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Toward software quality enhancement by Customer Knowledge Management in software companies

Arash Khosravi[a,*], Ab Razak Che Hussin[a], Mehrbakhsh Nilashi[a,b]

[a] Faculty of Computing, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia
[b] Department of Computer Engineering, Lahijan Branch, Islamic Azad University, Lahijan, Iran

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ABSTRACT

Customer Knowledge Management (CKM) plays an important role in the production of high quality software products. As CKM in Enterprise Software (ES) development is still immature, this raises questions on how CKM enablers can be used to help ES development companies improve their software quality. In this study, Human, Organizational and Technological CKM enablers were identified from the literature. The weights of these factors were determined by experts from the ES development companies. Based on the most important factors, a theoretical model was developed. The proposed model was evaluated by distributing a survey questionnaire to decision-makers in ES development companies. The results showed that "Customer Involvement" together with "Trust" were the most influential factors, followed by "CRM Technology Infrastructure" and "Cross-Functional Cooperation". In addition, there was no impact from "Organizational Training", "Customer Knowledge Map", and "CKM Strategy Development". The results also revealed that the impact of CKM on software quality is significant. The proposed model in this study can be used as a guideline for the successful application of CKM in ES development companies to improve the software quality.

1. Introduction

Customer Knowledge (CK) is increasingly important for company competitiveness. Consequently, research on Customer Knowledge Management (CKM) is rapidly increasing (Korhonen-Sande and Sande, 2016; Wang, 2015; Rollins et al., 2012). CKM helps companies leverage their unique CK to improve the new product performance, enhance product\service quality, and cut costs (Korhonen-Sande and Sande, 2016; Salojärvi et al., 2013; Rollins et al., 2012). However, companies desiring to develop a well-functioning CKM face challenges (Korhonen-Sande and Sande, 2016; Wang, 2015; Rollins et al., 2012). In particular, there is a lack of research on how firms should deploy Human, Organizational and Technological conditions to manage CK and become more responsive to customer needs (Korhonen-Sande and Sande, 2016; Salojärvi et al., 2013; Garrido-Moreno and Padilla-Meléndez, 2011).

Many previous studies in software quality enhancement have only focused on the technical aspects of software quality such as reliability, maintainability, and functionality. However, because of the nature of Enterprise Software (ES), the transfer and integration of CK for customization, enhancements, maintenance and training is required (Schaarschmidt et al., 2015; Cho et al., 2013).

Customers are one of the most important stakeholders in any project (Association for Project Management, 2006). There is no doubt that appropriate communication and collaboration with customers in different phases of the ES development project can help in increasing the overall satisfaction of customers and the overall success of an entire project (Schaarschmidt et al., 2015). CKM could

* Corresponding author.
E-mail address: khosravi.280@gmail.com (A. Khosravi).

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be used to facilitate the reception of customer feedback and the collection and utilization of customer information (Zhang, 2011). As the integration of CK in ES development is still immature, there is a lack of theoretical framework to fully capture the use of CKM to improve software quality in ES. In addition, there is a fundamental need to further explore how organizational factors such as CKM can enhance the ES quality. There are significant challenges regarding the transfer and integration of CK inside software companies. Attafar et al. (2013) reported that a lack of senior management commitment to CKM, poor communication, a lack of cultural readiness, and a lack of customer management skills are barriers to the CKM (Attafar et al., 2013). The major problems facing the effective application of CKM in any company are organizational, not technical (Smith and McKeen, 2005). According to Al-Shammari and Global (2009), successful CKM requires the transformation of organizations from product–centric operations to customer centric operations. Attafar et al. (2013) noted that an important barrier to CKM is interdepartmental conflict. When internal departments operate autonomously, cooperation between such departments is limited. Thus, several likely benefits of CKM are not exploited (Garrido-Moreno et al., 2014; Khodakarami and Chan, 2014). Moreover, Skotis et al. (2013) reported that one of the most important challenges of CKM is a lack of CK absorptive capacity in organizations. Salojärvi et al. (2010) noted that the most companies lacked systematic processes for CKM. According to Davenport et al. (2001), the utilization of CK is a 'stumbling block' for several firms. However, the rate of absorption and application of CKM in ES is low, for example, only 27% of the ES development companies that proposed products in ELECOMP 2014 (Big annual ICT exhibition in Tehran) had a CKM strategy to increase production efficiency and provide better service to customers (Khosravi et al., 2017).

Many studies in the field of Information Systems (IS) have investigated the significant factors that influence CKM. Research on the factors that enhance CKM in the ES development to improve software quality improvement is one of the less explored and examined topics in IS (Kannabiran and Sankaran, 2011). Particularly for developing countries, according to an investigation of 22 software development companies that proposed products in ELECOMP 2014, 63% of the ES development companies used Customer Relationship Management (CRM) systems, 36% of them had a solution or guidelines for the use of CK to increase the quality of products and services. 61% of them mentioned that the software production process in their companies is product-centric rather than customer centric (Khosravi et al., 2017). An inadequate theoretical framework for antecedent factors of CKM in general, and a lack of comprehensive theoretical framework for the effect of CKM on software quality in ES development, reflect a fundamental need to further explore the solutions for this issue (Aho and Uden, 2013; Kannabiran and Sankaran, 2011). Accordingly, the major question of the current study that reflects the gap in the literature was emerged as: "What are the antecedent factors that influence CKM for ES quality improvement in the ES development companies?"

This paper is divided into the following sections. In Section 2, the theoretical foundation is reviewed. In Section 3, a research design framework was developed. In Section 4, the research hypotheses are formulated. In Section 5, the result of data collection and analysis was reported and compared with previous studies. In Section 6, the implications and suggestions for future studies were described. Section 7 presents the conclusion.

2. Literature review

2.1. Customer Knowledge Management

According to Campbell (2003), CK refers to the ordered and structured information pertaining to the customer driven by methodical processing. Gebert et al. (2002) offered a commonly acknowledged definition of customer knowledge: "the vigorous blend of value, experience, and perceptive information that is required, generated and imbibed during the process of transaction and interchange between the organization and customers". Gebert et al. (2002) classified CK into three main categories. The first type called "knowledge for customers" refers to knowledge about products, markets and suppliers applied to satisfy customers' knowledge needs. The second type is referred as "knowledge about customers," which is created based on the analysis of historical customers' data and information. The third type, which is known as "knowledge from customers", refers to the customers' feedbacks. Another type of CK stated by Smith and McKeen (2005) is co-created knowledge. This knowledge can be captured during the cooperation between an organization and its customers. As per Sofianti et al. (2010), CKM is the strategic practice based on which forward-looking organizations unshackle their customers from being submissive recipients of products and services to authorization as the knowledge partners. The CKM pertains to obtaining, sharing, and using the knowledge within customers for the benefit of those customers as well as the organization. It is termed as an on-going practice of creating, distributing and utilizing CK within a business entity and between a business entity and its customers.

2.2. The Generic CKM framework

According to the Knowledge-Based View (KBV), knowledge is a distinctive resource and organizational performance relies on how well its members can improve the organization's knowledge base, assimilate various knowledge areas, and deploy the knowledge for the development of high quality and pioneering products (Eisenhardt and Santos, 2002; Grant, 1996). Lin (2007) proposed a general framework of Knowledge Management (KM) processes which is supported by KBV (see Fig. 1). This framework involves three main aspects: Enablers, Processes and Outcomes. Lin (2007) arranged Enablers into three categories which are: Human, Organizational and Technology. In this framework, Enablers are the mechanism for developing individual, organizational and technological capabilities to facilitate knowledge management in the organization (Lin, 2007). The Processes refers to the process of collecting, sharing and applying the experience, expertise, know-how, and contextual information in the organization. The Outcomes exposes the consequences of the degree of knowledge management effectively achieved in a company's performance, innovation capability and

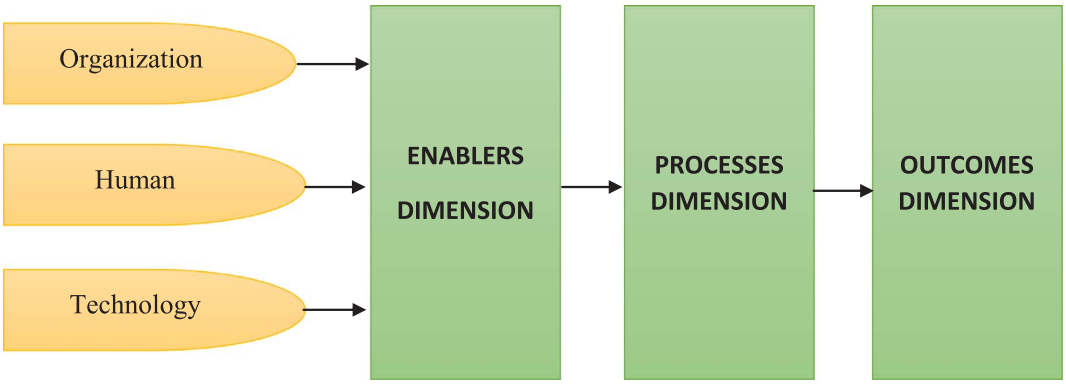

Fig. 1. The General Framework of Knowledge Management Processes (Lin, 2007).

product and service quality (Lin, 2007). Salojärvi et al. (2013) follow this general framework for proposing the model for CKM. Other scholars recognize the existence of different influences on CKM activities, such as Human, Organizational, and Technological factors (Ghobadi, 2015; Salojärvi et al., 2013; Lin, 2007; Feher and Gabor, 2006).

The Generic CKM Framework (see Fig. 2) includes CKM enablers (Human, Organizational and Technological antecedent factors), the CKM processes (Acquisition, Storage, Sharing and Application) and the CKM outcomes. Recent studies have highlighted different outcomes for CKM such as business performance, operational performance, competitive advantages, innovation, service quality and product quality (Tseng, 2016; Fidel et al., 2015a, 2015b; Salojärvi and Sainio, 2015; Choi and Ryu, 2013). In the following sections, three important parts of the Generic CKM Framework (CKM enablers, CKM processes and CKM outcomes) are explained.

2.2.1. CKM Enablers

CKM enablers are mechanisms to activate CKM, break the obstacles of CKM, and provide Organizational, Human and Technological condition to facilitate CKM (Khosravi et al., 2014; Liao and Wu, 2010; Gebert et al., 2002). According to Gibbert et al. (2002), KM enablers are the crucial aspects which put the CKM ideas into practice for attaining CKM outcomes. CKM enablers and CKM practices are essential prerequisites for effectual CKM (Garrido-Moreno et al., 2014).

The KBV enables us to expect that the use of human, organizational and technological capability would improve the knowledge management process which can lead to product and service effectiveness (Durmuşoğlu and Barczak, 2011). Regarding to the Human dimension, most scholars agree that CKM depends on the human characteristics, including skills, experience, motivation, values, and beliefs (Attafar et al., 2013; Nagati and Rebolledo, 2012; Al-Shammari and Global, 2009). In addition, regarding to the Organizational dimension, the atmosphere of the organization is generally made to capture efficiently the benefits of innovation-supportive culture. In the context of CKM, the different aspects of the organizational climate are critical drivers of CKM, such as cross-functional cooperation (Khodakarami and Chan, 2014), reward systems (Garrido-Moreno et al., 2014), and top management support (Salojärvi et al., 2010). Finally, referring the Technology dimension, ICT can be effectively used to facilitate the codification, integration, and dissemination of CKM (Khodakarami and Chan, 2014; Rollins and Halinen, 2005).

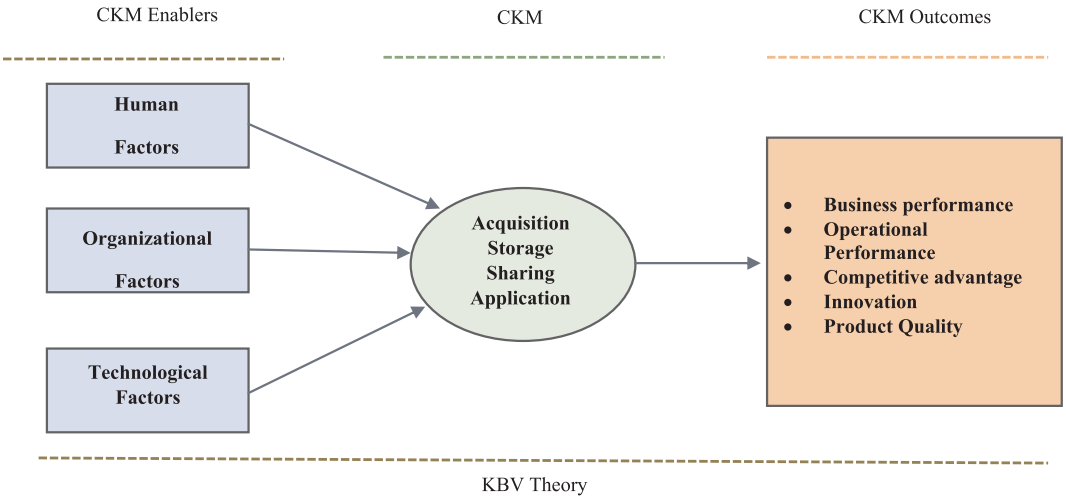

Fig. 2. Generic CKM Framework.

2.2.2. CKM Processes

There are four main processes involved in the CKM, with which the knowledge is employed in the organization (Salojärvi et al., 2010). The process begins with the phases of acquiring and storing the knowledge into the CKM system, and is followed by the phases of disseminating and using of the knowledge among the communities (Al-Busaidi, 2013; Salojärvi et al., 2010). Most of the researchers in the CKM area mentioned that CKM has four dimensions (Khodakarami and Chan, 2014; Yang et al., 2014; Skotis et al., 2013; Mukherji, 2012; Talet, 2012; Buchnowska, 2011; Ranjan and Bhatnagar, 2011; Gibbert et al., 2002). In addition, Yang et al. (2014) measures CKM latent variable with four aspects (Acquisition, Storage, Dissemination and Utilization).

2.2.3. CKM Outcomes

Scholars have discussed different outcomes of CKM such as improving the efficiency of the firm's operation (Hammami and Triki, 2011), enhancing the quality of products and service (Alamgir and Quaddus, 2012). This pertains to enhancing the business entity's capability to identify customer requirements as well as the business and operational performance (Aho and Uden, 2013; Alamgir and Quaddus, 2012). The KBV theorizes that CKM might generate a long-term, viable competitive advantage for the business entity as CK-based resources are socially intricate and tough to imitate (Hammami and Triki, 2011).

Dous et al. (2005) conducted a survey in the different industries and found that improving the product quality is one of the important outcomes of CKM, they discussed product and service quality is the part of the performance outcome of CKM. Al-Busaidi (2013) also found that the acquisition of CK is positively linked to the products' performance (Al-Busaidi, 2013). Thus, product quality is one of the main CKM outcomes. However, the effect of CKM on product quality in the field of software development seems to be one of the less explored and examined topic.

2.2.4. Software Quality

Quality is the ability of a set of intrinsic characteristics to satisfy requirements. The phrase "satisfaction of customer requirements" (Kannabiran and Sankaran, 2011) encompasses several currently agreed-upon definitions of the software quality. In this study, in order to measure the software quality construct, software quality attributes need to be measured. The review was conducted to extract more iterative attributes of software quality in the literature and use them to measure software quality in the model. According to the result of this review, Reliability, Efficiency, Usability, Maintainability and Functionality were found to be more iterative than other attributes in the literature. Kannabiran and Sankaran (2011) used the same attributes in their research for measuring the software quality construct.

3. Research methodology

According to Kumar (2012), explaining how to answer the research questions is the main function of research design, which leads the researchers from broad assumptions to detailed methods of data collection and analysis. The research design framework of this study is illustrated in Fig. 3. The following subsections thoroughly explain each phase and their stages.

i. In order to identify the existing research gap and challenges in the context of ES quality literature, a review was conducted. To this end, the lack of comprehensive research on enhancing ES quality by using the CKM was found. Accordingly, the major question of the current study that reflects the gap in the literature was emerged as "What are the antecedent factors that influence the CKM for the ES quality improvement in the ES development companies?" Therefore, to address the main question of this study from the lens of the Generic CKM Framework, three other questions were asked: (1) what are the Human, Organizational and Technological antecedent factors that impact CKM in the organization? (2) what are the antecedent factors that influence CKM for the ES quality improvement in the ES development companies? (3) what is the suitable research model that aims at fostering the ES quality by using CKM factors within the ES development companies?
ii. The first objective of this study was to identify the Human, Organizational and Technological antecedent factors that impact CKM in the organization. To this end, a comprehensive systematic literature review was conducted. In order to select the appropriate studies for extracting the CKM antecedent factors, seven databases (AISeL, Emerald Insight, IEE Explore, Science Direct, Scopus, Springerlink, Taylor & Francis Online) were explored. Moreover, the articles were selected by filtering the results based on title, keywords and by reading the abstract and using inclusion and exclusion criteria. The result of our searches showed that since 2011, the number of articles regarding CKM has grown considerably. Most of the new CKM articles have investigated CKM outcomes. Therefore, new trends in CKM illustrated the studies about the relationship between CKM and organizational performance, the CKM and organizational learning and innovation, CKM and the product and service quality. However, studies regarding the CKM enablers are less explored. Thus, 72 articles from 2002 until 2016 were selected. After reviewing these articles, 22 CKM antecedent factors were extracted. Antecedent factors were categorized to Human, Organizational and Technological factors. These factors were extracted from the articles that investigated CKM in the different context and countries. The selected studies explored CKM factors in the 14 different contexts. The selected studies were performed in the 19 different countries, of which most of them are developed countries. Then, the research methods of selected articles were inspected. The most articles have used survey method. The result of extracting the CKM antecedent factors showed that "Customer-Centric Culture", "Collaboration System" and "CRM Technology Infrastructure" have the most frequency in the literature, while "Intellectual Property", "Program Champion" and "Trust" are less iterative factors (see Table 1).
iii. The second objective of this study was focused on the ranking of potential factors that influence CKM for the ES quality improvement in the context of the ES development companies. The Theoretical CKM Model was developed based on 22 antecedent

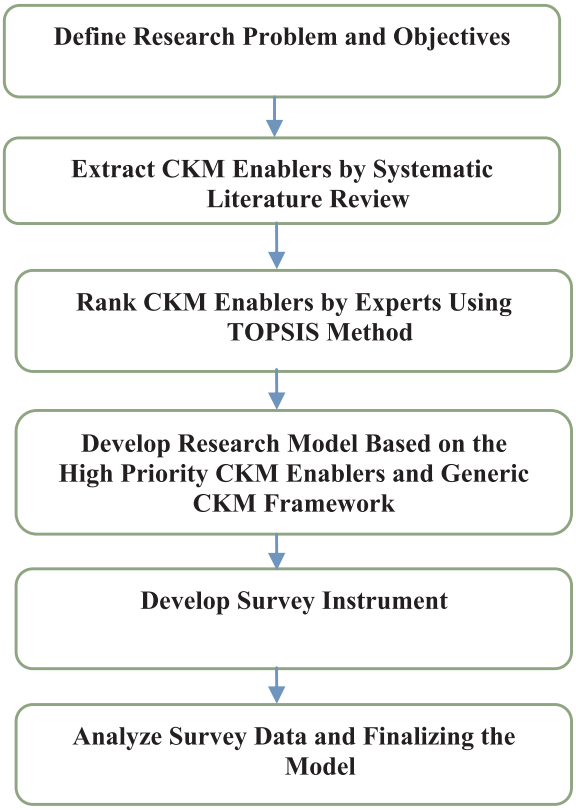

Fig. 3. Research Design Framework.

Table 1
The Frequency of CKM Antecedent Factors in the Literature.

CKM Antecedent Factors	Frequency
Customer-centric culture	38
Collaboration system	29
CRM technology infrastructure	29
CKM Strategy development	28
Individual competences and skills	25
Community of practice	24
CK oriented business process	20
Reward system	20
Key customer support	18
Top manager support	18
Individual motivation	17
Training	17
Cross-functional cooperation	14
Customer involvement	12
Integrated knowledge repository	12
Social media	11
Customer knowledge quality	8
Knowledge map	7
Provide privacy for customers	5
Trust between customer and company	5
Program champion	4
Respect to the intellectual property	4

CKM factors that have been extracted from the literature. The experts in the field of ES development in Iran evaluated the proposed model. The Theoretical CKM Model is developed by extracting the antecedent factors from the literature. Then, Technique for order of Preference by Similarity to Ideal Solution (TOPSIS) as a Multi-Criteria Decision Making (MCDM) technique is applied to find the importance level of factors regarding CKM development in the software companies. 31 experts in the ES development companies determined the weight and priority of the factors. From the experts' viewpoint, the results showed that

Table 2
Final Ranking of CKM Antecedent Factors.

CKM Antecedent Factors	Rank
Customer involvement	0.593590
Customer-centric culture	0.590937
CKM strategy development	0.590003
Collaboration system	0.587413
Cross-functional cooperation	0.580199
Individual competences and skills	0.572135
Trust between customer and company	0.568038
Top manager support	0.564566
CRM technology infrastructure	0.558364
Training	0.547299
Knowledge map	0.543385
Key customer management	0.390853
Reward system	0.383553
CK oriented business process	0.383275
CK quality	0.375244
Individual motivation	0.368001
Program champion	0.341885
Integrated knowledge repository	0.341851
Community of practice	0.334415
Social media	0.326380
Provide privacy for customers	0.309822
Respect to the intellectual property	0.308688

CKM antecedent factors can be categorized into high priority and low priority groups. 11 factors from the extracted antecedent factors were in the high importance group. Therefore, these factors have been considered which are critical for the successful implementation of CKM. In addition, high priority organizational factors ("Customer involvement", "Customer-centric culture", "CKM strategy development", "Cross-functional cooperation", "Top manager support", "Organizational training") activate other factors and provide the appropriate condition for CKM. Furthermore, high priority technological factors ("Collaboration system", "CRM technology infrastructure", "Knowledge map") facilitate CKM in the organization. Moreover, high priority human factors ("Individual competencies and skills", "Trust between customer and company") are activated and influenced by the organizational and technological conditions (see Table 2).

iv. In this study, the Generic CKM Framework is used to develop the research model. This framework shows the sequence effect of three aspects (Enablers, Processes and Outcomes). In addition, in this research, the main outcome of using CKM is software quality improvement. Therefore, the research model is developed based on the high priority CKM factors which are extracted from the literature and evaluated by the ES development experts (see Fig. 4).

v. After developing the theoretical model and defining the research hypotheses, measurement items were extracted from the literature to evaluate the model whether the research hypotheses are supported or rejected (see Table A1 in Appendix A). To achieve this objective, this study developed valid and reliable measurement items for the hypothesized constructs and the relationships in the proposed research model. Hair et al. (2013) provided some criteria to identify the construct type which can be in two categories, formative or reflective. According to Hair et al. (2013), CKM and Software Quality as shown in Fig. 4 are multidimensional constructs and formative and the other constructs are reflective. The most of the contemporary researchers used the existing measurement items in the literature and revised them regarding to the purpose and the context of their research (Ramirez et al., 2013). The same approach is followed. Therefore, the measurement items are adopted from the previous validated sources. The questionnaire was evaluated using content validity and a pilot study. Content validity identifies that to what degree measurement items reflect the operational definition of a construct. A Content Validity Index (CVI) approach was used to validate the measurement items in term of relevancy and simplicity. During the content validity, the number of measurement items was reduced from 50 to 46. Some questions were refined in their expression and wording. The pilot study assessed the reliability and validity of the measurement items. The pilot testing has a role in ensuring that the designed instrument functions well. In the pilot study, 48 completed questionnaires from the ES development companies were collected. In this step, two instrument items were eliminated because of low outer loading. All other instrument items were confirmed for the data collection.

vi. After designing a valid and reliable measurement instrument and based on the target population, survey data were collected. The data were analyzed using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method with the aid of SmartPLS 2.0 statistical software. The results of the analysis were used to finalize the conceptual model.

4. Hypothesis formulation

Based on the selected antecedent factors that effect on the CKM and the relation between the CKM and the software quality, 12 research hypotheses were developed which are explained as follows.

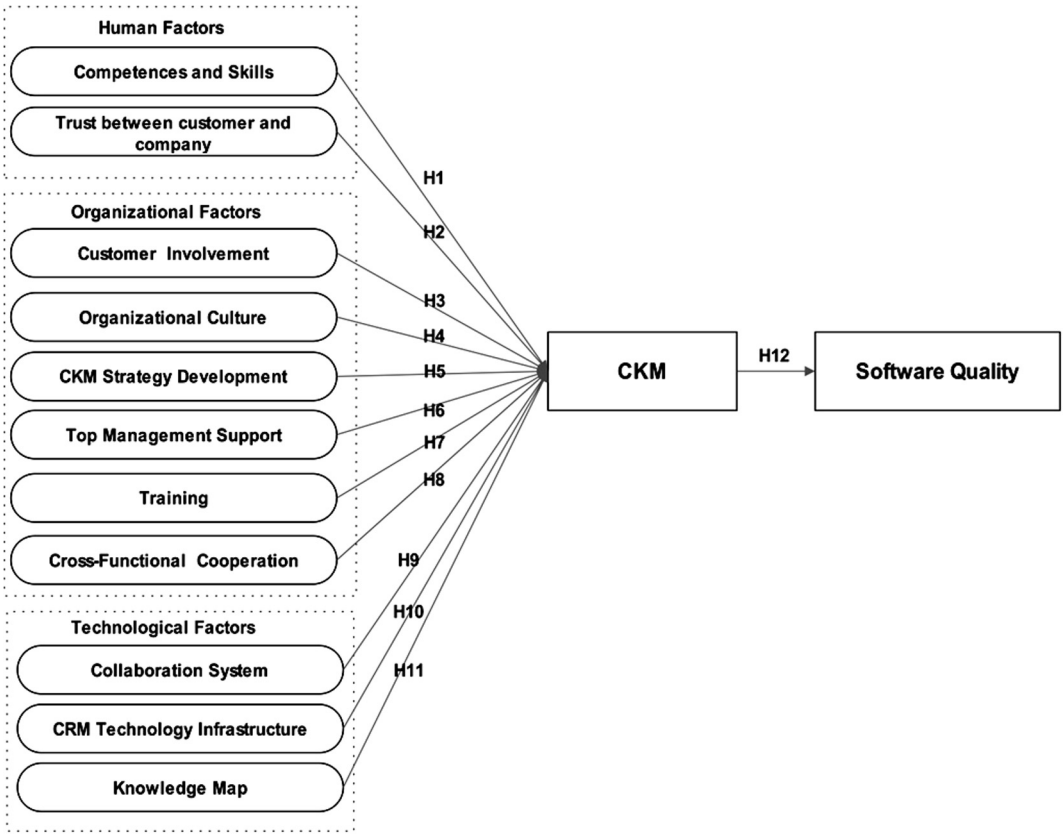

Fig. 4. Research Model.

4.1. Individual Competences and Skills

This pertains to all the aptitudes and skills of workers in obtaining, sharing and utilizing the customer knowledge. Previous empirical studies found a positive relationship between individual competences and skills and CKM (Tseng and Fang, 2015; Attafar et al., 2013; Hair et al., 2013; Wu et al., 2013; Wilde, 2011). The higher levels of individual competencies and skills are associated with the successful CKM in the ES development context (Aho and Uden, 2013). Therefore, this leads to the following hypothesis:

H1. Individual competences and skills positively influence the CKM in the ES development context.

4.2. Trust between Customer and Company

According to Skotis et al. (2013), trust refers to the avoidance of opportunistic behaviors to gain CK and the parallel improvement of the firm's reputation and image. There is an empirical evidence that trust between customer and company is significant and positively related to the CKM (Vaezitehrani, 2013; Wu et al., 2013; Lin et al., 2006). Therefore, the following hypothesis is suggested:

H2. Trust between customer and company positively influences the CKM in the ES development context.

4.3. Customer involvement

Customer involvement refers to the participation and cooperation of the customers in the prelaunch phase of a development or enhancement of product/service, which has four phases: (1) Idea Generation, (2) Concept Development, (3) Product Design and (4) Prototyping/Testing (Lorenzo-Romero et al., 2014; Lohan et al., 2011). Customer involvement is a valuable source for the CKM since the amount of customer involvement can improve the degree of knowledge that would be gathered from the customer (Mukherji, 2012). Thus, the customer involvement is positively related to the CK development (Aho and Uden, 2013; Zogaj and Bretschneider, 2012). Accordingly, the following hypothesis is proposed:

H3. Customer involvement positively influences the CKM in the ES development context.

4.4. Customer-Centric culture

The CKM as a customer-oriented business approach is one of the significant resources in firms that assist them to transform themselves into a customer-centric situation (Nejatian et al., 2011). Al-Shammari and Global (2009) noted that successful CKM requires transformation of the organizations from product–centric to customer centric and from hoarding to a sharing culture. Hence, the following hypothesis is proposed:

H4. Customer-Centric Culture positively influences CKM in ES development context.

4.5. CKM Strategy Development

This pertains to the organizational approach that investigates CK as a prized source of product and process enhancement, and simplifies the process of sharing, acquiring and implementing consumer knowledge (Aho and Uden, 2013). Khodakarami and Chan (2014) mentioned that an effective strategy can be an important organizational factor that influence the CK creation efforts. Hence, the following hypothesis is proposed:

H5. CKM strategy development positively influences the CKM in the ES development context.

4.6. Top management support

This pertains to the processes through which the top management indicates its backing for the generation and assimilation of the CK within the organization (Campbell, 2003). The support of top management has been found to be critical for the CKM success in many studies (Salojärvi et al., 2010; Rollins and Halinen, 2005). Therefore, the following hypothesis is suggested:

H6. Top management involvement positively influences the CKM in the ES development context.

4.7. Organizational training

This refers to the CKM training program for the employees to empower them, to absorb, share and apply the CK effectively. It was remarked by Lyu et al. (2009) that, utilizing the CK depends on the personnel training. The previous studies showed that employee training has positively associated with the CKM enhancement in the firms (Garrido-Moreno et al., 2014; Khodakarami and Chan, 2014; Talet, 2012; Garrido-Moreno and Padilla-Meléndez, 2011; Shieh, 2011; Gebert et al., 2002). Accordingly, the following hypothesis is proposed:

H7. Training program positively influences CKM in ES development context.

4.8. Cross-Functional cooperation

This refers to the cooperation among the different departments in a company. Shieh (2011) and Nejatian et al. (2011) argued about the importance of cross-functional cooperation for the CKM. Khodakarami and Chan (2014) mentioned that the independency of the collaborative systems within internal departments and the lack of cross-functional cooperation are the barriers of the CKM. Then, the following hypothesis is proposed:

H8. Cross-functional cooperation positively influences the CKM in the ES development context.

4.9. CRM Technology infrastructure

This refers to the information technology infrastructure such as CRM and other software and hardware systems that facilitate the management of the customer data and information (Salojärvi et al., 2010; Rollins and Halinen, 2005). The CRM technical infrastructure can help the organization not only by organizing the knowledge about and from the customers, but also help the service employee to provide the knowledge for the customers and solve their problems (Skotis et al., 2013; Talet, 2012; Dous et al., 2005). Hence, we propose the following hypothesis:

H9. CRM technology positively related to the CKM in the ES development context.

4.10. Collaboration system

Collaboration system is an information system which is used to facilitate efficient sharing of the documents and knowledge between the teams and individuals in an enterprise (Chan, 2009; Bueren et al., 2004; Gebert et al., 2002). Shieh (2011) indicated that the efficiency of the collaboration system and the team operation has a positive relationship with the CKM. Smith and McKeen (2005) noted that developing a collaboration system that support communities of practice for customers is necessary for successful CKM.

Thus, we propose the following hypothesis:

H10. Collaboration system positively related to the CKM in the ES development context.

4.11. Knowledge map

A customer knowledge map is a navigation aid to discover the sources of explicit and tacit CK by illustrating how CK flows through the organizations. The knowledge map would act as a reference in the development of KM to support CRM (Talet, 2012). The previous studies found a positive relationship between knowledge map and successful CKM in the organizations (Bagheri et al., 2015; Mukherji, 2012; Smith and McKeen, 2005; Gebert et al., 2002). Then, the following hypothesis was proposed:

H11. Knowledge map positively influences the CKM in the ES development context.

4.12. CKM and Software quality

CK plays a vital role in developing the quality software (Prabhu et al., 2011). Yeung et al. (2008) noted that CK enhances the product quality in the supply chain environment. The previous studies found a positive relationship between CKM and product quality in the organizations (Aho and Uden, 2013; Al-Busaidi, 2013; Wu et al., 2013; Talet, 2012; Kannabiran and Sankaran, 2011; Prabhu et al., 2011; Yeung et al., 2008; Lin et al., 2006; Stefanou et al., 2003). Then, the following hypothesis is proposed:

H12. CKM positively influences the Software Quality in the ES development context.

5. Data analysis and discussion

5.1. Profile of respondents

The present study focuses on the software companies in Iran that produce ES such as CRM, Accounting Systems, and Enterprise Resource Planning (ERP). The respondents in this study are involved in the decision-making and handling customer inquiries such as the Chief Customer Officer, Chief Commercial Officer, Chief Product Officer, and Chief Executive Officer, who are highly knowledgeable about the management of CK and product quality. The Computer Trade Organization (CTO) in Iran is responsible for validating the company capabilities. Companies that want to work in the field of computer hardware and software need to get a license from the CTO before working in this area. CTO works under the Supreme Council of Informatics (SCI). The SCI is a high-level government body that monitors and ranks all active companies in the Iranian informatics sector. According to the latest statistics from the CTO website, 283 software companies are active in the field of ES development. This study uses the CTO database. The contact number, mail address, and email of these companies are available in the CTO database. The International Exhibition of Electronic Computers and IT (ELECOMP) is a big annual ICT exhibition in Tehran. This event showcases the products like electronics and software products from the manufacturer and retailer related services companies.

In this study, the data collection began at ELECOMP 2015. 52 ES development companies were presented at the exhibition, all of which were given a survey questionnaire. A total of 33 (64%) valid questionnaires were collected. For the next phase of data collection, the rest of the ES development companies were called by telephone. 166 of these companies agreed to cooperate with this study. In all, 166 questionnaires along with a cover letter, prepaid return envelope, and a CTO's permission letter were dispatched to the partaking firms. The respondents were solicited to consider their CKM conditions and the customer feedback in their responses. A structured mail questionnaire was employed as a survey instrument. Several calls were made to the companies as a reminder. A total of 109 responses were received, and the response rate was 65 percent at the company level (109/166). However, only 95 responses were valid. An initial notification by phone, CTO's letter of permission for gathering data, and assurance of privacy and confidentiality were used to enhance the rate of response. Furthermore, the researcher promised to offer a descriptive summary of the research outcomes to respondents.

In the last phase of data collection, to improve the response rate, companies were called by telephone. The researchers visited the site of some companies to collect data face to face. 36 valid questionnaires were collected in this phase. A total of 164 valid questionnaires were collected from 283 software companies (a response rate of 57.9%). The minimum number of respondents was calculated using G*Power software. All observations with the missing data were excluded from the analysis because the number of cases was sufficient to be used in the selected statistical techniques. The number of the valid cases was larger than the required number of 123 cases as determined by the G*Power analysis.

The job function reported by the respondents was widely distributed between the Chief Commercial Officer (43%) to Chief Executive Officer (15%), and the majority of them (53%) had more than 10 years working experience in the field of software development. Most respondents reported (72%) 50–250 full-time employees in their organization. In this study, the definition of SMEs provided by the European Commission (2005) was adopted, which stipulates that micro enterprises have fewer than ten employees; small enterprises have 10–49 employees, medium-sized firms have 50–250 employees, and big organizations have more than 250 employees (Durst and Runar Edvardsson, 2012). Therefore, in this study, 72% of the companies were medium-sized firms and 18% of them were small enterprises. Only 10% of the respondents were from the big companies. The CRM experience variables represent how long a company has implemented CRM strategies (Garrido-Moreno and Padilla-Meléndez, 2011). In addition, the

Table 3
Profile of Survey Respondents.

Gender	%	Education	%	Age	%
Respondents profile					
Male	52	Bachelor's	76	26–35	49
Female	48	Master's	19	36–45	39
		Higher	5	46–55	9
				> 55	3
Job Title	%			Working Experience	%
Chief Executive Officer	15			< 5	4
Chief Commercial Officer	43			5–10	43
Chief Customer Officer	25			10–15	27
Chief Product Officer	17			Over 15	26
Employees	%			CRM Experience	%
> 250	10			< 5	28
50–250	72			5–10	50
< 50	18			> 10	22

majority of the software companies (72%) used the CRM strategies for more than 5 years. The majority of the respondents were male (52%), hold Bachelor degrees (76%), and were within the 26–35 age group (49%). An overview of demographic characteristics is given in Table 3.

5.2. Assessment of measurement model

In this study, the data analysis is divided into two steps, which is proposed by Hair et al. (2013). In the initial phase, the measurement model is examined regarding the validity and reliability. After the confirmation of the measurement model, in the next phase, the structural model should be estimated by assessing the relationship between constructs and the predictive capability of the model. Thus, in this section, the measurement model is assessed to make sure that each construct is measured appropriately. Hair et al. (2013) noted that reflective measures need to be evaluated for the indicator reliability, internal consistency, discriminant validity and convergent validity. Internal consistency is estimated using Cronbach's alpha and composite reliability. Indicator reliability is estimated in term of item loading, while convergent validity is evaluated using the value of Average Variance Extracted (AVE). Fornell-Larker criterion together with evaluation of cross-factor loading were used to assess the discriminant validity. The formative constructs are evaluated for their collinearity issue using the tolerance and Variance Inflation Factor (VIF) together with checking the significance and relevance of their indicators' outer weights. The proposed model in this study consists of two endogenous latent variables (dependent) which are formative and 11 exogenous (independent) variables that are reflective. Tables 4 present the validity and reliability assessment of reflective constructs.

As presented in Table 4, the outer loading of all indicators met the threshold of 0.7. The values of Composite Reliability (CR) and Cronbach's alpha of all reflective constructs are well above the acceptable threshold of 0.7. Furthermore, all the AVE values exceed the threshold of 0.5.

To assess the discriminant validity, the measurement model is examined by the criteria of cross-loading values and the more conservative approach of Fornell-Larcker. Table 5 demonstrated the Fornell-Larcker assessment, in which the square roots AVE of each construct should be greater than its correlation with the other constructs.

Table A2 in Appendix A presents the values of cross-loading of indicator items, in which an indicator's outer loadings on the related construct should be greater than of all its loading on other constructs (Hair et al., 2013). Hence, both criteria of cross-loading and Fornell-Larcker assessment were met. Therefore, the measurement model reflected the valid and reliable internal consistency, indicator reliability, discriminant and convergent validity regarding the values of their outer loading, composite reliability, Cronbach's alpha, AVE, cross-loading and Fornell-Larcker, respectively.

The formative constructs of the CKM and Software Quality were assessed regarding their collinearity issue and also the significance and relevance of their indicators' outer weights. The results of validity and reliability of these constructs are illustrated in Table 6.

According to Table 6, the result shows that there are no collinearity issues with the formative constructs as the measurement criteria of tolerance and VIF both met the thresholds of more than 0.2 and less than 5, respectively, for each indicator of the formative constructs (Hair et al., 2013).

5.3. Assessment of the structural model

In the first step, the structural model needs to be evaluated for the collinearity issues by assessing the value of Variance Inflation Factor (VIF) and the level of tolerance. Then, the significance and relevance of the structural model should be examined using path coefficient values and standard errors (t-values) which are obtained through the application of bootstrapping technique. Afterwards,

Table 4
Factor Loadings and Reliability of Reflective Constructs Using PLS-SEM.

Construct	Item	Outer loading	Cronbach's α	CR	AVE
Trust	TR 01	0.833	0.777	0.871	0.692
	TR 02	0.815			
	TR 03	0.845			
Competencies and Skills	CO 01	0.919	0.859	0.914	0.780
	CO 02	0.848			
	CO 03	0.881			
Customer Involvement	CI 01	0.899	0.841	0.904	0.759
	CI 02	0.816			
	CI 03	0.895			
Organizational Culture	OC 01	0.824	0.833	0.889	0.667
	OC 02	0.875			
	OC 03	0.815			
	OC 04	0.746			
CKM Strategy Development	SD 01	0.832	0.844	0.906	0.763
	SD 02	0.910			
	SD 03	0.875			
Cross-Functional Cooperation	CF 01	0.827	0.845	0.895	0.681
	CF 02	0.838			
	CF 03	0.843			
	CF 04	0.789			
Senior Management Support	TS 01	0.866	0.834	0.900	0.751
	TS 02	0.858			
	TS 03	0.874			
Training	TN 01	0.856	0.859	0.900	0.750
	TN 02	0.857			
	TN 03	0.775			
CRM Technology Infrastructure	TI 01	0.806	0.782	0.873	0.696
	TI 02	0.855			
	TI 03	0.840			
Collaboration System	CS 01	0.786	0.767	0.867	0.686
	CS 02	0.773			
	CS 03	0.916			
Customer Knowledge Map	KM 01	0.814	0.843	0.904	0.759
	KM 02	0.901			
	KM 03	0.896			

Note: CR = Composite Reliability and AVE = Average Variance Extracted.

Table 5
Fornell-Larcker Criterion Results.

	CF	CI	CK	CO	CS	KM	OC	SD	SQ	TI	TN	TR	TS
CF	0.825												
CI	0.666	0.871											
CK	0.758	0.756	F										
CO	0.675	0.610	0.735	0.883									
CS	0.713	0.610	0.730	0.630	0.828								
KM	0.321	0.340	0.375	0.406	0.289	0.871							
OC	0.402	0.414	0.511	0.437	0.407	0.264	0.817						
SD	0.391	0.403	0.484	0.459	0.438	0.080	0.290	0.874					
SQ	0.541	0.484	0.629	0.493	0.459	0.269	0.307	0.222	F				
TI	0.574	0.582	0.666	0.628	0.552	0.149	0.395	0.528	0.327	0.835			
TN	0.017	0.078	0.081	0.177	-0.001	0.243	0.122	0.175	0.029	0.166	0.866		
TR	0.694	0.706	0.726	0.592	0.661	0.306	0.311	0.385	0.371	0.496	0.067	0.832	
TS	0.223	0.275	0.334	0.274	0.183	0.119	0.152	0.146	0.152	0.143	0.033	0.236	0.867

Note: **F** indicates formative construct.

the level of R-square (R^2) should be reported. R^2 reflects the amounts of variance of the dependent variable, which is explained by its predictor constructs in the structural model (Hair et al., 2013). The value of R^2 ranges from 0 to 1 and the higher values indicate the better prediction capability of the model via PLS path modeling.(Lin et al., 2012; Ifinedo, 2011; Chow and Chan, 2008). Table 7

Table 6
Validity and Reliability Assessment for Formative Constructs.

Construct	Measure	Collinearity assessment		Significance of outer weight[a] (> 1.96)
		Tolerance (> 0.2)	VIF (< 5)	
CKM	CK1	0.406	2.461	3.0351
	CK2	0.394	2.539	3.0864
	CK3	0.442	2.265	3.9312
	CK4	0.373	2.679	5.7806
Software Quality	SQ1	0.946	1.057	4.0313
	SQ2	0.878	1.139	3.3079
	SQ3	0.936	1.068	2.293
	SQ4	0.916	1.091	4.1632
	SQ5	0.922	1.084	2.6378

[a] Results based on the application of bootstrapping method.

Table 7
Collinearity Assessment for the Structural Model.

Construct	Tolerance	VIF
CF	0.352	2.839
CI	0.382	2.615
CO	0.384	2.604
CS	0.397	2.518
KM	0.721	1.388
OC	0.755	1.325
SD	0.650	1.538
TI	0.454	2.201
TN	0.859	1.164
TR	0.379	2.638
TS	0.898	1.114

illustrated the result of the collinearity assessment. The results show that the values of tolerance are more than 0.20 and the values of VIF are less than 5. Thus, they passed the thresholds. Consequently, all the constructs included in the proposed model were not correlated and no construct is needed to be eliminated from the model.

The next step for evaluating the structural model is the assessment of path coefficients that are the result of the PLS algorithm. The path coefficient (β) has standard values between −1 and +1, in which a value closer to +1 resembles a strong positive relationship and a value closer to −1 reflects a strong negative relationship. In addition, to examine the significance of path coefficients the t-values are assessed using the criteria of p-values. While there was no direct way to obtain p-values. In this study, the p-values are calculated by using built-in function of MS Excel named as TDIST in which its arguments are the t-value, degree of freedom, and the number of tails for the distribution (in this case two-tailed test), and the output of this function is the p-value.

The path coefficient (β) indicates the strengths of the relationship between the independent and dependent variables (Ko et al., 2005). The hypothesis testing is done by following the guidelines proposed by Chin (1998). He recommended that the path significance can be estimated through t-tests values by using the bootstrapping procedure. Normally, t-value > 1.96 means significant level. In addition, based on previous studies, p-value < 0.05 confirms that related hypothesis is significant (Ifinedo, 2011). The PLS bootstrapping technique was utilized to measure significance as indicated by t-values in the PLS output (Hair et al., 2013). The PLS bootstrapping algorithm uses mean replacement for the missing values. The results reported in Table 8 include (1) the path coefficients (β), (2) the path's corresponding t-value with a notation of the associated level of significance, and (3) the p-values are used to indicate whether the relationship of the constructs are significantly or insignificantly correlated. Since the PLS method does not offer significance tests as a part of the general evaluation procedure, this approach is consistent with the recommendations in the previous studies published in the information systems journals (Lin et al., 2012). According to Backhaus et al. (2003, 2009), there is not any agreement regarding the acceptable threshold values of R^2. However, the larger R^2 is, the larger the percentage of variance explained (Götz et al., 2010). Chin and Dibbern (2010) describes R^2 values of 0.67, 0.33, and 0.19 in the PLS path models respectively as substantial, moderate, and weak.

The R^2 values of "CKM" and the "Software Quality" which are two dependent constructs of this research are 0.797 and 0.396, which are relatively substantial and moderate, respectively. As presented in Fig. 5, all the path coefficients were significance ($p < 0.01$) except the path coefficient of relationships between "CKM" and "Strategy Development" ($p = 0.344$), "Organizational Training" ($p = 0.514$), and "Customer Knowledge Map" ($p = 0.164$).

Table 8
Summary of the Structural Model.

Hypothesis	Description	Path Coefficient	*t*-value	*p*-Value	Significance Level	Results
H1	CO - > CK	0.130	2.416	0.017	**	Supported
H2	TR - > CK	0.156	2.227	0.027	**	Supported
H3	CI - > CK	0.181	2.721	0.007	***	Supported
H4	OC - > CK	0.113	2.523	0.013	**	Supported
H5	SD - > CK	0.044	0.948	0.344	NS	Not Supported
H6	TS - > CK	0.101	2.638	0.009	***	Supported
H7	TN - > CK	-0.035	0.653	0.514	NS	Not Supported
H8	CF - > CK	0.147	2.187	0.030	**	Supported
H9	TI - > CK	0.152	2.349	0.020	**	Supported
H10	CS - > CK	0.144	2.489	0.014	**	Supported
H11	KM - > CK	0.065	1.397	0.164	NS	Not Supported
H12	CK - > SQ	0.629	11.486	0.000	***	Supported

Note: NS = not significant.
*p < 0.10. **p < 0.05. ***p < 0.01. Hair et al. (2013).

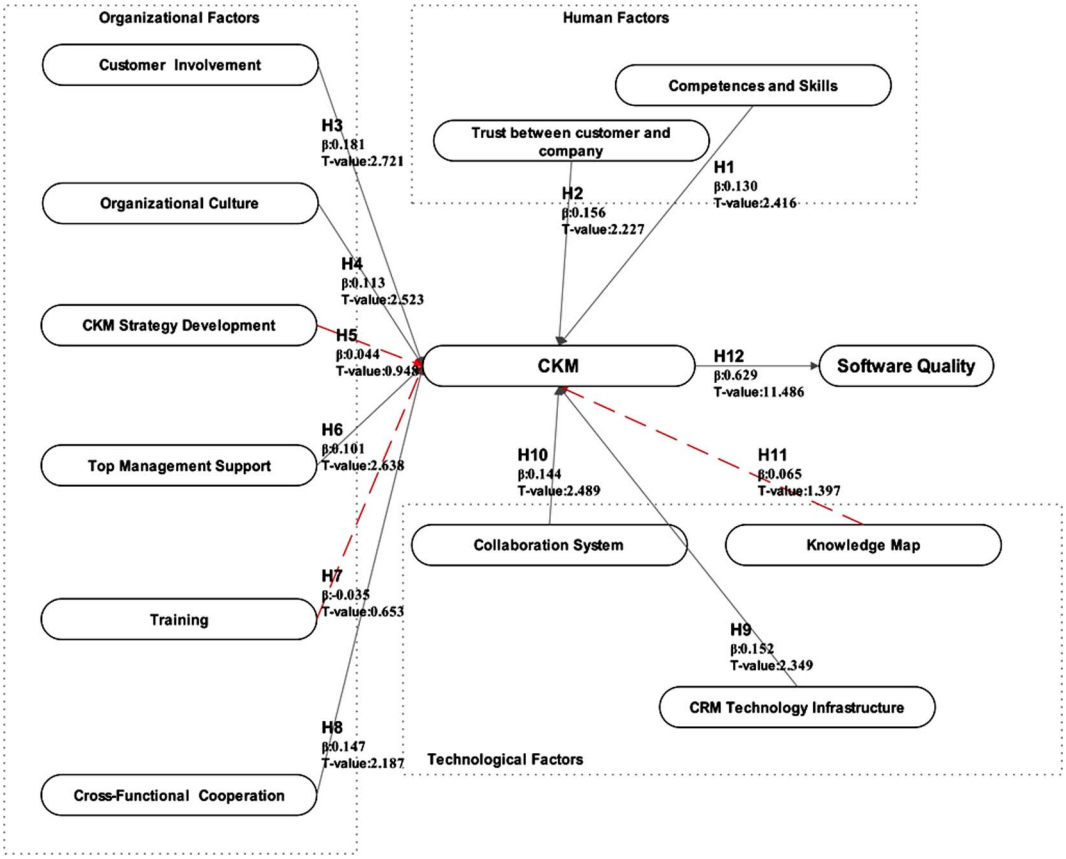

Fig. 5. Final Research Model.

5.4. Discussion

The results of this study confirmed that "Individual Competences and Skills" has a significant impact on CKM in the ES development. This finding is in line with the recent studies by Khodakarami and Chan (2014) and Skotis et al. (2013), which identified the important role of skills and expertise to effectively manage the CK. Hypothesis 2 predicts that the "Trust between customer and company" is positively related to the CKM. Confirmation of this hypothesis shows that the most software companies agreed that providing a trusting environment between company and customers encourages customers to share their knowledge and experience with the company. This enables customers to comfortably share knowledge, consult with company's experts, and provide new ideas to produce innovative products and improve the product\service quality. This finding is consistent with Vaezitehrani (2013), Stefanou et al. (2003) and Skotis et al. (2013), who indicated that trust between companies and customers enhances the capability of

organizations to identify, absorb, share, and deploy valuable customer knowledge. The result for Hypothesis 3 showed a positive relationship between the "Customer Involvement" and the CKM. Furthermore, the "Customer Involvement" had the highest impact on the CKM in this study. This indicates that the "Customer Involvement" is the most important factor for improving the CKM in the ES development context. The results of this study are consistent with those of prior studies, which stated that customer involvement is a discriminatory variable for the CKM systems, which considering the extent of customer involvement increases the volume of information/data collected from a customer. In addition, when customer involvement is high, it is easier to generate and gather interactive data (Lorenzo-Romero et al., 2014; Kruse, 2013a, 2013b; Mukherji, 2012). Hypothesis 4, which predicted that the "Customer-Centric Culture" has a positive impact on the CKM, was confirmed in this study. This result is consistent with the findings from Salojärvi et al. (2013), Gibbert et al. (2002) and Tseng and Fang (2015), who noted that CKM is positively affected by the "customer-focused culture".

The results for Hypothesis 5 did not confirm a positive relationship between the "CKM Strategy Development" and the CKM. This means that, in the eyes of organizational decision makers, the strategy of the most software companies might not support the CKM. The demographic data shows that the most software companies in Iran are SMEs (90%). The SMEs face resource constraints (Durst and Runar Edvardsson, 2012). According to Durst and Runar Edvardsson (2012), the majority of SMEs are short of explicit and inclusive KM strategies, and thus have a tendency to deal with the KM on an operational level, emphasizing only the systems and tools. In comparison with the large-sized companies, SMEs have a tendency to be more inclined towards the management of implicit knowledge, and their paths of communication often involve other firms, instead of just within the organization. The SME sector does not seem to be very developed when it comes to knowledge construction, for which it espouses only a highly mechanistic approach and is less engaged in social interaction (Durst and Runar Edvardsson, 2012). Furthermore, for formulating an effective strategy plan, the primary step is to put forward goals of CKM that are consistent with the goals of an organization. However, most small companies do not have enough time, budget, and experience to provide the clear strategic plans regarding the CKM. According to an investigation of 22 software development companies that proposed products in ELECOMP 2014 (Khosravi et al., 2017), 69% of them did not have any solutions or guidelines for gathering customer knowledge. Therefore, lacking systematic processes for CKM in many companies (Salojärvi et al., 2010) and ignoring the utilization of CK in several firms (Davenport et al., 2001), signified that developing a clear CKM strategy in the most of software companies in Iran are not strong.

The results of this study exposed a significant correlation between the "Top management support" and the CKM in the ES development context. Thus, it could be concluded that the top management support relates to and contributes to the variance in CKM. The top management support is a widely accepted condition for the successful implementation of CKM as mentioned in the previous studies (Attafar et al., 2013; Campbell, 2003) and confirmed by the current study.

The research findings implied that organizational training did not significantly contribute to the CKM. This means that, in the eyes of the organizational decision makers, organizational training did not support the CKM in the ES development context in Iran. The SMEs do not have enough budget for employee training, especially as they do not invest for training programs that are not directly related to their core business. Durst and Runar Edvardsson (2012) reported that the most SMEs manifest an informal short-term approach towards the organizational learning. The SMEs try to encourage employees to self-train. In these companies, employees try to learn needed skills from the other coworkers, websites, social media, customers, and other knowledge sharing channels. The employees enhance their knowledge and skills in related areas by knowledge sharing. Therefore, direct organizational training in these organizations is not strong. Thus, software companies should create a self-learning environment where the staff has access to knowledge that enables them to acquire certain skills and competencies (Tseng and Fang, 2015). This may be the reason why the organizational training does not significantly contribute to the CKM.

The result of this study indicated that a positive association between the "Cross-Functional Cooperation" and the CKM was found. Confirmation of this hypothesis illustrated that cooperation between the different departments in an organization has a significant effect on enhancing the CKM. In line with the results of previous studies (Garrido-Moreno et al., 2014; Salojärvi et al., 2013; Nejatian et al., 2011; Campbell, 2003), our findings provide empirical support of the importance of the "Cross-Functional Cooperation" in the CKM. The Hypothesis 9 proposed that the "CRM Technology Infrastructure" has a significant impact on the CKM. The data analysis results confirmed a strong positive relationship between the "CRM Technology Infrastructure" and the CKM. The results of this hypothesis are consistent with the results found by Tseng and Wu (2014) and Salojärvi et al. (2010), who suggested that CRM systems are necessary to support the CKM. Technology can facilitate the way in which customers and employees can contact each other to discuss and share the knowledge. The results of this study signified a positive association between the "Collaboration System" and the CKM in the ES development. Confirmation of this hypothesis demonstrated that the "Collaboration System" in organizations has a significant effect on enhancing the CKM. These findings were confirmed by the results of the previous studies related to the CKM. (Skotis et al., 2013; Mukherji, 2012; Buchnowska, 2011; Gebert et al., 2002).

The Hypothesis 11 proposed that the "Knowledge Map" had a significant impact on the CKM. Contrary to our expectations, the "Knowledge Map" did not contribute significantly to the CKM. It means that, in the eyes of the organizational decision makers, the "Knowledge Map" does not support the CKM in the ES development context in Iran. Thus, according to our results, using the "Knowledge Map" to manage the experts' directories and organize the tacit and explicit CK in the software companies in Iran does not necessarily lead to an active and systematic CKM. This means that, in spite of the decent presence of CKM in the software firms, managing implicit as well as explicit knowledge is more ad-hoc or instinct-based than based on the systematic management of knowledge. Furthermore, the "Knowledge Map" may be positively associated with the earlier stages of processing, attainment and sharing the CK within an enterprise, but the enterprise may not have the aptitudes to use this. According to Tao et al. (2006), their survey showed that 30 percent of the organizations have a "Knowledge Map". The fact that the adoption of "Knowledge Map" is the second to the last among the 15 items of KM implementation is a serious concern (Tao et al., 2006). The same result was reported on

an investigation of the 22 software development companies in Iran that proposed their product in ELECOMP 2014 (Khosravi et al., 2017). 41% of these companies did not have a list of qualified experts (directory) and only 9% of them used the "Knowledge Map" to manage the customer knowledge. This shows that the rate of using the "Knowledge Map" in the software companies is low because the most software companies are small and face limitations in the human resources, time, budget and expertise to manage and create the "Knowledge Map". Thus, it is clear that the most software companies in Iran did not adapt any kind of the "Knowledge Map".

The Hypothesis 12 posited that the CKM is positively related to the "Software Quality". The results of this study support the argument that the CKM considerably enhances the "Software Quality" in the ES development. Throughout this study, the positive impact of the CKM on the software quality is showcased. Hence, it can be concluded that once an organization is able to obtain and share customer information in an effective way, enhancing the product quality through the application of the CK can be acheived.

6. Implications and limitations

6.1. Theoretical implications

This study makes the following theoretical contributions:

Presenting the Generic CKM Framework is the first theoretical contribution that clarified how the CKM antecedent factors lead to the software quality. This framework has justified that CKM is a valuable and rare asset for businesses, which will allow them to respond quickly to the customer needs and adapt to changing the markets (Shi and Yip, 2007). It should be noted that collecting information from and about the customers through relationship and offering a superior value to those customers based on this knowledge will provide a non-imitable advantage (Garrido-Moreno and Padilla-Meléndez, 2011). Thus, knowledge can be treated as an important resource for organizations as per KBV of the firm (Wernerfelt, 1984). The KBV of the firm proposition states that the organization exists to create, transfer and transform knowledge into the competitive advantage (Alamgir and Quaddus, 2012). Therefore, this theoretical framework sheds light on the overall mechanism to successfully enable the CKM in the organizations and the conditions by which the CKM enhances software quality.

To find out the CKM antecedent factors, a comprehensive systematic literature review was conducted and 22 CKM antecedent factors were extracted. Hence, another theoretical contribution of this study that assists the researchers for further research is the awareness of the significance of these extracted factors. The weight and priority of the factors were determined by the experts. Thus, this study provides a significant contribution in the context of CKM by ranking the CKM antecedent factors for the ES development companies. In addition, this research made an important contribution in defining a model for CKM in order to implement CKM successfully for enhancing the product quality. The comprehensive study that shows the Human, Organizational and Technological condition for enhancing CKM in the software companies have been a missing piece of CKM puzzle.

Finally, this study provided a theoretically grounded lens through which to better understand the condition for managing CK and integrating it in the organizational business processes to improve the software quality and thus, achieve the business improvement.

6.2. Practical implications

CK is becoming an increasingly essential strategic advantage for the companies. However, the CK has been often not easy to manage in practice. Overall, this study makes the following practical contributions:

For successfully implementing and deployment the CKM in the software companies, two phases are suggested. In the first phase, the emphasis should be on the high priority CKM antecedent factors group in order to initiate and implement the CKM effectively. Also, practitioners need to consider the high significant factors more than others. Then in the next phase, the managers can focus on the low priority factors to improve the performance of CKM and complete the deployment of CKM. Considering the fact that the most software companies in Iran are SMEs, the human resources and the budget in these companies are limited. Therefore, dedicating the budget and human resource for CKM is very difficult. Consequently, using the result of this study helps them to focus on the high priority CKM success factors that can decrease the risk of CKM implementation failures.

This study has interesting implications for the managers in that it provides a useful model for the successful implementation of the CKM. The results of the empirical test of the model indicated that "Customer Involvement", "Trust between Customer and Company" and "CRM Infrastructure" are the high significant factors, while "Organizational Training", "CKM Strategy Development" and "Knowledge Map" have not significant impact on the CKM in the context of ES development companies in Iran. Therefore, the result of the study shows that "Customer Involvement" is vital for the successful implementation of CKM in the software companies, since the customer involvement provides a valuable and practical knowledge for the companies. Thus, the role of the customer to provide the useful knowledge for the firms is highlighted more in the recent product development literature. Accordingly, this study has suggested that companies have to provide the strong relationship with lead customers in order to absorb and use more CK and develop high quality and innovative software products that fit the customer demands. It is strongly recommended that software companies provide enough resources and plans for involving the leading customers in the process of the software development.

The finding of this research shows that developing and maintaining a system that can facilitate a trustworthy environment in which both customers and the employees could communicate properly and exchange their relative knowledge in an efficient way for enhancing the CKM. The findings of this study also show that how fostering an appropriate CRM technology infrastructure generates value for the customers, enhancing the CKM and empowering the improvement of the products and services.

Finally, this study indicates that a top-rated product quality is favourably and greatly influenced by the rate of the CKM, and in due course, there can be an improvement in the operational performance (Anderson et al., 2004). Considering that customers at times

cannot articulate their demands, the organizations should fortify themselves with the exceptional communication ability to effectually interact with the consumers to attain the knowledge pertaining to their demands. The results of this empirical study rejected the direct influence of the training on the CKM. Thus, the direct organizational training in the software organizations in Iran is not strong. Hence, software companies need to provide a self-learning environment where the employees have access to knowledge that enables them to acquire the certain skills and competencies.

6.3. Suggestions for future studies

First, the context of this study is ES development companies in Iran. The findings can be tested in the other contexts and countries to extend and further verify the results of this study.

Second, this research explored the impact of the CKM on the software quality based on the company's perception. Therefore, it is suggested that future research can focus on a specific company and investigate the effect of the CKM on the software quality from the customers' perception of the company.

Third, proposing the new strategies and policies based on the CKM antecedent factors that help the organizations to reduce the risk of CKM implementation is an open opportunity for further research. In addition, it has a positive impact on the economy as a whole.

Fourth, due to the newness of the present research topic, considering appropriate variables that can facilitate the relationship between the CKM and the software quality is an opportunity for the further research. Thus, the futur research can extend the research model of this study and investigate the effect of the moderators such as company size, industry type and CRM experience on the relationship between the CKM and the software quality.

Finally, although it was recognized that knowledge is either tacit or explicit, the empirical analysis of the study did not make a distinction between these two types of knowledge. Thus, the future studies should examine in more detail the effect of the nature of the knowledge on the CKM and its relationship with the software quality.

7. Conclusion

To shed light on the topic, a model was developed that draws on the Generic CKM Framework to indicate links between the CKM enablers and the CKM as well as the CKM and the software quality. In this research, the proposed model was confirmed in the context of the ES development companies. Of 12 hypothesizes, 3 of them (CKM Strategy Development, Organizational Training and Knowledge Map) were rejected. The results confirmed that the CKM enablers are categorized into the Organizational, Human and Technological factors that have an effective impact on the CKM. The relationship between the CKM (Processes dimension) and software quality (Outcomes dimension) is statistically significant. Thus, the results of this study strongly confirmed and supported the Generic CKM Framework.

The KBV enabled us to expect that the use of Human, Organizational and Technological capabilities improves the KM processes and increases the product and service effectiveness. According to KBV, when developing products and services from tangible resources, the combination and application of those resources plays a vital role, which is related to the function of an enterprise's know-how. Therefore, the Human factors such as Competencies and Skills, Trust between the Customer and Company and Organizational factors such as Organizational Culture, Cross-Functional Cooperation, Customer Involvement, Top Management Support as well as Technological factors such as CRM Infrastructure and Collaboration System enable and influence the CKM in the software organizations.

In this study, 8 CKM enablers were statistically approved that can enhance the CKM and the CKM significantly lead to one of the vital outputs for the software development companies. This outcome is consistent with the KBV theory, which elucidates that knowledge is a distinctive resource and that the performance of an organization (in terms of business, innovation, operations, product & service quality) is dependent on how soundly members of a business entity can improve their knowledge base, assimilate new knowledge and information within the business entity as well as the external sources to the business entity, and apply the knowledge to the formulation of products with excellent quality and novelty.

A

Table A1. Measurement Items of Each Construct.

Construct	Code	Refined Item
Competencies and Skills	CO1	In our company, employees are empowered to share and apply what they have learnt from customer experiences.
	CO2	Our company has employees that are qualified to acquire and manage customer knowledge.
	CO3	In our company, employees have sufficient skills and competencies to manage customer feedback.
Trust between Customer and Company	TR1	Our company has shaped trustworthy relationships with most customers.
	TR2	Most of our customers trust the company to provide suggestions for our products and services.
	TR3	This company has built an environment of trust for its customers, in order to effectively manage customer knowledge.

Customer Involvement	CI1	We often meet customers to discuss their requirements and needs during the software development process.
	CI2	We involve some of our customers during software development activities.
	CI3	Our customers help the company by sharing their knowledge with us to overcome software bugs.
Organizational Culture	OC1	Our company's organizational culture stimulates customer knowledge sharing between employees.
	OC2	The atmosphere of our company encourages employees to absorb and manage customer knowledge.
	OC3	In our company, employees frequently interact with each other to discuss customer-related needs, suggestions and ideas.
	OC4	We share a vision across the organization of how we manage customer knowledge.
CKM Strategy Development	SD1	Our company has established clear business objectives, with respect to customer knowledge management.
	SD3	The company cares about long-term strategies to manage customer knowledge effectively.
	SD4	The firm's business strategies are driven by the objective of perceiving customer knowledge as a valuable source of product innovation and quality improvement.
Cross-Functional Cooperation	CF1	In our company, open and two-way communication exists between different departments to manage customer knowledge.
	CF2	Different departments within the company cooperate and share customer knowledge with each other.
	CF3	In our company, employees spend time discussing customers' future needs with employees from other departments.
	CF4	Our company has established an integrated mechanism for the cooperation of different departments to apply customer knowledge.
Senior Management Support	TS1	The company's senior management considers CKM to be a top priority.
	TS2	Senior management regards CKM as a helpful strategy to increase company profits.
	TS3	In our company, the senior management has provided the necessary resources for CKM.
Training	TN1	In our company, training programs are designed to help employees develop the skills needed to effectively manage customer knowledge.
	TN2	Our company provides a customer knowledge management training program for the employees.
	TN3	In this company, staff training is undertaken that focuses specifically on better customer communication to absorb and store more customer knowledge.
CRM Technology Infrastructure	TI1	This company has an appropriate portfolio of CRM technologies to manage customer knowledge.
	TI2	In this company, CRM technology infrastructure is used to effectively acquire and store customer knowledge.
	TI3	This company uses CRM technology infrastructure to manage customer demands, complaints and suggestions.
Collaboration System	CS1	In our company, a collaboration system is used for the better management of customer knowledge.
	CS2	In our company, a collaboration system assists in the interaction between co-workers to communicate customer complaints and suggestions.
	CS3	The company's collaboration system maintains collaborative communication between software developers to apply customer knowledge.
Customer Knowledge Map	KM1	In our company, employees often use the customer knowledge map to identify customer needs and suggestions.
	KM2	Using the company's customer knowledge map simplifies determining what customer knowledge is available and where.
	KM3	In our company, the customer knowledge map has become the media to organize customer knowledge well.
Customer Knowledge Management (CKM)	CK1	This company has established processes to acquire customer knowledge.
	CK2	Customer knowledge is shared across units for software development projects.
	CK3	Customer knowledge is stored and updated periodically for software development projects.
	CK4	This company utilizes customer knowledge practically to improve product quality.

Software Quality	SQ1	According to customer feedback, most of our customers assert that the company's software products have fulfilled their stated specifications.
	SQ2	Customer feedback shows that the response time of our company's software products is rated as good, and meets user's expectations.
	SQ3	Customer feedback shows that our company's software products are stable and unlikely to fail.
	SQ4	The majority of our customers state that the company's software products are easily understood by the users and convenient to use.
	SQ5	Our company's software can be easily customized to suit new specifications or operating environments.

Table A2. Cross-Factor Loading Test Results.

	CF	CI	CO	CS	KM	OC	SD	TI	TN	TR	TS
CF1	0.828	0.567	0.442	0.548	0.359	0.343	0.236	0.433	0.006	0.572	0.106
CF2	0.838	0.526	0.604	0.646	0.260	0.326	0.341	0.516	0.020	0.568	0.238
CF3	0.844	0.608	0.704	0.641	0.231	0.333	0.396	0.538	-0.002	0.630	0.198
CF4	0.790	0.485	0.438	0.497	0.213	0.327	0.303	0.384	0.034	0.508	0.188
CI1	0.629	0.899	0.603	0.576	0.345	0.398	0.370	0.543	0.126	0.624	0.271
CI2	0.512	0.817	0.404	0.482	0.154	0.267	0.333	0.441	-0.067	0.556	0.162
CI3	0.592	0.895	0.574	0.533	0.372	0.406	0.350	0.531	0.126	0.660	0.276
CO1	0.690	0.638	0.919	0.654	0.390	0.444	0.471	0.635	0.141	0.616	0.298
CO2	0.578	0.557	0.848	0.529	0.299	0.378	0.355	0.534	0.107	0.508	0.217
CO3	0.496	0.392	0.881	0.461	0.385	0.321	0.377	0.474	0.235	0.422	0.197
CS1	0.529	0.485	0.540	0.786	0.243	0.392	0.443	0.453	0.007	0.519	0.168
CS2	0.642	0.511	0.478	0.773	0.211	0.279	0.214	0.474	-0.030	0.513	0.139
CS3	0.584	0.512	0.545	0.917	0.264	0.344	0.444	0.436	0.024	0.604	0.146
KM1	0.290	0.225	0.357	0.185	0.814	0.150	0.065	0.134	0.182	0.212	0.070
KM2	0.256	0.282	0.394	0.240	0.901	0.197	0.054	0.100	0.221	0.262	0.150
KM3	0.298	0.362	0.320	0.313	0.896	0.317	0.089	0.155	0.225	0.312	0.087
OC1	0.219	0.205	0.228	0.243	0.155	0.824	0.221	0.286	0.102	0.155	0.127
OC2	0.262	0.290	0.346	0.280	0.273	0.876	0.171	0.318	0.127	0.195	0.111
OC3	0.297	0.313	0.314	0.293	0.146	0.815	0.192	0.290	0.083	0.251	0.161
OC4	0.485	0.493	0.491	0.471	0.266	0.747	0.337	0.375	0.087	0.375	0.099
SD1	0.333	0.349	0.376	0.338	0.112	0.271	0.833	0.439	0.158	0.290	0.111
SD2	0.364	0.376	0.381	0.424	0.069	0.250	0.910	0.472	0.134	0.352	0.182
SD3	0.327	0.331	0.446	0.383	0.031	0.240	0.876	0.472	0.170	0.364	0.085
TI1	0.491	0.417	0.519	0.388	0.090	0.326	0.436	0.806	0.183	0.345	0.162
TI2	0.472	0.524	0.505	0.472	0.110	0.270	0.479	0.856	0.123	0.366	0.085
TI3	0.474	0.513	0.546	0.513	0.168	0.388	0.410	0.841	0.113	0.519	0.113
TN1	0.001	0.059	0.177	-0.022	0.218	0.123	0.200	0.188	0.945	0.049	0.068
TN2	0.042	0.088	0.143	0.036	0.216	0.073	0.101	0.114	0.876	0.092	-0.029
TN3	-0.004	0.070	0.124	-0.018	0.249	0.188	0.136	0.051	0.769	0.010	0.033
TR2	0.517	0.536	0.457	0.515	0.222	0.221	0.319	0.383	0.101	0.834	0.210
TR3	0.638	0.600	0.482	0.471	0.222	0.212	0.285	0.432	0.022	0.815	0.245
TR4	0.575	0.623	0.536	0.660	0.317	0.339	0.355	0.420	0.048	0.845	0.136
TS1	0.138	0.172	0.197	0.160	0.031	0.121	0.155	0.104	0.014	0.163	0.867
TS2	0.245	0.304	0.275	0.150	0.136	0.160	0.129	0.160	0.042	0.242	0.859
TS3	0.191	0.232	0.235	0.166	0.139	0.111	0.095	0.103	0.029	0.204	0.874

References

Aho, A.-M., Uden, L., 2013. Customer knowledge in value creation for software engineering process. In: 7th International Conference on Knowledge Management in Organizations: Service and Cloud Computing. Springer.

Alamgir, M., Quaddus, M., 2012. Customer relationship management success model: a conceptual framework. In: The 26th Australian and New Zealand Academy of Management Conference (ANZAM), Dec 5–7 2012.:1–39.

Al-Busaidi, K.A., 2013. Empowering organizations through Customer Knowledge Acquisition: a pilot investigation. In: Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois. 9(1):121.

Al-Shammari, M., Global, I., 2009. Customer Knowledge Management: People, Processes, and Technology. Information Science Reference Hershey.

Anderson, E.W., Fornell, C., Mazvancheryl, S.K., 2004. Customer satisfaction and shareholder value. J. Marketing 68 (4), 172–185.

Association for Project Management, 2006. APM Body of Knowledge, 5th ed. APM, Cambridge (UK).

Attafar, A., Sadidi, M., Attafar, H., Shahin, A., 2013. The role of Customer Knowledge Management (CKM) in improving organization-customer relationship. Middle-East J. Sci. Res. 13 (6), 829–835.

Backhaus, K., Erichson, B., Plinke, W., Weiber, R., 2003. Multivariate Analysemethoden–eine anwendungsorientierte Einführung, 10, neu bearb. und erw. Aufl., Berlin/Heidelberg/New York.

Backhaus, K., Erichson, B., Plinke, W., Weiber, R., 2009. Multivariate Analysemethoden. Eine anwendungsorientierte Einführung. Aufl., Berlin ua: Springer.

Bagheri, S., Kusters, R.J., Trienekens, J.J.M., 2015. The Customer Knowledge Management lifecycle in PSS Value Networks: towards process characterization. In: 16th European Conference on Knowledge Management. 16(1):3–4.

Buchnowska, D., 2011. Customer Knowledge Management Models: assessment and proposal. In: Research in Systems Analysis and Design: Models and Methods. Springer, pp. 25–38.

Bueren, A., Schierholz, R., Kolbe, L., Brenner, W., 2004. Customer knowledge management improving performance of customer relationship management with knowledge management. In: 2013 46th Hawaii International Conference on System Sciences. IEEE Computer Society.

Campbell, A.J., 2003. Creating customer knowledge competence: managing customer relationship management programs strategically. Ind. Mark. Manage. 32 (5), 375–383.

Chan, J.O., 2009. Integrating Knowledge Management and relationship management in an enterprise environment. Commun. IIMA 9 (4), 37.

Chin, W.W., 1998. The partial least squares approach for structural equation modeling. In: Marcoulides, G.A. (Ed.), Modern Methods for Business Research. Lawrence Erlbaum Associates, Mahwah, NJ, pp. 295–336.

Chin, W.W., Dibbern, J., 2010. An introduction to a permutation based procedure for multi-group PLS analysis: Results of tests of differences on simulated data and a cross cultural analysis of the sourcing of information system services between Germany and the USA. In: Handbook of Partial Least Squares, pp. 171–193.

Cho, W., Subramanyam, R., Xia, M., 2013. Vendors' incentives to invest in software quality in enterprise systems. Decis. Support Syst. 56, 27–36.

Choi, S., Ryu, I., 2013. Leveraging Customer Knowledge in Electronic Knowledge Repositories for Service Expertise. In: PACIS 2013 Proceedings. 31: 132–145.

Chow, W.S., Chan, L.S., 2008. Social network, social trust and shared goals in organizational knowledge sharing. Inf. Manage. 45 (7), 458–465.

Davenport, T.H., Harris, J.G., Kohli, A.K., 2001. How do they know their customers so well? MIT Sloan Manage. Rev. 42 (2), 63–73.

Dous, M., Salomann, H., Kolbe, L., Brenner, W., 2005. Knowledge Management Capabilities in CRM: Making Knowledge For, From, and About Customers Work. In: AMCIS 2005 Proceedings: 33.

Durmuşoğlu, S.S., Barczak, G., 2011. The use of information technology tools in new product development phases: Analysis of effects on new product innovativeness, quality, and market performance. Ind. Mark. Manage. 40, 321–330.

Durst, S., Runar Edvardsson, I., 2012. Knowledge management in SMEs: a literature review. J. Knowl. Manage. 16 (6), 879–903.

Eisenhardt, K.M., Santos, F.M., 2002. Knowledge-based view: a new theory of strategy. Handb. Strategy Manage. 1, 139–164.

European Commission, 2005. The New SME Definition, User Guide and Model Declaration.

Feher, P., Gabor, A., 2006. The role of knowledge management supporters in software development companies. Soft. Process Improv. Practice 11 (3), 251–260.

Fidel, P., Cervera, A., Schlesinger, W., 2015a. Customer's role in knowledge management and in the innovation process: effects on innovation capacity and marketing results. Knowl. Manag. Res. Practice 9 (1), 132–146.

Fidel, P., Schlesinger, W., Cervera, A., 2015b. Collaborating to innovate: Effects on customer knowledge management and performance. J. Business Res. 68, 1426–1428.

Garrido-Moreno, A., Padilla-Meléndez, A., 2011. Analyzing the impact of knowledge management on CRM success: the mediating effects of organizational factors. Int. J. Inf. Manage. 31 (5), 437–444.

Garrido-Moreno, A., Lockett, N., García-Morales, V., 2014. Paving the way for CRM success: the mediating role of knowledge management and organizational commitment. Inf. Manage. 51 (1), 1031–1042.

Gebert, H., Geib, M., Kolbe, L., Riempp, G., 2002. Towards customer knowledge management: Integrating customer relationship management and knowledge management concepts. In: The Second International Conference on Electronic Business (ICEB 2002).

Ghobadi, S., 2015. What drives knowledge sharing in software development teams: a literature review and classification framework. Inf. Manage. 52 (1), 82–97.

Gibbert, M., Leibold, M., Probst, G., 2002. Five styles of customer knowledge management, and how smart companies use them to create value. Eur. Manage J 20 (5), 459–469.

Götz, O., Liehr-Gobbers, K., Krafft, M., 2010. Evaluation of structural equation models using the partial least squares (PLS) approach. In: Handbook of Partial Least Squares. Springer, Berlin Heidelberg, pp. 691–711.

Grant, R.M., 1996. Toward a knowledge-based theory of the firm. Strateg. Manag. J. 17 (S2), 109–122.

Hair, J.F., Hult, G.T.M., Ringle, C., Sarstedt, M., 2013. A primer on Partial Least Squares Structural Equation Modeling (PLS-SEM). Sage Publications.

Hammami, S.M., Triki, A., 2011. Exploring the information technology contribution to service recovery performance through knowledge based resources. Vine 41, 296–314.

Ifinedo, P., 2011. Examining the influences of external expertise and in-house computer/IT knowledge on ERP system success. J. Syst. Softw. 84 (12), 2065–2078.

Kannabiran, G., Sankaran, K., 2011. Determinants of software quality in offshore development–An empirical study of an Indian vendor. Inf. Softw. Technol. 53 (11), 1199–1208.

Khodakarami, F., Chan, Y.E., 2014. Exploring the role of customer relationship management (CRM) systems in customer knowledge creation. Inf. Manage. 51 (1), 27–42.

Khosravi, A., Ismail, M.A.B., Najaftorkaman, M., 2014. A Taxonomy of Knowledge Management Outcomes for SMEs. In: PACIS 2014 Proceedings. Paper 162.

Khosravi, A., Ab Razak, C.H., Minaei-Bidgoli, b., 2017. Customer Knowledge Management in Software Development: a Descriptive Field Survey. J. Theor. Appl. Inf. Technol. 96 (1).

Ko, D.-G., Kirsch, L.J., King, W.R., 2005. Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. MIS Q 59–85.

Korhonen-Sande, S., Sande, J.B., 2016. Improving customer knowledge transfer in industrial firms: how does previous work experience influence the effect of reward systems? J. Bus. Ind. Marketing 31 (2), 232–246.

Kruse, P., 2013a. Customer Involvement in Organizational Innovation-Toward an Integration Concept. In: Proceedings of the Nineteenth Americas Conference on Information Systems Chicago, Illinois, August 15–17.

Kruse, P., 2013b. External Knowledge In Organisational Innovation-Toward An Integration Concept. In: Proceedings of the 21st European Conference on Information Systems.

Kumar, R., 2012. Research Methodology: A Step-by-Step Guide for Beginners. SAGE Publications.

Liao, S.-H., Wu, C.-C., 2010. System perspective of knowledge management, organizational learning, and organizational innovation. Expert Syst. Appl. 37 (2), 1096–1103.

Lin, H.-F., 2007. Knowledge sharing and firm innovation capability: an empirical study. Int. J. Manpower 28 (3/4), 315–332.

Lin, Y., Su, H.-Y., Chien, S., 2006. A knowledge-enabled procedure for customer relationship management. Ind. Mark. Manage. 35 (4), 446–456.
Lin, T.C., Wu, S., Lu, C.T., 2012. Exploring the affect factors of knowledge sharing behavior: the relations model theory perspective. Expert Syst. Appl. 39 (1), 751–764.
Lohan, G., Lang, M., Conboy, K., 2011. Having a customer focus in agile software development. In: Information Systems Development. Springer, pp. 441–453.
Lorenzo-Romero, C., Constantinides, E., Brünink, L.A., 2014. Co-creation: Customer Integration in Social Media Based Product and Service Development. Proc. Soc. Behav. Sci. 148, 383–396.
Lyu, J.-J., Yang, S.-C., Chen, C., 2009. Transform customer knowledge into company value-case of a global retailer. In: 2009. ICSSSM'09. 6th International Conference on Service Systems and Service Management. IEEE.
Mukherji, S., 2012. A framework for managing customer knowledge in retail industry. IIMB Manage. Rev. 24 (2), 95–103.
Nagati, H., Rebolledo, C., 2012. The role of relative absorptive capacity in improving suppliers' operational performance. Int. J. Oper. Prod. Manage. 32, 611–630.
Nejatian, H., Sentosa, I., Piaralal, S.K., Bohari, A.M., 2011. The influence of customer knowledge on CRM performance of Malaysian ICT companies: a structural equation modeling approach. Int. J. Bus. Manage. 6 (7), p181.
Prabhu, N.A., Latha, R., Sankaran, K., Kannabiran, G., 2011. Impact of knowledge management on offshore software development: an exploratory study. In: 2011 Third International Conference on Advanced Computing (ICoAC). IEEE.
Ramirez, E., David, M.E., Brusco, M.J., 2013. Marketing's SEM based nomological network: Constructs and research streams in 1987–1997 and in 1998–2008. J. Bus. Res. 66 (9), 1255–1260.
Ranjan, J., Bhatnagar, V., 2011. Role of knowledge management and analytical CRM in business: data mining based framework. Learn. Organiz. The 18 (2), 131–148.
Rollins, M., Halinen, A., 2005. Customer knowledge management competence. towards a theoretical framework. In: 2005. HICSS'05. Proceedings of the 38th Annual Hawaii International Conference on System Sciences. IEEE.
Rollins, M., Bellenger, D.N., Johnston, W.J., 2012. Does customer information usage improve a firm's performance in business-to-business markets? Ind. Mark. Manage. 41 (6), 984–994.
Salojärvi, H., Sainio, L.-M., 2015. CRM Technology and KAM Performance: The Mediating Effect of Key Account-Related Knowledge. J. Bus. Marketing Manage. 8, 435–454.
Salojärvi, H., Sainio, L.-M., Tarkiainen, A., 2010. Organizational factors enhancing customer knowledge utilization in the management of key account relationships. Ind. Mark. Manage. 39 (8), 1395–1402.
Salojärvi, H., Saarenketo, S., Puumalainen, K., 2013. How customer knowledge dissemination links to KAM. J. Bus. Ind. Marketing 28 (5), 383–395.
Schaarschmidt, M., Bertram, M., Walsh, G., von Kortzflieisch, H.F., 2015. Customer Knowledge and Requirements Engineering in Customization Projects: a Multi-Method Case Study. In: ICIS 2015 Proceedings. 12(1):111–126.
J., Shi, Yip, L., 2007. Driving innovation and improving employee capability: The effects of customer knowledge sharing on CRM. In: The Global Management & Information Technology Research Conference, New York, 23–26 May 2007.
Shieh, C.-J., 2011. Study on the relations among the customer knowledge management, learning organization, and organizational performance. Serv. Ind. J. 31 (5), 791–807.
Skotis, A., Katsanakis, I., Macris, A., Sfakianakis, M., 2013. Creating Knowledge within a C-Business Context: A Customer Knowledge Management View. In: Collaborative, Trusted and Privacy-Aware e/m-Services. Springer, pp. 264–277.
Smith, H.A., McKeen, J.D., 2005. Developments in practice XVIII-customer knowledge management: adding value for our customers. Commun. Assoc. Inf. Syst. 16 (1), 36.
Sofianti, T., Suryadi, K., Govindaraju, R., Prihartono, B., 2010. Customer Knowledge Co-creation Process in New Product Development. In: Proceedings of the World Congress on Engineering.
Stefanou, C.J., Sarmaniotis, C., Stafyla, A., 2003. CRM and customer-centric knowledge management: an empirical research. Bus. Process Manage. J 9 (5), 617–634.
Talet, A.N., 2012. KM Process and CRM to manage Customer Knowledge Relationship Management. Int. Proc. Econ. Dev. Res. IPEDR 29, 60–67.
Tao, Y.-H., Wu, Y.-L., Li, J.-K., 2006. A taxonomy of knowledge maps in business application. In: Thirty-Fifth Annual Meeting of Western Decision Institute, Big Island, Hawaii, April 11–14. 35(1): 72–81.
Tseng, S., 2016. The effect of knowledge management capability and customer knowledge gaps on corporate performance. J. Enterp. Inf. Manage. 29 (1), 34–71.
Tseng, S.M., Fang, Y.Y., 2015. Customer Knowledge Management Performance Index. Knowl. Process Manage. 22 (2), 68–77.
Tseng, S.-M., Wu, P.-H., 2014. The impact of customer knowledge and customer relationship management on service quality. Int. J. Qual. Service Sci. 6 (1), 77–96.
Vaezitehrani, S., 2013. Customer Knowledge Management in Global Software Projects. Master thesis. Northumbria University Gothenburg, Sweden.
Wang, M.-L., 2015. Learning climate and customer-oriented behaviors: the mediation of customer knowledge. J. Manage. Psychol. 30 (8), 955–969.
Wernerfelt, B., 1984. A resource-based view of the firm. Strategic Manage. J. 5 (2), 171–180.
Wilde, S., 2011. Customer Knowledge Management. Springer.
Wu, J., Guo, B., Shi, Y., 2013. Customer knowledge management and IT-enabled business model innovation: a conceptual framework and a case study from China. Eur. Manage. J. 31 (4), 359–372.
Yang, L.-R., Huang, C.-F., Hsu, T.-J., 2014. Knowledge leadership to improve project and organizational performance. Int. J. Project Manage. 32 (1), 40–53.
Yeung, A.H.W., Lo, V.H.Y., Yeung, A.C.L., Cheng, T.C.E., 2008. Specific customer knowledge and operational performance in apparel manufacturing. Int. J. Prod. Econ. 114 (2), 520–533.
Zhang, Z.J., 2011. Customer knowledge management and the strategies of social software. Bus. Process Manage. J. 17 (1), 82–106.
Zogaj, S., Bretschneider, U., 2012. Customer Integration in New Product Development-A Literature Review Concerning The Appropriateness of Different Customer Integration Methods to Attain Customer Knowledge. In: ECIS 2012 Proceedings. 15 (2): 12–18.