

# STRATEGY FOR THE MODERNIZATION OF THE ARMED FORCES:

A Study made with small and medium companies of the sector of the Spanish defence

Helena de Almeida

[halmeida@ualg.pt](mailto:halmeida@ualg.pt), Faculdade de Economia, Universidade do Algarve

António Juan Briones Peñalver

[Aj.briones@upct.es](mailto:Aj.briones@upct.es)

## ABSTRACT

We intend to study the mediating role of the Maximum of benefits, Innovation of products and differentiation and Innovation in processes in the relation between those predictors and the Increment of the market share. We have used a sample of 236 small and medium companies of the sector of the Spanish defence. The results show the direct effect of all the predictive variables on the criterion market share increment variable. The results show that the influence of the cost reduction on the increment of the market share can be either direct or indirect through the intermediate variables. However, the results did not show any mediating effect between the previous Results of Innovation on the sector and Increment of the market share. Among other implications, we intended to list the main tendencies, the most competitive, namely, in military terms and technologies in its most comprehensive meaning, aiming at strengthening the national industry, not only of the defence, but also of other transversal sectors.

Keywords: defence, medium and small business, innovation

## INNOVATION AND TECHNOLOGICAL CAPABILITY

The need of organization to keep forward its competitors explains the constant demand for innovation. Therefore, Mañas (2001) states that innovation must be incorporated in a systemic and constant way in the processes and in the culture of the company. Any organization that wishes to achieve a relatively advanced stage of innovation successfully, should transform itself into an integrated machine, as a living organism, capable of creating, solving problems, changing and adapting to any innovation. Cavalcanti, Gomes and Neto (2001) agree with this point of view and said that for the company to keep competitive and to survive in this new business environment it is necessary to be aware of the changes, to be flexible, to understand Technological Innovations and, mainly, to understand that information and knowledge are strategical factors. Innovation can be in the project of a product, in the manufacturing process, in the model of business, in the model of relationship with the clients, in logistics of distribution or in the upgrading of the original design. The innovator runs the risk inherent to the pioneer innovation because he is introducing an idea which doesn't exist in the market. The company that adopts this strategy needs a good creative and technical capacity, internally or through a privileged access to labs and research centres and an exclusive relationship with consultants and suppliers of inputs, raw material and services. To absorb and generate new knowledge, the pioneer companies have to count on technical and skilled workers in different areas. When adapting an offensive strategy, the company should be prepared to invest in a long term and to assume risks. Immediate returns should not be expected, as the clients have to be motivated and induced to experiment the new product. So, the progressive capitalization of the entrepreneurship is critical for the success of the task. When a company introduces an innovation but hasn't got the necessary resources to develop it ends up by creating spaces for the penetration of competitors in the market, who are in better conditions to do it.

According to Coombs (1994), the relationship between the formulation of entrepreneurial strategies and technological innovation is determined by the following factors: the degree in which the products are being directed by the scientific or technical change, or if they are based on a mature technology; the structure of the company in terms of the number and diversity of units of business; the corporative and strategical style and its emphasis either on the financial control or on the corporative management of innovation guiding the strategy of the unit of business; the presence or absence of a technological and corporative group in charge of the property and management of the technological corporative actives and of promoting its mobility among the different businesses; the involvement of this technological group in the development of the strategies of business and of the corporative strategy and its degree of development and use of analytical tools to keep and evaluate technologies and to use that information as an integral part of the strategical formulation of the business. There are several definitions of Technological Capability in the literature. The oldest has got to do with an "inventive activity" or the systematic creative reinforcement to obtain new knowledge at the level of production (Katz, 1976). The technological Capacity also includes the skills and knowledge incorporated in the workers, in the premises and in the organizational systems, concerning changes both in the production and in the used areas (Bell, 1982; Scott-Kemmis, 1988).

Lall (1982, 1987) defines Technological Capacity as an "internal technological effort" to dominate the new Technologies, adapting them to the local conditions, perfecting them and even exporting them.

Dahlman and Westphal (1982) have formulated the concept of "Technological Dominion", which was achieved through the "Technological Effort" to assimilate, adapt and/or create technology. Such definition is similar to the "Technological Capacity" of Bell (1982) and Scott Kemmis (1988), upgrading the concept of Westphal and collaborators (1984:5) which defines Technological Capacity as the "aptitude to effectively use the technological knowledge". All these definitions are clearly associated to the internal efforts of the companies to adapt and improve the technologies they import. Such efforts are connected to the upgrading in terms of processes and organization of the production, products, equipment and technical projects. In a more restrict point of view, Pack (1987) defends that the Technological Capacity is incorporated in a group of individuals (for example, managers, technicians and engineers). However, such definition is too limited because it ignores the organizational context where such resources develop. To Enos (1991) the Technological Capacity involves the technical knowledge that the engineers, operators and the institution have. However, its definition as the one of Pack's suggests that the people are the *locus* where the Technological Capacities lie and that the institutions only gather them but do not incorporate them. Bell and Pavit (1993, 1995) have formulated a wider definition, according to which the Technological Capacity incorporates the necessary resources to generate and manage the technological changes. Such resources accumulate and incorporate themselves in the individuals (aptitudes, knowledge and experience and to the organizational systems). This definition seems to be based on others previously

formulated (e.g. Katz, 1976; Lall, 1982, 1987; Dahlman & Westphal, 1982; Bill, 1982; Westphal *et al.*, 1984; Scott Kemmis, 1988). Furthermore, the Technological Capacity has a diffuse nature. From the “approach based on specific resources” of the company (Penrose, 1959) and making use of empirical evidences, Bell (1982) distinguishes two types of resources: those which are necessary to “change” and the systems of production. The latter should not be taken as a distinct set of specialized resources, because they have a diffuse nature, they are widely disseminated all over the organization. In other words, the Technological Capacity of a company or of an industrial sector is stored, accumulated in at least four components (Lell, 1992; Bell & Pavitt, 1993; Figueiredo, 2001) a) physical systems – it refers to the machinery and equipments, systems based on information technology, software in general, manufacture plants; b) people’s knowledge and qualification - it refers to the tacit knowledge, to the experiences, ability of the managers, engineers, technicians and operators which are acquired over time, but which also include their formal qualification. C) organizational system – it refers to the accumulated knowledge in the organizational and managerial routines of the companies, the procedures, instructions, documentation, implementation of the management ( for example Total Quality Management, TQM), in the processes and flows of the production of products and services and in the way of making some activities in the organizations. d) Products and services – it refers to visible part of the Technological Capacity, reflecting the tacit knowledge of the people and of the organization and its physical and organizational systems, for example, in the drawing activities, development, production and part of the commercialization of products and services, the other three components of the technological capacity are reflected.

So, there is an inseparable relationship among those four components.

Thus the Technological Capacity has a nature which is not only predictable but also comprehensive. Furthermore, the Technological Capacity is intrinsic to the context of the firm, region or country where it is developed (Penrose, 1959; Dosi, 1988). Therefore, because of the tacit and wide nature of technology – and of the Technological Capacity – the organizational dimension is, in fact, a component of the technology. So, at this point, we don’t make a distinction between Technological and Organizational Capacity or between Technology and organization, once the latter is part of the first.

## **1. THE CONNECTION BETWEEN DEFENCE INDUSTRIES, TECHNOLOGY AND INNOVATION**

Defence industries, either in the aeronautical or naval sector, or in the terrestrial area, are associated to a very diversified state of the art technology, from components to various integrated systems and, therefore, very connected and dependent on innovation. In the past, these industries had the leadership in terms of innovation, and they could or not give origin to applications in the civil area. There are studies about the process of transference of technology between the military and civil sectors. More recently, the civil sector has led the process of innovation, except in very particular niches. Anyway, there seems to be an evidence of an important process of transference of technology between the two sectors, civil and military. The transfer of technology consists of a process through which a specific technology is applied to a new usage, namely, the reproduction of a new product or a service delivery. So, it consists of sharing scientific or technological knowledge between two entities, one that has that knowledge and another which doesn’t have it, but intends to make use of it. The policy of modernization of the Armed Forces adopts the most recent lines followed by the governing states of our environment in the area of defence. For the National Defence of the 21<sup>st</sup> century, a new Army is established, which is the product of “the New Model of The Armed Forces”, which guarantees the defence of the citizens within and outside the limits of Spain (Bono,2004), and which makes part of the international missions and promotes the consciousness of defence.

To reach modernization, the “Model of Organization of Defence”: a) will promote to its most the logistics of the defence, establishing certain criteria for the efficiency of this organization in what concerns personnel; b) it will support the acquisition of the systems of defence (resources, material and infrastructures); c) it will promote a higher quality in what concerns quantity (a lower quantity of soldiers and a higher quantity of technicians); d) it will promote the specialization concerning diversity; e) it will promote the rationalization and reorganization which enables a bigger allocation of material; f) it will increase the resources assumptions (Penálver, 2007).

The programmes which evaluate the modernization and integration of Spain in the supranational organizations of defence materialize the needs of the Armed Forces in three documents: 1) the initiative of the capacity of the defence (ICD), 2) the Plan of Action of the European capacities of the European Union (PAEC) and 3) the new “commitment of the capacities of Prague of NATO” (PCC). Spain

participates in other three strictly national initiatives and which link us with the plans of the European Union (Peñalver, 2007). The companies, either from the civil or defence sector, may have several types of changes in their working methods, in their use of factors of production, giving sometimes origin to several types of results which increase productivity and/or commercial development.

According to Schumpeter (1984) an innovation may be defined as an essentially economic phenomenon, in which the commercialization of a new product or the implementation of a new process happens.

## **2. INNOVATION IN PRODUCTS AND DIFFERENTIATION**

In this sense, the product innovation is characterized by the improvement of products or the creation of new ones, which are significantly different in their characteristics of future usage, giving origin to another new product which was not previously produced by the company. Meanwhile, some authors consider that a new product can only be considered this way after having been successfully commercialized (OECD, 1997).

According to Cooper (2000) to guarantee the success in the development of new products it is of great importance that the attributes which lie on the product are seen in a differentiated way, with unique benefits for the consumers, or better, with an aggregated value. According to this, the strategy of innovation deserves being highlighted because it provides value to the clients. In the presence of so many offers, it is believed that the consumers make their choices mainly based on what they believe that offers them more value. So, the notion of Product Innovation must be understood in the context of the differentiating strategy of the companies, due to the amplitude of the factors/elements in which the changes may occur. For Porter (1989) the strategy of differentiation demands that a company chooses attributes which are different from the ones of their rivals in such a way that it is really unique in something, or it is considered unique so that it can expect a price-premium. The means for differentiation can be specific in each industry. It can be based on the acquisition of high quality raw material, on an agile system of assisting clients in the product itself, on the system of delivery, on the method of marketing, and on a large variety of other factors, like the image and durability of the product. Through all these strategies we can say that the strategies of Product Innovation and differentiation are important to be performed by the Armed Forces, to take advantage of the experienced opportunities in the sector, in what concerns the increase of consumption of military products of a higher aggregated value. Another issue, but not less pertinent, is the innovation of the processes.

## **3. INNOVATION OF THE PROCESSES**

According to Morris and Brandon (1994) the innovation of the processes is adopted when an organization searches important goals for its success, such as: redirection of the operation – it means eliminating redundant operations, improving the work and information flux and increasing the support systems, providing more efficiency, flexibility and quality to the operations – cost reduction - through the mediation and evaluation of the efficiency of the efforts of innovation, allowing it to see the labour costs (elimination of the unnecessary activities), information (related to the achievement, guard, processing and dissemination of the information to take decisions) and material (better integration between the company and its suppliers, resulting in less costs of acquisition); improvement of the quality - adds value to the products/services and to the client, reducing waste and costs and increasing the reliability in the answer to the client's demand and in the projects of development of new products/services, increases the income by the alteration of factors like the increase of the quantity produced due to the decrease of the costs and consequent transfer to the price of the product/service, reduction of the time of the manufacturing cycle and increase of the speed of innovation of the products (services, increase the orientation turned to the client – the perception that the client has of the company and its products is intimately related to the differential of the services that it offers; and increase profit – the reduction of costs, the increase of the revenue and the improvement of the client's satisfaction lead to the increment of profit.

Analysing what was previously said, we can say that the motivations (or the intended aims) which lead organizations, civil or military, to adopt Innovation of the Processes are related to the implementation of strategies which aim at improving its performance and gain competitive advantages through a new paradigm. Another question, but not less important, is innovation as a source of value.

## **4. VALUES WHICH FACILITATE THE ENTREPRENEURIAL INNOVATION**

Innovation as a source of Value for the competitive advantage is based on the market happenings which are apparently diverse and on the need of more flexible models to allow the companies to have the capacity of changing when necessary. Innovation involves very dynamic processes, which are in constant interaction with the environments. In that dynamic, individuals, managers in the organizations and the

available resources, among others can be considered. Other elements, even if not foreseen, can contribute in order to press the companies to a better knowledge of their internal capacities, to obtain competitive and consistent positions in the market. Nevertheless, the importance of innovation has shown to be important to the entrepreneurs, not only when an enterprise is formed, but during the development of their activities, making it a process of continuity. It is necessary to identify the conditions that have to be accomplished to carry on a process of innovation and the criteria which must be adopted to idealize new products or services, according to the concept exposed by Schumpeter. Here we highlight a new vision of economic development and of innovation conceptualized by Schumpeter. His theory stands out a dynamic economic model where transformations which generate development occur. It conceptualizes that the entrepreneur is responsible for the making of new combinations. These combinations can be identified through: introduction of a new method of production or commercialization of goods; opening of new markets; conquest of new sources of offer of raw material or semi-manufactured goods; and the establishment of a new organization of any industry, thus covering the new things and the new ways of making. According to this point of view and considering that the entrepreneur is responsible for innovation and that according to Schumpeter these processes can bring the stimulus for the development, generating new innovations in the new paradigm of the Armed Forces

## **5. THE EMERGENCE OF THE NETWORK SETTINGS IN THE SMALL AND MEDIUM COMPANIES**

Some authors have signaled that the network settings allow the small and medium companies to have strategical advantages (Casarotto & Pires, 1999; Fachinelli, Marcon & Moinet, 2001; Fayard, 2000; Jariloo, 1988; Marcon & Moinet, 2001). Among these advantages, which can be conquered, there is a greater exchange of information and knowledge between companies, a bigger participation on the sales of products in fairs, lobbying, improvement in entrepreneurial processes, negotiation of the fair price with the suppliers, joint marketing, among others. In a general way, the appearance of cooperation networks has become a common practice in several industries of distinguished countries, without restrictions of size or market scope (Fachinelli *et al.*, 2001). According to Amato Neto (2000), one of the principal tendencies of the modern economy, under the framework of globalization and industrial restructuring, concerns the intra and inter companies relationships, especially those which involve small organizations. The formation and the development of company's networks has been gaining importance not only to the economies of several industrialized countries, like Italy, Japan and Germany, but also to the so called emerging countries like Mexico, Chile, Argentina and Brazil. According to the conclusions of the research of Silva (2004), the small companies have shown flexibility to build organizational arrangements, valuing the simple but dynamic structure, innovative and sensitive to the market demands and offering a personalized service to the consumer. These companies are also characterized by the creation of jobs, the availability of opportunities to the entrepreneurship and the capacity to diversify. In this context, a way of diminishing risks and getting synergy can be translated by the formation of alliances between the small and medium companies, because these have more difficulties or limitations to compete by themselves. Through cooperative relations, the companies may work together to improve their performance, sharing resources and making a commitment with joint objectives (Gnyawali & Madhavan citado in Balestro, Lopes & Pellegrim, 2004). The network setting also promotes a favourable environment to the sharing of information, knowledge, abilities and essential resources for the innovation processes (Balestrin & Vargas, 2004). This way, the companies may minimize their individual difficulties and become able to achieve competitiveness in the markets where they act, by means of accession to the cooperation networks. Porter points out three possible generic strategies which may be adopted by companies within an environment of competition: cost, differentiation and focus (Porter, 1986, 1989). Usually, when the strategy of cost is adopted, we assume that the activity of a company is grounded on scale economies, which, ultimately, implies big companies and great investments. Small companies, because they usually either do not work with large scales or do not catch resources easily, may find difficulties on the competition with big companies, focusing on strategies based on differentiation, with products or services which are different from those offered by competition (Porter 1986). Another possible strategy for a small or medium company would be focusing, based on the fact that a company can pay more attention to its strategical target than those competitors who think they may pay attention to all the industries, or to a large number of segments of the industry. The focus, target or strategical scope should be narrow enough, allowing the company to assist it in a more efficient and effective way. This can be defined in various dimensions: type of clients, line of products, variety of the channel of distribution, geographical area (Porter, 1986). So, when we analyze the strategies proposed by Porter, we can affirm that the selection of the strategy is a predominant factor to attain a level of growth and the

efficient prosperity of the company. Therefore, in addition, the union of the small and medium companies will overcome of the industry they belong to. The strategical networks turn themselves to the development of the ability to act and decide. According to Fachinelli and collaborators (2001) and Marcon and Moinet (2001), the network strategy implies sharing a project which falls within the field of action. The territorial proximity, as much as the economic interdependence, constitutes coherent logics of definition of the field of action of a network. Another characteristic of the strategy-network concerns the continuity and living together. Within this idea, a dynamic of learning should be generated. Learning skills means knowledge and abilities, while relational learning means the sociability inherent to the network of actors, allowing that each member creates solutions for the problems (Fachinelli *et al.*, 2001; Marcon & Moinet, 2001) and still, that the ideas quickly transform into actions (Uzzi, 1996). In this context, Paiva and Barbosa (2001) show that the networks are a favourable scenario for the exploration of opportunities by the small companies, which is later corroborated by Balestrin and Vargas (2003a, 2000b). Jarillo (1988) describes the networks as being long term agreements, with clear purposes between distinct companies, however related, which allow the establishment or the support of a competitive advantage towards the companies outside the network. Considering the diversity of the networks of the companies, there isn't only one rule in what concerns the advantages for its constitution. According to Ribault *et al.* (1995) the advantage can be specialization. The companies select themselves according to affinity, and they may form a deeply original network in relation to the competitors, thus providing themselves with a high level of exclusivity. The companies which constitute a technological centre may be an example of this, because they are focused on a target: the development of technologies. According to Simantob and Lippi (2003) there's much to be learned with the small and medium companies, because they show small bonds and are more creative and flexible. One of the most relevant advantages is that together, integrated companies have more chances of negotiating a purchase with a higher margin than a small company by itself.

## 6. PARTICIPANTS AND PROCEDURE

A population of companies related to the industry of the Spanish defence has participated in this study, taking into account the criterion that they have been entities of great importance in their relation with the defence and they have usually kept commercial relations with the Ministry of Defence. The data base used was offered by the *Direccion General de Asuntos Económicos del Ministerio de Defensa* with the general aim of knowing the strategical determinants in the organizations of Defence, based on the strategy of professionalization and modernization of the Spanish Armed Forces and of the Systems of Defence and the analysis of the cooperation processes of companies related to defence. This study corresponds to a part of the central study intending to focus on modernization in companies related to the National Defence.

The participating companies answered a questionnaire which was sent by mail between February and August. 236 complete questionnaires were sent back, corresponding to an answer rate of 52.44% with an error of 4.4% to  $p=q=50\%$  and a level of reliability of 95.5. As for the legal training, 57.6% of the participating companies in this study have constituted cooperative societies and business partnerships (42.4%). Although they develop cooperation processes related to defence, they belong mostly to the tertiary sector (68.2%), followed by the secondary sector (28.8%) and at last the primary sector (1%) (*missing system* = 1.5%).

## 7. OPERACIONALIZATION OF THE VARIABLES AND DATA PROCESSING

The indicators were created for the present study by the collaboration between the Department of Economics of the Polytechnic University of Cartagena and the Ministry of Defence, with reference to the needs presented by this ministry and based on the literature about this subject. All the indicators were answered on a scale of the type *Likert* of 5 points, where 1 corresponds to total disagreement and 5 to total agreement.

The **Innovation in Processes** was operationalized through the following items: investigation and development in key technologies; personnel qualification in key technologies; production systems with investigation organizations. **Innovation of products and differentiation** was operationalized this way: Launching new products and services in the market; having access and specializing in market sectors. The variable **Values which facilitate business innovation** were operationalized the following way: Adaptation and optimization of resources; evaluation and control of objectives; continuous learning and innovation; recognition of the human resources of the company; client's initiatives to increase quality.

**The results of innovation in the defence sector were operationalized the following way:** specialization in assets and services of the industry; client's perception of professionalism; participation

with the Armed Forces in the process of hiring; consideration *Consideración de proveedor preferente* for the Armed Forces.

The variables in table 1 correspond to the item: cost reduction, increment of the market share.

So, we ask the first two questions:

Question 1: Do the antecedent variables - cost reduction, values which facilitate the business innovation and results of the innovation in the sector- the intermediate variables – maximum benefit, Innovation of products and differentiation and innovation in processes – and the result variable – Increment of the market share – correlate with each other?

Question 2: Do the intermediate variables, Innovation in products and differentiation and innovation in processes – have a mediating influence between the antecedent variables – cost reduction, values which facilitate the business innovation and results of the innovation in the sector – and the result variable – increment of the market share?

The Alfa of *Cronbach* was calculated as a measure of evaluation of the internal consistence of the scales. The factorial analysis was used, a technique of reduction of the dimensionality of the data. We have applied as a method the extraction of factors in Analysis of Main Components and the items were elected with a weigh equal or superior to 50, applying the test of Kaiser Meyer Olkin (KMO) and the proof of sphericity of Bartlett. To determine how the independent variables included in the hypothesized model influence the criterion variables Increment of the market share we have adopted the procedure of analysis of Multiple Linear Regression of the programme *Statistical Package for the Social Sciences* (SPSS) version (17.0). On the evaluation of the mediating effect of the variable creativity we have adopted the test of the effects of mediation following the procedures recommended by Baron e Kenny (1986). Specifically, on the evaluation of the effect of simple mediation (the effect of X on Y is mediated by M), the following steps were verified: 1) showing that X (predictor) is related to M (mediator) – consists of estimating the regression coefficient of M on X in a model of simple regression (Model 1); 2) showing that X (predictor) is related to Y ( result variable) – consists of estimating the coefficient of Y on X in a model of simple regression (Model 2); showing that M relates to Y when X is constant – consists of estimating the regression coefficients of Y on M and of Y on X in a model of multiple regression (Model 3). If the data suggest that the regression coefficient estimated on step 1) is not null but that its analogous in the model of multiple regression estimated on 3) is not different from zero, so we should conclude that the effect of X on Y is totally mediated by M (complete mediation). If the coefficient of regression estimated on step 1) is not null and its analogous in the model of multiple regression estimated on 3) is softened but continues being different from zero, then we should conclude that the effect of X on Y is partially mediated by M (partial mediation). The estimate tests of *Sobel* of Preacher and Leonardelli (<http://people.ku.edu/~preacher/sobel/sobel.htm>) are also made to verify if the calculated steps on the structural equations are significant or not.

## 8. PRESENTATION OF RESULTS

In this section, we present the results obtained on the analysis of the answers given by the 236 enquired companies to the instrument used to operationalize the variables being studied. We begin the presentation of the results with an exploratory factorial analysis of the different variables of the study made, following a descriptive analysis of the different variables for the overall respondents. We also make a correlational analysis and a regression analysis to evaluate the two raised questions about the existence of a significant relationship between the Maximum Benefit, Cost reduction, innovation in processes, results of innovation in the defence sector, and increment of the market share and the mediating effect of the variables Maximum Benefit, innovation in processes, innovation in products and differentiation between on the one hand the antecedent variables cost reduction, results of the innovation in the defence sector and Values that facilitate the business innovation, and on the other hand the Increment of the market share. First, we made an Exploratory Factorial Analysis in main components (varimax rotation) of the indicators which constitute the variables of the model of analysis. This analysis allowed the extraction of three independent factors which correspond to the variables which we intend to study and which explain 65.9 % of the variance. If we retain the indicators with higher weighs in each factor, according to the described operationalization, we will create the indexes for each variable (table 2)

The results obtained on table 2 are an evidence of commonalties superior to .050 in every variable. On the other hand, the factorial analysis has reduced the analysed variables to three factors: a first one which includes the variables of cost reduction, Results of the business innovation which facilitate the business innovation; a second factor constituted by the variables of Maximum Benefit, innovation in processes and

innovation in products and differentiation; and a third one formed by the increment of the market share., the KMO=.82.

On table 3 we present the average, the standard deviation, the correlations and the internal consistency of the variables which constitute the analysed model.

In what concerns the correlations, we can see that, in a general way, all the variables are positively and significantly associated. The highest correlation between values which facilitate the business innovation and the innovation in products and differentiation ( $r=.654^{**}$ ) and the lowest correlation is the innovation in processes and maximum benefit ( $R=.108$ ). This result allows us to confirm the answer to question 1: the antecedent variables, cost reduction, values which facilitate the business innovation and the results of the innovation in the sector – intermediate variables- maximum benefit, innovation in processes- and the result variable- increment of the market share- correlate with each other.

All the analysed variables show good psychometric qualities expressed through the values of the internal consistency of *Alpha of Cronbach* (values equal or superior to (.70)).

With the aim of testing the mediating effect of the variables maximum benefit, innovation in processes and innovation in products and differentiation and trying to answer to question 2, we have analysed the models of regression in which we included, besides the antecedents, the intermediate variables.

Besides this, we have also included in the analysis the demographic variables, but later we have removed them, once they do not show predictive power on the increment of the market share. With the aim of understanding if each of the antecedents (cost reduction, results of the innovation in the defence sector, and values which facilitate the business innovation) has a significant contribution on the intermediate variables (maximum benefit, innovation in the processes and innovation in products and differentiation) we have made the analysis of Model 1 (table 4). The results show that, in general, the antecedent variables significantly influence the intermediate variables: the antecedent variable cost reduction positively and significantly influences the variable maximum benefit ( $\beta=.408$ ,  $p=.000$ ), innovation in processes ( $\beta=.106$ ,  $p=.003$ ) and innovation in products and differentiation ( $\beta=.110$ ,  $p=.092$ ); the antecedent results of the innovation in the defence sector significantly influences the variable maximum benefit ( $\beta=.349$ ,  $p=.001$ ), innovation in processes ( $\beta=.267$ ,  $p=.009$ ) and innovation in products and differentiation ( $\beta=.156$ ,  $p=.004$ ); and the antecedent values which facilitate the business innovation significantly and positively influences the variable maximum benefit ( $\beta=.248$ ,  $p=.000$ ) innovation in processes ( $\beta=.376$ ,  $p=.000$ ) in products and differentiation ( $\beta=.334$ ,  $p=.000$ ). These results meet the prerequisite of the first procedure recommended by Baron & Ken, the antecedent variables should influence the intermediate variables. As we can see on Model 2, Table 4, the analysis of the estimates of the regression coefficients, when only the antecedents are considered, allows us to state that the obtained results only show that the antecedent variable Cost Reduction influences in a significant and positive way the result variable Increment of the market share ( $\beta=.315$ ,  $p=.000$ ) and the antecedent Values which facilitate business innovation influences the increment of the market share ( $\beta=.364$ ,  $p=.000$ ). The remaining variables do not show the wished levels of significance.

The antecedent variables Results of the Innovation in the sector of defence and Value which facilitate Innovation do not do not meet the prerequisite of Baron & Kenny once they do not have any significant effect on the variables of result Increment of the market share.

With the aim of understanding if the intermediate variables specifically mediate the effect of the antecedents on the result variable we have analysed the models of regression in which we have included first each one of the antecedent variables in an isolated way and then together, followed by the intermediate variables (Model3).

On model 3 we can see that the antecedent variable Cost Reduction, when we introduce an intermediate variable ( Maximum benefit), two intermediate variables (maximum benefit and innovation in products and differentiation) and three variables (maximum benefit and Innovation in products and differentiation and Innovation in processes), the value of regression doesn't invalidate, as expected, in a way that it could show a Total Mediating effect, however, its effect diminishes on the variable of result Increment of the market share. (from  $\beta=.315$ ,  $p=.000$  to  $\beta=.237$ ,  $p=.000$  from Maximum benefit to  $\beta=.105$ ,  $p=.084$  to the two intermediate variables and  $\beta=.196$ ,  $p=.009$ ) to the three intermediate variables, showing that the intermediate variables, Maximum benefit, Innovation in products and differentiation and innovation in processes, either they appear together or singly, have a partial mediating effect between the cost reduction and increment of the market share. The testing of Sobel showed significance of these effects.

The variable Values which facilitate the business innovation which had a direct influence on the variables of result Increment of the market share ( $\beta=.364$ ,  $p=.000$ ), when mediated by only one intermediate variable (Maximum benefit) diminishes its effect, although it keeps significant ( $\beta=.252$ ,  $p=.000$ ) showing a partial mediating effect. The test of Sobel showed significance ( $Z=2.05$ ;  $p>.01$ ). When the antecedent Values which facilitates the business innovation appear mediated by two variables (Maximum benefit and innovation in processes) its effect on the variable of result of the increment of the market share, invalidates ( $\beta=.014$ ,  $p=.825$ ), showing a Total Mediating effect (test of Sobel  $Z=1.4$ ;  $p<.01$ ). It means that it is decisive that the variables Maximum benefit and innovation in processes appear together to have a total mediating effect between the values which facilitate the business innovation and the increment of the market share.

When the values which facilitate the business innovation appear mediated by the three variables (Maximum benefit, innovation in processes and innovation in products and differentiation) the effect on the variable of result Increment of the market share only diminishes ( $\beta=.164$ ,  $p=.027$ ), showing the existence of a partial mediating effect (the Sobel test shows that the way is significant) and thus accomplishing the third step suggested by Baron & Kenny. When the variable results of the innovation in the defence sector appears mediated by one, two or three intermediate variables, it is not analysed because its direct effect on the criterion variable Increment of the market share was not significant on Model 2, and so the analysis of Model 3 is not necessary because the second condition suggested by Baron & Kenny didn't happen. Thus, question 2, if the intermediate variables – Maximum benefits, innovation in products and differentiation and innovation in processes – have a mediating influence among the previous variables – cost reduction, values which facilitate the business innovation and results of the innovation in the defence sector - and the result variable – Increment of the market share, it is only once confirmed once the variable results of the innovation is not mediated by any of the mediating variables although the other variables either mediate partially or totally.

Summarizing, the analysis of the results showed that all the variables are positively and significantly related to the increment of the market share. The relations between cost reduction and increment of the market share are partially mediated by the variables maximum benefit, innovation of the products and differentiation and innovation in processes whether these variables appear together or alone. The relations between the values which facilitate innovation and increment of the market share are partially mediated by the variable maximum benefit when it appears alone and also when the three intermediate variables appear together. The relation between Values which facilitate innovation and increment of the market share are totally mediated when the two variables, Maximum benefit and innovation on processes, appear together. The results didn't show that the Results of innovation influence the increment of the market share but they also didn't show the existence of a mediating effect on the relation between Results of innovation and increment of the market share.

## **9. DISCUSSION**

This study had as aim to determine the effect of the Increment of the market share, analyzing the direct effect of the Cost Reduction, Values which facilitate innovation and Results of innovation on the Increment of the market share. We still intended to study the mediator effect of Maximum benefit, innovation of products and differentiation and Innovation in Processes on the relation between those predictors and the increment of the market share. The results showed that, as foreseen, the Cost Reduction, Values that facilitate innovation, Results of innovation, Maximum benefit, Innovation of products and differentiation and Innovation in processes are positively and significantly related to the increment of the market share. Nevertheless, in this study, and contrary to what was expected, there was no existence of a significant influence of the results of the innovation on the increment of the market share, therefore, it was not possible to test the mediating effect of Maximum benefit, innovation of products and differentiation and innovation in processes on the relation between the results of innovation and increment of the market share. The relation between Values which facilitate innovation and Increment of the market share show a total mediation of the two variables Maximum Benefit and innovation in processes. The results have still shown the role of the partial mediation of the Maximum benefit, Innovation of products and differentiation and innovation in processes on the relation between Cost reduction and increment of the market share, and of the variables Maximum benefit, innovation on processes and innovation of products and differentiation, when they appear together on the relation between Values which facilitate innovation and Increment of the market share.

## **10. IMPLICATIONS**

We don't know any study that has analyzed the relation between Cost reduction, Values which facilitate innovation and Results of innovation and Increment of the market share. However, this study stands out the importance for the companies of the defence sector to develop the Cost Reduction, values which facilitate innovation and Results of innovation in order to improve the market share. In this study we have questioned not only the direct relation between Cost Reduction, Values which facilitate innovation and Results of Innovation but also an indirect relation between the three predicting variables and the result variable, through the perception of Maximum benefit, Innovation of products and differentiation and Innovation in processes. Although, in the last few years, the idea of the development of Values, Cost Reduction and results of Innovation on the increment of the market share has generalized, it hasn't been researched. The results of this study show that these variables are positively and significantly associated. Thus, we can say that the better the entrepreneurs understand the Maximum Benefit, Innovation of the product and differentiation and Innovation in processes, the better they understand how important the Cost reduction and the Values which facilitate innovation are. The results of this study also show that the relation between Cost Reduction and Increment of the market share is partially mediated by the Maximum Benefit, Innovation of products and differentiation and Innovation in processes, suggesting that the influence of Cost Reduction on the Increment of the market share can be both direct and indirect through the intermediate variables. The same happens to the relation between Values and Increment of the market share which partially mediated by the Maximum benefit when it appears alone and totally mediated by the two variables when they appear together, Maximum benefit and Innovation in processes and partially mediated when the three variables Maximum Benefit and Innovation in processes and Innovation of products appear together, suggesting that the influence they have on the Values which facilitate Innovation can be either direct or indirect on the Increment of the market share.

## **11. CONCLUSIONS**

The results of the study allow us to confirm relationship between the antecedent variables (Cost Reduction, Values which facilitate business innovation), the intermediate variables (Maximum benefit, Innovation of products and differentiation, Innovation on processes) and the result variable (Increment of the market share). Therefore, the answer to one of the two initial questions, if there is a significant relation between Cost reduction, Values which facilitate business innovation, Maximum benefit, Innovation of products and differentiation, Innovation on processes, Increment of the market share, Ability to get and keep the human resources, is positive. The results have also shown the relation between the antecedent variables (Cost reduction, Values which facilitate business innovation) and the intermediate (maximum benefit, Innovation of products and differentiation, Innovation in processes) suggesting that a higher degree of Cost reduction, Values which facilitate business innovation increases the Maximum benefit, Innovation of products and differentiation, Innovation in processes. Concerning the mediator effect that we have tested, the results have shown that the variables of Maximum benefit, Innovation of products and differentiation and Innovation on processes, either they appear alone or together, can have a partial mediating influence between Cost reduction, and Increment of the market share. This result allows us to conclude that the Cost reduction acts at the level of the Maximum benefit, Innovation of products and differentiation and Innovation in processes, which, in turn, determine the degree of the Increment of the market share, meaning that when these companies understand that there is Cost reduction, they urge variables of Maximum benefit, Innovation of products and differentiation and Innovation in processes aiming at improving the Increment of the market share. Therefore, we may conclude that the existence of Cost reduction is fundamental to stimulate the Maximum benefit, Innovation of products and differentiation and innovation in processes which, in turn, triggers the Increment of the market share. The results show that the Maximum benefit and Innovation in processes can have a total mediator influence when the partial mediator effect is associated to the Innovation of products and differentiation, between Values which facilitate business innovation and Increment of the market share

This result allows us to conclude that the Value which facilitate the business innovation act at the level of Maximum benefit and Innovation in processes, Innovation of products and differentiation which, in turn, determine the level of Increment of the market share, meaning that when these companies understand that there are Values which facilitate the business Innovation they stimulate Maximum benefit and Innovation in processes and innovation of products and differentiation aiming at increasing the Increment of the market share. However, the results didn't show any mediating effect between the antecedent Results of Innovation on the sector and Increment of the market share. It means that the answer to the second question, if the intermediate variables (Maximum benefit, Innovation of products and differentiation and Innovation in processes) have any mediating influence between the antecedent variables (Cost reduction,

Values which facilitate innovation in the sector) and the variable of result (Increment of the market share) is positive, once the Maximum benefit and Innovation in processes and Innovation of products and differentiation have the capacity of having a partial and total mediating effect even though that hasn't happened to all the variables. The model of the Armed Forces and SDE, relates the organizing structure of the Ministry of Defence and the performance of the Armed Forces and SDE aiming at adapting the Organization of the Defence to the turbulent context – synonymous of the combination of the complexity and dynamism; as well as the orientation to an organizational exchange to the implementation of mechanisms which put into practice new strategies to the modernization of the resources/capacities they have (Peñalver, 2007). The challenge of allowing – allow me to use the expression with economic connotation – the structural readiness, supported by a Defence industry which is ample and competitive, echoes positively on the economic indicators of the country and its functioning adds substance to the external policy when it amplifies the continental integration through the participation on the regional competition through maintenance, modernization and re-equipment of the Armed Forces of our neighbours and interlocutors of other continents. Such fact contributes not only to consolidate our mutual trust, converging to a higher compatibility of equipments – known and shared armies supplant the hostile unawareness of its acquisition – but it also allows a conjecture on areas of public and private production and multilateral criteria. It was our objective to list the main tendencies, the most competitive, namely, in military terms and technologies, in its broadest sense, aiming at strengthening the national industry, not only of the defence, but also of other transversal sectors, making it able of competing and sharing in multinational projects and in the market of international defence.

I&DT is a determinant vector on the development and sustains itself on the military capabilities of the defence. Consequently, although there are financial constraints today, it is fundamental to keep on investigating new technologies for the defence. It is also important to be aware of the need to invest on highly qualified personnel and with innovative ideas to cooperate not only on the defence industry but also on the government.

## 12. BIBLIOGRAPHIC REFERENCES

BALESTRIN, Alsones; VARGAS, LILIA Maria. (2004).A dimensão estratégica das redes horizontais de PMEs: teorizações e evidências. *Revista de Administração Contemporânea – RAC*, Edição Especial, v. 8, p. 203-227.

BALESTRO; M.V.; ANTUNES JR.; J.A.V.; LOPES, M.C.; PELEGRIN (2003).I. A

BARON, REUBEN M. AND DAVID A. KENNY (1986). “Moderator-Mediator Variables Distinction in Social Psychological Research: Conceptual, Strategic, and Statistical Considerations,” *Journal of Personality and Social Psychology*, 51 (6), 1173-82.

BELL, M., AND K. PAVITT (1993). “Technological Accumulation and Industrial Growth: Contrasts between Developed and Developing Countries,” *Science Policy Research Unit*. University of Sussex, Brighton. Oxford university press

BELL, R.M. (1984) "Learning" and the Accumulation of Industrial Technological Capacity in Developing Countries', in M. Fransman & K. King (eds), *Technological Capability in the Third World*.

capacidades dinâmicas. In: *Encontro de estudos em estratégia*, 1.,2003, Curitiba. Anais... Rio de Janeiro: ANPAD,. 1 CD-ROM.

BONO, J. (2004). Os presupuestos garantisan el compromise de las Fuerzas Armadas con la seguridad de los espñoles, <http://www.mde.es/Actualidade.htm> (11 de Octubre, 2004), Madrid.

CASAROTTO Filho, N. e PIRES, L. (1999). *Redes de pequenas e médias empresas e*

CAVALCANTI, M. C. B.; GOMES, E. B. P.; PEREIRA NETO, A. F.(2001). *Gestão de empresas na sociedade do conhecimento: um roteiro para ação*. 4 ed. Rio de Janeiro: Campus.

COOMBS, R. (1994). “Technology and Business Strategy”. In: DOGSON, M., ROTHWELL,R., *The Handbook of Industrial Innovation*, Cheltenham, UK: Edward Elgar.

da Concorrência”, Editora Campus, Rio de Janeiro 1986.

DAHLMAN, C. AND WESTPHAL, L. (1982) 'Technological Effort in industrial development: a survey', in F. Stewart & J. James (eds), *The Economics of New Technology in Developing Countries*, London: Pinter

*desenvolvimento local*. São Paulo, Atlas p.240.

DOSI, G.(1982). Technological paradigms and technological trajectories: a suggested interpretation of the determinants and directions of technical change. *Research Policy*, v. 11,p. 147-162.

experiência da rede Petro-RS: uma estratégia para o desenvolvimento das

FACHINELLI, A. C., MARCON, C., & MOINET, N. (2001). A prática de gestão de redes: uma necessidade estratégica da sociedade da informação. Sociedade da informação: inclusão e exclusão. *Com Ciência Revista Eletrônica de Jornalismo Científico*. Recuperado em 02 agosto,2005, de <http://www.comciencia.br/reportagens/socinfo/info14.htm>

FAYARD, P. (2000). *O jogo da interação*. Caxias do Sul: Educs

FERREIRA, J.J., Marques, C.S., Barbosa, M.J., (2007). Relação entre Inovação, Capacidade Inovadora e Desempenho: O Caso das empresas da região da Beira Interior. *RAI - Revista de Administração e Inovação*, São Paulo, v. 4, n. 3, p. 117-132, 2007

GOEDHUYS, M. (2007).The impact of innovation activities on productivity and firm growth: evidence from Brazil. UNU-MERIT Working Paper Series 002, United Nations University; Maastricht Economic and social Research and training centre on Innovation and Technology.

*Indian Experience*. London: Macmillan.1982b. “The Emergence of Third World Multinationals: Indian Joint Ventures Overseas.” *World Development* 10(2):127–46

LALL, R. B. (1986). *Multinationals from the Third World: Indian Firms Investing Abroad*.Oxford: Oxford University Press.

LALL, S. 1982a. *Developing Countries as Exporters of Technology: A First Look at the*

MAÑAS, A. V. (2001). *Gestão de Tecnologia e Inovação*. São Paulo: Érica.

MARCON, C., & MOINET, N. (2001). *Estratégia-rede*. Caxias do Sul: EDUCS.

MOGOLLÓN, R. M. H.; VAQUERO, A. C.(2004). El comportamiento innovador y los resultados de la empresa: un análisis empírico. In *Congreso hispano-francês de aedem, 14.,2004, Ourense. Memórias...* Madrid: Academia Europea de Dirección y Economía de la Empresa, p.739-750.

PENROSE, E. T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley

PEÑALVER, A.J.B.; PEÑALVER, F.L. (2007) Las políticas institucionales para la modernización e profesionalización de las Fuerzas Armadas Españolas. *Hologramática – Facultad de Ciencias Sociales – UNLZ – Año IV, número 7, v.2, p. 57-78. www.hologramatica.com.or.*

PORTER, M. (1986), “Estratégia Competitiva: Técnicas para a Análise de Indústrias e

PORTER, M. (1989) *A Vantagem Competitiva das Nações*, 7. ed., Rio de Janeiro - RJ, Editora Campus, 897p.

RIBAUT, M.; MARTINET, B. & LEBIDOIS, D.(1995).*A gestão das tecnologias. oleção gestão &inovação*. Lisboa, Publicações Dom Quixote.

ROBERTS, P. W., & AMIT, R. (2003). The dynamics of innovative activity and competitive advantage: The case of Australian retail banking, 1981 to 1995. *Organization Science*, 14(2), 107-122. Disponível online em <http://orgsci.journal.informs.org/cgi/reprint/14/2/107>. Acesso em 14/08/2009.

SCHUMPETER,Joseph A.(1984). *Capitalismo, Socialismo e Democracia*, Rio, Zahar.

SCOTT-KEMMIS, D. (1988). ‘Learning and the Accumulation of Technological Capacity in Brazilian Pulp and Paper Firms’, Working Paper, No. 187, World Employment Programme Research p.2-22.

SIRILLI G., EVANGELISTA R. (2001). “Technological innovation in services and manufacturing: results from Italian surveys,” *Research Policy*, 27, pp 881-899.

**Table 1**

Variables studied of the results of the new paradigm of the Spanish Armed Forces.

INNOVATION	Strategy of technological innovation		QUESTION
F1: Technology	Innovation in processes.	Investigation and development in key technologies.	Item 6.1
		Qualified Personnel in key technologies.	Item 6.2
		Systems of production developed by experts.	Item 6.3
		Collaboration with investigation organizations.	Pregunta 8
F2: Product.	Innovation of products and differentiation	Incorporation of new products and services in the market.	Item 6.4
		Access and specialization in market segments	Item 6.5
F3: Valores.	Values which facilitate business innovation	Adaptation and optimization of resources.	Item 9.1
		Programming and evaluation of objectives.	Item 9.2
		Continuous learning and innovation measures.	Item 9.3
		Recognition of the human resources of the company.	Item 9.4
		Client's initiatives to increase quality.	Item 11.4
		Results of innovation in the defence sector.	Specialization in assets and services of the industry.
F4: Performance.		Client's perception of quality.	Item 11.5
		Participation in the process of hiring with the Armed Forces	Item 11.6
		Consideración de proveedor preferente para las FAS.	Item 11.8
			Item 7.1
			Item 7.1
LEVEL OF MANAGEMENT GOALS ACOMPLISHMENT		Maximum benefit	Item 7.1
		Cost Reduction.	Item 7.2
		Increment of the market share.	Item 7.3

Source: Peñalver, A.

**Table 2**

Results of the factorial analysis in Main components (varimax rotation) (N=66).

Indicators	Factorial Weights			
	Commonalties	1	2	3
Maximum of Benefit	.492	.482	<b>.493</b>	-.127
Cost reduction	.501	<b>.666</b>	-.208	-.118
Increment of the market share	.652	.480	-.018	<b>.649</b>
Innovation in Processes	.771	.590	<b>.628</b>	.169
Results of Innovation in the defence sector	.867	<b>.707</b>	-.371	.480
Values which facilitate the business innovation	.805	<b>.877</b>	-.097	.163
Innovation in products and differentiation	.836	.511	<b>.719</b>	-.240

Note: The highest factorial weights in each factor are in bold.

KMO =.82

**Table 3**

Average, standard deviation, correlations and internal consistency (N=236)

Variable	N	M	DP	1	2	3	4	5	6	7	
1	236	3,70	.922	1	(.75)						
2	236	3.93	.903	.408**	1	(.73)					
3	236	3,92	.905	.327**	.315**	1					
4	236	3,51	.920	.108	.216**	.153*	1	(.70)			
5	236	3,85	1.030	.349**	.378**	.162	.267**	1	(.72)		
6	236	3,17	1,01	.248**	.435**	.364**	.376**	.743**	1	(.83)	
7	236	3,65	.915	.348**	.110	.222**	.598**	.202**	.654**	1	(.69)

<sup>a</sup> Scale of 1 to 5<sup>b</sup> The diagonal presents the values of *Alpha of Cronbach*

\*p &lt;.05 \*\*p &lt;. 01

1. Maximum benefit
2. Cost reduction
3. Increment of the market share
4. Innovation in processes
5. Results of innovation in the defence sector
6. Values which facilitate the business innovation
7. Innovation in products and differentiation

**Table 4**

Model 1			Model 2		Model 3		
Intermediate variables				Increment of the market share			
	Maximum benefit	Innovation in processes	Innovation in products and differentiation	Increment of the market share	Antecedent + 1 Mediator	Antecedent + 2 Mediators	Antecedent + 3 Mediators
Cost reduction	$\beta=.408$ $p=.000$	$\beta=.106$ $p=.003$	$\beta=.110$ $p=.092$	$\beta=.315$ $p=.000$	$\beta=.237$ $p=.000$	$\beta=.105$ $p=.084$	$\beta=.196$ $p=.009$
Results of innovation in the defence sector	$\beta=.349$ $p=.001$	$\beta=.267$ $p=.009$	$\beta=.156$ $p=.004$	$\beta=.062$ $p=.550$	$\beta=-.021$ $p=.846$	$\beta=.096$ $p=.366$	$\beta=.312$ $p=.020$
Values which facilitate business innovation	$\beta=.248$ $p=.000$	$\beta=.376$ $p=.000$	$\beta=.334$ $p=.000$	$\beta=.364$ $p=.000$	$\beta=.252$ $p=.000$	$\beta=.014$ $p=.825$	$\beta=.164$ $p=.027$