

Influence of Cooperation and Collaborative ICT in Knowledge Management

A J Briones Peñalver¹, José António C Santos^{2*}, J A Bernal Conesa³ and M Custódio Santos²

¹Technical University of Cartagena, 30202 Cartagena, Spain

²University of Algarve, ESGHT, Campus Penha, 8005-328 Faro, Portugal

³University Centre of Defence at the Spanish Air Force Academy, Spain

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The purpose of the theoretical framework of this paper is to explain the cooperation processes designed for small-sized firms, allowing access to the knowledge of the organization and inter-company cooperation. Data from 236 companies of the Spanish defense industry were used. Analysis of the principal components which group together all the variables from the questionnaire is carried out in order to determine the factors which will be taken into consideration in the analysis of inferences of the theoretical propositions and working hypotheses. The confirmation statistics of the hypotheses have been achieved using a multinomial logistic model. Further exploration on how cooperation levels relate to each other and with existing uses of information technologies in large companies could help improve the rigor of the results. Finally, conclusions covering theoretical and empiric aspects are shown.

Keywords: Business Performance, Cooperation, Knowledge Management, ICT

Introduction

The importance of collaborative Information and Communication Technologies (ICT) in the strategic corporate configuration requires not only a new change in the information management systems, but also a higher participation of technologies as an important competitive advantage factor. Our theoretical framework seeks to explain the cooperation processes designed for small-sized firms, allowing access to the knowledge of the organization and inter-company cooperation. We seek to understand the transformation of information into knowledge, the management of knowledge and intellectual capital and inter-company cooperation, i.e. the acquisition, learning, transmission and management of knowledge¹. We relate ICT, the competitive advantage of companies, and the evolution of the Information Systems and its implantation in companies as a support to the processes of business management and decision. On the other hand, we refer to the Inter-Company Systems as a strategic resource². Taking into account the aspects of the theoretical framework referring to: 1) the adoption of ICT and *e-Business Tools*³; 2) the integration of *e-government* technologies; and, 3) the benefits of the *Business Information and Decision Systems (BIDS)*, we incorporate a proposition into our study: “*The utilization of Collaborative ICT is*

positively associated to the promotion of collaboration and the management of business cooperation projects”⁴. Working hypotheses are established, which respond to the “Analysis of determining factors of the Knowledge Management in Defense and companies related to the defense industry”.

Conceptual framework

The strategic conceptual development carried out below considers if the endogenous variables, including commitment, culture and reputation of the partners, would be positively related with the results of the alliance.

Knowledge and intercompany cooperation

The Knowledge Society is characterized by constant generation of new knowledge. Information is transformed into knowledge and it is the resource⁵ which appears in the language systems, in the technology, and in the collaboration of activities. Smart-technology companies may have to positively deal with ever increasing brutal challenges of cost, quality and on-time delivery⁶. Bueno⁷ indicates that the Administration of the Intellectual Capital refers to renovating and maximizing the knowledge that improves the competitiveness and defines the function of the knowledge as being that which plans, coordinates and controls the flows of knowledge that take place in the organization in connection with its activities. Dyer and Singh⁸ affirm that the companies generate reciprocal

*Author for Correspondence
E-mail: jasantos@ualg.pt

synergies when collaborating closely, thus facilitating their growth. On the other hand, alliances are indispensable elements for their survival, developing networks of agreements, both in their own sector as well as in those that are favorable to undertake diversification processes. This is possible through the business collaboration relations that the companies can adopt through the collaboration mechanisms, and contractual and informal agreements⁹.

Collaborative ICT and business performance

Companies use Collaborative ICT to obtain strategic advantages and to implement innovations. The development of Collaborative ICT is increasing mainly due to two reasons: first, companies encounter serious difficulties when developing ICT internally; secondly, in the ICT sector, companies are observing that their products have shorter life cycles. Although it is true that the benefits that these Collaborative ICT offer to companies are not easily determinable, and that the integration of the technologies into business processes is very difficult¹⁰, the advances in the ICT can offer great capacity tools whose objective is to provide business information and decision systems (BIDS). The development of Collaborative ICT influences the cooperation in innovation, facilitating the transmission of information, saving costs and time, and favoring the internal development of knowledge. Martínez and Pérez¹¹ find a significant positive relationship between the use of the Collaborative ICT and the strategic benefits that they offer, to finally consider that a positive moderator effect exists between the previous experience in cooperation (EXPE.), and the type of tool employed. ICT increase the productivity, the flexibility, and in general the competitiveness in the organizations, facilitating the collaboration relationships between internal and external agents¹². There are positive relationships between the exchanges of information, the use of the multiple possibilities of Internet, and the extent to which these Collaborative ICT are employed in the organizations, because these tools have a moderator effect on the collaboration relationships in the different dimensions of the administration of cooperation projects (ADCP.); Innovative managers should be willing to cooperate with other companies, designing organization models for projects that provide greater technological development and better use of the technological knowledge. On the other hand, complexity of the organizations (COMP.) and their managerial size

(SIZE.) increase. Once the initial phase of the collaboration relationship has been carried out, it will be necessary to plan the cooperation process, to inform all the members of the participant organizations, the signing and the contents of this agreement, and finally to create a performance plan to successfully develop the necessary changes in the organizations for the effective implementing of the cooperation strategy. The use of the different Collaborative ICT provides a closer relationship with suppliers (COOP SUP.), because it allows a better knowledge of the consumers' desires. Finally, we consider that these ICT with collaboration ends promote cooperation, improving the relationship of quality and continuous improvement with clients (COOP CLI.), helping progress and a new environment for the demand of the products and services of the reference market.

Hypotheses

The adoption of ICT with collaborative ends leads companies to create knowledge as a consequence of the relationships that the internal agents of the company maintain with the external agents¹³. These ICT can lead to a continuous and better relationship in terms of quality with suppliers and clients in three ways: (1) by means of the incorporation of their advances for the transformation of the structure of the managerial sector; (2) as an important means of obtaining competitive advantage, facilitating informative content of their products and application in the production process; and, (3) generating new business, and new companies with the workers' participation, and greater communication with the social agents of the company¹⁴. Taking into consideration our theoretical framework, we consider the variables (BIDS.; EXPE.; ADCP.; REPRO.; RECLI.; COMP.; SIZE.) decisive in the use of the Collaborative ITC in the cooperation relationships between companies. Finally, we formulate the following proposition: "the use of Collaborative ICT associates positively to the development of the collaboration and to the administration of managerial cooperation projects". Therefore, the existence and use of Collaborative ICT and Business performance is key for any user of cooperation relationships. Therefore, we propose following hypotheses:

- H₁. Collaborative ICT and the Systems of Information are positively associated with the cooperation relationships.

- H₂. Collaborative ICT and the Previous Experience in Managerial Cooperation (EXPE.) are positively associated with the cooperation relationships.
- H₃. Collaborative ICT and the Administration of Projects of Managerial Cooperation (ADCP.) are positively associated with the cooperation relationships.
- H₄. Collaborative ICT and the Cooperation Relationships with Suppliers (RESUP.) are positively associated with the cooperation relationships.
- H₅. Collaborative ICT and the Cooperation Relationships with Clients (RECLI.) are positively associated with the cooperation relationships.
- H₆. Collaborative ICT and the presence of greater Organizational Complexity (COMP.) are positively associated with the cooperation relationships.
- H₇. Collaborative ITC and the presence of greater Managerial Size (SIZE) are positively associated with the cooperation relationships.

The empirical study

The empiric analysis is made on companies related with the Spanish defense industry. After a meticulous analysis, we found a total of 450 external organizations to the Spanish Ministry of Defense (companies and institutions), with importance for the Department of Economic Matters of that Ministry. For the elaboration of the questionnaire, experts were also consulted as regards administrative and personnel recruitment with experience qualified in the service, and their relationships with the Spanish Armed forces. Finally, the investigation was carried out with 236 completed questionnaires being obtained, which corresponds to a response rate of 52.44%, with an error of 4.4% for $p=q=50\%$ and a confidence interval of 95.5%. The variables were measured through 5 point scales (1= total disagreement and 5 = total agreement). We can determine rules of behavior of the companies, and their interest for the use of Collaborative ITC as support for projects of managerial cooperation. On the other hand, we carry out a Contingency Analysis (CA), or tests of independence of variables, based on the statistical Chi-square that measures the discrepancy between theoretical or prospective frequencies and real frequencies globally. Before the multidimensional analysis, we consider it of value to carry out an analysis of reliability to value the internal consistency of the scale, assuming that its elements combine in order to analyze the functionality of the use of

Collaborative ITC as support to the cooperation projects. Factorial analysis will also be used. The data have been treated by means of different regression techniques. The statistical technique for additional confirmations for groups, has been binary logistical regression (BLR). In the pattern of BLR, the dependent variable takes two values 0 and 1; then we consider cooperation with collectives (COOP) as the dependent variable. This regression analysis allows to know if the managerial information and decision systems (MIDS.), the administration of cooperation projects (ADPC.), the relationships with suppliers (RESUP.), the relationships with clients (RECLI.), and the presence of more organizational complexity (COMP.), as well as the managerial size (SIZE.), influence in the use of Collaborative ITC for the companies related with the Armed forces and the Defense Systems. Taking the six cooperation possibilities in the analyses, categorical variables were included to cover the possibilities of cooperation of the companies (with suppliers, - COOP SUP.; with clients, - COOP CLI.; with competitors, - COOP COMP.; with companies of different sectors, - COOP CDS.; with private or public institutions, - COOP INS.; and mainly with the Armed forces and Defense Systems, - COOP ADS.). These variables will be important for analyzing the possibility that the companies carry out some collaboration relationships with the different communities of interest, and the Collaborative ITC use as support in their projects of managerial cooperation.

Results and Discussion

Most of those interviewed answered favorably with regard to the suitability of using Collaborative ITC, and they consider these to help to promote collaboration relationships and managerial cooperation. It is considered a major priority that they can provide improvements in the decision systems and managerial information, as well as assisting in the administration of cooperation projects. The median for all analyzed variables is 4 in a 5-point scale, which shows that most of the companies consider the use of these Collaborative ICT to be correct. The contingency analysis provides us a clear dependence relationship between the use of Collaborative ICT and the development of the cooperation in close collaboration, mainly when this relationship is carried out with the Armed Forces and the Defense Systems. Our data analysis shows that as the use of ICT tools increases, so the relationship with clients also

Table 1 — Construct correlations matrix

	1	2	3	4	5	Common	Compo	$\alpha_1 =$
Collaborative ITC.	1							0.91
Information Systems	0.838 ^a	1				0.705	0.840	
RESUP.	0.848 ^a	0.625 ^a	1			0.694	0.833	$\alpha_2 =$
RECLI.	0.817 ^a	0.553 ^a	0.601 ^a	1		0.695	0.834	0.85
ADCP.	0.828 ^a	0.617 ^a	0.555 ^a	0.605 ^a	1	0.683	0.826	

Source: Own production

Cronbach's alpha coefficient (α): acceptable value between 0.6 and 0.9; $\alpha = 0.911$ (5 items); $\alpha = 0.851$ (4 items).
 $p < 0.01$. Kaiser-Meyer-Olkin measure of sampling adequacy (KMO): values below 0.5 are unacceptable; KMO = 0.809

Table 2 — Summary of the contrasts of hypothesis

SUMMARY OF SIGNIFICANCE	AC.	RLB	RL	Signif.
H1. : ACCEPTED PARTIALLY (BIDS.)	YES	YES	---	0.00b
H2. : ACCEPTED TOTALLY (EXPE.)	YES	YES	---	0.00a
H3. : ACCEPTED TOTALLY (ADCP.)	YES	YES	YES	0.00a
H4. : ACCEPTED PARTIALLY (RESUP.)	NO	YES	---	0.00b
H5. : ACCEPTED PARTIALLY (RECLI.)	NO	YES	---	0.00b
H6.: ACCEPTED TOTALLY (COMP.)	YES	YES	YES	0.00a
H7.: ACCEPTED TOTALLY (SIZE.)	YES	YES	YES	0.00a

SOURCE: Own elaboration.

Where: $p < 0.01$. Significance to 99%; b $p < 0.05$. Significance to 95%.

increases in terms of quality and continuous improvement, and this is mainly so if this business institutional collaboration is with the Organization of Defense. For the rest of the collectives with this analysis significant dependence does not exist, possibly due to the size and presence of normality. Given the existing correlation matrix (Table 1), with a significance of 99% for all the items, good conditions are noticed for the outlined regressions (RLB), and to conclude with the appropriate classification, and more probably, for each one of the collectives and stakeholders, with whom the companies relate. In the factorial analysis as a reduction technique it is noted that the communalities that inform of the proportion of the explained variance are high (values between 0.68 and 0.70) in the presence of a single factor (Collaborative ITC as support to the cooperation projects). Likewise, in relation to the factorial load of the items, all have a similar factorial load (values between 0.82 and 0.84) without significant differences. If we try to further debug this factorial analysis, in two decisive dimensions, the extracted components would contain the Collaborative ITC in two significant factors: Information Systems and the relationship with suppliers (IF. - RESUP.) and the administration of cooperation projects with clients (RECLI.- ADCP.), with 84.61% of the variance explained for both components. Finally, with Table 2,

below, we conclude the data analysis, showing a summary of the contrast of the seven outlined hypotheses considering the different statistical methods; all these hypotheses come from the studied proposition.

Conclusions

The combined use of information, knowledge and ICT has become the main tool of the cooperation processes. For this reason, it is becoming more and more frequent in the organizations to employ ICT and the different ICT instruments which can be used with the Internet, and with which the companies can obtain bigger competitive advantages. In this article, we seek to explain both theoretically as well as empirically, the functionality and the potential benefits that can be obtained following the use of Collaborative ICT for the development of collaboration and the administration of managerial cooperation projects. In this sense, when contrasting the use of these ICT in companies related with the defense industry, we observe that a clear association exists if the company has previous experience in cooperation relationships. Likewise, they help the administration of this type of processes in managerial collaboration, and it increases their employment according to the complexity of the organization and the managerial size. We also find significant dependences when contrasting the use of

Collaborative ICT for the development of the cooperation relationships with the communities of the companies, or stakeholders. Also, the closest cooperation is presented with competitors, with companies of different sectors, and with the Armed Forces and the Defense Systems, in terms of quality and continuous improvement; and the more the Collaborative ICT is used to improve the Decision and Managerial Information Systems, the closer the relationship is with suppliers. These tools also help the administration of cooperation projects, mainly those that can be carried out with clients. These results suggest that the companies can be overestimating the presence of Collaborative ICT for their relationships with their main clients, which are those related with the Organization of Defense, and also neglecting their utility for new exchanges of information with suppliers and other types of firms.

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