

CUSTOMER KNOWLEDGE MANAGEMENT ANTECEDENT FACTORS
FOR ENTERPRISE SOFTWARE QUALITY

ARASH KHOSRAVI

A dissertation submitted in fulfillment of the
requirements for the award of the degree of
Doctor of Philosophy (Information Systems)

Faculty of Computing
Universiti Teknologi Malaysia

APRIL 2017

Dedicated to my beloved family

ACKNOWLEDGEMENT

I am heartily expressing my greater gratefulness to Allah s.w.t for His blessing and strength that He blessed to me during the completion of this research.

My sincere thanks goes to my supervisor Dr Ab Razak Che Hussin for his continuous motivation, advices, encouragement and support from the starting to the end of my studies.

I am ever grateful to my family, especially my wife, for their support and encouragement. And the very genuine appreciation goes to my father and my mother whom I owe my very existence to the world, whom always gave me motivation and courage to look on the bright side every time I felt unmotivated, whom that never let me down and whom I respect the most in my heart.

ABSTRACT

Customer Knowledge Management (CKM) plays an important role in the production of high quality software products. Previous studies have only focused on the technical aspects of software quality. However, because of the nature of enterprise software, there is a greater dependence on CKM for customization, enhancement, maintenance, and training. As CKM in Enterprise Software (ES) development is still immature, this raises questions on how CKM can help ES development companies to improve their software quality. In this research, Knowledge-Based View (KBV) and Theory of Technology were used to demonstrate the Organizational, Human, and Technological antecedent factors that enable the CKM process and lead to ES quality. Human, Organizational and Technological CKM antecedent factors were identified from the literature. The importance degree of each factor was determined by experts from ES development companies using Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS). Moreover, based on high priority factors, a theoretical model was developed. The proposed model was evaluated by distributing a survey questionnaire to decision-makers in ES development companies. With 164 valid questionnaires received, the collected data was analyzed using the Partial Squares Structural Equation Modelling (PLS-SEM) technique. The results show that Customer Involvement together with Senior Management Support were the most influential factors. There was no impact from Organizational Training, Customer Knowledge Map, and CKM Strategy Development. The results revealed that the impact of CKM on software quality is significant. The model developed in this research can be used as a guideline for the successful application of CKM in enterprise software development companies to improve the software quality.

ABSTRAK

Pengurusan Pengetahuan Pelanggan (CKM) memainkan peranan yang penting dalam menghasilkan produk perisian yang berkualiti tinggi. Penyelidikan terdahulu yang telah dijalankan hanya memfokuskan aspek teknikal produk perisian. Namun begitu, disebabkan sifat semula jadi perisian perusahaan maka terdapat kebergantungan yang lebih tinggi terhadap CKM untuk penyesuaian, penambahbaikan, penyelenggaraan dan latihan. CKM adalah masih muda dalam pembangunan Perisian Perusahaan (ES) maka ini, menimbulkan persoalan tentang bagaimana CKM boleh digunakan untuk membantu syarikat-syarikat yang membangunkan perisian perusahaan bagi meningkatkan lagi kualiti perisian. Dalam kajian ini Pandangan Berasaskan Pengetahuan (KBV) dan Teori Teknologi digunakan untuk menunjukkan faktor yang efektif tentang Organisasi, Manusia dan Teknologi membolehkan proses CKM dan membawa kepada ES yang berkualiti. Faktor yang efektif tentang Manusia, Organisasi dan Teknologi CKM telah dikenal pasti melalui literatur. Tahap dan keutamaan setiap faktor telah ditentukan oleh pakar dalam syarikat-syarikat pembangunan ES menggunakan Teknik Tertib Keutamaan dengan Persamaan bagi Penyelesaian Unggul (TOPSIS). Selanjutnya, berdasarkan faktor yang mempunyai keutamaan tinggi, sebuah model teori telah dibangunkan. Model yang dicadangkan itu telah dinilai dengan mengedarkan kajian soal selidik kepada pembuat keputusan dalam syarikat pembangunan ES. Terdapat 164 buah soal selidik yang sah dan data yang dikumpul dianalisis menggunakan teknik Pemodelan Persamaan Separa Persegi Terkecil (PLS-SEM). Hasil analisis menunjukkan bahawa Penglibatan Pelanggan dengan Sokongan Pengurusan Kanan menjadi faktor yang paling berpengaruh. Tidak terdapat kesan daripada Latihan Organisasi, Peta Pengetahuan Pelanggan, dan Pembangunan Strategi CKM. Hasil kajian menunjukkan bahawa kesan CKM ke atas kualiti perisian adalah penting. Model yang dibangunkan dalam kajian ini boleh digunakan sebagai garis panduan bagi pelaksanaan CKM yang berjaya dalam syarikat-syarikat pembangunan perisian perusahaan bagi meningkatkan kualiti perisian.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGE
	ACKNOWLEDGEMENT	V
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENTS	viii
	LIST OF TABLES	xiii
	LIST OF FIGURES	xiv
	LIST OF APPENDICES	xvi
	LIST OF SYMBOLS AND ABBREVIATIONS	xvii
1	INTRODUCTION	1
	1.1 Overview	1
	1.2 Background of Study	3
	1.3 Statement of the Problems	6
	1.4 Objectives of the Study	7
	1.5 Scope of the Study	8
	1.6 Significance of the Study	8
	1.7 Structure of the Thesis	9
2	LITERATURE REVIEW	11
	2.1 Introduction	11
	2.2 Customer Data, Information and Knowledge	12
	2.3 Customer Knowledge Management	13
	2.4 Types of Customer Knowledge	14
	2.5 Key challenges of CKM	16

2.5.1	Structural Challenges	17
2.5.2	Cultural Challenges	17
2.5.3	Competency Challenges	18
2.5.4	Privacy Concerns	19
2.5.5	Trust Concerns	19
2.5.6	Individual Motivation challenges	20
2.6	CKM Theoretical Foundation	21
2.6.1	Knowledge-Based View (KBV)	21
2.6.2	The Generic Framework of CKM	24
2.6.3	CKM Enablers	26
2.6.4	Type of CKM Enablers	28
2.6.5	CKM Processes	29
2.6.6	CKM Outcomes	31
2.6.7	Product quality	34
2.7	Enterprise Software Development	35
2.7.1	CKM and Enterprise Software Development	36
2.8	Quality Conceptualization	38
2.9	Software quality (SQ)	40
2.9.1	Software Quality Attributes	40
2.9.2	Software/System Quality and CKM	44
2.10	Summary	47
3	RESEARCH METHODOLOGY	48
3.1	Introduction	48
3.2	Research Paradigm	48
3.3	Research Approach	49
3.4	Research Design Framework	50
3.5	Phase 1: Problem Definitions	55
3.6	Phase 2: Develop Research Model	55
3.6.1	TOPSIS Method	56
3.7	Phase 3: Survey Development and Validation	57
3.7.1	Unit of Analysis	58
3.7.2	Identify Target Population	59
3.7.3	Develop the Survey Instrument	61

3.7.4	Validate Survey Content	61
3.7.5	Pilot Testing	62
3.8	Phase 4: Data Collection and Analysis	62
3.9	Phase 5: Result and Conclusion	64
3.10	Summary	64
4	RESEARCH MODEL AND HYPOTHESES	65
4.1	Introduction	65
4.2	Preliminary Investigation	65
4.2.1	Preliminary Findings	66
4.2.2	Preliminary Discussion	71
4.3	Extracting CKM Antecedent Factors	72
4.3.1	SLR Method for Selection of Factors	73
4.3.2	Finding of the SLR	76
4.4.1	Data collection from Experts	83
4.4.2	TOPSIS analysis	85
4.4.3	CKM Factor Selection Results	91
4.4.4	Research Model	92
4.5	Research Hypotheses	93
4.5.1	Individual competences and skills	94
4.5.2	Trust between customer and company	95
4.5.3	Customer Involvement	95
4.5.4	Customer-Centric Culture	96
4.5.5	CKM Strategy development	97
4.5.6	Top Management Support	98
4.5.7	Organizational Training	99
4.5.8	Cross-functional cooperation	100
4.5.9	CRM Technology Infrastructure	101
4.5.10	Collaboration System	102
4.5.11	Knowledge Map	103
4.5.12	CKM and System quality	103
4.6	Summary	105

5	INSTRUMENT DEVELOPMENT AND VALIDATION	106
5.1	Introduction	106
5.2	Instrument Development	106
5.2.1	Formulating Measurement Model	107
5.3	Instrument Validation	115
5.3.1	Content validity	115
5.3.2	Pilot Study	124
5.3.3	Assessment of Measurement Model	124
5.3.4	Validity and Reliability Analyses	128
5.4	Summary	137
6	DATA ANALYSIS AND MODEL VALIDATION	138
6.1	Introduction	138
6.2	Demographic Data	138
6.3	Assessment of Measurement Model	141
6.4	Assessment of the Structural Model	147
6.4.1	Collinearity Issue Assessment	149
6.4.2	Examination of Research Hypothesis	149
6.4.3	Effect Size	156
6.4.4	Importance-Performance Matrix Analysis	158
6.5	Discussion of the Results	159
6.5.1	Hypothesis 1: Individual competences and skills	159
6.5.2	Hypothesis 2: Trust between customer and company	161
6.5.3	Hypothesis 3: Customer Involvement	161
6.5.4	Hypothesis 4: Customer-Centric Culture	163
6.5.5	Hypothesis 5: CKM Strategy Development	164
6.5.6	Hypothesis 6: Top Management Support	167
6.5.7	Hypothesis 7: Organizational Training	169
6.5.8	Hypothesis 8: Cross-Functional Cooperation	171
6.5.9	Hypothesis 9: CRM Technology Infrastructure	172
6.5.10	Hypothesis 10: Collaboration System	173
6.5.11	Hypothesis 11: Knowledge Map	175
6.5.12	Hypothesis 12: Software Quality	177

6.5.13	Overall discussion	178
6.6	Summary	180
7	CONCLUSION	181
7.1	Introduction	181
7.2	Summary of Major Finding	181
7.2.1	Achievement of First Research Objective	182
7.2.2	Achievement of Second Research Objective	183
7.2.3	Achievement of Third Research Objective	184
7.3	Contributions	185
7.3.1	Theoretical Contributions	185
7.3.2	Practical Contributions	187
7.3.3	Guidelines for Using CKM	192
7.4	Limitation of Study	195
7.5	Suggestions for Future Studies	195
7.6	Summary	196
	REFERENCES	197
	Appendix A-F	217-237

LIST OF TABLES

TABLE NO	TITLE	PAGE
Table 2.1:	CKM Outcomes	33
Table 2.2:	Software Quality Attributes Analysis	41
Table 3.1:	Deliverables for Every Objective	53
Table 3.2:	Summary of the survey development and validation phase	57
Table 3.3:	Number of software companies (Computer-Trade-Organization, 2012)	58
Table 3.4:	SCI registered software companies that develop ES	60
Table 4.1:	Respondent Demographic Profiles	66
Table 4.2:	Questionnaire Results	67
Table 4.3:	Electronic Databases Used in SLR	74
Table 4.4:	Data Extraction Form.	76
Table 4.5:	Search Process of SLR	76
Table 4.6:	Description of CKM antecedent factors	80
Table 4.7:	The Respondents' Demographic Profile	85
Table 4.8:	PIS and NIS	88
Table 4.9:	Distance From Positive And Negative Ideal	89
Table 4.10:	Result of Factors Selection	92
Table 5.1:	Definition of Constructs	107
Table 5.2:	Guidelines For Choosing Measurement Model (Hair <i>et al.</i> , 2013)	109
Table 5.3:	Measurement Items of Each Construct	110
Table 5.4:	Content Validity Respondents' Characteristic	116
Table 5.5:	Experts' CVI Evaluation Scores For Relevancy of Measurement Items	119

Table 5.6:	Experts' CVI evaluation scores for Simplicity of measurement items	121
Table 5.7:	Constructs' Reliability and Validity Assessments Based on the (Hair <i>et al.</i> , 2013)	125
Table 5.8:	Factor loadings and reliability of reflective constructs using PLS-SEM	129
Table 5.9:	Factor Loadings and Reliability of Reflective Constructs after Item Deletion	130
Table 5.10:	Fornell-Larcker Criterion Results After Item Deletion	131
Table 5.11:	Cross-Factor Loading Test Results	133
Table 5.12:	Validity and Reliability Assessment For Formative Constructs	136
Table 6.1:	Profile of Survey Respondents	140
Table 6.2:	Factor Loadings and Reliability of Reflective Constructs Using PLS-SEM	142
Table 6.3:	Fornell-Larcker Criterion Results	143
Table 6.4:	Cross-Factor Loading Test Results	144
Table 6.5:	Validity and Reliability Assessment for Formative Constructs	146
Table 6.6:	Structural Model Assessment Criteria	148
Table 6.7:	Collinearity Assessment for The Structural Model	149
Table 6.8:	Summary of the Structural Model	153

LIST OF FIGURES

FIGURE NO	TITLE	PAGE
Figure 2.1:	Literature Map	12
Figure 2.2:	Customer Knowledge Flow (Smith and McKeen, 2005)	16
Figure 2.3:	The General Framework of Knowledge Management Processes (Lin, 2007)	25
Figure 2.4:	Theory of Technology (Orlikowski, 1992)	25
Figure 2.5:	Proposed Generic CKM Framework	26
Figure 2.6:	CKM Processes	29
Figure 2.7:	Sand Cone Model of Cumulative Performance (Bortolotti <i>et al.</i> , 2015).	32
Figure 2.8:	Customer Focus Model (Lohan <i>et al.</i> , 2011)	37
Figure 2.9:	More Iterative Software Quality Attributes	43
Figure 2.10:	Software Quality Model (Kannabiran and Sankaran, 2011)	45
Figure 2.11:	Software Quality Model (Prabhu <i>et al.</i> , 2011)	45
Figure 2.12:	Customer Knowledge Acquisition Benefits (Al-Busaidi, 2013)	46
Figure 3.1:	Research Design Framework (Part 1)	52
Figure 3.2:	Research Design Framework (Part 2)	53
Figure 4.1:	Mean Positive Percent Responses for CKM Enablers.	70
Figure 4.2:	Mean Positive Percent Responses For CKM Processes.	71
Figure 4.3:	Papers in Seven Selected Databases	77
Figure 4.4:	Selected Studies Per Year	77
Figure 4.5:	CKM in Different Variety of Context	78
Figure 4.6:	Using CKM in Different Countries	78

Figure 4.7:	The Frequency of CKM Antecedent Factors in The Literature	83
Figure 4.8:	Final Ranking of CKM Antecedent Factors	91
Figure 4.9:	Research Model	93
Figure 5.1:	Type of Content Validity Index (CVI) (Polit and Beck, 2006)	117
Figure 6.1:	Structural Model Assessment Procedure (Hair <i>et al.</i> , 2013)	147
Figure 6.2:	The Result of PLS Calculation Function	151
Figure 6.3:	Result of The Structural Model	152
Figure 6.4:	Structural Model Testing Result (bootstrapping)	155
Figure 6.5:	Final Structural Model	156
Figure 6.6:	IPMA Representation of CKM	158

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
A	Systematic Literature Review Studies	211
B	CKM Antecedent Factors Survey Questionnaire	214
C	G*Power Software Result	218
D	Instrument for Content validation	219
E	Survey Questionnaire for Pilot Study	226
F	Final Survey Questionnaire	231

LIST OF SYMBOLS AND ABBREVIATIONS

AISeL	-	Association for Information System
CVI	-	Content Validity Index
CK	-	Customer Knowledge
CKM	-	Customer Knowledge Management
CRM	-	Customer Relationship Management
ERP	-	Enterprise Resource Planning
ES	-	Enterprise Software
ELECOMP	-	Exhibition of Electronic, Computer & E-Commerce
IS	-	Information System
IT	-	Information Technology
IEC	-	International Electro Technical Commission
ISO	-	International Organization for Standardization
ISNA	-	Iranian Students' News Agency
KM	-	Knowledge Management
KBV	-	Knowledge-Based View
MCDM	-	Multi Criteria Decision Making
PLS	-	Partial Least Squares
β	-	Path Coefficients
RBV	-	Resource-Based View
SQ	-	Software/ System quality
SEM	-	Structural Equation Modeling
SCI	-	Supreme Council of Informatics
SLR	-	Systematic Literature Review
		Technique for order of Preference by Similarity to Ideal
TOPSIS	-	Solution
CTO	-	The Computer Trade Organization
VIF	-	Variance Inflation Factor

CHAPTER 1

INTRODUCTION

1.1 Overview

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). Customer Knowledge Management (CKM) helps companies leverage their unique Customer Knowledge (CK) to improve 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 company 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).

Given an unpleasant past of substandard solutions and technology fiascos, several companies have a tough time defending CKM initiatives in the current business environment. Several researchers have addressed the dearth of an assimilated and all-inclusive framework from a CKM perspective. Attafar et al. (2013) stated that, in Iran, less than 50 percent of the manufacturing companies always or often utilize instruments to assess the external environment, as well as to evaluate and acquire knowledge from consumers. Only 25 percent of Iranian companies methodically

conducted a customer knowledge absorbing process. Around 50 percent of the business entities do not typically engage in any CKM. (Attafar et al., 2013). A survey pointed out that customer knowledge was mentioned as the most significant kind of knowledge (97 percent) that aids business entities to effectively act. (Aghamirian et al., 2015). As software development is a very knowledge intensive task (Patil and Bamnote, 2015), the design and development of innovative, high quality Enterprise Software (ES) such as Microsoft Dynamics CRM requires sufficient CK (Schaarschmidt et al., 2015; Vaezitehrani, 2013). Therefore, companies should thoroughly analyze underlying customer characteristics to deepen their knowledge regarding how to satisfy customer needs and desires, as well as to enhance customer satisfaction and corporate performance (Tseng, 2016).

Today, consumers seek thorough and complete solutions (Schaarschmidt et al., 2015). The manufacturing of custom-made products entails precise knowledge regarding (and from) the customer. This is particularly vital in terms of value creation for software engineering (Aho and Uden, 2013). Lingering issues in software development include unfulfilled user needs, disparities in user requirements, and systems unsuccessful in meeting the expectations of consumers.(Schaarschmidt et al., 2015). CK integration enhances software development effectiveness (Tiwana, 2004). In addition, users prefer and expect to pay premiums for high quality products. Hence, the priority factors that determine competitive advantage has also changed from cost to quality (Aho and Uden, 2013). To achieve high quality products, software developers must acquire and use knowledge regarding customer needs or otherwise risk software failures because they do not satisfy end users (Kannabiran and Sankaran, 2011). Furthermore, it is simply not enough to identify customers in terms of interests, future needs or behavior analysis regarding software use are also required (Aho and Uden, 2013). This is because, over the course of time, the software industry has acknowledged that successful innovation requires a synthesis of knowledge from various perspectives. Hence, CK has become an indispensable component for encouraging product innovation and enhancing product quality (Zogaj and Bretschneider, 2012). However, there is a risk that the produced software will not satisfy end user needs (Korhonen-Sande and Sande, 2016; Aho and Uden, 2013).

1.2 Background of Study

Although a few studies have been conducted regarding the effect of organizational factors on software quality, there is still a fundamental need for researchers to focus more on investigating Customer Knowledge Management (CKM) success factors to improve software quality in enterprise software development for reasons that will be elaborated in the following section.

First, compared to the other types of software, the quality of Enterprise Software (ES) is vital and the sales of ES include products and services which are associated with it (Cho et al., 2013). ES requires related services such as installation, customization, maintenance (repair and updates), training, and routinization (Sarrab and Rehman, 2014; Cho et al., 2013). These related services need customer and end user comments, feedback, suggestions, complaints, and experiences regarding software utilization (Knowledge from customers). Customization needs knowledge about customers to suggest the best solution. The final goal of CKM is to have a steady and long-term relationship with customers in order to turn them into trade partners. Therefore, customers expect from software companies a continuous relationship that informs them of software updates, bugs, and new versions. They also expect continuous training (Knowledge for customers). The process of ES adoption requires long-term organizational and financial commitments (Cho et al., 2013). Compared to other types of software products, the support services of ES are unique. If ES development companies invest more in software development, then the quality of the ES will improve, which can reduce the cost of service delivery. For example, as the capability, scalability and flexibility of the ES increases, it will cost less to customize enterprise systems to meet customer's needs. Thus, investigation on enhancing software quality is much demanded in the enterprise software development industry.

Second, many previous studies in software quality enhancement have focused only on the technical aspects of software quality such as reliability, maintainability, and functionality. However, because of the nature of enterprise software, the transfer and integration of customer knowledge 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). For software development projects in particular, there are four key aspects for CKM, which are: improvement of customer relationships, receiving customer feedback, collecting and utilization of customer information and more importantly, gathering and understanding of customers' requirements (Lohan, et al., 2011). CKM could be used to facilitate the reception of customer feedback, the collection and utilization of customer information as well as gathering and understanding of customers' requirements (Zhang, 2011). As the integration of CK in enterprise software development is still immature, there is a lack of theoretical frameworks to fully capture the use of CKM to improve software quality in ES. There is a fundamental need to further explore how organizational factors such as CKM can enhance ES quality.

Third, due to rapid changes in user requirement and expectation of users to develop and deliver greater volumes of high-quality products and services, customer knowledge is important to meet customer needs (Schaarschmidt et al., 2015; Kannabiran and Sankaran, 2011). There is a risk of crucial customer knowledge not reaching the intended software engineers (Aho and Uden, 2013). Furthermore, customer data, such as customer suggestions are not appropriately documented. It would seem that currently the use of customer knowledge in software development is insufficient (Aho and Uden, 2013). Most project managers in software development domain need to know the effect of customer knowledge management on software quality, and strategies and mechanisms for acquiring customer knowledge. Most project managers are not familiar with the use of customer knowledge in software project management. Using customer knowledge to improve software in software project management is still in its infancy (Yang et al., 2014). It was reported that there have been only few comprehensive studies on the factors that influence software quality and that quantitative survey-based research is lacking on the subject (Tseng, 2016; Kannabiran and Sankaran, 2011). Software quality research has focused on the technical and engineering aspects of quality control, while paying limited attention to its organizational dimensions. So are insufficient empirical studies on the management

of quality software development (Kannabiran and Sankaran, 2011). Studies related to the effect of customer knowledge on software quality are few in number.

Fourth, there are significant challenges regarded the transfer and integration of customer knowledge 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 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.*, 2014b; Khodakarami and Chan, 2014). “Some organizations shy away from customer-centricity because of corporate narcissism, i.e., a sense that we know better than our customers. Furthermore, not all companies want to hear what their customers really think of their products, services, image, and credibility. In addition, companies must be willing to actually change their behavior towards customers based on what they are told” (Gibbert et al., 2002). Moreover, Skotis et al. (2013) reported that one of the most important challenges of CKM is a lack of CK absorptive capacity in organizations.

Aho and Uden (2013) found that in software development, creating possibilities to participate and express personal opinions are key to successful development processes. Thus, systems should motivate consumers to complain, with an aim to supply better feedback to an organization. In employing a CKM system within an organization, customer information profiles should be expanded to involve non-transactional data, including general enquiries, recommendations and grievances.(Stefanou et al., 2003). Salojärvi et al. (2010) found that most companies have a tendency to absorb CK rather than use it. Salojärvi et al. (2010) noted that 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 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.

Fifth, many studies in the field of Information Systems (IS) have investigated the significant factors that influence customer knowledge management. Research on the factors that enhance CKM in 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 (Big annual ICT exhibition in Tehran), 63% of enterprise software development companies used CRM systems, 69% of them have no solution or guidelines for gathering customer knowledge, and only 36% of them had a solution or guidelines for the use of customer knowledge 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. An inadequate theoretical framework for antecedents factors of CKM in general, and a lack of comprehensive theoretical framework for the effect of CKM on software quality in enterprise software development, reflect a fundamental need to further explore (Aho and Uden, 2013; Kannabiran and Sankaran, 2011).

1.3 Statement of the Problems

Due to the significant challenges of CKM in ES context, investigation of the Human, Organizational, and Technological factors for implementing CKM in the software development companies is lacking in the literature. There is a need to proposing a theoretical model that considers critical success factors of CKM for enhancing software quality in ES context. Therefore, the main question of this study is “How CKM can help the enterprise software development companies to improve software quality?”

In order to address the above question on this topic, the following research questions that can address the problem are identified as follows:

- i. What are the antecedent factors that influence CKM in an organization?
- ii. What are the high priority factors that influence CKM for ES quality improvement in enterprise software development companies?
- iii. What is the research model that aims at fostering ES quality by using high priority CKM factors within the enterprise software development companies?

1.4 Objectives of the Study

The objectives of the study are:

- i. To identify the antecedent factors that influence CKM in an organization.
- ii. To rank the potential factors that influence CKM for ES quality improvement in the context of enterprise software development companies.
- iii. To develop and validate a research model that aims at fostering ES quality by using successful CKM factors within the enterprise software development.

1.5 Scope of the Study

This study will concentrate on investigating the effects of Human, Organizational, and Technological factors on CKM to enhance ES quality in enterprise software development companies. The scope of this study is enterprise software development companies registered with the Supreme Council of Informatics (SCI) in Iran. The SCI is a high-level government body that monitors and ranks all companies active in the Iranian informatics sector.

This study concentrated on software companies that develop enterprise software such as Customer Relationship Management (CRM), Accounting Systems, and Enterprise Resource Planning (ERP). The respondents in this study are involved in decision-making and handling customer inquiries in Iranian software companies such as the Chief Customer Officer, Chief Commercial Officer, Chief Product Officer, and Chief Executive Officer who are highly knowledgeable about the management of customer knowledge and product quality. The data is collected by the questionnaire. The collected is analyzed by using Smart PLS (Partial Least Squares).

1.6 Significance of the Study

A. For practitioners:

- I. This study proposes a model that can be used as a guideline for successful CKM application in ES development companies.
- II. This study provides suggestions which are useful to specify various activities that are necessary for the successful implementing CKM system in enterprise software development companies. It can be considered the first step in the development of various CKM system modules.
- III. It can help managers implement CKM successfully to improve product quality in software companies.

B. For researchers:

- I. The Human, Organizational, and Technological factors that were extracted from the literature are theoretical contribution of this study that assists the researchers for further research on the significant effect of them in other industries and contexts.
- II. This study proposes the model that can be useful as a foundation for research to improve CKM systems in enterprise software development companies in developing countries.

This study represents one of the first studies focusing on the influence of Human, Organizational, and Technological enablers on CKM and illustrates the most important CKM outputs (software quality) in enterprise software development.

1.7 Structure of the Thesis

This research is structured to provide a critical review of information related to the topic of the study. This study consists of seven chapters structured as follows:

Chapter 1 introduces the research field, research questions, research objectives, problem background, study scope, and study significance.

Chapter 2 describes the relationship between CKM and ES. CKM challenges are highlighted. The theoretical foundation of CKM is discussed. Software quality as an important outcome of CKM is highlighted.

Chapter 3 focuses on the methodology used in this study and justifies the choice and use of particular methodological approaches. The research design framework is proposed and described in detail.

Chapter 4 focuses on conducting a systematic literature review to discover CKM antecedent factors. Survey questionnaires based on TOPSIS method are distributed among ES experts to select adaptable CKM factors for ES. This chapter is finished by proposing a research model and research hypotheses.

Chapter 5 focuses on developing instruments. Measurement items were extracted from the literature for instrument development. The questionnaire was evaluated using content validity and a pilot study.

Chapter 6 is related to the main data collection of this study and the analysis approach used to test the model. It includes the assessment of the measurement model and structural model using PLS-SEM. The final model and the main outcomes of this study are presented at the end of the chapter.

Chapter 7 highlights the key findings of the study for each research objective. It also presents the implications of the research's outcomes for both academics and practitioners. The limitations of this study and opportunities for future research are provided at the end of the chapter.

REFERENCES

- Agha Mohammad Ali Kermani, M., Badiee, A., Aliahmadi, A., Ghazanfari, M. and Kalantari, H. (2016). Introducing a procedure for developing a novel centrality measure (Sociability Centrality) for social networks using TOPSIS method and genetic algorithm. *Computers in Human Behavior*. 56: 295-305.
- Aghamirian, B., Dorri, B. and Aghamirian, B. (2015). Customer Knowledge Management Application in Gaining Organization's Competitive Advantage in Electronic Commerce. *Journal of Theoretical & Applied Electronic Commerce Research*. 10: 63-78.
- Aho, A.-M. and Uden, L. (2013). Customer knowledge in value creation for software engineering process. *7th International Conference on Knowledge Management in Organizations: Service and Cloud Computing*, Springer.
- Al-Busaidi, K. A. (2013). Empowering Organizations through Customer Knowledge Acquisition: A pilot investigation. *Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois*. 9 (1): 121.
- Al-Shammari, M. and Global, I. (2009). *Customer knowledge management: People, processes, and technology*. Information Science Reference Hershey.
- Alamgir, M. and Quaddus, M. (2012). Customer Relationship Management Success Model : A Conceptual Framework. *The 26th Australian and New Zealand Academy of Management Conference (ANZAM), Dec 5-7 2012.*: 1-39.
- Ar, I. M. and Kurtaran, A. (2013). Evaluating the relative efficiency of commercial banks in Turkey: An integrated AHP/DEA approach. *International Business Research*. 6 (4): 129.
- Arazpoor, S. and Meymand, M. M. (2016). Identifying the effective factors on customer knowledge management development: Evidence from customs industry. *Management Science Letters*. 6: 25-30.

- Arsham, H. (2011). Questionnaire design and surveys sampling. *Retrieved January*. 14 (1): 34-46.
- Attafar, A., Sadidi, M., Attafar, H. and Shahin, A. (2013). The Role of Customer Knowledge Management (CKM) in Improving Organization-Customer Relationship. *Middle-East Journal of Scientific Research*. 13 (6): 829-835.
- Austin, P. C. and Tu, J. V. (2004). Bootstrap methods for developing predictive models. *The American Statistician*. 58 (2): 131-137.
- Awasthi, A., Chauhan, S. S., Omrani, H. and Panahi, A. (2011). A hybrid approach based on SERVQUAL and fuzzy TOPSIS for evaluating transportation service quality. *Computers & Industrial Engineering*. 61 (3): 637-646.
- Azhar, S. M. b. (2014). The Relationship between Customer Knowledge and Customer Relationship Management towards Service Quality in Malaysia. *Igarss 2014*. 1: 1-5.
- Bagheri, S., J. Kusters, R. and J. M. Trienekens, J. (2015a). Business-IT Alignment in PSS Value Networks - Linking Customer Knowledge Management to Social Customer Relationship Management. *Proceedings of the 17th International Conference on Enterprise Information Systems*: 249-257.
- Bagheri, S., Kusters, R. J. and Trienekens, J. J. M. (2015b). The Customer Knowledge Management lifecycle in PSS Value Networks: Towards process characterization. *16th European Conference on Knowledge Management*. 16 (1): 3-4.
- Bagheri, S. K. and Casprini, E. (2014). Intellectual Property Paradoxes in Developing Countries: The Case of Software IP Protection in Iran. *Journal of Intellectual Property Rights*. 19: 33-42.
- Banister, P., Bunn, G., Burman, E. and Daniels, J. (2011). *Qualitative Methods In Psychology: A Research Guide: A Research Guide*. McGraw-Hill International.
- Behzadian, M., Khanmohammadi Otaghsara, S., Yazdani, M. and Ignatius, J. (2012). A state-of the-art survey of TOPSIS applications. *Expert Systems with Applications*. 39 (17): 13051-13069.
- Belkahla, W. and Triki, A. (2011). Customer knowledge enabled innovation capability: proposing a measurement scale. *Journal of Knowledge Management*. 15 (4): 648-674.

- Bortolotti, T., Danese, P., Flynn, B. B. and Romano, P. (2015). Leveraging fitness and lean bundles to build the cumulative performance sand cone model. *International Journal of Production Economics*. 162 (1): 227-241.
- Brislin, R. W. (1970). Back-translation for cross-cultural research. *Journal of cross-cultural psychology*. 1 (3): 185-216.
- Bruce Ho, C.-T., Denis Yang, J.-M. and Victor Hung, C.-S. (2015). The Factors of Information System Success: An Example of Customer Relationship Management Implementation in Food & Beverage Industry. *International Journal of e-Education, e-Business, e-Management and e-Learning*. 5: 114-128.
- Bryman, A. (2012). *Social Research Methods*, New York: Oxford University Press.
- Buchnowska, D. (2011). Customer Knowledge Management Models: Assessment and Proposal. *Research in Systems Analysis and Design: Models and Methods* 25-38, Springer.
- Bueren, A., Schierholz, R., Kolbe, L. and Brenner, W. (2004). Customer knowledge management improving performance of customer relationship management with knowledge management. *2013 46th Hawaii International Conference on System Sciences*, IEEE Computer Society.
- Bueren, A., Schierholz, R., Kolbe, L. M. and Brenner, W. (2005). Improving performance of customer-processes with knowledge management. *Business Process Management Journal*. 11 (5): 573-588.
- Campbell, A. J. (2003). Creating customer knowledge competence: managing customer relationship management programs strategically. *Industrial Marketing Management*. 32 (5): 375-383.
- Carbonell, P., Rodríguez-Escudero, A. I. and Pujari, D. (2009). Customer Involvement in New Service Development: An Examination of Antecedents and Outcomes. *Journal of Product Innovation Management*. 26 (5): 536-550.
- Chan, J. O. (2009). Integrating Knowledge Management and Relationship Management in an Enterprise Environment. *Communications of the IIMA*. 9 (4): 37.
- Chang, L.-M., Chang, S.-I., Ho, C.-T., Yen, D. C. and Chiang, M.-C. (2011). Effects of IS characteristics on e-business success factors of small-and medium-sized enterprises. *Computers in Human Behavior*. 27 (6): 2129-2140.

- Chen, W. J. and Cheng, H. Y. (2012). Factors affecting the knowledge sharing attitude of hotel service personnel. *International Journal of Hospitality Management*. 31 (2): 468-476.
- Chen, Y.-H. and Su, C.-T. (2006). A Kano-CKM model for customer knowledge discovery. *Total Quality Management & Business Excellence*. 17 (5): 589-608.
- Cheng, M. Y., Ho, J. S. Y. and Lau, P. M. (2009). Knowledge sharing in academic institutions: a study of Multimedia University Malaysia. *Electronic Journal of Knowledge Management*. 7 (3): 313-324.
- Chin, W. W. (1998). Commentary: Issues and opinion on structural equation modeling, JSTOR. 22: 134-142.
- Cho, W., Subramanyam, R. and Xia, M. (2013). Vendors' incentives to invest in software quality in enterprise systems. *Decision Support Systems*. 56: 27-36.
- Choi, S., Kim, J. and Qu, M. (2015). Leveraging Customer Knowledge and It Resources To Enhance Service Expertise and Service Quality. *PACIS 2014 Proceedings*. 31 (1): 34-46.
- Choi, S. and Ryu, I. (2013). Leveraging Customer Knowledge in Electronic Knowledge Repositories for Service Expertise. *PACIS 2013 Proceedings*. 31: 132-145.
- Chow, W. S. and Chan, L. S. (2008). Social network, social trust and shared goals in organizational knowledge sharing. *Information & Management*. 45 (7): 458-465.
- Chua, A. Y. and Banerjee, S. (2013). Customer knowledge management via social media: the case of Starbucks. *Journal of Knowledge Management*. 17 (2): 237-249.
- Cohen, J. (1988). Statistical power analysis for the behavior science. *Lawrance Erlbaum Association*.
- Computer-Trade-Organization. (2012). "Main category of ICT companies in Iran." 2015, from http://www.irannsr.org/web_directory/.
- Cooper, D. R. and Schindler, P. S. (2003). *Business research methods*. NewYork:McGraw-Hill.
- Creswell, J. W. (2013). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage.

- Cri , D. and Micheaux, A. (2006). From customer data to value: What is lacking in the information chain? *Journal of Database Marketing & Customer Strategy Management*. 13 (4): 282-299.
- Cui, A. S. and Wu, F. (2015). Utilizing customer knowledge in innovation: antecedents and impact of customer involvement on new product performance. *Journal of the Academy of Marketing Science*. 71 (2): 81-92.
- Davenport, T. H., Harris, J. G. and Kohli, A. K. (2001). How do they know their customers so well? *MIT Sloan Management Review*. 42 (2): 63-73.
- Davis, L. L. (1992). Instrument review: Getting the most from a panel of experts. *Applied nursing research*. 5 (4): 194-197.
- Diamantopoulos, A., Sarstedt, M., Fuchs, C., Wilczynski, P. and Kaiser, S. (2012). Guidelines for choosing between multi-item and single-item scales for construct measurement: a predictive validity perspective. *Journal of the Academy of Marketing Science*. 40 (3): 434-449.
- Ding, Y. (2010). *Quality in IS Research: Theory and Validation of Constructs for Service, Information, and System*. Doctor of Philosophy thesis. Georgia State University
- Dous, M., Salomann, H., Kolbe, L. and Brenner, W. (2005). Knowledge Management Capabilities in CRM: Making Knowledge For, From, and About Customers Work. *AMCIS 2005 Proceedings*: 33.
- Duke, J. M. and Aull-Hyde, R. (2002). Identifying public preferences for land preservation using the analytic hierarchy process. *Ecological Economics*. 42 (1): 131-145.
- Durgam, P. and Sinha, A. (2014). Positive Disruptions Caused by SCRM Activities in the SECI process of Knowledge Creation: Insights from Four Case Studies.
- Durlak, J. A. (2009). How to select, calculate, and interpret effect sizes. *Journal of pediatric psychology*: jsp004.
- Durmu ođlu, S. S. and 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. *Industrial Marketing Management*. 40: 321-330.
- Durst, S. and Runar Edvardsson, I. (2012). Knowledge management in SMEs: a literature review. *Journal of Knowledge Management*. 16 (6): 879-903.

- Eisenhardt, K. M. and Santos, F. M. (2002). Knowledge-based view: A new theory of strategy. *Handbook of strategy and management*. 1: 139-164.
- Faed, A. (2013). *An Intelligent Customer Complaint Management System with Application to the Transport and Logistics Industry*. Springer Science & Business.
- Feher, P. and Gabor, A. (2006). The role of knowledge management supporters in software development companies. *Software Process: Improvement and Practice*. 11 (3): 251-260.
- Feng, T., Sun, L. and Zhang, Y. (2010). The effects of customer and supplier involvement on competitive advantage: An empirical study in China. *Industrial Marketing Management*. 39 (1): 1384-1394.
- Feng, T. X. and Tian, J. X. (2005). Customer knowledge management and condition analysis of successful CKM implementation. *Machine Learning and Cybernetics, 2005. Proceedings of 2005 International Conference on*, IEEE.
- Ferreras-Méndez, J. L., Newell, S., Fernández-Mesa, A. and Alegre, J. (2015). Depth and breadth of external knowledge search and performance: The mediating role of absorptive capacity. *Industrial Marketing Management*. 47: 86-97.
- Fidel, P., Cervera, A. and Schlesinger, W. (2015a). Customer's role in knowledge management and in the innovation process: effects on innovation capacity and marketing results. *Knowledge Management Research & Practice*. 9 (1): 132-146.
- Fidel, P., Schlesinger, W. and Cervera, A. (2015b). Collaborating to innovate: Effects on customer knowledge management and performance. *Journal of Business Research*. 68: 1426-1428.
- Fogli, D. and Guida, G. (2015). A practical approach to the assessment of quality in use of corporate web sites. *Journal of Systems and Software*. 99: 52-65.
- Fornell, C. and Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*: 39-50.
- Forsman, H. (2011). Innovation capacity and innovation development in small enterprises. A comparison between the manufacturing and service sectors. *Research Policy*. 40 (5): 739-750.
- Garcia-Murillo, M. and Annabi, H. (2002). Customer knowledge management. *Journal of the Operational Research Society*: 875-884.

- Garrido-Moreno, A., Lockett, N. and García-Morales, V. (2014a). Paving the way for CRM success: The mediating role of knowledge management and organizational commitment. *Information & Management*. 51 (1): 1031-1042.
- Garrido-Moreno, A., Lockett, N. and García-Morales, V. (2014b). Paving the way for CRM success: The mediating role of knowledge management and organizational commitment. *Information & Management*.
- Garrido-Moreno, A. and Padilla-Meléndez, A. (2011). Analyzing the impact of knowledge management on CRM success: The mediating effects of organizational factors. *International Journal of Information Management*. 31 (5): 437-444.
- Garrido-Moreno, A., Padilla-Meléndez, A. and Del Águila-Obra, A. R. (2010). Exploring the Importance of Knowledge Management for CRM Success. *World Academy of Science, Engineering and Technology*. 42: 81-93.
- Gebert, H., Geib, M., Kolbe, L. and Riempp, G. (2002a). Towards Customer Knowledge Management—Integrating Customer Relationship Management and Knowledge Management concepts. *The Second International Conference on Electronic Business (ICEB 2002)*.
- Gebert, H., Geib, M., Kolbe, L. and Riempp, G. (2002b). Towards customer knowledge management: Integrating customer relationship management and knowledge management concepts. *The Second International Conference on Electronic Business (ICEB 2002)*.
- Gefen, D., Straub, D. W. and Rigdon, E. E. (2011). An update and extension to SEM guidelines for administrative and social science research. *Management Information Systems Quarterly*. 35 (2): 34-41.
- Ghobadi, S. (2015). What drives knowledge sharing in software development teams: A literature review and classification framework. *Information & Management*. 52 (1): 82-97.
- Gholami, R., Sulaiman, A. B., Ramayah, T. and Molla, A. (2013). Senior managers' perception on green information systems (IS) adoption and environmental performance: Results from a field survey. *Information & Management*. 50 (7): 431-438.
- Gibbert, M., Leibold, M. and Probst, G. (2002). Five styles of customer knowledge management, and how smart companies use them to create value. *European Management Journal*. 20 (5): 459-469.

- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic management journal*. 17 (S2): 109-122.
- Griffith, T. L., Sawyer, J. E. and Neale, M. A. (2003). Virtualness and knowledge in teams: Managing the love triangle of organizations, individuals, and information technology. *MIS quarterly*: 265-287.
- Hadi, W., Al-Widian, J. and Alhawari, S. (2013). An Integrated Model for Knowledge Management and Electronic Customer Relationship Management. *Journal of American Science*. 9 (11).
- Hair, J. F., Hult, G. T. M., Ringle, C. and Sarstedt, M. (2013). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage Publications.
- Hair, J. F., Ringle, C. M. and Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *The Journal of Marketing Theory and Practice*. 19 (2): 139-152.
- Hammami, S. M. and Triki, A. (2011). Exploring the information technology contribution to service recovery performance through knowledge based resources. *Vine*. 41: 296-314.
- Hennestad, B. W. (1999). Infusing the organisation with customer knowledge. *Scandinavian journal of management*. 15 (1): 17-41.
- Henseler, J. and Fassott, G. (2010). Testing moderating effects in PLS path models: An illustration of available procedures. *Handbook of partial least squares* 713-735, Springer.
- Herath, G. and Prato, T. (2006). *Using multi-criteria decision analysis in natural resource management*. Ashgate Publishing, Ltd.
- Hidayanto, A. N. and Setyady, S. T. (2014). Impact of Collaborative Tools Utilization on Group Performance in University Students. *TOJET*. 13 (2).
- Holste, J. S. and Fields, D. (2010). Trust and tacit knowledge sharing and use. *Journal of knowledge management*. 14 (1): 128-140.
- Howell, R. D., Breivik, E. and Wilcox, J. B. (2007a). Is formative measurement really measurement? Reply to Bollen (2007) and Bagozzi (2007). *Psychological Methods*. 12 (2): 238-245.
- Howell, R. D., Breivik, E. and Wilcox, J. B. (2007b). Reconsidering formative measurement. *Psychological methods*. 12 (2): 205.
- Hsu, I.-C. (2008). Knowledge sharing practices as a facilitating factor for improving organizational performance through human capital: A preliminary test. *Expert Systems with applications*. 35 (3): 1316-1326.

- Hu, J., Du, Y., Mo, H., Wei, D. and Deng, Y. (2016). A modified weighted TOPSIS to identify influential nodes in complex networks. *Physica A: Statistical Mechanics and its Applications*. 444: 73-85.
- Ifinedo, P. (2011). Examining the influences of external expertise and in-house computer/IT knowledge on ERP system success. *Journal of Systems and Software*. 84 (12): 2065-2078.
- Jayachandran, S., Sharma, S., Kaufman, P. and Raman, P. (2005). The role of relational information processes and technology use in customer relationship management. *Journal of marketing*. 69 (4): 177-192.
- Kakabadse, N. K., Kakabadse, A. and Kouzmin, A. (2003). Reviewing the knowledge management literature: towards a taxonomy. *Journal of knowledge management*. 7 (4): 75-91.
- Kannabiran, G. and Sankaran, K. (2011). Determinants of software quality in offshore development—An empirical study of an Indian vendor. *Information and Software Technology*. 53 (11): 1199-1208.
- Khodakarami, F. and Chan, Y. E. (2014). Exploring the role of customer relationship management (CRM) systems in customer knowledge creation. *Information & Management*. 51 (1): 27-42.
- Kitchenham, B. A. (2007). Guidelines for performing systematic literature reviews in software engineering. *Technical report, Ver. 2.3 EBSE Technical Report*. EBSE 1-65.
- Ko, D.-G., Kirsch, L. J. and King, W. R. (2005). Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *MIS quarterly*: 59-85.
- Kong, L.-b., Yu, K.-c. and Hou, K.-h. (2010). An analytical CRM based on customer knowledge. *2010 IEEE 17Th International Conference on Industrial Engineering and Engineering Management*. 47 (1): 1641-1645.
- Korhonen-Sande, S. and Sande, J. B. (2016). Improving customer knowledge transfer in industrial firms: how does previous work experience influence the effect of reward systems? *Journal of Business & Industrial Marketing*. 31 (2): 232-246.
- Kruse, P. (2013a). Customer Involvement in Organizational Innovation—Toward an Integration Concept. *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. *Proceedings of the 21st European Conference on Information Systems*.
- Kumar, R. (2012). *Research Methodology: A Step-By-Step Guide For Beginners*.
- Kytösalmi, E. (2015). *Customer Knowledge Transfer In Mncs*. Master thesis. Lappeenranta University of Technology
- Lee, M. K. O., Cheung, C. M. K., Lim, K. H. and Sia, C. L. (2006). Understanding customer knowledge sharing in web-based discussion boards: An exploratory study. *Internet Research*. 16: 289-303.
- Li, M., Jin, L. and Wang, J. (2014). A new MCDM method combining QFD with TOPSIS for knowledge management system selection from the user's perspective in intuitionistic fuzzy environment. *Applied Soft Computing*. 21: 28-37.
- Li, Z., Wu, B. and Li, Y. (2012). Relational Model of and its Appraisal on Environment Supporting Factors and Customer Knowledge Management Performance. *Business Intelligence and Financial Engineering (BIFE), 2012 Fifth International Conference on*, IEEE.
- Liao, S.-H. and Wu, C.-c. (2010). System perspective of knowledge management, organizational learning, and organizational innovation. *Expert Systems with Applications*. 37 (2): 1096-1103.
- Liberona, D., Ruiz, M. and Fuenzalida, D. (2013). Customer Knowledge Management in the Age of Social Networks. *7th International Conference on Knowledge Management in Organizations: Service and Cloud Computing*, Springer.
- Limayem, M., Khalifa, M. and Chin, W. W. (2004). CASE tools usage and impact on system development performance. *Journal of Organizational Computing and Electronic Commerce*. 14 (3): 153-174.
- Lin, H.-F. (2007). Knowledge sharing and firm innovation capability: an empirical study. *International Journal of manpower*. 28 (3/4): 315-332.
- Lin, R.-J., Chen, R.-H. and Kuan-Shun Chiu, K. (2010). Customer relationship management and innovation capability: an empirical study. *Industrial Management & Data Systems*. 110 (1): 111-133.
- Lin, T. C., Wu, S. and Lu, C. T. (2012). Exploring the affect factors of knowledge sharing behavior: The relations model theory perspective. *Expert Systems with Applications*. 39 (1): 751-764.

- Lin, Y., Su, H.-Y. and Chien, S. (2006). A knowledge-enabled procedure for customer relationship management. *Industrial Marketing Management*. 35 (4): 446-456.
- Lin, Y. C., Wang, Y. C. and Kung, L. A. (2015). Influences of cross-functional collaboration and knowledge creation on technology commercialization: Evidence from high-tech industries. *Industrial Marketing Management*. 49: 128-138.
- Linderman, K., Schroeder, R. G., Zaheer, S., Liedtke, C. and Choo, A. S. (2004). Integrating quality management practices with knowledge creation processes. *Journal of Operations Management*. 22: 589-607.
- Lipsey, M. W., Puzio, K., Yun, C., Hebert, M. A., Steinka-Fry, K., Cole, M. W., Roberts, M., Anthony, K. S. and Busick, M. D. (2012). Translating the Statistical Representation of the Effects of Education Interventions into More Readily Interpretable Forms. *National Center for Special Education Research*. 25 (1): 54-61.
- Liu, I. L., Cheung, C. M. and Lee, M. K. (2013). Customer Knowledge Contribution Behavior in Social Shopping Communities. *System Sciences (HICSS), 2013 46th Hawaii International Conference on, IEEE*.
- Lohan, G., Lang, M. and Conboy, K. (2011). Having a customer focus in agile software development. *Information Systems Development* 441-453, Springer.
- Lopez-Nicolas, C. and Molina-Castillo, F. J. (2008). Customer Knowledge Management and E-commerce: The role of customer perceived risk. *International Journal of Information Management*. 28 (2): 102-113.
- Lorenzo-Romero, C., Constantinides, E. and Brünink, L. A. (2014). Co-creation: Customer Integration in Social Media Based Product and Service Development. *Procedia - Social and Behavioral Sciences*. 148: 383-396.
- Lynn, M. R. (1986). Determination and quantification of content validity. *Nursing research*. 35 (6): 382-386.
- Lyu, J.-J., Yang, S.-C. and Chen, C. (2009). Transform customer knowledge into company value—case of a global retailer. *Service Systems and Service Management, 2009. ICSSSM'09. 6th International Conference on, IEEE*.
- Ma, Z. and Qi, L. (2009). Toward an integrated customer knowledge management model: A process-based approach. *Management and Service Science, 2009. MASS'09. International Conference on, IEEE*.

- MacKenzie, S. B., Podsakoff, P. M. and Podsakoff, N. P. (2011). Construct measurement and validation procedures in MIS and behavioral research: Integrating new and existing techniques. *MIS quarterly*. 35 (2): 293-334.
- Martinez-Ruiz, A. and Aluja-Banet, T. (2009). Toward the Definition of a Structural Equation Model of Patent Value: PLS Path Modelling with Formative Constructs. *REVSTAT-Statistical Journal*. 7 (3): 265-290.
- Mei-Hsiang, W., Chen-Fen, H. and Yang, T.-Y. (2012). Acceptance of Knowledge Map Systems: An Empirical Examination of System Characteristics and Knowledge Map Systems Self-efficacy. *Asia Pacific Management Review*. 17 (3).
- Menguc, B., Auh, S. and Uslu, A. (2013). Customer knowledge creation capability and performance in sales teams. *Journal of the Academy of Marketing Science*. 41 (1): 19-39.
- Mitussis, D., O'Malley, L. and Patterson, M. (2006). Mapping the re-engagement of CRM with relationship marketing. *European journal of Marketing*. 40 (5/6): 572-589.
- Mukherji, S. (2012). A framework for managing customer knowledge in retail industry. *IIMB Management Review*. 24 (2): 95-103.
- Nagati, H. and Rebolledo, C. (2012). The role of relative absorptive capacity in improving suppliers' operational performance. *International Journal of Operations & Production Management*. 32: 611-630.
- Nejatian, H., Sentosa, I., Piaralal, S. K. and Bohari, A. M. (2011). The influence of customer knowledge on CRM performance of Malaysian ICT companies: a structural equation modeling approach. *International Journal of Business and Management*. 6 (7): p181.
- Nilashi, M. and Ibrahim, O. B. (2014). A model for detecting customer level intentions to purchase in B2C websites using TOPSIS and fuzzy logic rule-based system. *Arabian Journal for Science and Engineering*. 39 (3): 1907-1922.
- Nilashi, M., Zakaria, R., Ibrahim, O., Majid, M. Z. A., Zin, R. M. and Farahmand, M. (2015). MCPCM: a DEMATEL-ANP-based multi-criteria decision-making approach to evaluate the critical success factors in construction projects. *Arabian Journal for Science and Engineering*. 40 (2): 343-361.
- Nonaka, I. (1991). The knowledge-creating company. *Harvard business review*. 69 (6): 96-104.

- Nonaka, I. and Takeuchi, H. (1995). *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford university press.
- Nonaka, I., Von Krogh, G. and Voelpel, S. (2006). Organizational knowledge creation theory: Evolutionary paths and future advances. *Organization studies*. 27 (8): 1179-1208.
- Orlikowski, W. J. (1992). The duality of technology: Rethinking the concept of technology in organizations. *Organization science*. 3 (3): 398-427.
- Orlikowski, W. J. and Barundi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research*. 2 (1): 1-28.
- Ozkaya, H. E., Droge, C., Tomas, G., Hult, M., Calantone, R. and Ozkaya, E. (2015). Market orientation, knowledge competence, and innovation. *International Journal of Research in Marketing*. 32: 309-318.
- Patil, G. and Bamnote, G. (2015). A Survey on Knowledge Management in Small-Sized Software Organizations. *International Research Journal of Engineering and Technology*. 2 (2): 116-123.
- Peltier, J. W., Zahay, D. and Lehmann, D. R. (2013). Organizational Learning and CRM Success: A Model for Linking Organizational Practices, Customer Data Quality, and Performance. *Journal of Interactive Marketing*. 27 (1): 1-13.
- Peng, J., Lawrence, A. and Koo, T. (2009). Customer knowledge management in international project: a case study. *Journal of Technology Management in China*. 4 (2): 145-157.
- Petter, S., Straub, D. and Rai, A. (2007). Specifying formative constructs in information systems research. *MIS quarterly*. 31 (4): 623-656.
- Piry, S., Luikart, G. and Cornuet, J. (1999). Computer note. BOTTLENECK: a computer program for detecting recent reductions in the effective size using allele frequency data. *Journal of Heredity*. 90 (4): 502-503.
- Plessis, M. d. and Boon, J. (2004). Knowledge management in eBusiness and customer relationship management: South African case study findings. *International Journal of Information Management*. 24 (1): 73-86.
- Polanyi, M. and Sen, A. (1967). *The tacit dimension*. Doubleday New York.
- Polit, D. F. and Beck, C. T. (2004). *Nursing research: Principles and methods*. Lippincott Williams & Wilkins.

- Polit, D. F. and Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in nursing & health*. 29 (5): 489-497.
- Prabhu, N. A., Latha, R., Sankaran, K. and Kannabiran, G. (2011). Impact of knowledge management on offshore software development: An exploratory study. *Advanced Computing (ICoAC), 2011 Third International Conference on*, IEEE.
- Primer, A. P. (1992). Quantitative methods in psychology. *Psychological bulletin*. 112 (1,155-159).
- Racela, O. C. (2014). Customer Orientation, Innovation Competencies, and Firm Performance: A Proposed Conceptual Model. *Procedia - Social and Behavioral Sciences*. 148: 16-23.
- Rahgoshay, h. (2010). challenges and problems of Information technology In Iran. *rahavardNoor*. 1 (7): 40-45.
- Ramirez, E., David, M. E. and Brusco, M. J. (2013). Marketing's SEM based nomological network: Constructs and research streams in 1987–1997 and in 1998–2008. *Journal of Business Research*. 66 (9): 1255-1260.
- Rhodes, J., Hung, R., Lok, P., Lien, B. Y. H. and Wu, C. M. (2008). Factors influencing organizational knowledge transfer: implication for corporate performance. *Journal of knowledge management*. 12 (3): 84-100.
- Riege, A. (2005). Three-dozen knowledge-sharing barriers managers must consider. *Journal of knowledge management*. 9 (3): 18-35.
- Ringle, C., Sarstedt, M. and Straub, D. (2012). A critical look at the use of PLS-SEM in MIS quarterly. *MIS Quarterly (MISQ)*. 36 (1).
- Ringle, C. M., Wende, S. and Will, A. (2005). SmartPLS 2.0 (beta), Hamburg.
- Rollins, M. (2008). *Customer information usage and its effect on seller company's customer performance in business-to-business markets: an empirical study*. Turku School of Economics.
- Rollins, M., Bellenger, D. N. and Johnston, W. J. (2012). Does customer information usage improve a firm's performance in business-to-business markets? *Industrial Marketing Management*. 41 (6): 984-994.
- Rollins, M. and Halinen, A. (2005). Customer knowledge management competence: towards a theoretical framework. *System Sciences, 2005. HICSS'05. Proceedings of the 38th Annual Hawaii International Conference on*, IEEE.

- Rowley, J. (2002). Eight questions for customer knowledge management in e-business. *Journal of knowledge management*. 6 (5): 500-511.
- Salojärvi, H., Saarenketo, S. and Puumalainen, K. (2013). How customer knowledge dissemination links to KAM. *Journal of Business & Industrial Marketing*. 28 (5): 383-395.
- Salojärvi, H. and Sainio, L.-M. (2015). CRM Technology and KAM Performance : The Mediating Effect of Key Account-Related Knowledge. *Journal of Business Marketing Management*. 8: 435-454.
- Salojärvi, H., Sainio, L.-M. and Tarkiainen, A. (2010). Organizational factors enhancing customer knowledge utilization in the management of key account relationships. *Industrial Marketing Management*. 39 (8): 1395-1402.
- Sanayei, A. and Sadidi, M. (2011). Investigation of customer knowledge management (CKM) dimensions: A survey research. *International Journal of Business and Management*. 6 (11): p234.
- Sarrab, M. and Rehman, O. M. H. (2014). Empirical study of open source software selection for adoption, based on software quality characteristics. *Advances in Engineering Software*. 69: 1-11.
- Schaarschmidt, M., Bertram, M., Walsh, G. and von Kortzflieisch, H. F. (2015). Customer Knowledge and Requirements Engineering in Customization Projects: A Multi-Method Case Study. *ICIS 2015 Proceedings*. 12 (1): 111-126.
- Schaarschmidt, M. and Kilian, T. (2014). Impediments to customer integration into the innovation process: A case study in the telecommunications industry. *European Management Journal*. 32 (2): 350-361.
- Shannak, R., Masa'deh, R., Al-Zu'bi, Z., Obeidat, B., Alshurideh, M. and Altamony, H. (2012). A theoretical perspective on the relationship between knowledge management systems, customer knowledge management, and firm competitive advantage. *European Journal of Social Sciences*. 32 (4): 520-532.
- Shek, S. P. and Sla, C.-L. (2008). Understanding the Motivations of Consumer Knowledge Sharing in Online Community. *Proceedings of the Fourteenth Americas Conference on Information Systems* Toronto, ON, Canada August 14th-17th.

- Shieh, C.-J. (2011). Study on the relations among the customer knowledge management, learning organization, and organizational performance. *The Service Industries Journal*. 31 (5): 791-807.
- Shih, J.-Y. (2012). A Comparison of Knowledge Map and Keyword Search in Knowledge Retrieval. *Asian Social Science*. 10 (15): 118-132.
- Sim, J.-B. and Kim, Y.-J. (2013). Influencing Factors For The Adoption Of Mobile Office Services: Empirical Investigation Among Sales Workers. *International Journal of Arts & Sciences*. 6 (3): 797.
- Sindakis, S., Depeige, A. and Anoyrkati, E. (2015). Customer-centered knowledge management: challenges and implications for knowledge-based innovation in the public transport sector. *Journal of Knowledge Management*. 19: 559-578.
- Skotis, A., Katsanakis, I., Macris, A. and Sfakianakis, M. (2013). Creating Knowledge within a C-Business Context: A Customer Knowledge Management View. *Collaborative, Trusted and Privacy-Aware e/m-Services* 264-277, Springer.
- Smith, H. A. and McKeen, J. D. (2005). Developments in practice XVIII-customer knowledge management: adding value for our customers. *Communications of the Association for Information Systems*. 16 (1): 36.
- Sofianti, T., Suryadi, K., Govindaraju, R. and Prihartono, B. (2010). Customer Knowledge Co-creation Process in New Product Development. *Proceedings of the World Congress on Engineering*.
- Sousa, R. (2003). Linking quality management to manufacturing strategy: an empirical investigation of customer focus practices. *Journal of Operations Management*. 21 (1): 1-18.
- Steel, M., Dubelaar, C. and Ewing, M. T. (2013). Developing customised CRM projects: The role of industry norms, organisational context and customer expectations on CRM implementation. *Industrial Marketing Management*. 42 (8): 1328-1344.
- Stefanou, C. J., Sarmaniotis, C. and Stafyla, A. (2003). CRM and customer-centric knowledge management: an empirical research. *Business Process Management Journal*. 9 (5): 617-634.
- Straub, D. (1989). Validating instruments in MIS research. *MIS quarterly*: 147-169.

- Straub, D., Gefen, D. and Boudreau, M.-C. (2005). Quantitative Research. D. E. Avison and J. Pries-Heje. *Research in information systems: A handbook for research supervisors and their students* 221-238. Amsterdam, Elsevier.
- Sulaiman, S., Ariffin, M. K. A., Esmailian, G. R., Faghihi, K. and Baharudin, B. T. H. T. (2011). Customer Knowledge Management Application in Malaysian Mobile Service Providers. *Procedia Engineering*. 15: 3891-3895.
- Taherparvar, N., Esmailpour, R. and Dostar, M. (2014). Customer knowledge management, innovation capability and business performance: a case study of the banking industry. *Journal of Knowledge Management*. 18 (3): 591-610.
- Talet, A. N. (2012). KM Process and CRM to manage Customer Knowledge Relationship Management. *International Proceedings of Economics Development & Research IPEDR*. 29: 60-67.
- Tao, Y.-H., Wu, Y.-L. and Li, J.-K. (2006). A taxonomy of knowledge maps in business application. *Thirty-Fifth Annual Meeting of Western Decision Institute, Big Island, Hawaii, April 11-14*. 35 (1): 72-81.
- Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M. and Lauro, C. (2005). PLS path modeling. *Computational statistics & data analysis*. 48 (1): 159-205.
- Theriou, G. N. and Chatzoglou, P. D. (2008). Enhancing performance through best HRM practices, organizational learning and knowledge management. *European Business Review*. 20: 185-207.
- Tiwana, A. (2004). An empirical study of the effect of knowledge integration on software development performance. *Information and Software Technology*. 46 (13): 899-906.
- Tobin, D. R. (1998). Networking your knowledge. *Management Review*. 87 (4): 46-48.
- Triki, A. and Zouaoui, F. (2011). Customer Knowledge Management Competencies Role in the CRM Implementation Project. *Journal of Organizational Knowledge Management*. 27 (1): 41-52.
- Tseng, S.-M. (2009). A study on customer, supplier, and competitor knowledge using the knowledge chain model. *International Journal of Information Management*. 29 (6): 488-496.
- Tseng, S.-M. (2012). Correlations between external knowledge and the knowledge chain as impacting service quality. *Journal of Retailing and Consumer Services*. 19 (4): 429-437.

- Tseng, S.-M. and Wu, P.-H. (2014). The impact of customer knowledge and customer relationship management on service quality. *International Journal of Quality and Service Sciences*. 6 (1): 77-96.
- Tseng, S. (2016). The effect of knowledge management capability and customer knowledge gaps on corporate performance. *Journal of Enterprise Information Management*. 29 (1): 34-71.
- Tseng, S. M. and Fang, Y. Y. (2015). Customer Knowledge Management Performance Index. *Knowledge and Process Management*. 22 (2): 68-77.
- Unger, B. N., Kock, A., Gemünden, H. G. and Jonas, D. (2012). Enforcing strategic fit of project portfolios by project termination: An empirical study on senior management involvement. *International Journal of Project Management*. 30 (6): 675-685.
- Urbach, N. and Müller, B. (2012). The updated DeLone and McLean model of information systems success. *Information Systems Theory* 1-18, Springer.
- Vaezitehrani, S. (2013). *Customer Knowledge Management in Global Software Projects*. Master thesis. Northumbria University Gothenburg, Sweden
- Van Den Brink, P. (2001). Measurement of conditions for knowledge sharing. *Proceedings 2 nd European Conference on Knowledge Management, Bled, Citeseer*.
- Van den Brink, P. (2003). *Social, organizational, and technological conditions that enable knowledge sharing*. TU Delft, Delft University of Technology.
- Wagner, S. and Deißeböck, F. (2013). *Software product quality control*. Springer.
- Wahlroos, J. (2010). Social media as a form of organizational knowledge sharing. A case study on employee participation at Wärtsilä. *Master thesis , Department of Social Research, Faculty of Social Sciences, University of Helsinki, Helsinki*.
- Waltz, C., Strickland, O. and Lenz, E. (2005). *Measurement in nursing and health research*, New York, NY: Springer.
- Wang, H. and Yu, Z. (2010). The Research of Customer Knowledge Management in CRM. *Intelligent Computation Technology and Automation (ICICTA), 2010 International Conference on*, 11-12 May 2010.
- Wang, M.-L. (2015). Learning climate and customer-oriented behaviors: the mediation of customer knowledge. *Journal of Managerial Psychology*. 30 (8): 955-969.

- Wilcox, J. B., Howell, R. D. and Breivik, E. (2008). Questions about formative measurement. *Journal of Business Research*. 61 (12): 1219-1228.
- Wilde, S. (2011). *Customer Knowledge Management*. Springer.
- Wong, K. Y. and Aspinwall, E. (2005). An empirical study of the important factors for knowledge-management adoption in the SME sector. *Journal of knowledge management*. 9 (3): 64-82.
- Wu, J., Guo, B. and Shi, Y. (2013). Customer knowledge management and IT-enabled business model innovation: A conceptual framework and a case study from China. *European Management Journal*. 31 (4): 359-372.
- Wu, L.-Y. (2006). Resources, dynamic capabilities and performance in a dynamic environment: Perceptions in Taiwanese IT enterprises. *Information & Management*. 43 (4): 447-454.
- Xu, M. and Walton, J. (2005). Gaining customer knowledge through analytical CRM. *Industrial management & data systems*. 105 (7): 955-971.
- Xuelian, L., Chakpitak, N. and Yodmongkol, P. (2015). A Novel Two-Dimension' Customer Knowledge Analysis Model. *Asian Social Science*. 11.
- Yang, J. L. and Tzeng, G.-H. (2011). An integrated MCDM technique combined with DEMATEL for a novel cluster-weighted with ANP method. *Expert Systems with Applications*. 38 (3): 1417-1424.
- Yang, L.-R., Huang, C.-F. and Hsu, T.-J. (2014). Knowledge leadership to improve project and organizational performance. *International Journal of Project Management*. 32 (1): 40-53.
- Yayla, A. A. (2008). *Antecedents of IT-business strategic alignment and the moderating roles of goal commitment and environmental uncertainty*. Master Thesis. Florida Atlantic University
- Yeung, A. H. W., Lo, V. H. Y., Yeung, A. C. L. and Cheng, T. C. E. (2008). Specific customer knowledge and operational performance in apparel manufacturing. *International Journal of Production Economics*. 114 (2): 520-533.
- Yin, R. K. (2009). *Case study research: Design and methods*. sage.
- Yu, Y. and Choi, Y. (2014). Stakeholder pressure and CSR adoption: The mediating role of organizational culture for Chinese companies. *The Social Science Journal*. 53 (2): 226-235.
- Zhang, Z. J. (2011). Customer knowledge management and the strategies of social software. *Business Process Management Journal*. 17 (1): 82-106.

- Zhao, J., Wang, T. and Fan, X. (2015). Patient value co-creation in online health communities: Social identity effects on customer knowledge contributions and membership continuance intentions in online health communities. *Journal of Service Management*. 26 (1): 72-96.
- Zhongke, Z. and Lixin, L. (2010). The Application Tactics of Customer Knowledge Management. *Management and Service Science (MASS), 2010 International Conference on*, IEEE.
- Zogaj, S. and Bretschneider, U. (2012). Customer Integration in New Product Development-A Literature Review Concerning The Appropriateness of Different Customer Integration Methods to Attain Customer Knowledge. *ECIS 2012 Proceedings*. 15 (2): 12-18.