determine the share exchange-based companies in Pakistan, were the study data source. Initially, this study utilized purposive sampling for companies and approached them conveniently. Therefore, out of the 544 manufacturing and service companies, 210 innovative manufacturing (automobiles, food & cosmetics, textile, and pharmaceuticals) and service (banks) organizations were selected as participants. Figure 1 shows the participants’ (companies) selection and eligibility criteria. The sample size has then calculated with a 95% confidence interval and a 0.05% margin for error in Yamane formula (Yamane, 1967). According to Saunders et al. (2009), if the population size is 200, the sample size at a ±5% confidence interval should be 132. In our case, the population size is 210, and the sample size is 136, which shows a sufficient sample size eligible to obtain a ±5% confidence interval. Afterward, the researcher of the current project adopted a stratified sampling technique for data collection amongst 136 listed manufacturing and service companies (Table 1) with at least 100 employees and ISO certification.

Organizations located in different provinces of Pakistan were contacted to acknowledge their participation. A list of contacts (addresses, emails, telephone numbers) has arranged from the PSX website. Initially, the organizations have contacted via given email addresses and phone contacts in the list, and five questionnaires to each organization besides research information were sent. Data collection was performed through a self-administered survey and followed a comprehensive strategy of emails, phone contacts, physical visits, and google form link sending on corresponding emails and WhatsApp to enhance the response rate. Afterward a continuous follow-up process was carried out from August 2020 to February 2021. Only targeted innovative sectors of PSX. The innovative nature of large firms shows enough ability to create and use knowledge and invest more in KM activities to outperform (Sukumar et al., 2020). The sectors like automobiles, food & cosmetics, textiles, and pharmaceuticals in manufacturing, and banks in service lines are becoming innovative and changing their products and services at short intervals. For example, the textile sector is a cornerstone in developing and boosting Pakistan’s economy and contributing about 60% of the total export. Pakistan is the 8th largest exporter of textile products in Asia. The government of Pakistan investing its time and efforts in providing policy support like textile policy 2025 with an investment of $ 3 billion in new projects. After textile food & beverage processing industry is the 2nd largest in Pakistan. Halal products (food & cosmetics) are taking new horizons of opportunity. Pakistan halal food products authority is an endeavor to capture the international markets as a competitive edge over other non-muslim countries that offer halal products.

The automobile industry in Pakistan is one of the large-scale manufacturing (LSM) sector and the fastest-growing industry. Fetching technological advancements and increasing the national economy, employing a workforce of over 1.8 million people, and generating revenue through taxes and duties. Continuous-based production of automobile products is a sign that the auto industry is increasing at a regular speed. Pakistan is looking to introduce its first national electric vehicle as a solution to green Pakistan and climate concerns soon. This industry is expanding with buyer choice and

**Table 1. Target population.**

| Sectors                  | No. of companies | Percentage | Strata’s |
|--------------------------|------------------|------------|----------|
| Automobiles              | 22               | 10.48      | 14       |
| Banks                    | 20               | 9.52       | 13       |
| Food & cosmetics         | 22               | 10.48      | 14       |
| Textile                  | 134              | 63.81      | 87       |
| Pharmaceutical           | 12               | 5.71       | 8        |
| **Total**                | **210**          | **100**    | **136**  |
providing safe, modern, and cost-effective vehicles. Pharmaceutical is a highly technological and R&D incentive sector. Top pharmaceutical companies in Pakistan adopt and use new technologies, good manufacturing practices (GMP), striving for the latest equipment and production technologies to sustain economic health and gain productivity. Apart from direct contribution to Pakistan’s GDP, banks contribute to many economic and social development activities. In the coming years banking sector is anticipated to develop long-term financing, investment products, and green banking products.

A total of 680 (136*5) questionnaires were disseminated consisting of 99 items to the potential respondents of the sampling frame. Initially, all responses were entered on an MS Excel sheet. At the end of the span, a total of 281 responses were in hand, which enabled the scholars to proceed to the next step of the data analysis phase. Among these, 80 questionnaires were excluded from the final analysis using the screening process because a major part of the data was incomplete and missing. For data screening, all responses were entered against the respective ID under every post-coded item to check consistency, completeness, and legitimacy. In addition to the procedure, to ensure the coding accuracy and precision of the data entry, every 10th record has to recheck using a double-entry technique.

Measurement scale design
The study cast items from previous literature to measure the variables KM processes, CC, and FC. Table 2 (constructs and measures) shows the selection of items from existing literature. Before the final execution of the original research questionnaire, the measurement instrument was refined and tested by using methods like pilot testing to identify uncertainty, problems, wording errors, or confusing questions from the contents of the questionnaire. The pilot study shows with 73 participants randomly selected from manufacturing and service organizations. Respondents were allowed to comment on the difficulty or any improvement suggestions in open-ended questions provided at the end of the questionnaire or send their valuable advice via email or phone contacts. Finally, the researcher considered the best items to have high Cronbach’s alpha values for the final version of the questionnaire (see Extended data, Fatima et al., 2022).

### Table 2. Constructs and Measures.

| No. | Constructs and variables | Items | Symbols | References |
|-----|--------------------------|-------|---------|------------|
| 1   | Knowledge management (KM) |       |         |            |
|     | Knowledge Creation (KC)  | Our organization stresses creative and essential dialogues | V6 | Lee & Choi (2003) |
|     |                          | Our organization stresses the use of metaphors in dialogues for concept creation | V8 |     |
|     |                          | Our organization stresses forming teams as a model and conducting experiments and sharing results with entire departments | V17 |     |
|     |                          | Our organization stresses searching and sharing new values and thoughts | V18 |     |
|     | Knowledge Sharing (KSH)  | People in our organization frequently share existing reports and official documents with members of organization. | V20 | Wang et al. (2014) |
|     |                          | People in our organization frequently share reports and official documents that they prepare by themselves with members of organization. | V21 |     |
|     |                          | People in our organization frequently collect reports and official documents from others in their work. | V22 |     |
|     | Knowledge Application (KAPP) | Our organization has processes for using knowledge in developments of new products/services | V32 | Gold et al. (2001) |
|     |                          | Our organization quick applies knowledge to critical competitive needs | V35 |     |
|     | Knowledge Storage (KST)  | We extensively search through customer and task-related databases to obtain knowledge necessary for the tasks | V41 | Liu et al. (2004) |
|     |                          | We are able to systematically administer knowledge necessary for the tasks and store it for further usage | V44 |     |
Validity and reliability

Before moving towards SEM analysis of the hypothesized relationships in the proposed model, reliability and validity had measured. For the internal consistency of the constructs in the questionnaire, accessed a reliability test through Cronbach's alpha value using through SPSS ver.20. The value of Cronbach's alpha could vary between 0 and 1. The 0.8 value is generally considered the acceptable level. While, in literature, for any construct reliability, the value must be 0.7 or above is recommended as adequate (Pallant, 2010). For this study, the value of each construct varies between 0.7 and 0.8. All values are in the range of the specified threshold limit (>0.7) of Cronbach alpha, shown in Table 3.

According to Hair et al. (2010), for the establishment of convergent validity (CV) of variables, the value of average variance extracted (AVE) should be > 0.5. All AVE values of latent variables are in their specified ranges except knowledge application (0.44), knowledge storage (0.44), and quality (0.49) which are < 0.5. Whereas the AVE value of 0.44 is acceptable when the value of composite reliability (CR) is > 0.6 (Fornell & Larcker, 1981). So the value of the CV is in the acceptable range. The CR values of all latent constructs are far > 0.6, as indicated in Table 3.

Table 2. Continued

| No. | Constructs and variables | Items                                                                 | Symbols | References                           |
|-----|--------------------------|----------------------------------------------------------------------|---------|--------------------------------------|
| 2   | Core competence (CC)     | Technology (T) Our organization uses technology that allows it to retrieve or use knowledge about its markets and competition | V53     | Gold et al. (2001)                   |
|     |                          | Organization (O) In our organization there is a willingness to accept responsibility for failure | V58     | Lee & Choi (2003)                    |
|     |                          | People (P) In our organization, managers frequently examine knowledge for errors/mistakes | V67     | Gold et al. (2001)                   |
|     |                          | In our organization, members are satisfied by contents of job training or self-development programs | V68     | Lee & Choi (2003)                    |
|     |                          | In our organization, performance appraisal is based on results | V69     | Chen & Huang (2009)                  |
|     |                          | In our organization, training for problem solving activities are available | V70     |                                      |
|     |                          | In our organization, teamwork has been promoted as a regular practice | V73     | Donate & Guadamillas (2011)          |
| 3   | Firm competitiveness (FC)| Innovation (IN) The level of newness (novelty) of organizations new product is higher than competitors | V74     | Laosirihongthong et al. (2015)       |
|     |                          | The speed of new product development process is higher than competitors | V75     |                                      |
|     |                          | The number of new product that is first to market is higher than competitors (early market entrants) | V76     |                                      |
|     |                          | Delivery (D) On time delivery of products improved | V87     | Jalil et al. (2017)                  |
|     |                          | Delivery speed increased | V88     |                                      |
|     |                          | Delivery reliability increased | V89     |                                      |
|     |                          | Quality (Q) Product reliability improved | V92     |                                      |
|     |                          | Product durability improved | V93     |                                      |
|     |                          | Manufacturing process control improved | V99     |                                      |
|     |                          | Financial Performance (FP) Market share increased | V107    |                                      |
|     |                          | Sales volume increased | V111    |                                      |
Results
Out of the 680 questionnaires sent to the 136 companies, 201 filled questionnaires were returned from 119 companies, as shown in Figure 2 (Fatima et al., 2022). It represents a usable response rate of 87.5% (119/136*100) company wise and 29.5% (201/680*100) respondent wise. The earlier response is higher than the study of Shafiq (2011), while the latter is close to the study of Aboelmaged (2014).

Demographic characteristics of respondents
Table 4 indicates the respondents varied characteristics of job position, no. of employees, nature of the organization, job experience, gender, ISO certification, and types of organization sector. The study established a descriptive analysis of the demographic characteristic. The results of job position indicates the majority of respondents were quality managers (26.37%), followed by sales & marketing managers (13.43%), production managers (11.94%), R&D managers (10.95%), procurement managers (10.45%) finance managers (6.46%), the human resource manager (4.48%), and 15.92% respondents were performing other responsibilities. These mixed responses from different departments give confidence to the researcher that the data will not be biased (Kumar et al., 1993). The response rate of 33.33% and 31.84%
broadly came from medium to large firms that had number of employees > 500. This result gave much confidence to the researcher. Most of the organizations listed on the PSX are manufacturing companies. Therefore, 83.08% of responses were received from manufacturing organizations and 17% (16.92%) from the service sector. The analysis showed that 48.26% of respondents had a job experience of 11-15 years, and only 9.45% had job experience of 2-5 years. The maximum response rate was obtained from well-experienced employees of the sample organizations. Only 8.46% of respondents calculated as female, and 91.54% were male. The results indicate that nearly 80% (79.60%) of Pakistan organizations are ISO certified. The majority of data, like 40% (39.80%), was collected from the textile sector as it is one of the largest leading manufacturing sectors in Pakistan.

Measurement models

The CFA analysis of measuring KM, CC, and FC shows all the estimated values in the specified threshold ranges as given in outcome summary Table 5. This first measurement model examines the relationships among measures of the independent variable (IV), comprised of 4 KM processes (creation, sharing, application, and storage). The results of parameter re-estimates, fit indices, and observed residuals imply that the dimensions of KM provide the best fit for the observed co-variances among the collection of measures. Measurement model of FC constructs (innovation, delivery, quality, and financial performance) at the loss of cost and flexibility constructs (due to low Cronbach’s alpha values), others are in specified range value of thresholds and demonstrating uni-dimensional (Gaskin & Lim, 2016). Afterward, CFA confirmed the measurements in such constructs with low factor loadings. It is also interesting to mention that constructs like technology (T) and organization (O) competence were deleted during the construction of the CC measurement model and remained with 1 item of technology and 1 item of organization factors competence. However, people (P) construct stayed with a good number of items. In this way, only the variable CC came into existence with all TOP.

After performing the reliability and validity successfully, measurement models remained with a total of 29 items (KM = 11 items, CC= 7 items, FC = 11 items) used to measure the four constructs of KM and four constructs of FC (Table 2).

Hypothesis testing and structural analyses

Direct effect (D)

The proposed three direct relationships (KM->FC, KM->CC, and CC->FC) were tested by using structural equation modelling (SEM). Predominantly, the revealed first direct relationship is a path between the measured KM processes and outcomes of FC. It had noticed that the path coefficient of the estimated model supports the hypothesized relationship of fit in all directions and magnitudes. Table 5 indicates all the main results and goodness of fit indices for
Table 4. Demographic characteristics of the respondents.

| Job position                  | %  | No. of employees | %  | Nature of organization | %  | Job experience (Years) | %  | Gender | %  | ISO certification | %  | Types of organization | %  |
|-------------------------------|----|------------------|----|------------------------|----|------------------------|----|--------|----|-------------------|----|----------------------|----|
| Quality Manager               | 26.37 | ± 100          | 10.95 | Manufacturing Service | 83.08 | 2-5        | 9.45 | Male    | 91.54 | Yes              | 79.6 | Automobiles           | 14.93 |
| Production Manager            | 11.94 | 101-500        | 10.95 | Service                | 83.08 | 6-10       | 48.26 | Female  | 8.46  | No Certification in process | 7.46 | Banks                 | 16.92 |
| R&D Manager                   | 10.95 | 501-1000       | 4.48  | Manufacturing Service | 83.08 | 5-11       | 31.33 | Male    | 15.92 | Certification in process | 9.46 | Food & Cosmetics       | 16.92 |
| Human Resource Manager        | 13.43 | ≥1000           | 3.48  | Manufacturing Service | 83.08 | 11-15      | 33.33 | Female  | 15.92 | Not decided yet       | 3.98  | Textile               | 39.80 |
| Sales & Marketing Manager     | 6.47   |                | 6.47  |                       | 10.45 | 16-20      |       |        |      |                  |      | Pharmaceuticals        | 11.44 |
| Finance Manager               | 10.45 |                | 10.45 |                       | 10.45 |            |       |        |      |                  |      |                      |    |
| Procurement Manager           | 15.92 |                | 15.92 |                       | 15.92 |            |       |        |      |                  |      |                      |    |
| Others                        | 15.92 |                | 15.92 |                       | 15.92 |            |       |        |      |                  |      |                      |    |

Table 5. Summary of Measurement and Structural models Goodness of fit.

| Measurement model for Knowledge management (KM) | Measurement model of Core competence TOP (CC) | Measurement model of Firm competitiveness (FC) | Direct relationship structural model | Indirect relationship structural model for mediation | Recommendation values for satisfactory fit of a model to data |
|-------------------------------------------------|-----------------------------------------------|-----------------------------------------------|-------------------------------------|----------------------------------------------------|----------------------------------------------------------|
| χ²/df                                           | 1.28                                          | 1.66                                          | 1.64                                | 1.67                                               | 1.58                                                      | <3.0                                                   |
| Root Mean Square Error of Approximation (RMSEA)  | 0.05                                          | 0.07                                          | 0.07                                | 0.08                                               | 0.07                                                      | <0.08                                                  |
| Comparative Fit Index (CFI)                     | 0.98                                          | 0.98                                          | 0.97                                | 0.91                                               | 0.90                                                      | >0.90                                                  |
| Parsimony Normed Fit Index (PNFI)               | 0.67                                          | 0.63                                          | 0.67                                | 0.70                                               | 0.69                                                      | >0.50                                                   |

Table 6. Direct and Indirect Effects-two tailed significance (BC) (Group number 1 - Default model).

| Hypothesis | Independent variable | Mediator       | Dependent variable | Type of mediation | Direct effect | Indirect effect | Total effect |
|------------|----------------------|----------------|-------------------|-------------------|---------------|-----------------|--------------|
| KM--→CC--→FC | Knowledge management | Core competence | Firm competitiveness | Full              | 0.95           | 0.31            | 0.61         |
direct relationships on standardized estimates are in acceptable ranges and at the significance level of p=0.000. So, the results of the regression coefficient of the direct path exhibited the effect of KM on FC and endorsed that the KM implementation practices significantly encourage FC at a standardized value ($\beta = 0.78$). This significant and positive result supported H1. Furthermore, the effect of KM on CC was observed positively and significantly at standardized estimates ($\beta = 0.89$). The last direct effect of CC on FC also indicated a significant and positive relationship with standardized value ($\beta = 0.84$) and supporting H2 and H3.

**Indirect effect (IND) structural model of mediation analysis**

For testing the mediation, the researcher followed the method of Baron & Kenny (1986). The bootstrapping technique with 5000 bootstraps (number of samples) was employed to examine the indirect relationship (Zhao et al., 2010). SEM testing of the relationship between KM and FC through the mediating role of measured CC exhibited perfect goodness of fit indices (Table 6). According to Baron & Kenny (1986), mediation exists if the independent variable (IV) does not affect the dependent variable (DV), and the mediator variable controls the influence of the IV on the DV.

So, in this study, the CC (mediator TOP) has dominated the effect of KM (IV) on FC (DV). That determines, in the presence of core competence related to technology, organization, and people, that the direct influence of KM does not remain more on the FC (Figure 3). Table 6 shows that the presence of a mediator (indirect effect) suppressed the KM direct effect on FC and remained less with a standardized estimate ($\beta = 0.3$), and analysis remained statistically significant at 0.001 (<0.005). Results established CC (TOP) mediation between KM and FC and supported H4.

**Discussion and conclusion**

The findings of this study have proved KM effectiveness in FC and that all four processes are equally important to address the KM performance to impact organizational competitiveness in the context of manufacturing and service organizations of Pakistan. The results of the H1 ascertained a positive and significant relationship between KM and the FC (KM -> FC). All four measurements of KM (creation, sharing, application, and storage) statistically verified the contribution toward competitiveness. While the strategic value of knowledge substituted the theoretical assumptions suggested in KBV, management of knowledge mechanisms as intangible firm resources is a fundamental source of competitive performance.
Generally, the finding agrees with previous empirical studies that KM significantly impacts firms' performance. No difference emerges while comparing the existing result of H1 with studies performed by Al Yami et al. (2021), Al Ahbabi et al. (2019), Dzenopoljac et al. (2018), and Aboelmaged (2014) validated all KM processes significantly affect organizational performance in UAE and Kuwait. The result is similar to Mohamad & Zin (2019) who found a direct influence of KM on the performance of Malaysian construction firms. The conclusion is constant with Kiessling et al. (2009) who established that KM at the firm level has more capacity to increase organizational performance in manufacturing and service firms in Croatia. Gold et al. (2001) empirically proved the influence of knowledge process capability on organizational effectiveness in the USA manufacturing industries context.

The results of four KM constructs demonstrated on the scale lead to FC. Knowledge creation (KC) exhibits KM performance to attain firms' competitiveness ($\beta$=0.90). In other words, this study experienced that when a firm deploys knowledge creation and generates new knowledge (internal and external) may improve its performance. These findings are in line with prior studies. Like collecting data from Spanish service firms, Obeso et al. (2020) observed the significant connection between knowledge creation and firm performance. Tubigi & Alshawi (2015), in the UK service industry, also observed the positive impact of knowledge creation.

The positive role of knowledge sharing (KSH) shows a better understanding through KM, and the result is constant with past findings (Migdadi, 2020; Ali et al., 2019; Dzenopoljac et al., 2018; Durmuş-Özdemir & Abdukhoshimov, 2018). In contrast, explicit knowledge sharing shows less support than the previous study conducted by Wang et al. (2014). Their study found the only positive relationship of explicit knowledge sharing with financial performance except for the operational performance of technology firms in China.

Knowledge application (KAPP) is significant in the prediction of KM as ($\beta$=0.97) used to enhance performance shows agreement with past research performed by Tubigi & Alshawi (2015). There is a fundamental role of knowledge usage in firm performance (Tubigi & Alshawi 2015). If firms deploy their knowledge in the new products and services and apply knowledge to critical competitive needs will perform better than competitors.

Knowledge storage (KST) is pivotal in KM performance ($\beta$=0.81). Several studies confirmed the significant connection between knowledge storage and firm performance. Migdadi (2020) found a direct and positive relationship between knowledge storage and the manufacturing and service companies' performance in Jordan. In contrast, Obeso et al. (2020) and Durmuş-Özdemir & Abdukhoshimov (2018) did not find a relationship between knowledge storage and firm performance. In this study, systematically administered knowledge and the knowledge stored in the databases are necessary for making the task easier. In a nutshell, while going through the literature review, the extent showed the relationship between KM and firm performance remained inconsistent. However, the current impact of knowledge processes such as creation, sharing, application, and storage will increase the firm's competitiveness.

The findings show significant and positive impacts of KM on CC and supported H2. In other words, the firm supposed to implement KM (creation, sharing, application, and storage) will increase its competencies. This finding is in line with Mahdi et al. (2019), who significantly supported the implementation of KM processes for resources, capacities, competence, and core competence in the universities of Iraq. The result is constant with Momeni et al. (2011), who found that KM processes contribute significantly to core competencies in Iranian automotive industries. Consistently Tseng & Lee (2014) study showed the influence of KM capability on the dynamic capability of China. The result is similar to those that examined the intellectual capital as an organization's intangible competence against KM impact (Wang et al., 2014). The finding is comparable with prior studies that established the direct relationship between KM and organizational learning competence. Such as Obeso et al. (2020) successfully examined the effect of KM in Spain on organizational learning. Data from Spain and Italy Villar et al. (2014) found that knowledge management practices significantly determine internal and external learning capabilities.

The results show CC (TOP) significantly influenced FC, and H3 is accepted. This relationship indicates that people-based practices (P) are the most prominent core competencies of manufacturing and service organizations in Pakistan compared to technology (T) and organization (O) factors. The outcomes of people factors support studies done in the past, and those empirically suggested similar results (Hafeez & Essmail, 2007; Hafeez & AbdellMeguid, 2003). In the KBV, the findings of H3 are constant with Tan & Wong (2015) for KM factors to significantly enhance manufacturing performance and Andreeva & Kianto (2012) as they observed a strong influence of technology and people practices on firm competitiveness. Similarly, finding supports others like Cooper et al. (2016), Mills & Smith (2011), and Gold et al. (2001) discovered that the level of firm knowledge-based capabilities (structure, culture, people) exhibit an improved level of organizational effectiveness.
Finally, the SEM results also showed a significant relationship between KM and FC through the mediating role of CC (TOP) and supported H4. The finding suggests that the more manufacturing and service firms develop core competence, the more firm increases their competitiveness and lead performance of their unique and distinctive products and services. Previously, technology (T) and organization (O) factors remained a significant core competence of competitive advantages in many previous studies from different countries (Hafeez et al., 2010; Hafeez & Essmail, 2007). While in Pakistan, this result indicates that T and O are less contributing factors to competitiveness in larger sectors of Pakistan. The less or no impact of technological competence are consistent with the studies conducted on another cultural context in larger firms (Mills & Smith, 2011; Pérez-López & Alegre, 2012).

Contribution to the literature
The findings of this study will contribute to existing literature that knowledge management significantly determines competitiveness in developing countries’ research perspective. Results found statistically significant direct and indirect effects of knowledge management on firm competitiveness. Respondents of the organizations tend to believe that the more knowledge management implementation initiatives and improvement practices generate facts, the more firms will be competitive.

Contribution to the practice
Knowledge management has been an emerging competitive global trend and incorporates all the sectors in developed and knowledge-economic countries. However, the organizations of developing countries are still in their struggling phase to find out the business ways for the full potential of knowledge management. Hence, organizations in developing countries like Pakistan must comprehend the importance of knowledge management in response to being more competitiveness.

Limitations
Most importantly, the limitation may affect the generalizability issue. However, the findings are not generalized to the manufacturing and service sectors other than Pakistan. The current study is cross-sectional and performed in one go (snapshot) and conducted the data using a self-administered close-ended questionnaire design. It would be interesting to conduct a longitudinal study to measure the knowledge management effect over periods with a chronological break. Similarly, it would also be interesting for future scholars to use qualitative research studies by implementing multiple experiment methods in a similar domain to reduce the chance of variance in the data method. Further, future studies should examine the obstacles facing Pakistan’s larger sectors in knowledge management implementation.

Data availability
Underlying data
UK Data Service ReShare: Impact of Knowledge Management on Firm Competitiveness: Core Competence as Mediator, 2020-2021. https://dx.doi.org/10.5255/UKDA-SN-855898 (Fatima et al., 2022).

This project contains the following underlying data:
- Data file.xlsx
- Spss data file.sav

Extended data
UK Data Service ReShare: Impact of Knowledge Management on Firm Competitiveness: Core Competence as Mediator, 2020-2021. https://dx.doi.org/10.5255/UKDA-SN-855898

This project contains the following extended data:
- KM Questionnaire
- Data coding file
- Short methodology paper

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).
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