

ICT RESOURCES & CAPABILITIES, ECONOMIC CRISIS AND CRM ADOPTION

Research full-length paper

General Track

Kyriakou, Niki, University of the Aegean, Samos, Greece, nkyr@aegean.gr

Loukis, Euripidis, University of the Aegean, Samos, Greece, eloukis@aegean.gr

Abstract

Firms are implementing Customer Relationship Management (CRM) systems not for reducing their operational costs and increasing their efficiency, as it happens with other kinds of information systems, but in order to offer better services to their customers and build better relationships with them. This fact stems from CRM's customer facing nature, which is there to improve the relationship a firm has with its most valuable asset: the customers. However, there is limited research about the factors that lead firms to adopt CRM systems. This paper aims to contribute to filling this research gap, by investigating the effects of a wide range of factors on CRM adoption by firms; these factors include firm's ICT resources and capabilities, and also the effects of a major disruption in the environment: economic crisis leading to recession. Our main theoretical foundation is the Technology, Organization, Environment (TOE) theory of technological innovation adoption. Based on data from 363 Greek firms CRM adoption models have been estimated, which indicate that the sophistication of firm's ICT technological resources has a strong positive effect on CRM adoption, alongside two ICT capabilities: ICT strategic planning, and the rapid internal implementation of various interconnections/integrations of existing applications to achieve interoperability. Human capital, innovativeness and use of 'organic' forms of work organization (such as horizontal teamwork) are also important factors that affect positively CRM adoption. On the contrary, the effects of the economic crisis (decrease of domestic demand for products/services from businesses, individual customers and the public sector, reduction of credit limits by banks and non-payment or late payment by customers) do not have impact on CRM systems adoption.

Keywords: CRM adoption, economic crisis, economic recession, ICT resources, ICT capabilities.

1 Introduction

Nowadays, firms are expected to cope with a highly complex, globally competitive and financially unstable business environment, where there are constantly large and unpredictable changes. These conditions oblige firms to adopt novel organizational structures, processes and practices in order to become more competitive, and operate more efficiently and effectively (Puklavec et al., 2018; Chan, Chong, 2013). Achieving or maintaining competitive advantage can only become reality through the search for change and resilience to business risks (Arvanitis, Loukis, 2009; Zhu et al., 2006). In this context, firms place much emphasis on the development of various kinds of complex enterprise information systems (IS), such as Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM) and Collaboration Support Systems (CSS) (Laudon,

Laudon, 2014; Rainer et al., 2015). The day-to-day business transactions that take place through the available enterprise systems in a firm offer a wealth of structured and unstructured data that can be used to better understand, manage and exploit complex customer behaviour (Baesens, 2014). A technological innovation that can make a significant contribution to the utilization of this data for improving the relationship with the customers is the adoption of ICT-supported Customer Resource Management (CRM). Thus, it is now essential for firms to understand the process and the determinants of adopting CRM systems.

CRM is recognized as one of the most successful strategic approaches since 1990. However, there is not a consistent definition yet (Xu et al., 2002; Ling, Yen, 2001). Kincaid (2003) defines CRM as “the strategic use of information, processes, technology, and people to manage the customer's relationship with [the] company across the whole customer life cycle.” Also, Swift says that CRM is “an enterprise approach to understanding and influencing customer behaviour through meaningful communications in order to improve customer acquisition, customer retention, customer loyalty, and customer profitability”. Moreover, Ko et al. (2004) define CRM as “the integrated customer management strategy of a firm to efficiently manage customers by providing customized goods and services and maximizing customers' lifetime values”. The aim of CRM is to achieve a competitive advantage with respect to customer management and in this way increase firms' sales and profits (Gartner Group, 2006).

Research on Customer Relationship Management (CRM) systems adoption by firms is limited, and it shows that the adoption is not high, and that there is a high probability for the adoption to fail (Reijonen, Laukkanen, 2010; Nguyen, Waring, 2013; Ahani et al., 2017). Firms seem to lack understanding, knowledge and also capability to develop CRM systems (Peltier et al., 2009; O'zgener, Iraz, 2006). Factors that seem to affect CRM adoption include user acceptance, the interconnection with the existing firms' systems and the ICT business alignment (Richard et al., 2007). When firms are deciding to adopt CRM systems is mainly because they expect this investment to change their customer behavior and, as a result, increase their sales and revenue (Maklan, Knox, 2009); this is quite different for the motivation behind the adoption of the main kind of enterprise systems, the ERP ones, which is efficiency and operational costs reduction.

Customers relationships are particularly important for firms, and CRM systems can contribute positively to managing and improving them based on ICT. CRM systems allow “relationship marketing” using ICT in order to build better and deeper relationships with different groups of customers (Goodhue et al., 2002). However, the investment on CRM system implementation seems to be not convincing, when they are assessed from a return on investment perspective, and also because of their high probability of failure. Although CRM systems have the potential to offer benefits to firms, studies show low levels of success regarding benefits generation (Mitussis et al., 2006). Also, studies that describe the benefits from CRM systems show that the effective adoption is difficult to be achieved and that the expected benefits in almost half of the cases are not achieved (Reijonen, Laukkanen, 2010; Ismail et al., 2007). However, the demand for CRM systems has increased because most of the firms can understand the value of customer relationships, the value of knowing the customers better and customer retention (Greenberg, 2010).

So far, the effects of only some factors on the adoption of CRM systems have been investigated in previous research; on the contrary the effects of some other factors whose importance has been highly emphasized in IS research (such as firm's ICT resources and capabilities) or in management research (such as economic crises that repeatedly appear in market-based economies). We are aiming to shed light on such factors, based on data collected from 363 Greek firms that use CRMs through a questionnaire, which are closely related to our research hypotheses concerning factors affecting the adoption (or not) of CRM systems. Among the factors we discuss in the paper, we point out two very important factors' groups. First, previous research in the IS domain has found that a firm in order to take advantage of the great potential of ICTs has to acquire different kinds of ICT resources, and then rationally combine them in order to develop a wide range of ICT-related capabilities (both technological and human ones), and combine them ((Kyriakou, Loukis, 2017; Loukis et al., 2009; Ravichandran,

Lertwongsatien, 2005). Since the adoption of a CRM system is a complex undertaking, which requires close interconnection between ICT personnel and business users, as well as with the provider of the system, in order to adapt the system to the needs and specificities of the firm, and necessitates integration with other enterprise systems of the firm that store customer-related information (such as the ERP systems), we expect that firm's ICT resources and capabilities play an important role in the adoption of a CRM system.

Second, there has been extensive research concerning the most important disruption that repeatedly appear in firms' external environment: the economic crises, which are an unavoidable trait of market-based economies, leading to economic recessions of various durations and intensities (Keeley, Love, 2010; Knoop, 2015; Izsak et al., 2013). When the demand for products/services drops because of widespread economic decline due to an economic crisis firms have to reduce production and procurement, which will have a significant negative impact on the whole supply chain. At the same time, lower demand results in lower sales, which, in turn, will shatter revenue. This has negative impact on capital investment, so we expect that it will affect ICT capital investment as well, in both its soft and hard forms. Thus, new technologies will be unlikely to be adopted during a declining economy. Hence, we would expect firms that operate in economic crises would not be adopting CRM systems as much as the companies in a flourishing economy.

This paper consists of six sections. In section 2 a review of literature relevant to our study is presented. Then in section 3 research hypotheses are formulated. In section 4 the data and the method of this study are described. The results are presented and discussed in section 5. Finally, section 6 concludes the paper with a summary, and future research directions.

2 Literature Review

CRM is considered an innovative management strategy for all firms in all the sectors of the economy. Even though many researchers have explored the benefits of CRM (Kang et al., 2004; Ko et al., 2004; Aspinall et al., 2001; Reinartz, Kumar, 2002; Lemon et al., 2002), there is limited research on the factors that affect the adoption of CRM systems (Ko et al., 2008, Nguyen, Waring, 2013; Alshawi et al., 2011). When it comes to adoption factors, the first organizational characteristic that affects the CRM adoption, based on former studies (Swanson, 1994; Whately, 1985), is the size of the firm. In general, large firms tend to adopt innovations faster than the small ones. In addition, small firms have higher competition, lack of resources and professionals, as well as financial difficulties. Another organizational characteristic that affects CRM adoption is the organizational strategy. Companies with an aggressive organizational strategy are more likely to adopt an innovation or innovative technologies. Finally, information system maturity is one more organizational characteristic that affects CRM adoption. Firms that have prior knowledge of information systems are more mature and tend to adopt new systems, like the CRM systems (Chang et al., 1999; O'Leary et al., 2004).

Nguyen and Waring (2013) studied the relationship between organizational characteristics and the process of CRM adoption by firms in California, through a questionnaire-based research and a dataset of 126 firms. The results of this research indicate that the factors that affect CRM adoption are the management's innovativeness, the management's perception of CRM systems (perception of benefits and usefulness of the CRM technology), as well as the firm's size and firm's perceived market position (the way a firm perceives itself in the market, in relation to other companies within the same industry). The study shows that firm's sector is not a significant factor for adopting CRM systems. Other research, which is focused on the factors that affect CRM adoption comes from Ashawi et al. (2011). This research, through a qualitative data analysis, concluded that the main factors which lead a firm to the CRM adoption are: Benefits; Staff ICT skills; Managerial ICT skills; Organisation size; Support; Funding; Strategy; Business objectives; Customer response/attitude; Government; Competitive pressure; Suppliers; ICT infrastructure; Purchase, implementation and integration cost; System evaluation

and selection criteria; Complexity; Integration; Vendor after sale support; Software selection criteria; Evaluation of the Data Quality Tools and Processes; Evaluation of the quality of customer data; Customer data infrastructure; and Customer data sources classification. Also, Ko et al. (2008) studied the influence of organization characteristics on the CRM adoption process in the Korean fashion industry. Based on a dataset of 299 firms, they concluded that organizational strategy (prospector, analyser, reactor, defender), maturity of information system, and product category significantly influence the CRM adoption process.

This paper aims to explore other factors that lead firms to adopt CRM systems. We base our analysis on the Technology, Organization, Environment framework and attempt to model several different factors that affect the CRM adoption, including, but not limited to, firm's ICT capabilities and potential effects of the economic crisis.

3 Research Hypotheses

Our theoretical foundation for the formulation of the research hypotheses of this study was the Technology, Organization and Environment (TOE) theory of technological innovation adoption (Tornatzky and Fleischer, 1990; Baker, 2011); according to this theory the adoption of technological innovations by firms is influenced by three categories of factors, which concern the technological, organizational context and environmental context. For each of these three influencing contexts we have defined specific factors we expect to affect CRM adoption and formulated corresponding research hypotheses.

3.1 Technological Context

The first eight research hypotheses are associated with the technological context, and concern the effects of ICT technological and human resources as well as of six important ICT capabilities on CRM adoption. With respect to firm's ICT technological resources we expect that firms having highly sophisticated ICT infrastructure will have extensive knowledge and experience regarding the efficient and effective use of ICT in order to support their activities, including the ones dealing with the customer; both their ICT personnel and their business units' personnel will already have some knowledge and experience in using ICT in order to manage some part of their transactions with customers (e.g. through a sales management application they will already have some knowledge and experience in managing electronically the main stages of their sales to their customers). Therefore, they will have a propensity to obtain more customer-related functionality in order to manage electronically other stages of their relationships with their customers, such as the pre-sales and after-sales stages, and this will lead to a propensity to adopt CRM. In order to manage more effectively customers in a highly competitive environment, firms will proceed towards adopting and using an additional important type of enterprise systems, the CRM (supporting sales automation, customer analysis, after sales service, marketing databases, etc.). These technologies coordinate and automate processing of business process information between employees of different business departments that are directly related to customers, such as marketing, sales, and customer service departments (Laudon, Laudon 2014; Ahearne et al., 2007; Crittenden et al., 2010). Also having a sophisticated ICT infrastructure means having some customer-related data, so it will be highly beneficial to augment them with the additional customer-related data that CRM systems generate. Therefore, our first research hypothesis is:

H1. The degree of firms' ICT infrastructure sophistication has a positive effect on the extent of adoption of CRM systems.

The complexity of business processes of modern firms necessitates the employment of ICT staff with advanced ICT skills who understand on one hand firm's specific business processes and needs and on the other hand the continuously increasing capabilities of modern ICT in order to make innovative use

of the latter in order to support the former. The advantage provided by competent ICT staff is vital for the effective implementation of ICTs in existing business processes or the adoption of new innovative ICT to meet new needs. ICT staff have to perform multiple duties in a firm context related to the operation, management and support of firm's IS, the development of new ICT applications and the management of various ICT projects undertaken in collaboration with external partners and consultants (Moore, 2000; Shih et al., 2011). For the efficient management of all these issues, it is understood that in addition to the multitude of skills that ICT professionals need to have, there is a need for a large percentage of dedicated ICT employees so that their total working time is not spent on their urgent and everyday tasks. Previous literature has concluded that human capital is of critical importance for the introduction of innovations, and especially ICT human capital is quite important for the adoption of ICT-based innovations (Arvanitis et al., 2013). Therefore, since the adoption of CRM systems is an important innovation in firm's customer-facing activities and processes we expect that the employment of ICT personnel will have a positive impact on it, so our next research hypothesis is:

H2. The employment of ICT personnel has a positive effect on the extent of adoption of CRM systems.

Previous research in the IS domain has revealed that firms in order to exploit the big potential of ICT should not only acquire ICT resources, but also combine them rationally in order to develop some ICT-related capabilities (Arvanitis, Loukis, 2017; Ravichandran, Lertwongsatien, 2005; Gu, Jung, 2013). The adoption of a CRM system will necessitate its interconnection/integration with other existing applications of the firm, which support customer facing activities and store customer related data, such as pre-existing sales, marketing, etc. applications. Also, it will necessitate the development of new software applications that exploit the capabilities and the data collected through the CRM system, as well as the change of pre-existing applications. Furthermore, capabilities for internal development of software applications as well as changing pre-existing ones (including capabilities for analysing users' requirements and transforming them to new software functionalities and capabilities) will be very useful for the adaptation of the selected CRM solution to the specific needs of the firms, as well as for the better exploitation of the capabilities of this solution, even the more advanced ones. Therefore, we expect that ICT capabilities for software interconnection/integration, development and change will be quite useful for the successful adoption and implementation of a CRM system, and for the generation of business benefits from it, so they will have positive impact on the degree of CRM adoption; thus the next three research hypotheses are:

H3. The capability of rapid internal implementation of various interconnections/integrations of existing applications has a positive effect on the extent of adoption of CRM systems.

H4. The capability of rapid internal implementation of various changes in the application software of information systems in order to meet new requirements has a positive effect on the extent of adoption of CRM systems.

H5. The capability of rapid internal development of new software applications in order to meet new requirements has a positive effect on the extent of adoption of CRM systems.

Previous IS literature has emphasized the importance of internal and external ICT relations: the relation and co-operation of ICT personnel with employees of other business units (using ICT applications for supporting their activities) are quite important in order to make effective use of ICT applications, and achieving better alignment with business objectives; also external relations and co-operations with firm's ICT vendors are quite important for the effective exchange of information with them, and finally for the generation of business value from ICT (Feeny, Willcocks, 1998; Ravichandran, Lertwongsatien, 2005; Gu, Jung, 2013). For the success of the CRM systems close interaction and co-operation is required between three parties: firm's ICT unit, firm's business units dealing with customer facing activities and external vendors providing CRM related systems and services. CRM systems are used to collect, and store data related to customers, so for their implementation it is necessary to take into consideration the specific work practices, processes and needs of several different customer facing business units. All of the above suggest that close co-ordination and co-operation between

the business units of the firm and the ICT unit is required. Also, developing a good and deep relationship with corresponding ICT vendors, characterized by extensive exchange of information and knowledge, shared understanding, trust and a positive attitude towards solving problems and resolving any differences is quite important for CRM systems success and effectiveness. Furthermore, previous IS domain research has revealed and analysed the importance and impact of ICT strategic planning and alignment for the generation of business value from ICT (Chan and Reich, 2007; De Haes and Van Grembergen, 2009; Wu et al., 2015). Development of ICT strategic planning, defining firm's directions and plans for ICT investment, development, use and management, aligned with firm's overall strategic directions and plans, are very important factors for creating high levels of business value from the use of ICT. We expect this to hold for CRM systems' investments as well, which should be aligned with overall firm's strategies. Therefore, we have the next three research hypotheses:

H6. The capability for establishing good cooperation, mutual understanding and trust between the ICT staff of a firm and the staff of the other business units that use ICT has a positive effect on the extent of adoption of CRM systems.

H7. The capability for establishing good cooperation, trust and exchange of information with ICT suppliers and their support to solve relevant problems has a positive effect on the extent of adoption of CRM systems.

H8. The capability for developing ICT strategies and plans which are connected with the overall strategies and plans of the firm has a positive effect on the extent of adoption of CRM systems.

3.2 Organizational Context

The following four research hypotheses are associated with the organizational context, and concern firm's size, human capital, innovativeness as well as use of 'organic structures' (such as horizontal teams). Previous research has found organizational size to be related to business innovation, with larger organizations appearing to be more innovative (Malladi, Krishnan, 2013; Mahler, Rogers, 1999). As far as organizational size of is concerned, studies show that the organizational complexity and resources increase with size, which are drivers for the introduction of process innovations and especially innovative technological infrastructures (Geroski, 2000; Rogers, 1995). Large firms due to economies of scale (the tendency of long-term total costs to decline as production increases) are able to adopt CRMs with lower 'unit costs' (e.g. CRM system costs per customer, or per sold product or service unit) compared to small and medium-sized firms. Also, due to the great complexity large-scale enterprises face at all levels of their operations, they are turning to integrating innovations to cope with this complexity. So our next research is:

H9. Firm's size has a positive effect on the extent of adoption of CRM systems.

Numerous previous studies have found positive relationships between firm's human capital and innovation (Aghion, Howitt, 1998; Barro, 1999; Romer, 1990). Business manpower is the driving force of all kinds of innovation, as it is a key factor in order to identify new needs and requirements for innovations, as well as for absorbing relevant external knowledge, and combine it with their existing knowledge base, which enables companies to create new knowledge and innovation (Vandenbussche et al., 2006). Indeed, it has been concluded by previous research that personnel with a high level of education and work experience, through the day-to-day duties, have the ability to accumulate knowledge about their business activities, while at the same time they can evaluate and assimilate more effectively relevant external knowledge, from various external sources, including colleagues from other firms, promoting innovation activity (Vinding, 2006; Lopez-Garcia, Montero, 2012). Thus, taking into account the complexity of the CRM systems regarding their implementation and use, we expect that firm's human capital will be quite important for both, so our next research hypothesis is:

H10. Human capital has a positive effect on the extent of adoption of CRM systems.

Innovative firms accumulate experience in the acquisition of innovation relevant external knowledge, as well as its combination with internal knowledge, and exploitation for the design and implementation of innovations; and also, in the management of the inherent risk of innovation, and the require management of the changes they drive. This experience can be quite useful for future innovation activities. Therefore, when firms are more innovative they have a higher propensity to invest into more innovative technologies in the future; hence, innovative firms would be expected to have a higher propensity to invest in CRM systems: the degree of introduction of innovative products and services in the past is expected to have a positive impact on the adoption of CRM. So, our next research hypothesis will be:

H11. The degree of firm's innovativeness has a positive effect on the extent of adoption of CRM systems.

Management science research has revealed that complementing the 'traditional' hierarchical forms of work organization with non-hierarchical 'organic' ones, such as horizontal teams and decentralization, can provide significant performance advantages, especially with respect to firm's capacity to respond to dynamic environments and make innovations (Black, Lynch, 2001; Donaldson, 2001; Ichniowski et al., 2000). In terms of employee motivation efforts, the use of these new forms of work organization increases information and knowledge exchange as well as processing capabilities, act as an incentive for employees and improve their performance increasing efficiency and effectiveness (Mookherjee, 2006). Decentralized decision-making and teamwork can reduce the number of levels of senior management and foster the exchange of information and knowledge as well as the creation of new knowledge through co-operation among employees (Lee and Choi, 2003). Since the adoption of CRM is an important innovation in firm's customer facing activities, which requires extensive information and knowledge exchange and processing within the firm (between the ICT unit and the customer facing units of the firm, we expect that the adoption of these new organic forms of work organization will benefit CRM adoption; therefore, our next research hypothesis is:

H12. The adoption of organic forms of work organization has a positive effect on the extent of adoption of CRM systems.

3.3 Environmental Context

Our final two research hypotheses are associated with firm's external context, and concern the intensity of price and non-price competition as well as the main consequences of economic crisis (decrease of demand for products/services, reduction of credit limits by banks and non-payment or late payment by customers). There has been extensive previous literature concluding that intense competition between firms tends to drive an increase in the adoption of innovations, and especially technological innovations (Mansfield, 1968; Mansfield et al., 1977; Arvanitis et al., 2013; Boonsiritomachai et al., 2016). This relevant literature discriminates between two kinds of competition. The first one relates to the competition that the companies face in the price of products and services (price competition); the second one accounts for all other axes of competition, such as the quality of products and services, the ability to adapt to special needs of customers, the introduction of new products and services, the provision of support services, etc. (non-price Competition). Since the adoption of a CRM system represents an important innovation in firm's customer facing practices and processes, we expect that increasing price and non-price competition will lead to a higher degree of adoption of CRM, so our next research hypotheses are:

H13a. Price competition has a positive effect on the extent of adoption of CRM systems.

H13b. Non-price competition has a positive effect on the extent of adoption of CRM systems.

As mentioned in the introduction the most important disruption in firms' external environment are the economic crises, which repeatedly appear in market-based economies, and lead to economic recessions of various durations and intensities (Keeley, Love, 2010; Knoop, 2015; Izsak et al., 2013). These

economic crises reduce the available financial resources of firms for three main reasons: a) they reduce the demand (by businesses, individual customers and public organizations) for most products and services, so firms' sales revenue is reduced; b) banks become less willing to lend money to firms, as there is uncertainty concerning the ability of firms to repay their loans, so credit limits are reduced; c) as customers face similar problems of reduced financial resources they delay their payments or even cannot pay their suppliers. This reduced availability of financial resources results in lower capital investment. Also, when there is uncertainty about the demand for products or services the investments become more risky. The risk of investment is related to the type of investment (e.g. investment in technological innovation is more dangerous than investment in real estate) and the size of businesses (e.g. small businesses face more difficulties getting investments compared to the large ones in times of deep recession due to the lack of credit and limited access to external financing by financial institutions) (Kahle, Stulz, 2012; Gerner, Stegmaier, 2013; Geroski, Gregg, 1997; Stiglitz, Weiss, 1981; Goodacre, Tonks, 1995). As the adoption of a CRM system necessitates a significant investment our final three research hypotheses are:

H14a. Decrease of domestic demand from businesses, individual customers and the public sector has a negative effect on the extent of adoption of CRM systems.

H14b. Reduction of credit limits by banks has a negative effect on the extent of adoption of CRM systems.

H14c. Non-payment or late payment by customers has a negative effect on the extent of adoption of CRM systems.

Figure 1 shows our research model concerning the factors that affect CRM adoption.

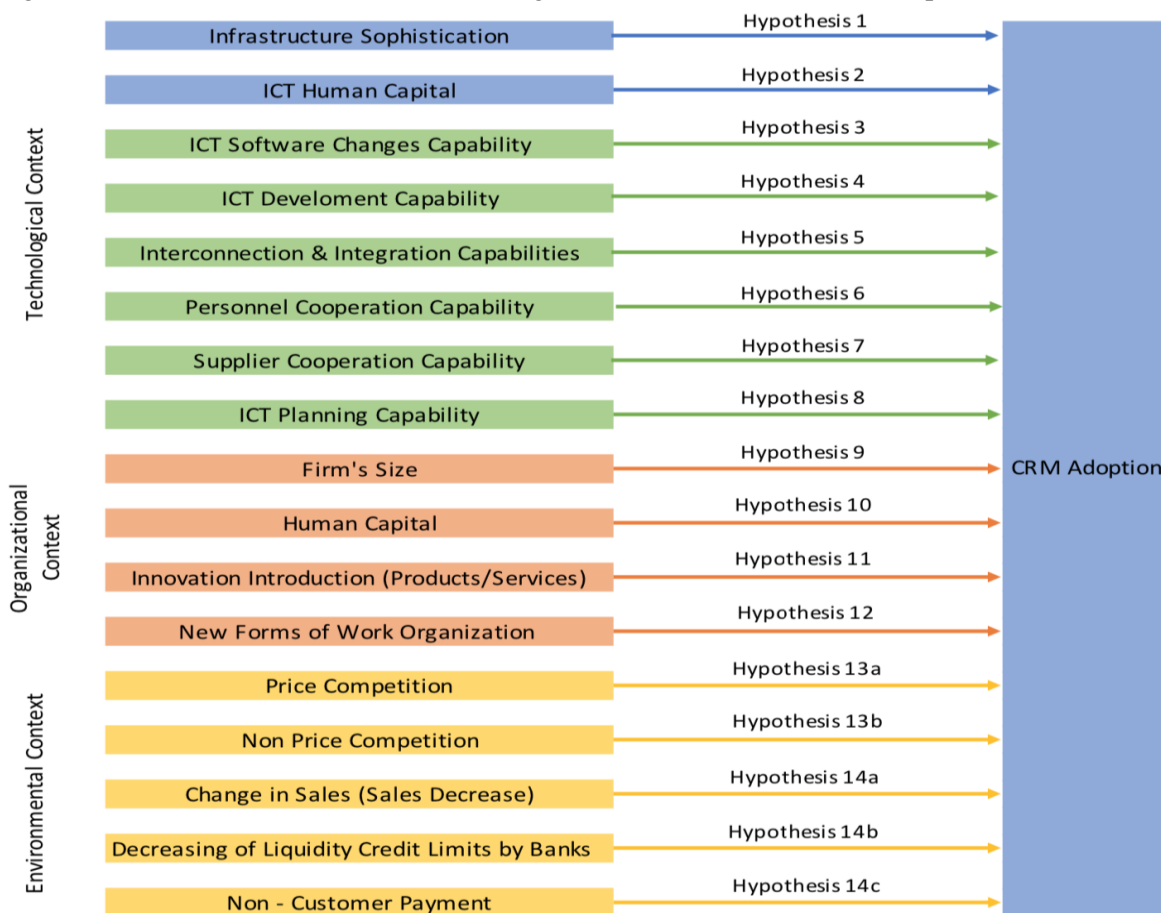


Figure 1. Research model concerning factors affecting CRM adoption.

4 Data and Method

In this study, we have used data from 363 Greek firms (188 small, 131 medium and 41 large ones). This data was collected through a questionnaire-based survey, titled “Innovation – Use of ICT and Cloud Computing – Impact of the Economic Crisis on Greek Firms”, which has been conducted in cooperation with one of the largest business information and consulting companies in Greece, ICAP Group S.A. The response rate of the survey was 11%.

We should note that the original sample of ICAP is not representative of the composition of Greek firms by industry. The Greek economy contains thousands of small and very small enterprises in trade, particularly in retail trade, tourism, particularly in catering, and construction. The ICAP sample focuses on the most technologically developed part of the Greek economy: it concentrates on manufacturing (30.7% of sample firms) and some modern service industries (such as computer services, business services and transport/communication - 13.7% of sample firms), while still keeping a high percentage of trade and tourism firms (49.5% of sample firms).

In order to test our research hypotheses H1 to H14 ordinal regression models were estimated using the above data based on the following specification:

$$\text{CRM} = b_0 + b_1 \cdot \text{IS_Sophistication} + b_2 \cdot \text{ICT_HC} + b_3 \cdot \text{Soft_Change_Cap} + b_4 \cdot \text{ICT_Dev_Cap} + b_5 \cdot \text{Inter_Cap} + b_6 \cdot \text{Coop_IT_Bus_Cap} + b_7 \cdot \text{Coop_Sup_Cap} + b_8 \cdot \text{ICT_Plan_Cap} + b_9 \cdot \text{Size} + b_{10} \cdot \text{HC} + b_4 \cdot \text{Innov} + b_{11} \cdot \text{Organ_Forms} + b_{12} \cdot \text{NP_Comp} + b_{13} \cdot \text{P_Comp} + b_{14} \cdot \text{Decr_Dem} + b_{15} \cdot \text{Decr_Banks} + b_{16} \cdot \text{NonCustPay} + b_{17} \cdot \text{Sect_Man_Serv} + e_i \quad (1)$$

The dependent variable in all our models is the degree of adoption of a CRM system (5-point Likert scale variable, with 1 = not at all and 5 = to a very large extent). Regarding the independent variables of our models, as we base our analysis on the three contexts/categories of factors that the TOE (Technology, Organization & Environment) theory defines (Tornatzky and Fleischer, 1990; Baker, 2011), for each of them we defined a number of specific independent variables corresponding to our research hypotheses, and we also added a dummy variable for firms’ sector (service or manufacturing). Most of our independent variables are ordinal in a 5-point Likert scale (with 1 = not at all and 5 = to a very large extent). In particular, we used the following independent variables:

Technological context: IS_Sophistication (=degree of development and use enterprise systems, such as ERP, SCM, BI/BA – calculated as the average of three ordinal variables assessing the degree of adopting these three kinds of enterprise systems), ICT_HC (= ICT personnel as a percentage of firm’s overall personnel), Soft_Change_Cap (=capability of rapid internal implementation of various changes in the application software of firm’s IS), ICT_Dev_Cap (=Capability of rapid internal development of new software applications in order to meet new requirements), Inter_Cap (=Capability of rapid internal implementation (by the IT staff of a company) of various interconnections/integrations of existing applications, so that there is interoperability between them), Coop_IT_Capab (=Good cooperation, mutual understanding and trust between the IT staff of a company and the staff of the other business units that use IT), Coop_Sup_Cap (=Good cooperation, trust and exchange of information with IT suppliers and support of them for solving all relevant problems), ICT_Plan_Cap (=IT strategies and plans which are connected with the overall strategies and plans of the company)

Organizational context: Size (=Firm size based on the number of employees), HC (=percentage of employees who are graduate of Universities/Technological Education Institutes), Innovation (=Introduction of new products/services with significant innovations during the last three years), Org_Forms (= use of the new organic forms of work organization, such as such as horizontal teams and decentralization)

Environmental context: NP_Comp (= intensity of non price competition), P_Comp (= intensity of price competition), Decr_Dem (decrease of domestic demand from businesses, individual customers and public sector due to the crisis), Decr_Banks (=reduction of credit limits by banks (liquidity) due to the crisis), NonCustPay (=nonpayment or late payment by customers due to the crisis).

5 Results and Discussion

In the following two Tables 1 and 2) we can see the result of the estimates of the ordinal regression models. Because of the high level of correlation among the eight ICT resources and capabilities independent variables in order to avoid multi-collinearity problems we did not include all these variables in the same model, and estimated separate models for each of them. The same happened for the two competition variables. So we estimated a total of 16 models. The statistically significant independent variables are represented with asterisks (***, ** and * indicate statistical significance less than 1%, 5% and 10% respectively).

Ctx	Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Technological	IS_Soph	1.388***							
	ICT_HC		1.454***						
	Soft_Change_Cap			.351***					
	ICT_Dev_Cap				.276***				
	Integr_Cap					.385***			
	Coop_IT_Cap						.336***		
	Coop_Sup_Cap							.428***	
	ICT_Plan_Cap								.641***
Organizational	Size	-.172	.432***	.136	.226	.152	.119	.115	-.069
	HC	.976**	.493	.803**	.903***	.792**	.748**	.810**	.570*
	Inno	.016	.204**	.167*	.151*	.144*	.159*	.174*	.104
	Org_Forms	.359*	.544***	.442**	.480**	.491**	.553***	.534***	.339*
Environmental	NP_Comp	.116	.190**	.226**	.201**	.221**	.231***	.211**	.198**
	Decr_Dem	.132	.055	.034	.038	.073	.065	.050	.015
	Decr_Banks	-.008	-.018	.001	-.007	-.002	-.023	.007	.001
	NonCustPay	.141	.077	.065	.078	.061	.066	.057	.107
Dum	Sector	-.219	-.083	-.140	-.159	-.160	-.100	-.158	-.145

Table 1. Non-Price Competition Ordinal Regression Models.

Table 1 shows the results of the eight non-price competition ordinal regression models. As we can see in the results from the technological context variables, the employment of ICT-skilled personnel has a positive and statistically significant effect on the CRM adoption, followed by the IS sophistication variable, which represents the degree of the sophistication of ICT infrastructures such as ERP, SCM and BI/BA. In terms of the ICT capabilities, they all have positive and statistically significant effects on CRM adoption; the capability of ICT strategic planning connected with the overall strategies and plans of the firm and the capability of good cooperation, trust and exchange of information with ICT suppliers have the strongest effects.

In addition, from the organizational variables the human capital and the use of organic non-hierarchical forms of work organization (such as teamwork and decentralization), and to a lower extent the innovativeness of the firm have a positive and statistically significant effect on the CRM adoption. Finally, from the environmental variables we can see that only the non-price competition variable has a positive and statistically significant effect on the adoption of CRM systems; on the contrary none of the crisis-related variables has a statistically significant effect on CRM adoption.

Table 2 shows the results of the same eight ordinal regression models, but with the price competition independent variable instead of the non-price competition one. As we can see the results are similar, with the only difference that the price competition seems to not have a statistically significant effect on the adoption of CRM systems.

Ctx	Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Technological	IS_Soph	1.399***							
	ICT_HC		1.539***						
	Soft_Change_Cap			.346***					
	ICT_Dev_Cap				.284***				
	Inter_Cap					.383***			
	Coop_IT_Cap						.331***		
	Coop_Sup_Cap							.431***	
	ICT_Plan_Cap								.670***
Organizational	Size	-.169	.444***	.148	.231	.159	.129	.119	-.096
	HC	.973**	.438	.786**	.880**	.773**	.728**	.803**	.530*
	Inno	.006	.198**	.156*	.140	.135	.147	.163*	.085
	Org_Forms	.397*	.593***	.512**	.536***	.557***	.626***	.603***	.388*
Environmental	NP_Comp	.038	.096	.068	.073	.063	.099	.078	.171
	Decr_Dem	.136	.063	.043	.046	.082	.072	.058	.016
	Decr_Banks	.000	-.007	.015	.004	.011	-.007	.021	.011
	Non_CustPay	.140	.078	.062	.077	.058	.064	.056	.106
Dum	Sector	-.228	-.103	-.174	-.189	-.191	-.132	-.184	-.171

Table 2. Price Competition Ordinal Regression Models.

From the above results we can conclude that from the technological factors the existence of ICT-skilled personnel (H2) and the degree of the development of IS systems in the enterprise (H1) affect positively CRM systems adoption. The adoption of CRM systems is also positively correlated with all the firm examined ICT capabilities. Specifically, we can see that hypotheses H4 (concerning the capability for rapid internal implementation of various changes in the application software of information systems in order to meet new requirements), H5 (concerning the capability for rapid internal develop-

ment of new software applications in order to meet new requirements), H3 (concerning the capability for rapid internal implementation of various interconnections/integrations of existing application), H6 (concerning the capability for establishing good cooperation, mutual understanding and trust between the ICT personnel of a firm and their colleagues of the other business units that use ICT), H7 (concerning the capability for establishing good cooperation, trust and exchange of information with IT suppliers and their support to solve relevant problems) and H8 (concerning the capability for developing IT strategies and plans which are connected with the overall strategies and plans of the company) are supported. Also, it has to be noted that ICT planning capability is the most significant among all ICT capabilities that affect CRM adoption, followed by the capability of rapid internal implementation of various interconnections/integrations of existing application, to achieve interoperability.

Regarding the organizational context hypotheses, we can see that Human Capital is one of the most positively and significant correlated with the adoption of CRM systems (H10 is supported), followed by the use of organic forms of work organization (H12 is supported) and the degree of firm's innovativeness (H11 is supported). As we can see the firms' size does not seem to affect the adoption of CRM systems (H9 is not supported). Finally, regarding the environmental hypotheses, we can see that the economic crisis consequences (the decrease of domestic demand from businesses, individual customers and the public sector; the reduction of credit limits by banks; the nonpayment or late payment by customers) seems not to significantly affect the adoption of CRM systems (H14 is not supported). Additionally, regarding the competition we can remark that non-price competition hypothesis is supported (H13b), while the hypothesis of price competition (H13a) is not supported as the price competition is not significantly affecting the adoption of CRM systems.

6 Conclusions

The research objective of this study was to identify factors that drive firms to move forward to the adoption of CRM systems. To this end, the Technology, Organization & Environment (TOE) theory has been utilized as our theoretical foundations, and for each of the three contexts that affect the adoption of technological innovation according to this theory we defined specific factors we expected to affect CRM adoption and formulated corresponding research hypotheses. Among the examined factors are firm's ICT resources and capabilities, and also consequences of economic crisis/recession, which have not been examined by previous relevant literature. For testing our research hypotheses 16 ordinal regression models have been estimated, based on data from 363 Greek firms, collected through a questionnaire.

It has been concluded that all the examined ICT resources and capabilities affect positively CRM adoption; especially the capability for strategic planning alignment has a strong positive effect on CRM adoption, indicating that the strategic orientation of ICT in a firm, and its association with firm's overall strategy, increases firms' awareness of the importance of supporting customers relationships management using advanced IS. On the contrary the examined consequences of economic crisis do not seem to affect the adoption of CRM: this indicates that the crisis on one hand reduces the available financial resources of firms for investments – including the CRM ones – but on the other hand puts pressure on firms to place emphasis on their relationships with their customers in order to protect their shares of the declining markets during the crisis, so these two contrary effects are cancelling one another. Another interesting finding is that the use of organic non-hierarchical forms of work organization, such as teamwork and decentralization, have positive impact on the adoption of CRM, as they increase CRM-related information and knowledge between the ICT unit and the customer facing business units, and enable a better processing of this information and knowledge (at the higher as well as the lower levels of hierarchy), leading to a better understanding of the benefits as well as the challenges of CRM adoption. Finally, firm's human capital (both general and ICT-related), seems to have an important role in the adoption of CRM, since it is a complex and demanding technological and organizational innovation.

Our study has interesting implications for research and practice. With respect to research it makes a contribution to the existing limited empirical literature concerning the factors that affect CRM adoption, examining the effects of some important factors that have not been investigated before. With respect to practice it indicates that firms' management should place emphasis on the development of firm's ICT resources base as well as capabilities, since they affect positively not only firm's efficiency and productivity, but also its capacity to adopt highly beneficial complex technological and organizational innovations. Similar hold for the adoption of organic non-hierarchical forms of work organization, such as teamwork and decentralization, as important complements of the dominant hierarchical organizational structures. Furthermore, firms' management during periods of economic crisis/recession should not reduce indiscriminately all kinds of investments, but should adopt a more selective approach, maintaining some important kinds of investment that affect positively their relationships with customers, which are quite important for reducing the negative impact of economic crises.

References

- Aghion, P. and P. Howitt (1998). *Endogenous Growth Theory*. Cambridge, MA: MIT Press.
- Ahani, A., N. Z. A. Rahim and M. Nilashi. (2017). "Forecasting social CRM adoption in SMEs: A combined SEM-neural network method". *Computers in Human Behavior* 75, 560-578.
- Ahearne, M., D. E. Hughes and N. Schillewaert (2007). "Why sales reps should welcome information technology: Measuring the impact of CRM-based IT on sales effectiveness". *International Journal of Research in Marketing* 24 (4), 336-349.
- Arvanitis, S. and E. Loukis (2009). "Information and Communication Technologies, Human Capital, Workplace Organization and Labour Productivity in Greece and Switzerland: A Comparative Study Based on Firm-level Data". *Information Economics and Policy* 21 (1), 43-61.
- Arvanitis, S., Loukis, E. and V. Diamantopoulou (2013). "ICT-Based and Traditional Innovation Determinants in the Greek Economy". *Journal of Balkan and Near East Studies* 15(4), 434-458.
- Arvanitis, S. and E. Loukis (2017). "Factors explaining ICT expenditure behaviour of Greek firms during the economic crisis 2009-2014" In: *7th International Conference on eDemocracy*, December 2017. Athens, Greece: Springer Verla, p. 255-271.
- Arvanitis, S., E. N. Loukis and V. Diamantopoulou (2016). "Are ICT, workplace organization, and human capital relevant for innovation? A comparative Swiss/Greek study". *International Journal of the Economics of Business* 23(3), 319-349.
- Arvanitis, S., Loukis, E. and Diamantopoulou, V. (2013). "The effect of soft ICT capital on innovation performance of Greek firms". *Journal of Enterprise Information Management* 26 (6), 679-701.
- Aspinall, E., C. Nancarrow and M. Stone. (2001). "The meaning and measurement of customer retention". *Journal of Targeting Measurement and Analysis for Marketing* 10 (1), 7987.
- Baesens, B. (2014). *Analytics in a big data world: The essential guide to data science and its applications*. USA, North Carolina: John Wiley & Sons.
- Baker, J. (2011). "The technology-organization-environment framework". In *Information Systems Theory: Explaining and Predicting Our Digital Society*. Ed. by Y. Dwivedi, M. Wade and S. Schneberger. New York: Springer, p. 231-246.
- Barro, R. J. (1999). "Human Capital and Growth in Cross-Country Regressions". *Swedish Economic Policy Review* 6 (2), 237-277.
- Black, S. E. and L.M. Lynch (2001). "How to Compete: The Impact of Workplace Practices and Information Technology on Productivity". *Review of Economics and Statistics* 83 (3), 434-445.
- Boonsiritomachai, W., G. M. McGrath and S. Burgess (2016). "Exploring business intelligence and its depth of maturity in Thai SMEs". *Cogent Business & Management* 3 (1), 1220663.
- Chan, Y. E., and Reich, B. H. (2007). "IT Alignment: What Have We Learned?." *Journal of Information Technology* 22, 297-315.

- Chan, F. T. S. and A. Y.-L Chong. (2013). "Determinants of mobile supply chain management system diffusion: a structural equation analysis of manufacturing firms". *International Journal of Production Research* 51(4), 1196-1213.
- Chang, Y.H., J.B. Lee and K.C. Nam. (1999). "A study of the framework of IS department innovation". *Management Information Systems Resource* 9 (3), 2546.
- Crittenden, V. L., R. A. Peterson and G. Albaum (2010). "Technology and business-to-consumer selling: Contemplating research and practice". *Journal of Personal Selling & Sales Management* 30 (2), 103-109.
- Damanpour, F. (1987). "The adoption of technological, administrative, and ancillary innovation: impact of organizational lag". *Journal of Management* 13 (4), 675-88.
- De Haes, S., and Van Grembergen, W. (2009). "An Exploratory Study into IT Governance Implementations and Its Impact on Business/IT Alignment". *Information Systems Management* 26(2), 123-137.
- Donaldson, L. (2001). *The Contingency Theory of Organization*. London: Sage Publications.
- Feeny, D. F. and L. P. Willcocks (1998). "Core IT capabilities for exploiting information technology". *Sloan Management Review* 39 (3), 9-21.
- Gartner Group. (2006). *Report highlight for market trends: CRM services - Asia/Pacific, 2006-2007*.
- Gerner, H. D. and J. Stegmaier (2013). "Investitionen in der Krise? Eine empirische Analyse zum Einfluss der Finanz- und Wirtschaftskrise 2008/2009 auf Investitionsanpassungen". *Schmollers Jahrbuch* 133 (2013), 67-96.
- Geroski, P. (2000). "Models of technology diffusion". *Research Policy* 29 (4-5), 603-625.
- Geroski, P. A. and P. Gregg (1997). *Coping with Recession – UK Company Performance in Adversity*. Cambridge: Cambridge University Press.
- Goodacre, A. and I. Tonks (1995). "Finance and Technological Change". In: *Handbook of the Economics of Innovation and Technological Change*. Ed. by Stoneman, P. Oxford: Basil Blackwell, p. 298-341.
- Goodhue, D.L., B.H. Wixom and H.J. Watson (2002). "Realizing business benefits through CRM: hitting the right target in the right way". *MIS Quarterly Executive* 1 (2), 79-94.
- Greenberg, P. (2010). "The impact of CRM 2.0 on customer insight". *Journal of Business & Industrial Marketing* 25 (6), 410-419.
- Gu, J. W. and H. W. Jung (2013). "The effects of IS resources, capabilities, and qualities on organizational performance: an integrated approach". *Information & Management* 50 (2-3), 87-97.
- Ichniowski, C., T. A. Kochan, D. I. Levine, C. Olson and G. Strauss (2000). "What Works at Work: Overview and Assessment". In *The American Workplace. Skills, Compensation and Employee Involvement*, edited by Casey Ichniowski, David Levine, Craig Olson, and George Strauss, 1-37. Cambridge: Cambridge University Press.
- Ismail, H.B., D. Talukder and M.F.A.K. Panni (2007). "Technology dimension of CRM: the orientation level and its impact on the business performance of SMEs in Malaysia". *International Journal of Electronic Customer Relationship Management* 1 (1), 16-29.
- Izsak, K., P. Markianidou, R. Lukach and A. Wastyn. (2013). "The impact of the crisis on research and innovation policies". *Study for the European Commission DG Research by Technopolis Group Belgium and Idea Consult*.
- Kahle, K. M. and R. M. Stulz (2012). "Access to Capital, Investment, and the Financial Crisis". *Journal of Financial Economics* 110 (2), 280-299.
- Kang, J.C. (2004). "A study on the factors associated with the success of CRM in the insurance company". *Journal of the Korean Data Information Science Society* 15 (1), 197-224.
- Keeley, B, P. Love. (2010). *From Crisis to Recovery - The Causes, Course and Consequences of the Great Recession*. Paris: OECD Publishing.
- Knoop, T. A. (2015). *Recessions and Depressions: Understanding Business Cycles* -2nd edition. Santa Barbara, California: Praeger.

- Ko, E., S.H. Kim, M. Kim and J.Y. Woo (2008). "Organizational characteristics and the CRM adoption process". *Journal of Business Research* 61 (1), 65-74.
- Ko, E., S.J. Lee and J.Y. Woo. (2004). "Current CRM adoption in the Korean apparel industry". *Journal of the Korean Society of Clothing and Textiles* 30 (1), 1-11.
- Kyriakou, N. and E. Loukis. (2017). "Hard And Soft ICT Capital And Cloud Computing Benefits". In *11th Mediterranean Conference on Information Systems (MCIS 2017)*.
- Laudon, K. C. and J. P. Laudon, (2014). *Management Information Systems: Managing the Digital Firm - 13th Edition*. UK: Pearson Education Limited.
- Lee, H. and B. Choi (2003). "Knowledge Management Enablers, Processes, and Organizational Performance: An Integrative View and Empirical Examination". *Journal of Management Information Systems* 20 (1), 179–228.
- Lemon, K.N., T.B. White and R.S. Winer. (2002). "Dynamic customer relationship management: incorporating future considerations into the service retention decision". *Journal of Marketing* 66 (1), 114.
- Ling, R. and D.C. Yen. (2001). "Customer relationship management: an analysis framework and implementation strategies". *Journal of Computer Information Systems* 41(3), 8297.
- Loukis, I., A. Sapounas, and Milionis (2009). "The effect of hard and soft information and communication technologies investment on manufacturing business performance in Greece - A preliminary econometric study." *Telematics and Informatics* 26(2), 193-210.
- Lopez-Garcia, P. and J. M. Montero (2012). "Spillovers and Absorptive Capacity in the Decision to Innovate of Spanish Firms: The Role of Human Capital". *Economics of Innovation and New Technology* 21 (7), 589–612.
- Mahler, A. and E. M. Rogers (1999). "The Diffusion of Interactive Communication Innovations and the Critical Mass: The Adoption of Telecommunications Services by German Banks". *Telecommunications Policy* 23 (10-11), 719–740.
- Maklan, S. and S. Knox (2009). "Dynamic capabilities: the missing link in CRM investments". *European Journal of Marketing* 43 (11), 1392-1410.
- Malladi, S. and M. Krishnan (2013). "Determinants of usage variations of business intelligence & analytics in organizations—an empirical analysis". In: *Thirty Fourth International Conference on Information Systems*, Milan.
- Mansfield, E. (1968). *Industrial research and technological innovation*. New York: Norton.
- Mansfield, E., J. Rapoport, A. Romeo, E. Villani, S. Wagner and F. Husic (1977). *The production and application of new industrial technology*. New York: Norton.
- Mitussis, D., O'Malley, L. and M. Patterson (2006). "Mapping the re-engagement of CRM with relationship marketing". *European Journal of Marketing* 40 (5-6), 572-589.
- Mookherjee, D. (2006). "Decentralization, Hierarchies, and Incentives: A Mechanism Design Perspective". *Journal of Economic Literature* 44 (2), 367–390.
- Moore, J. E. (2000). "One road to turnover: an examination of work exhaustion in technology professionals", *MIS Quarterly*, 24 (1), 141-168.
- Nguyen, T.H. (2009). "Information technology adoption in SMEs: an integrated framework". *International Journal of Entrepreneurial Behaviour & Research* 15 (2), 162-186.
- Nguyen, T.H. and Teresa S.W. (2013). "The adoption of customer relationship management (CRM) technology in SMEs: An empirical study." *Journal of Small Business and Enterprise Development* 20 (4), 824-848.
- O'Leary, C., S. Rao and C. Perry (2004). "Improving customer relationship management through database/Internet marketing: a theory building action research project". *European Journal of Marketing* 38(3/4), 338354.
- Ozgener, S. and R. Iraz (2006). "Customer relationship management in small-medium enterprises: the case of Turkish tourism industry". *Tourism Management* 27 (6), 1356-1363.

- Peltier, J., J. Schibrowsky and Y. Zhao (2009). "Understanding the antecedents to the adoption of CRM technology by small retailers: entrepreneurs vs owner-managers". *International Small Business Journal* 27 (3), 307-336.
- Puklavec, B., T. Oliveira and A. Popovič (2018). "Understanding the determinants of business intelligence system adoption stages: An empirical study of SMEs". *Industrial Management & Data Systems* 118 (1), 236-261.
- Ragowsky, A., P. Licker, J. Miller, D. Gefen and M. Stern. (2014). "Do Not Call Me Chief Information Officer, But Chief Integration Officer: A summary of the 2011 Detroit CIO roundtable". *Communications of the Association for Information Systems* 34 (1), 1333– 1346.
- Rainer, R. K., B. Prince and H. J. Watson (2015). *Management Information Systems – 3rd Edition*. USA: John Wiley and Sons.
- Ravichandran, T. and C. Lertwongsatien. (2005). "Effect of information system resources and capabilities on firm performance: a resource-based perspective". *Journal of Management Information Systems* 21(4), 237–276.
- Reijonen, H. and T. Laukkanen (2010). "Customer relationship oriented marketing practices in SMEs". *Marketing Intelligence & Planning* 28 (2), 115-136.
- Reinartz, W. and V. Kumar. (2002). "The mismanagement of customer loyalty". *Harvard Business Review* 80 (7), 8694.
- Richard, J.E., P.C. Thirkell and S.L. Huff (2007). "The strategic value of CRM: a technology adoption perspective". *Journal of Strategic Marketing* 15(5), pp. 421-439.
- Rogers, E.M. (1995). *Diffusion of Innovations*. Free Press, New York, NY.
- Romer, P. M. (1990). "Endogenous Technological Change". *Journal of Political Economy* 98 (5), S71–S102.
- Shih, S., J. Jiang, G. Klein and E. Wang (2011). "Learning demand and job autonomy of IT personnel: impact on turnover intention". *Computers in Human Behavior* 27(27), 2301-2307.
- Stiglitz, J. E. and A. Weiss (1981). "Credit rationing in markets with imperfect information". *The American Economic Review* 71 (3), 393–410.
- Swanson, E.B. (1994). "Information systems innovation among organizations". *Management Science* 40 (9), 106992.
- Tornatzky, L.G. and Fleischer, M. (1990). *The Processes of Technological Innovation*. Lexington: Lexington Books.
- Vandenbussche, J., P. Aghion and C. Meghir (2006). "Growth, Distance to Frontier and Composition of Human Capital". *Journal of Economic Growth* 11 (2), 97–127.
- Vinding, A. L. (2006). "Absorptive Capacity and Innovative Performance: A Human Capital Approach". *Economics of Innovation and New Technology* 15 (4-5), 507–517.
- Whately, W.C. (1985). "A history of mechanization in the Cotton South: the institutional hypothesis". *The Quarterly Journal of Economics* 100(4), 1191-1215.
- Wu, S. P., Straub, D. W. and Liang, T. P. (2015). "How Information Technology Governance Mechanisms and Strategic Alignment Influence Organizational Performance: Insights from a Matched Survey of Business and IT Managers". *MIS Quarterly* 39(2), 497-518.
- Xu, Y., D.C. Yen, B. Lin and D.C. Chou. (2002). "Adopting customer relationship management technology". *Industrial Management & Data Systems* 102(8): 442452.
- Zhu, K., K. L. Kraemer and S. Xu. (2006). "The process of innovation assimilation by firms in different countries: a technology diffusion perspective on e-business". *Management Science* 52 (10), 1557-1576.