THE IMPACT OF WEB BASED TECHNOLOGIES IN THE PERFORMANCE OF FINANCIAL INSTUTIONS

Author and author correspondence
Carmen de Pablos
Rey Juan Carlos University, Madrid, Spain
Paseo de los Artilleros s/n, 28032 Madrid, Spain
Phone: 34915344257
Fax: 34917750170
e-mail: cpablos@poseidon.fcjs.urjc.es

Abstract

As many other authors since early ninties (Armour, H.O.; Teece, D.J., 1978; Summer et al., 1990; Meyer, 1991; Pettigrew and Whipp, 1991; 1993; Thomas et al, 1994) we try to measure the performance achieved in insurance companies as a result of properly implementing new information and communication technologies (specifically those we define as web-based technologies). Although organisational performance has been measured in different ways, there are not available guides that allow researchers choose a proper measure. Multiple measures have been chosen in a random way (Kenneth, L.; Lawrence, J.; Boatwright, E., 1996). A way to front this problem is by using a dual perspective. Concretely in this study we propose a new measure in order to evaluate the impact of web based technologies in the relationship with customers. In this way we speak about agility as a combination of four different dimensions.

1.- Introduction

Since the resource based theory (Grant, 1996) we can look at information and communication technologies as resources and the information system it is designed by making a proper use of these resources, a capacity[1]. One of the main discussions in the Theory of the Organisation and Strategic Management is centered around the role of "the strategic choice" (Astley and Van de Ven, 1983). The ecology of populations and the perspectives of resource dependence sustain that profits in organisations come from environmental factors and that strategic choices do not influence too much in results (Hannan and Freeman, 1977). However, we support the strategic choice perspective: manager choices can promote differences over organisational results (Child, 1972). We can find how some environments allow managers a great level of choice while others do not. Hambrick and Finkelstein (1987) suggest how different environments in organisations vary according to the capacity of the managerial discretion they allow. In low discretion environments, as it is the case of the Financial Sector in Spain, managerial decisions and actions can have a great impact over organisational performance.

As many other authors since early ninties (Armour, H.O.; Teece, D.J., 1978; Summer et al., 1990; Meyer, 1991; Pettigrew and Whipp, 1991; 1993; Thomas et al, 1994) we try to measure the performance achieved in insurance companies as a result of properly implementing new information and communication technologies (specifically those we define as web-based technologies).

Although organisational performance has been measured in different ways, there are not available guides that allow researchers choose a proper measure. Even multiple measures have been chosen in a random way (Kenneth, Lawrence, Boatwright, 1996). A way to front this problem is by using a dual perspective. This way, organisational design can be measured by a mix of alternatives dealing with both efficiency and effectiveness.

Concretely in this study we propose a new measure in order to evaluate the impact of web based technologies in the relationship with customers. In this way we speak about agility as a combination of four different dimensions:

- Ubiquity
- Time responses
- Adaptability
- Integration

We choose different insurance companies in order to test the reliability of our proposed measure.

As main objectives in the study, we have put a special attention in the following ones:

- To identify main web based technologies as resources in the insurance companies.
- To identify ways for properly implementing these web based technologies in the information system the insurance company needs to achieve the right processes sequence.
- To look for optimal performance measures in order to evaluate the impact of the so called technologies in the insurance companies.

[1] Capacities are a group of differentiated skills, complementary assets and routines that can promote a sustainable competitive advantage in the firm (Teece et al, 1992 :28).

2.- The Information System: procedures of use of information technology

An Information System is a group of persons, procedures and resources that collect, transform and diffuse information in an organisation (Ohmae, 1991). An information system will be practical in an organisation if it allows to offer proper responses to its real information needs.

Every information system makes use of a series of items that intervine in the processing of input and ouputs, warehousing and control activities that convert data resources into information products. Automated information systems use hardware, software and telecommunications, this is, information technology items, in order to transform information.

Information is a vital resource in modern societies. Technology has made possible the development of information systems powerful enough to formulate business strategy around them by altering the typical organisational structure up to that moment. We live in a global information society, increasingly dependant in the creation, management and distribution of information resources. Labor force is heavily accumulated in services and in the so called "knowledge workers", who spend a great part of their labor time creating, using and distributing information[2]. Most of them are final users that develop their profession by using information systems to create, distribute and manage information products.

Information systems are then "enabling elements" of organisational processes, as they allow too use scarce resources in a more effective way. Since information systems in many organisations are interconnected by global, local and regional telecommunication networks, workers can enter and distribute information, manage resources from distant places. For that reason, information systems play an important role in our global economy.

We can distinguish some stages along the time in the introduction and use of different types of information systems in the firm, from transactional systems to integrated information systems.

Figure 1: Evolution on information systems in the firm

Data processing systems (1950-1960)	Automation of routines in the operational level
Management information systems (1960-1970)	Obtention of structured information for decision making
Decision support systems (1970-1980)	Information and communication technologies allow an interactive help for the process of decision making in the organisation
Experts systems for final user (1980-1990)	use of information technology to directly supporting final user, expert systems, pieces of advice based in the expert knowledge for final users, strategic information systems
Global integrated information systems (1990-.....)	Information systems are integrated by playing different roles in the process they are in

Source: Own elaborated

The strategic role of information systems mean using information technologies to develop products, services and capacities that make the firm achieve a competitive advantage to front with sucess challenges in the global market.

[2] We include here a wide range of employments: executives, managers and supervisors, independent professionals, accountants, engineers, scientifists, intermediates, teachers, secretaries and administrative workers.

Information systems can in a direct way support competitive strategies. Next figure shows some examples in the ones, given a group of strategic objectives, actions for supporting a strategy in cost leadership can be developed in relationship with any of the Porter's competitive forces (1985).

Figure 2: Strategic objectives and competitive strategies

	Customers	Providers	Competitors	New entrants	Substitutes
Strategic objectives	**To attract new customers and fidelise actual ones by creating costs of change**	**To attract providers looking for costs of change**	**To throw out competitors by attracting customers and providers**	**To create barriers to go inside the industry**	**To make substitution less attractive**
Strategy in cost leadership	**To offer lower prices**	**To help providers to low prices**	**To improve competitor prices**	**Disincentive the entrance to investments in the sector**	**Disincentive the entrance of substitutive products**
Strategy of differentiation	**To offer better quality, technical characteristics and service. To offer new products, services or markets**	**To help providers to improve services. To develop an only service offer or establish alliances with providers**	**To remove competence with exclusive products. To offer products and services that are not traditionally offered together.**	**To complicate entrance decisions. To enter in potentially new markets**	**To offer substitute characteristics. To produce substitutes**

Source: adapted from O´Callaghan (1991)

The value chain framework (Porter, 1985) can help to decide where and how to implement strategic capacities in the information systems to get profits. Figure 3 shows some examples.

Figure 3: Benefits from the implementation of strategic capacities in the information systems.

Tangible benefits	**Example**
To increase sales or benefits	Develop of computer based products or services
To decrease information processing costs	removal of uneeded procedures or documents
To decrease operational costs	reduction of inventory costs
To decrease the investments required	Reduction of required inventory investments
To increae the operative skills and the efficiency	To increase skills in production
Intangible benefits	**Example**
Better or different information availability	More appropriate information and on time and new types of information
Customer service improved	Faster response times
Employee's moral improved	Removal of boring tasks
Decision improved	Better information and decision analysis
Competitive position improved	systems that block customers
Improved image in organisational actions	Agressive image as the one percieved by customers, providers and investors

Source: own elaborated

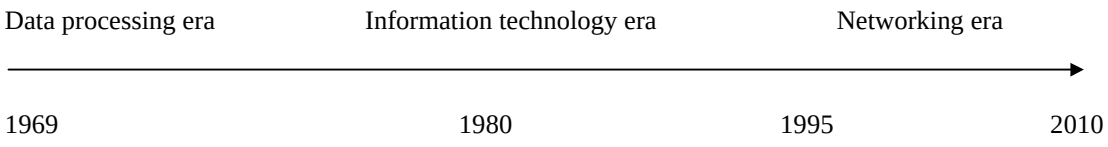
In this evolutive process, isolated information systems are replaced in the organisations. Since the smallest microprocessor to the biggest mainframe, computers are in a network or interconnected through telecommunication links with other information systems. This distribution of power in the computers in an organisation is called distributed processing and it often takes the shape of a client/server architecture, by means of final user computers (clients) and servers sometimes linked to little computers or mainframes

acting as superservers. Interconnected computer systems allow final users to communicate themselves in an electronic way and to share the use of hardware, software and other information resources. For example, final users of software, laser printers groupware databases.

This way, many information systems are composed by peripherical items interconnected by communication links to central processing units. Besides, networked computing depends on telecommunications. This way, networks of small computers are now an alternative to big information systems, as organisations decrease the size of their Computer equipments[3]. For example, a network of various microcomputers can replace a great information system. Interconnected microcomputers seem to be easier to install, use and maintain, besides they offer a more efficient, flexible y less costly alternative to big computer systems for many applications.

Nolan et al. (1996) sustain that a new technology in the firm must be introduced assuming changes in its organisational structure. Information technology itself does not allow organisations better business results, but combined with new ways of developing tasks can be a way to achieve dramatic improvements in productivity. This way, in a cronological point of view, different stages have been distinguished in the introduction of information technology in the organisations to support information systems functions.

Figure 4: Stages in the introduction of information technology in the organisations



Source: adapted from Powell and Dent-Micallef (1997)

We will use a dual tipology of information technology adoption in our study. For that, a list of information technologies and procedures of use has been proposed to be contrasted in the insurance spanish sector. This list has been later revised by a group of insurance managers. We distinguish among this two types of technology adoption (Damanpour et al. 1989).

a) The adoption of information technology refers to the equipments of hardware, software and communications used to process information related to products or services. One adoption of information technology can then be the adoption of a new tool for the firm, as for example, a software for managing electronic mail (Daft, 1978 ; Damanpour, 1992 ; Damanpour, Szabat and Evan, 1989).

b) The procedures of use of information technology, are defined, for the present work, as rules, steps and structures related to the use of information and communication technologies and the interchange of information amongst the members of a firm. They constitute in this sense measures of functioning or infrastructure policies and human resources that have as objective the formation and modification of administrative procedures facing a great absortion of information technologies and ways of using them.

As it has already been stressed in the previous paragraph, the information technology is not a direct source of competitive advantage, but properly implemented in a certain information system, and once established some habits in its correct use, it can be

[3] This process of evolution from mainframes to computer networks is called downsizing

decisive in obtaining better results (Daft, 1978 ; Damanpour, 1992 ; Damanpour, Szabat y Evan, 1989).
Since there are not clear classifications of information technologies in the organisations, being the more usual one the differentiation according to the decision level, we have established a list of two types of information technology adoption, taking into account the work of Subramanian and Nilakanta (1996) and distinguishing between information technologies and procedures of use.

Figure 5: Information technologies and procedures of use

Information technologies	Procedures of use[4]
Databases	**Procedures of information files for customers**
Specific software for an insurance company	**Procedures of database management systems**
Electronic data interchange (EDI)	**Fax transmisions**
Local area networks (LAN)	**Procedures of phone sales**
Toll free numbers	**Procedures of Internet selling**
Electronic document management	**Automated systems for channel distribution**
Electronic mail	**On-line customer systems**
Videoconferencing	**Customer services by phone**
Selfservice terminals	**Automated data systems**
EIS and DSS	**Explicit computer aided plans**
Expert systems	**Computer aided management by objectives**
Computer aided learning	**Computer aided process redesign**
Internet	**Training computer aided programs**
Intranet	**Computer aided job rotation**
Infovía	**Computer aided flexible labor timetable (partial time work, teleworking, etc.)**
Videotext	**Computer aided special labor force for ad hoc problems (consultants, etc.)**
Groupware	**Computer aided incentives/reward systems for channel distribution**
Workflow	**Computer aided incentives/reward systems for other workers outside the channel distribution**

Source: own elaborated

3.- Information technologies and performance

Some studies in the organisational level have checked the relationship between the investments in information technologies with some indicators of performance, as operational costs, return on assets and return on equity. They allow to get an improved product in variety, quality, and customer satisfaction. At the same time it makes easier the development of managerial processes and enables a greater work productivity. However, the achieved improvements do not have an impact in financial performance ratios, since benefits can be redistributed in the organisation or go to the consummers. Due to that, the study of the effects of the implementation of technologies over organisational performance must be based in intermediate measures that can better confirm the advantages in their use.

McFarlan (1981), Cash y Konsynski (1985), Charnes et al. (1985) y Conte et al. (1986) announced in the eighties that the adoption of information technologies was important since it was going to build the key for achiving a future competitive advantage. Others, as Dickson et al. (1984) and Clemons and Row (1991) have stressed

[4] and policies of organisational functioning or infrastructure and human resources policies. In this sense, and for this study, under the name "procedures of use of information technologies", we also mean a group of working measures or infraestructure policies and computer aided human resources that have as objective the training of employees and the modification of administrative procedures facing a greater absortion of information technologies or ways of using them.

that the introduction of information technology in the firm is, above all, a necessity, and the lack of it could drive towards a clear disadvantage in some organisations. Unfortunately the established relationships between information technology and organisational performance have been based under specific cases, for that, we must recognise that there is still an important gap in the studies that try to analise the impacts in information technology adoption and organisational performance (Mahmood, 1997). In the ninties some sectorial studies have appeared. This last ones have inspired us in the search of relations amongst performance measures and information technology adoptions.

Amogst the studies that relate information technology adoption and performance and apply their empirical analysis to concrete cases, we can stress the ones from McFarlan (1981), Cash y Konsynski (1985), Charnes et al. (1985) y Porter y Millar (1985). Charnes et al. (1985) support that the adoption of information technologies in the firm produce a better performance in processes measured in typical efficiency ratios, as return on assets and return on investments. McFarlan (1981) emphasised that information technologies improved the general performance in the organisations as they made possible the creation of entrance barriers, creating costs of change and transforming the base of the competence. Porter and Millar (1985) confirmed that information technologies can help to improve the performance in an organisation by offering a competitive advantage since they allow actions such as, decrease costs and promote product differentiation. In this first group we can also stress the research of Clemons and Row (1989) and Clemons (1991) who support that information technology is a need that makes firms to adopt a proper position to develop tasks, but not so easily to a better performance.

In a second group of literature, the ones that use the sector as the unit of analysis we have not found conclusive studies (Barua, Kreibel y Mukhapadhyay, 1995 ; Nault, 1995). Only the ones developed by Behrens (1993) and Hitt y Brynjolsson (1994) concluded in a clear positive relationship between information technology adoption and performance measures.

In this study, taking into account the assumptions of Mahmood (1997) about the need to incorporate new efficiency measures in order to be able to establish a relationship between information technology adoption and organisational performance, we have tried to make a different approach by considering the agility, a new qualitative measure integrated for four different factors in order to contrast the following hypothesis:

H* : There is a direct relationship between information technology adoption and the organisational agility.

Organisational agility

To introduce agility in our model we have considered some past literature, Goldsmith and Clutterbuck (1985), Viedma (1992), Campion, Papper and Medsker (1996) in the ones the need to complete traditional measures used to make an approach to performance, in a quantitative way, with new qualitative ones are stressed. We also take as reference, as more relevant one, the work of Blackburn (1991), Goldman et al. (1995), Lieberman et al (1997), Pennings et al. (1997) y Moss-Kanter (1998) to explain the different dimensions we have included in the variable agility. These authors make concrete references to adaptability, shorter answer times, ubiquity and task integration as defined elements of agility. Additionally, a part about perception of critical success factors have been included in the questionnary, a group of questions to check if really in

the sector we develop the study, agility is perceived as an important factor in order to evaluate it. Due to the found consistency, with high perceptions, summed in the following figure, we have decided to include agility as an additional measure of performance and incorporate it to the present study.

Figure 6: Perception of critical succes factors

Variable	meaning	mean	Standard deviation	minimum	maximum
PPFCE	**perception in the firm of different components of agility as critical sucess factors**	**3,735**	**0,515**	**2,90**	**4,95**
PSFCE	**perception in the sector of different components of agility as critical sucess factors**	**3,927**	**0,377**	**3,25**	**4,80**
PFCE (=PPFCE+PSFCE)/2)	**index of perception of different components of agility as critical sucess factors**	**3,831**	**0,366**	**3,08**	**4,72**

Source: own elaborated

Technology adoptions, specially those provoked by the direct implementation of information technologies in firm processes, cause agility in the processes insurance companies develop. Goldman et al. (1995) define agility as a reasonable answer to challenges in a firm environment dominated by change and uncertainty.

We consider firms as agile ones if they are able to reduce time responses in the delivery of goods or services, if they can, in a dynamic way, integrate processes, creating interactive relationships wirt customers and providers, in the way they can be present in different places without being physically in them, and if they are able to properly adapt to some changing circumstances in the environment.

Agility defines a framework for business action at different levels:

- In a level of marketing we can perceive a firm as agile if it enriches the customer by offering him individualised combinations of goods and services.
- In a production level, an agile firm produces goods and/or services adjusted to individual needs.
- In an organisational level, an agile firm tries to join learnt productive capabilities and new ones by following actions of resource optimisation.
- "It is a dynamic and opened term: agil firms are always prepared to know what they need to know, and learn to get benefits from new opportunities" (Goldman et al, 1995:42).

The actual competitive firm power do not just come from human or technological resources but from the way they are coordinated to achieve a group of common objectives. Ackoff, makes a comparison with cars: "for a car to properly work all pieces must be matched in a correct way, not each in its individual way" (Goldman et al, 1995:72).

Agile organisations are distinguished by the intensity of cooperative relation the search and by the virtual relations they create by implementing some technologies to their processes. Under some circumstances, the achieved agility in the firms, in the dimensions here considered, can lead them to develop new ways of selling, buying and producing, by developing different comercial relations and the use of new means. Agility allows firms to react faster now that in the past and implies, for that reason, a proactive attitude to customer requirements.

To get agility, the consideration of some characteristics in the organisational structures is needed. In some cases, this is translated in a new management philosophy that includes a new and different use of elements and relationships produced in the day to day operations. Apart from that, it is going to demand substantial investments in order to make attractive ways that allow the change. Goldman, Nagel y Preiss (1995) stress the atributes of the agile firm, as actions around its flexibility.

Figure 7: Atributes of the agile firm

Enrich the customer	Products in an agile firm are perceived as solutions for individual needs
Cooperate	To get products or services in the market as soon as possible since the costs point of view; one way is by using the existent resources independently where they are or who they belong to. For that multifunctional equipments are used, empowerment, concurrent engineering, virtual processes, subcontracting and alliances.
Organise for the change	To manage the change and the uncertainty a flexible enough structure must be got in order to allow a redesign of human and physical resources
Manage the change impact	Managers must control the impact of personal change, by making use of some tools as authority distribution, providing the needed resources to accomplish new operations

Source: own elaboration from Goldman, Nagel and Preiss (1995)

Information and comunication technologies are enabling tools that can contribute in organisational aspects as design, configuration, coordination, decrease distances, etc. It is obvious that traditional space and time concepts change in the organisations when networks are being used.
For this work, organisational agility is divided in four characteristics or elements. As the organisation reaches them, as a consequence of implementing technologies in its tasks, it can get a greater efficiency in the development of processes (Pennings et al., 1997 ; Moss-Kanter, 1998).

Elements in the organisational agility

Taking into account the literature about agility (Blackburn, 1991 ;Goldman et al., 1995 ; Lieberman et al., 1997 ; Pennings et al., 1997 ; Moss-Kanter, 1998) we have considered four main components. In this sense, we want to check if the organisations that more adopt information technologies, considering the two dimensions in this study, get or not a better performance.

1. Capacity of adaptation

Adapting consists of answering at an optimal time to changes in the environment (Goldman et al., 1995). Organisations need, in this sense, do it. As Maruta's affirms (1997:13) : "the challenge is to have an organisation constantly searching its renovation".
Firms are changing from a sequence of strategy, structure and processes to another one, in which after strategy, processes should be taken into account before organisation. Information technology is one of the means that have allowed the capacity of adaptation of organisations joined to competence, globalisation, surplus of products and services (Brynjolfsson, 1994). They are allowing the development of new structures.
Tarragó (1995) refers to the concept of autopoiesis as the capacity of organisational adaption that gives autonomy and allows redesign in a constant way looking for structural fit. Learning can be a source to get this structural fit (Andreu et al., 1996).

The need to rapidly offer services and products converges with the idea of giving flexibility to the organisation through the integration of people and decision processes[5], this way, technologies allow the coexistant of different options that before where not possible, removing their constraints.

2. Shorter answer times

We stress as a second constitutive element of agility, time response, as the mean time to offer a finalised good or service to the consummer (Lieberman et al., 1997).
Achiving shorter time responses for the customers is very important, specially when we are changing from a traditional model based in cost decrease and increasing quality to another model in which on trying to answer customer requirements firms must do it in very short times. For that reason, it is needed to develop redesigns in the organisations by removing "waste times" or "death times".
With this idea, to remove innecesary times generated in the processes, the "time based competition", defended by Stalk et al (1992) appears, as a consequence of studying the system "just in time" in Toyota. Stalk et al (1992) support that for being a time based competitor one must incide in different places in the value chain, act in the delays produced in the various phases in the elaboration of a product or service.

3. Ubiquity

We define ubiquity as the capacity of being present in a certain place without being physically in that place (Fernandez, 1997).
The development of some information technologies, as electronic processing networks, can reduce the distance amongst regionally sparce points and can allow, for example, the centralisation of the decision making.
Information technologies can impact in two important aspects to achieve the ubiquity:

- ⇒ Configuration: how value chain activities are going to be geographically distributed.
- ⇒ Coordination: the way and degree of activity interrelation; data transmission do not depend too much on data volume, nor the distance but in connection time and line capacity.

Kogut el at. (1996:506): "the essence of the design of a global strategy is in the conjunction of uses, way in which they must be performed". Porter (1996), refering to the problems in developping global strategies, distinguishes between advantages derived from the global activity system, which means a global coordination of activities, and the ones derived from the geographical localisation of activities in diferent places.
By using information and communication technologies a constant flow of information establishing conscient connections amongst those implied in the firm management. Collaboration allows communication and cooperation amongst members of a dispersed equipment. Collaboration allows communication and cooperation in the members of a dispersed equipment and can effectively share all their knowledge and uncertainties, increasing the possibility of generating reach economies.

4. Task integration through information technologies

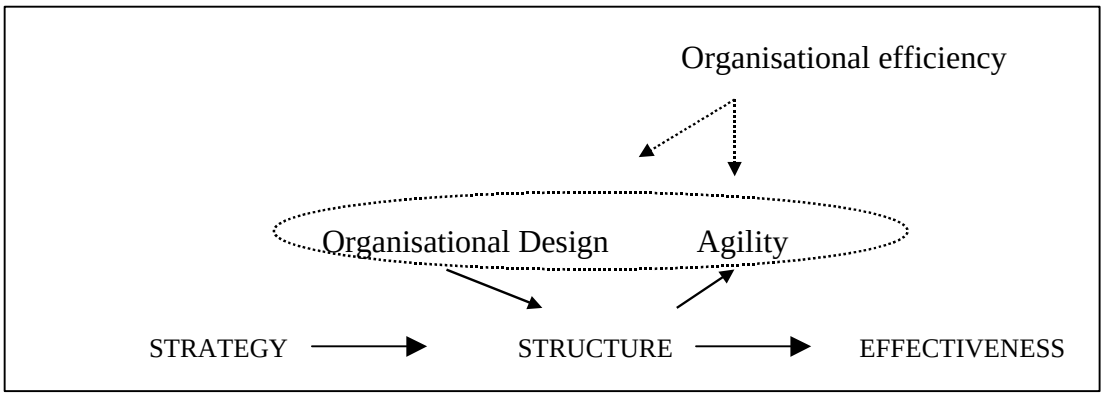
[5] Information technologies, for example, allow the centralisation and decentralisation of processes in a simultaneous way.

Task integration consist of organising in a proper way a needed interrelation amongst the activities developed in the different firm processes (Moss-Kanter, 1998).
Information technologies can widely decrease the costs of interrelating tasks integration. As these costs decrease, many business tasks, previously internally designed, can be realised through other external agents.
Information technologies can make the change easier. Indeed, organisational networks are composed by firms, parts or institutions, little ones sometimes, that are joined to act as a group. Some innovations, as the ones coming from the introduction of information technologies favourish the integration of tasks by making possible to disperse actors to coordinate, operate in a joint way in big distances, during long periods and under the base of more and better information.
Chandler (1990) supports that every coordinated activity improves organisational efficiency since it allows a better use of production factors.Williamson (1985) vindicates the concept of modern coorporation as the result of a group of firms that have as main purpose to economise transaction costs.
Information technologies influence the coordination mechanisms that allow to integrate the desintegrated work in little, dispersed units. Big firms can, be divided in a group of little articulated units, that can offer the environmental demanded flexibility, combining this way the advantages of the big and small size.

4.- Model of the proposed analysis

Under the following analysis, in a graphical way, the theorical framework of the present study can be reflected.

Figure 8: Theorical framework of the study



Source: own elaborated

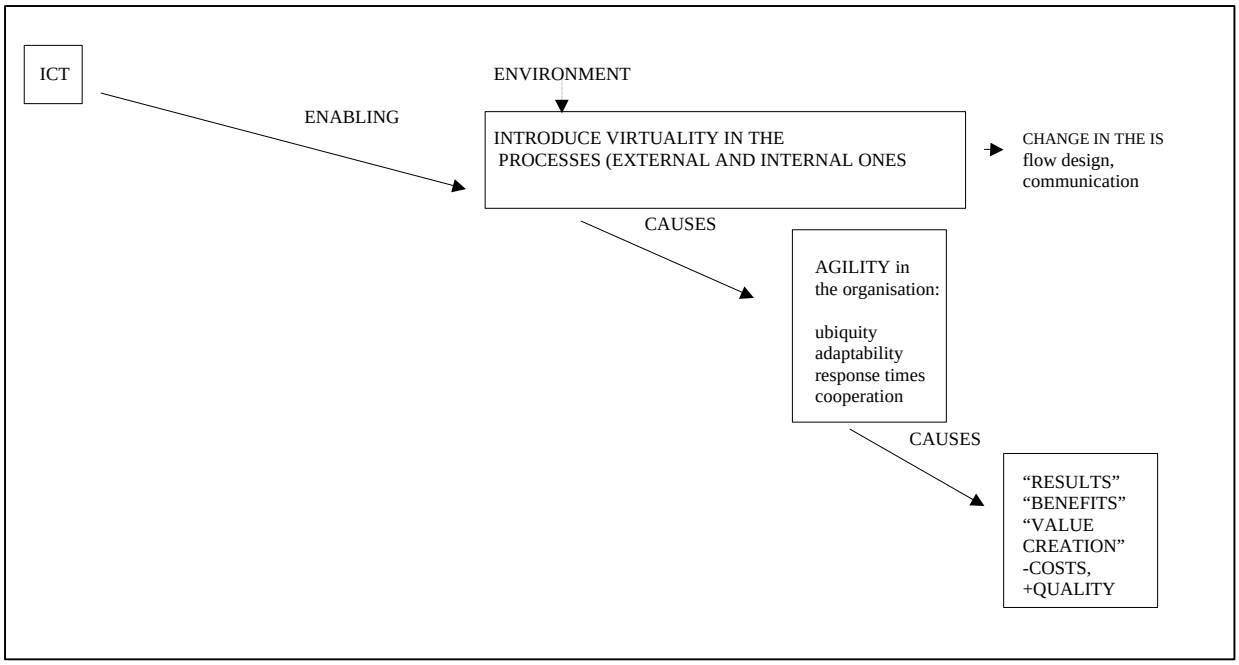
Organisation is created with some concrete objectives reflected in the concept of firm strategy. The development of the proper processes to get the objectives, case in which organisational effectiveness[6] would be achieved, it is developed in a certain structure. This structure, result of disposing design parameters in the organisation (in both dimensions differentiation and integration) provokes agility in the business processes helping to get the planned objectives.

[6] Degree in which the organisation reaches its objectives (Etzioni, 1965).

Model of the proposed analysis

The following figure represents the scheme we try to develop in the research

Figure 9: Research schema



Source: own elaborated

The implementation of information and communication technologies in the organisations allows the introduction of virtuality in their processes. This causes agility, measured through a group of variables and it can be translated in better business results.

Study focus

Data in this study have been collected through a quesionary based in a group of questions related with the different variables that we have tried to measure and to check the hypotheses. Domain in the sample is the spanish insurance sector, specifically companies that operate in the sector, with a high rate in the implementation of information and communication technologies[7]. We have contacted with 100 companies for this study. Companies have been selected from the ICEA report nº 654 "evolution of computers in the spanish insurance sector", that groups the first one hundred firms with better results in Spain in 2000. To choose this selection we have taken into account that the spanish insurance sector is a highly concentrated one, where a little number of firms get the highest percentage of premiuns in the whole sector (Martínez, 1994). The same report signals how the first twenty companies, measured through the volumen of premiuns achieved in 1999, had the 87,6% of the total volumen of sales in the sector in Spain. Final sample is comprised by the 33% of the sent questionnaries[8]. Now let us briefly describe variables used in this work.

[7]according to the Report nº 654 from ICEA (Cooperative Research of Insurance Companies), "Survey over the evolution of computers in the Insurance Sector".
[8] thirteen surveys have been unestimated for uncomplete information.

Information technology adoption

We can understand information technology adoption, as we have already expressed, as a problem of organisational and strategic character. Organisations that incorporate information and communication technologies exhibit a consistent innovative behavior in time (Subramanian y Nilakanta, 1996). Any valid measure of information technology adoption must, then, capture this temporal dimension. In previous studies to the just mentioned, adoption of information technology had been considered as a unique measure, by employing time of adoption. Organisational change studies measure the adoption as the number of innovations adopted in a firm (Damanpour y Evan, 1984 ; Damanpour y Childers, 1985). These measures of information technology adoption have some limitations:

1.- Research in information technology adoption is typically refered to the diffusion of one or few technologies. If a firm adopts a technology before others, this do not neccesarily means that it will exhibit the same behaviour for other technologies. For that, valid measures for information technology adoption must be based in the adoption of various technologies (Damanpour, 1987).

2.- Studies that have measured information technology adoption based in the number of technologies adopted have not considered time of adoption of every technology. By excluding time of adoption, however, important differences in the capacity and propension to adopt technology can not be determined. This could be a main dificulty, since some research in the area of strategic management have showed that the advantages of "moving first" have been translated into important competitive advantages (Porter, 1985 ; Zangwill, 1993).

3.- Almost all studies in the adoption of technology have worked with the adoption at a moment in time. A significant exception are Damanpour and Evan (1990), they measured the capacity of adoption by fixing changes in the mean time of technology adoption in two different periods of time. Due to the fact that environment and internal conditions in the firm rarely change, it seems logical to assume, under the strategic choice and contingency theories, that the rythm in the adoption of technologies will change in time. However, if technology means very complex changes and of difficult implementation, firms will keep innovated through time. That it is, firms that adopt information technologies will develop a high level of "innovative consistence", in the sense of maintaining a certain information technology active along the time. Many of the developed research over this subject have ignored the consistency in technology adoptions.

The survey has also been used for collecting data over time of adoption of every information technology and procedures of use, if the mentioned technology has been implemented in the firm. The three dimensions of adoption in this study, are the ones considered by Nilakanta and Subramanian (1996) and they are obtained as follows:

1. **Mean number of adopted information technologies and procedures:** the total number of adopted information technologies and procedures for each firm. Most part of them had been implemented in the period from 1988-96.

   Damanpour y Evan (1990), in their study, made use of data in a five year period, because they sustain that this period is long enough to show the effects of such adoptions in the organisational performance.

   In our study, the mean number of adopted technologies and procedures is obtained as follows: first, the number of years between the first and last adoption is considered, second, the mean number of adopted technologies and procedures is calculated by dividing the total number of implemented information technologies and procedures

of use by the number of years between the first and the last implemented technology and procedure of use.

2. **Mean time in the adoption of the information technology and procedures of use of the technology:** this variable will be used to measure the time of adoption of the information technology and procedures of use of the technology for each firm in comparison with other firms. For each information technology and procedure of use, the moment of adoption of the last adopting firm has been determined. Time of adoption of a firm for each technology and procedure has been calculated by adding one unit to the last year of adoption by sustracting of this value, the year of adoption of that technology and procedure of use in the firm. Those firms that have not adopted one technology or procedure of use mantain a level of 0. Mean adoption time for each technology and procedure of use for each firm and for all information technologies and procedures of use is calculated.

3. **Consistency in the time of adoption:** this variable has been used to measure the consistency in which many firms have adopted information technologies and procedures of use soon or late. This variable is calculated for each firm by fixing the coeficient of variability in the adoption of technologies or procedures. The coeficient is a normalised measure. It is calculated by dividing the standard deviation of a group of measures by the mean value of that group of measures. In this concrete case it is calculated by dividing the time of adoption of each information technology and procedure of use by the mean time of adoption of all firms in relationship with that technology or procedure of use. It is calculated for each technology and procedure of use of each firm and an unique mean index for all adoptions in a firm is calculated. This way, firms that adopt information technologies in a consistent way, sooner or later than others, will have lower coeficients of variability than the firms that were relatively inconsistent in their time of adoption.

Organisational performance

As we have already shown, we have chosen a new way of measuring performance, the "organisational agility". We consider it as an additional measure of performance to the clasic ones with a more qualitative character. Studies from Goldsmith and Clutterbuck (1985), Viedma (1992), Campion, Papper y Medsker (1996) promote the need to complete measures of performance of a mere quantitative character, with other new ones, more qualitative that complete the previous. For the election of the dimensions that compound agility, we have consider, amongst others, as more relevant the work of Goldman et al. (1995), Lieberman et al. (1997), Pennings et al., (1997) and Moss-Kanter (1998) refered to adaptability, shorter time responses, ubiquity and tasks integration as components of the so called agility.
Next table show the characteristics we try to collect dimensions of agility in the questionarym applied to the insurance sector.

Figure 10: Characteristics and dimensions of agility

Characteristics	Dimensions
Fast change adaption of business procedures Higher worker knowledge of their own responsabilities Personalisation of the insurance contract to the specific conditions of the customer High mormalisation of information, specially in the	**capacity of adaption**

management of codes related to data Resolution of organisational aspects in the change in productive terms, as standards, route definition Resolution of organisational aspects in marketing in changes in relationship with customer, marketing conditions, tariffs, risks Easiness to decentralise operations Easiness to centralise operations	**Faster answer times**
Punctuality of the needed information to develop processes, functions Fastness in the process of insurance contracting Fastness in the process of sinister management Fastness in the relationship of the company with the channel distribution Fastness in the rest of processes in general	**Ubiquity**
Actualisation of information over products in the channel distribution Proper interpersonal communication flows inside the firm Easiness of communication with the used channel distribution Easy capture of information in the point it is generated Easy access to the information generated by the firm in disperse places, in a fast way	**Tasks integration**
Easiness in the capture of information in the information systems in general Easiness in the process of information of information systems in general Easiness in knowing where the information is Work evaluation in general	

Source: own elaboration

The Spanish Insurance Sector

The insurance sector is a mature one. It mainly deals with information: collecting, processing, warehousing and diffussing it.It is characterised by constantly processing and diffusing information in a group of permanent interrelations produced amongst customer, distribution channel, company and other companies, in a base of direct insurance, reinsurance or coinsurance agreements.

It is a highly globalised sector that traditionally has made used of information and communication technologies in order to support own business processes, mainly based in treating and transporting information. This has made it to be constantly inmersed in a strong dymamic of change.It is highly regulated by existing homogenity in the legal requirements in insurance companies according to the branches they comercialise.

Telecommunication networks are used for internal and external, private and public firm relationships, specific for the companies and general for a group of companies.

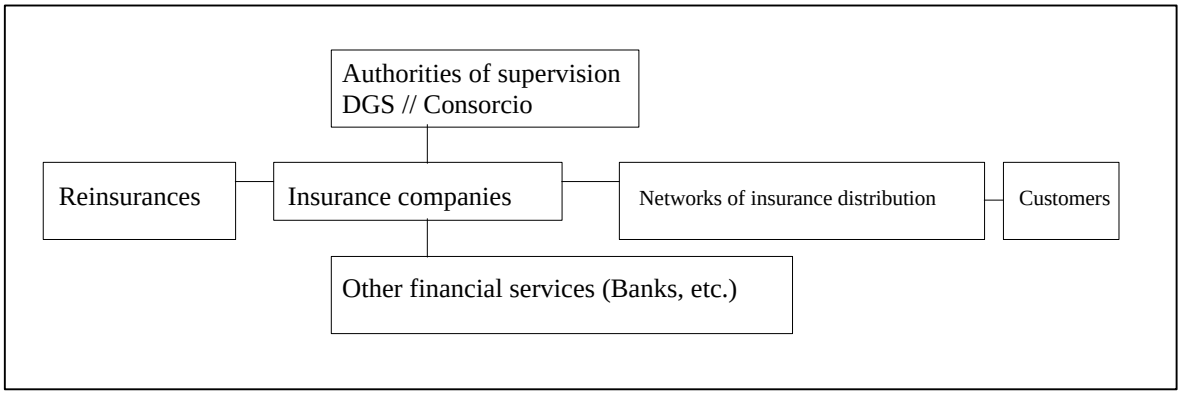
It is a sector that highly search for cost reduction in the relationships amongst different partners in the management of insurance and tries to add differentiation to a group of legally standardised products.

It is a sector where the essential competences of the partners in the management of the product are well defined.
Amongst the different interactions in an insurance company we can stress the following. Each of them is coordinated through any of the mechanims: authority, co-operation, market.

- Agent of sales-company
- broker-company
- bank-company
- other alternative channels -company
- company-same company
- company-other companies
- companies-customers
- customers-distribution channels

The following figure represents the structure of the Insurance Industry.

Figure 11: Insurance Industry Structure



Source: own elaborated

5.- Results

In november 2000 the letters with surveys have been sent. A two month period has been given to receive them.
In the month of February 2001 the proper statistics analysis have been made by using SPSS.
As we try to know if there are or not relationships amongst a group of variables, we are going to use as statistical technique the general regresion and the correlation.General regresion allows us to determine the structure of dependence that better express the kind of relationship amongst both analysed variables. Correlation will express the degree of the relation.

- In relation with the hypothesis, we get a significant regression: The adoption of information technologies is directly related with agility.

The equation we have got

LAGIL = 43426490216LNCADOPTIPU - 26400650918

In our case, for a reliance interval of 95% and a significance level of 0,05, we observe that:

F = 7,41224 Signif F = 0,0116

Which means that the model is optimal. If we analyse the significance of T, sig T, for every one of the variables, we confirm the final result:

Variable	Sig T
Cadoptipu	0,0116

Besides, on considering the beta signals, we can confirm that:
High levels of information technology adoption are related to high levels of agility.

6.- Conclusions

As typical analyses in the approach of changes due to the incorporation of technologies and its impact in organisational performance we can stress the ones coming from Armour and Teece, 1978; Summer et al., 1990; Meyer, 1991; Pettigrew and Whipp, 1991; 1993; Thomas et al., 1994. However, Brynjolfsson (1994) and Mahmood (1997) have found some deficiencies in those studies due to the way information technology adoption has been measured (not wide enough) or the ratios used to measure organisational performance. However we have found some quite conclusive ones (Behrens, 1993; Brynjolfsson, 1994) who conclude that high levels of information technology adoption are related with high levels of organisational performance. In both cases return on equity has been used as organisaitonal performance measure, but while Behrens has developed the study in the industrial sector, Brynjolfsson makes a similar analysis in the service sector.
In this study, by following the one from Subramanian and Nilakanta (1996), we have tried to reinforce these deficiencies, by not only considering the mean time of information technologies and procedures of use adopted in a firm, but also mean time of adoption of information technologies and procedures of use and the consistency in the adoption.
Results show that information technology adoption improves organisational performance by using agility as a measure of performance and considering the duality in the measuring of information and communication technologies.
The analysed sector, perceives agility as an important element in considering processes performance. For that, since the point of view of adoption of information technologies, the role that information technologies play in achieving agility has been highly evaluated.
There is a high variability in the collected values over the mean time of information technologies and procedures of use adopted, mean time of adoption and consistency in the time of adoption of these dimensions.

References

Andreu, R.; Ricart, J.E.; Valor J. (1996), La organización en la era de la información: aprendizaje, innovación y cambio, Arthur Andersen, Pamplona.
Armour, H.O. ; Teece, D.J. (1978), “Organizational structure and economic performance : a test of the multidivisional hypothesis”, The Bell Journal of Economics and Management Studies, nº 9, pp. 106-122.
Astley, W.G. ; Van de Ven, A.H. (1983), “Central perspectives and debates in organization theory”, Administrative Science Quaterly, nº 4, pp. 245-273.

Barua, A.; Kreibel, C.H.; Mukhopadhyay, T. (1995), "Information technologies and business value: an analytic and empirical investigation", Information Systems Review, nº 1, pp. 3-23.
Behrens, C.A. (1993), "Measuring the productivity of computer systems development activities with function points", IEEE Transactions on Software Engineering, nº 6, pp. 648-652.
Blackburn, J. (1991), Time-based competition, Irwin, Nueva York.
Brynjolfsson, E. (1994), "Information assets, technology and organization", Management Science, nº 12, pp. 1645-1662.
Campion, M.; Papper, E.; Medsker, G. (1996), "Relations between work team characteristics and effectiveness: A replication and extension", Personnel Psychology, nº 49, pp. 429-452.
Cash, J.I. ; Konsynski, B.R. (1985), "IS redraws competitive boundaries", Harvard Business Review, nº 2, pp. 134-142.
Clemons, E.K. (1991), "Evaluation of strategic investments in information technology", Communications of the ACM, nº 1, pp. 22-36.
Clemons, E.K. ; Row, M.C. (1991), "Sustaining IT advantage : the role of structural differences", Management Information Systems Quaterley, nº 3, pp. 275-292.
Conte, S.D. ; Dunsmore, H.F. ; Shen, V.Y. (1986), Software engineering metrics and models, Cummings, Menlo Park.
Chandler, A.D. (1990), Scale and scope : the dymanics of industrial capitalism, Harvard University Press, Cambridge.
Charnes, A. ; Clark, C.T. ; Cooper, WW. ; Golany, B. (1985), "A developmental study of data envelopment analysis in measuring the efficiency or maintenance units in the U.S. Air Forces", Annals of Operations Research, nº 2, pp. 95-112.
Child, J. (1972), "Organization, structure, environment and performance : the role of strategic choice", Sociology, nº 6, pp. 1-22.
Daft, R.L. (1978), "A dual core model of organizational innovation", Academy of Management Journal, nº 1, pp. 193-210.
Damanpour, F. (1987), "The adoption of technological, administrative, and ancillary innovations : the impact of organizational factors", Journal of Management, nº 4, pp. 675-688.
Damanpour, F. (1992), "Organizational size and innovation", Organizational Studies, nº 13, pp. 375-402.
Damanpour, F.; Childers, T. (1985), "The adoption of innovations in public libraries", Library and Information Science Research, nº 7, pp. 231-246.
Damanpour, F. ; Evan, W.M. (1984), "Organizational innovation and performance : the problem of organizational lag", Administrative Science Quaterly, nº 3, pp. 392-409.
Damanpour, F. ; Evan, W.M. (1990), "The adoption of innovations over time : structural characteristics and performance of organizations", Proceedings of National Decision Science Institute Conference, San Diego.
Damanpour, F.; Szabat, K.A. ; Evan, W.M. (1989), "The relationship between types of innovation and organizational performance", Journal of Management Studies, nº 4, pp. 587-601.
Dickson, G. ; Leitheuser, R. ; Wetherbe, J.C. (1984), "Key information systems issues for the 1990's", Management Information Systems Quaterly, nº 3, pp. 135-159.
Etzioni, A. (1965), Modern organizations, Prentice Hall, Englewood Cliffs.
Fernandez, J.A. (1997), "La tecnología de la información, factor estratégico en la segunda mitad de los 90", Harvard Deusto Business Review, nº 32, pp. 98-106.
Goldman, S. ; Nagel, R. ; Preiss K. (1995), Agile competitors and virtual organizations, Van Nostrand Reinhold, Nueva York.
Goldsmith, W.; Clutterbuck, D. (1985), The winning streak, Penguin Books, Londres.
Grant, R.M. (1996), Dirección estratégica, conceptos técnicas y aplicaciones, Civitas, Madrid.
Hambrick, D.C. ; Finkelstein, S. (1987), "Managerial discretion : A bridge between polar views organizations", in L.L. Cummings and B.M. Staw (eds), Research in Organizational Behaviour, vol. 9, JAI Press, Greenwich, pp. 369-406.
Hannan, M.T. ; Freeman, J.H. (1977), "The population ecology of organizations", American Journal of Sociology, nº 82, pp. 929-964.
Hitt, L.; Brynjolfsson, E. (1994), "The three faces of IT value: theory and evidence", in Proceedings of the 15th International Conference on Information Systems, pp. 263-277.

Icea (1999), “Encuesta sobre la evolución de la informática en el sector asegurador”, Informe nº 654.
Kenneth, L. ; Lawerence, J. ; Boatwright, E. (1996), “Assesing organizational effectiveness in the service sector”, Journal of Professional Services Marketing, nº 4, pp. 12-26.
Kogut, B.; Zander, V. (1996), “What firms do ?, Coordination, identity and learning”, Organization Science, nº 5, pp. 502-518.
Lieberman, M. ; Asaba, S. (1997), “Inventory reduction and productivity growth : a comparison of Japanese and US automotive sector”, Operational Research, nº 2, pp. 73-85.
McFarlan, F.W. (1981), “Portfolio approach to information systems”, Harvard Business Review, nº 5, pp. 142-150.
Mahmood, A. (1997), “How information technology resources affect organizational performance and productivity”, Information Resources Management Journal, nº 1, pp. 4-5.
Martinez, M.A. (1994), Organización y estrategia en la empresa aseguradora en España, Fundación Mapfre Estudios.
McFarlan, F.W. (1981), “Portfolio approach to information systems”, Harvard Business Review, nº 3, pp. 142-150.
Meyer, M. (1991), Environments and organizations, Jossey-Bass, San Francisco.
Meyer, A.D. (1991), “What is strategy´s distinctive competence ?”, Journal of Management, nº 1, pp. 821-833.
Moss-Kanter, R (1998), “Rethinking your strategy”, Executive Excellence, nº 2, pp. 3-7.
Nault, B.R. (1995), “Added value and pricing with information technology”, Management Information Systems Quaterly, nº 4, pp. 449-470.
Nolan, R. ; Galal, H. ; Tuller, Ch. (1996).- “Virtual offices : new arrangements for redefining organization boundaries”, in http ://www.hbs.harvard.edu/mis/multimedia/link/s_nolan.html.
O´Callaghan, J. (1991), “Los sistemas inter-empresariales y sus ventajas competitivas”, Harvard-Deusto Business Review, segundo trimestre, pp. 140-148.
Ohmae, K. (1991), The borderless World. Power and strategy in the interlinked economy, Harper Collins, Nueva York
Pennings, E. ; Lint, O. (1997), “The option value of advanced R&D”, European Journal of Advanced R&D, nº 1, pp. 83-94.
Pettigrew, A. ; Whipp, R. (1991), Managing change for competitive sucess, Basil Blackwell, Oxford.
Pettigrew, A. ; Whipp, R. (1993), “Managing the twin processes of competition and change: the role of intangible assets”, in: P.L. Lorrange ; B. Chakravarthy ; J. Roos ; J.A. Van de Ven (eds), Implementing strategic processes: change, learning and cooperation, Blackwell Business, Cambridge MA, pp. 3-42.
Porter, M.E. (1985), Competitive advantage: creating and sustaining superior performance, Free Press, Nueva York.
Porter, M.E. (1996), “What is strategy ”, Harvard Business Review, nº 437, pp. 61-78.
Porter, M.E. ; Millar, V.Z. (1985), “How information gives you competitive advantage”, Harvard Business Review, nº 4, pp. 149-160.
Powell, Th. ; Dent Micallef, A. (1997), “Information technology as competitive advantage : the role of human, business and technology resources”, Strategic Management Journal, nº 5, pp. 375-405.
Stalk, G. ; Evans P. y Shulman, L.E. (1992), “Competir en habilidades, clave de la nueva estrategia empresarial”, Harvard Deusto Business Review, nº 51, pp. 44-56.
Subramanian, A. ; Nilakanta, S. (1996), “Organizational innovativeness : exploring the relationship between organizational determinants of innovation, types of innovations and measures of organizational performance”, Omega, International Journal of Management Science, nº 6, pp. 631-647.
Summer, C.E. ; Bettis, M.A. ; Duhaime, I.H. ; Grant, J.H. ; Hambrick, D.C. ; Swanson, E.B. (1990), “Information systems innovation among organizations”, Management Science, nº 40, pp. 1069-1092.

Tarragó, F.- (1995), “Sobre la complejidad organizativa”, in: A. Cuervo (dir) “Memory to the Prof. Jesús Marcial López Moreno, Dirección de Empresas de los Noventa, cap. 14, Civitas, Madrid, pp. 388-400.
Teece, D.; Pisano G. ; Schuen, A. (1992), “Dynamic capabilities and strategic manangement”, Center for Research in Management, University of California at Berkeley, CCC Working Paper.
Thomas, J.B. ; Shankster, L.J. ; Mathieu, J.E. (1994), “Antecedents to organizational issue interpretation : the roles of single-level, cross-level, and content cues”, Academy of Management Journal, nº 3, pp. 1252-1284.
Viedma, J.M. (1992), La excelencia empresarial: un estudio del caso español con conclusiones aplicables a las empresas latinoamericanas, McGraw Hill. Madrid.
Vitale, G.L. (1996), “Benefits for both”, Credit Union Management, nº 1, p.8.
Williamson, O. (1985), The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting, Free Press, Nueva York.
Zangwill, W.I. (1993), Lightning Strategies for Innovation : How the World´s Best Firms Create New Products, Lexington Books, Nueva York.