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ICT use in marketing as innovation success factor

Enhancing cooperation in new product development processes

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Abstract

Purpose – This paper seeks to explore the role that Information and Communication Technologies (ICT) plays in the processes of product innovation and marketing – as an element that strengthens the cooperation and communication among agents within the innovation project, reducing the obstacles to innovation and enhancing the development of differentiated products as well.

Design/methodology/approach – The study of a sample of 2,038 companies from all sectors of economic activity in Catalonia allows the contrast of initial hypotheses and establishes a profile of an innovative company based on the significant relationships that exist between innovation and ICT use in marketing and cooperation.

Findings – Two ideas stand out from the analysis. First, intensive ICT use in marketing makes the company more innovative, as it perceives that its usage breaks down barriers to innovation and speeds up processes that in turn become more efficient. Second, increasing ICT use in marketing encourages company predisposition to collaborate with and integrate particular agents within the business environment in the development of the innovation process, improving the degree of adaptation of the new product to market demands.

Research limitations/implications – The use of dichotomic scales to measure variables, or restricting the study sample to any type of new product regardless of its degree of novelty or intangibility in company and market terms perhaps limits the usefulness of the paper.

Practical implications – The study shows the relationship between ICT use, cooperation and the innovation process.

Originality/value – This study offers important contributions, and draws conclusions for those directors involved in the development of new products. A new framework is presented for identifying the role that intensive ICT use in marketing plays as an element that strengthens the cooperation and communication relationships in new product development processes. On the other hand, the application of the CHAID analysis allows us to identify the principal traits that define an innovation company.

Keywords Marketing strategy, Product innovation, Communication technologies

Paper type Research paper

Introduction

Since the mid-1990s we have witnessed a significant process of entrepreneurial transformation. Companies are changing their organisational and business models, as well as the way they establish and develop their productive and strategic activities (Achrol and Kotler, 1999; Prasad *et al.*, 2001; Trim, 2002). Thus, a market oriented business culture considers the consumer as the central element of the business strategy (Schulze *et al.*, 2001). Also, ICT, relationships and knowledge are recognised as internal

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strategic elements of organisation (Grönroos, 2000; Ravald and Grönroos, 1996; Vorhies *et al.*, 1999).

The relevant literature has analysed the companies' source of success, recognising marketing and innovation activities – and their correct management – as the key success factors. In this sense, Achrol and Kotler (1999), Badaracco (1991), and Webster(1992), among others, consider that these activities provide the principal axis on the consumer's value creation process, and their integration make possible to increase firms' competitive and productivity.

As a global and interactive process that embraces all departments and functions developed both inside and outside the organisation, marketing's utility is twofold. First, it can guarantee the construction and maintenance of communication and cooperation relationships between different agents, both inside and outside the organisation. Second, the marketing function manages market data correctly, prioritising its acquisition, storage and dissemination throughout the company, and guarantees the existence of a market intelligence that can be used in the process of decision-making (Jaworski and Kohli, 1993; Vorhies *et al.*, 1999). On the other hand, innovation – especially product innovation – is recognised as a key element in the process of value creation (Han *et al.*, 1998; Weerawardena, 2003). Thus, Froehle *et al.* (2000) and; Schilling and Hill (1998) pointed out that firms often opt for innovation or renovation of their product portfolios in order to improve their competitive situation, so that strategy guarantees the increase of consumer's satisfaction and loyalty (Atuahene-Gima, 1996a, b; Vorhies *et al.*, 1999).

Product innovation is recognized as a complex and risky process that requires considerable capital and human resources inputs. This process should be developed quickly if the company wants to remain competitive within today's dynamic market-driven environments (Rangaswamy and Lilien, 1997). But also, aspects relative to product launch time or market requirements have to be taken into account when dealing with the process of product innovation. During this process, therefore, it is necessary that the company not only concentrates all its efforts and resources on the development of a complex technical process that leads to the creation of radical or incremental product innovations. It also needs to consider the importance of marketing in the process of innovation and to accept its total integration in that process (Leenders and Wierenga, 2002; Li and Calantone, 1998).

Recent studies emphasize the marketing contribution to product innovation success. For example, Han *et al.*(1998), Hillebrand and Biemans (2004), Johne and Storey (1998), Kahn (2001), Rothaermel (2001a, b) and Weerawardena (2003) suggest that cooperation between different environmental agents and the availability of market information are key elements in the success of new product development. And as it can be seen above, marketing oriented firms towards the construction of cooperation and communication relationships with different agents, brings the necessary assistance and knowledge for the new product to be launched on time, and shapes it to the market's needs and requirements (Atuahene-Gima, 1995, 1996 a, b; Han *et al.*, 1998; Johne and Storey, 1998; Johnston and Lawrence, 1988; Kahn, 2001; Ottum and Moore, 1997; Weerawardena, 2003).

Nevertheless, few studies have examined the role played by ICT use in marketing in the success of new product development (NPD) processes. This is not surprising considering that the new competitive environment is defined by an economy broadly

based on intensive ICT use and knowledge as key elements of business strategy. Consequently, the aim of our work is to analyse the role that ICT use in marketing plays in the processes of innovation, as an element that strengthens the degree of integration of agents within the relationship, favouring the establishment of relationships directed towards cooperation and the acquisition of useful market intelligence in the process of product innovation.

Cooperation relationships and new product development processes: benefits and barriers

Nowadays, organizations count on other agents' collaboration within their environment for development their innovation processes (Hillebrand and Biemans, 2004). Thus, with the aim of improving management (Deeds and Rothaermel, 2003), enhancing the processes' efficiency and efficacy, and cutting costs and risks (Ahuja, 2000a; Dyer, 1997; Hagedoorn, 1993; 2002) organisations draw certain agents into the NPD processes. These agents can be distributors, consumers (Appleyard, 2003; Kelly, 2001; Norman, 2004; Schulze *et al.*, 2001; Shaw, 1994), universities and research centres (Santoro, 2000), or even competitors (Ahuja, 2000a, b; Dogson, 1993).

Ample empirical evidence proves the existence of a positive relationship between cooperation and the achievement of success in the process of innovation (Ahuja, 2000a; Deeds and Rothaermel, 2003; Phua and Rowlinson, 2004; Rothaermel, 2001b). Cooperation offers important benefits to the company that are summarized in the following:

- The establishment of work teams made up of experts in different functional fields who adopt flat structures that are highly adaptable, wherein decisions are taken in a decentralised way (Henke *et al.* 1993).
- The transfer of information, experience and new technologies that help to identify and resolve quickly and efficiently any problems that might arise (Chakrabarti and Hauschild, 1989; Gulati *et al.*, 2000; Tatikonda and Stock, 2003; Veyzer and Borja de Mozata, 2005). Thus cooperation guarantees the circulation of information among agents and its use in the process of innovation, thereby improving the activities of investigation and new product development (Peterson *et al.*, 2003).
- The supply of economic, human and technological resources to reduce complexity, cost and duration of the process (Littler *et al.*, 1995).
- The improvement of communication and exchange information processes (Pitta and Franzak, 1997; Pitta *et al.*, 1996).
- Cooperation improves the relationship between the agents in the environment, internalising the project and favouring the development of a working relationship in which the members actively participate (Meyer, 1993; Neale and Corkindale, 1998; Webster, 1992).
- Cooperation also favours the creation of products designed for and adapted to new needs and demands, and the development of a more efficient process of innovation that incorporates the "voice of the consumer" together with the experience and know-how of other agents (Bhattacharya and Sen, 2003).

- Cooperation reduces the uncertainty surrounding the product's future (Freeman, 1991; Wind and Mahajan, 1988), and its dependence at the time of product launch (Hillebrand and Biemans, 2004; Littler *et al.*, 1995; Mabert *et al.*, 1992), while improving on the results obtained, and ensuring a favourable response to the market (Dogson, 1993; Kent, 1991).

According to Bleeke and Ernst (1991), Faems *et al.* (2005) and Kale *et al.*(2002), about 60 per cent of established cooperative relationships fail. Thus, guaranteeing a high degree of interaction is complex when company faces various factors identified as true barriers to cooperation. In this sense, the marketing literature points up the lack of familiarity between the partners, the distance that separates them or the absence of pre-collaboration experience as the most important inhibitors of the process of cooperation (Ahuja, 2000 a, b; Appleyard, 2003; Dahlin *et al.*, 2005; Griffin and Hauser, 1996; Kale *et al.*, 2002; McDonough *et al.*, 2001; Montoya-Weiss *et al.*, 2001; Peterson *et al.*, 2003; Song *et al.*, 1997).

Bigné *et al.*(2000) and Grönroos (1994) consider that one of the most crucial moments in the relationship is possibly the selection of a work partner. Each agent will have specific expectations in terms of the benefits they expect to gain from the relationship, and likewise, the risks and compromises they will be willing to accept. How attractive an agent is to the organisation could be a determinant factor in deciding whether or not collaboration begins (Ahuja, 2000b). So, an agent is deemed highly attractive if it shows a capacity to stick to agreed commitments; if the agent's culture, structure or strategies are similar to or compatible with those of the organisation; whether or not they perceive that with its help and collaboration the efficiency and efficacy of the process of innovation improve (Kaufman *et al.*, 2000, Wilson, 1995). However, as Peterson *et al.*(2003) suggest an agent's level of attraction is difficult to gauge, so prior knowledge of an agent and his/her characteristics will be particularly important for evaluating it and weighing up the opportunities and benefits that his/her integration into the relationship will bring.

Past research suggests that another factor that makes cooperation difficult is the distance – physical, time-related and cultural – that separates relationship members (Dahlin *et al.*, 2005; McDonough *et al.*, 2001). Nowadays, the internationalisation process means that product innovation processes could be developed by global and virtual work teams (Magretta, 1998; Montoya-Weiss *et al.*, 2001; Smith and Blanck, 2002). In this situation, the extent of physical and cultural dispersion between team members is great. While this contributes positively to the process of innovation (e.g. with high level of creativity, and the development of more alternative solutions to problems that arise), but also, it significantly limits the cooperation process reducing the extent of communication and the degree of trust, commitment, and cohesion between members, and raises the level of conflict within the relationship (Kahn and McDonough, 1997). Lastly, the lack of previous collaborative experience is also considered a factor that limits the process of cooperation (Kale *et al.*, 2002). Studies such as those by Ahuja (2000 a, b), Anand and Khanna(2000), Appleyard(2003) and Dyer and Singh(1998) recognise that when an organisation can count on prior, positive collaborative experiences, it not only tends to continue with the collaboration, but also acquires a greater relational capacity that is useful to manage efficiently the new relationships in which it is involved.

To avoid these barriers, organisations have begun to search for mechanisms that increase the level of cooperation and communication within their relationships. And as Leenders and Wierenga (2002), Oliver (1990), Ottum and Moore (1997) suggest, intensive Information and Communication Technologies (ICT) use in marketing activities is seen as an ideal solution as it enhances knowledge of the environment and reinforces communications flows and cooperation degree in the relationships in which the organisation is involved.

ICT use in marketing breaking down barriers to cooperation

ICT use has brought about a fundamental transformation at all levels of the organisation, and the marketing function has been one of the main beneficiaries. Most of the authors agree that ICT use in the development of marketing activities can be a true source of competitive advantage for any company improving innovation processes and their outcomes (Bond and Houston, 2003; Prasad *et al.*, 2001; Roberts, 2000; Tatikonda and Stock, 2003; Tzokas and Saren, 1997).

As Argyres (1999) and Tzokas and Saren (1997) show an important part of the benefits arise from the use of ICT as a source of acquisition and generation of market information. ICT are one of the most appropriate media for getting close to the environment and acquiring or creating knowledge about the different agents that are part of it. Thus, the company gains access to a vast quantity of relevant and up-to-date information quickly, easily and cheaply.

However, the availability of information does not guarantee knowledge creation. Knowledge is the end-result of a complex process of acquisition, interpretation (analysis and evaluation) and integration of that information (Li and Calantone, 1998). As Nonaka (1991) suggests for the organisation to acquire knowledge, it has to undergo a complex learning process to transform the information into knowledge. In NPD process, ICT are a key element, as they encourage the generation of market knowledge by putting at the company's disposal the necessary tools for the treatment, management, analysis and storing of information (Swan *et al.*, 1999). So, information derived from the analysis of data obtained from primary and secondary sources is stored and treated, provoking the development of the learning process and the subsequent creation of knowledge (Argyres, 1999; Nonaka, 1991).

As Sorensen and Lundh-Snis; (2001) suggest, ICT also facilitate and encourage the process of transmission and diffusion of knowledge throughout the entire organisation, and its later use in the decision-making process. An important part of the decisions to be taken correspond to marketing function, as they affect the design and development of actions directly undertaken in the markets. Others, however, are more of strategic kind and affect the organisational structure of the company and the building of relationships in which the search for a strategic partner is vital.

In marketing decisions ICT provide ready access to a vast array of global information resources, and facilitate the gathering of valuable competitive knowledge and consumer-related information that simplify the decision process. In addition, as Pine *et al.* (1995) and Prasad *et al.* (2001)) suggest, ICT endow marketing with an extraordinary capability to target specific groups of individuals with precision, and enable mass customisation and one-to-one strategies by adapting communications and other elements of the marketing mix to consumer segments.

Past research points out that when decisions are related to cooperation relationships creation, ICT, act as generators and transmitters of information and knowledge, and also constitute a socialising element (Chua, 2001; Sorensen and Lundh-Snis, 2001).The information supplied by the environment and its agents allows the organisation to identify and measure the degree of attraction of possible relationship partners (Grönroos, 2000; Porter and Millar, 1985; Rangaswamy and Lilien, 1997). Moreover, as a channel of communication, ICT provide the means through which the company can establish synchronous and asynchronous communication with other agents that is fluid and speedy, and operates in both directions (Daneshgar and Van der Kwast, 2005; Magretta, 1998. Prasad *et al.*, 2001). Thus, time, space and economic barriers can be eliminated (Argyres, 1999; Leenders and Wierenga, 2002; Porter and Millar, 1985; Rothwell, 1994; Sammut-Bonnici and McGee, 2002), allowing for effective and efficient transmission of tacit and explicit knowledge (Argyres, 1999; Grönroos, 2000). Further, authors such as Leenders and Wierenga (2002) suggest that ICT not only aid the transfer of knowledge between team members but also support the creation of new knowledge in other areas.

Leenders and Wierenga (2002) suggest that ICT use in the establishment of communications directly affects the degree of cooperation. In close-knit relationships, members usually share the same principles, culture and values, and are willing to commit significant resources and efforts to achieve the common strategic goal. And Argyres (1999), Heide and John (1992) and Wilson (1995) conclude that communication with ICT support can be vital for the clear and consented establishment of: the norms of government, the rights and obligations of each party, working methods, the resources each is to contribute and the objectives that the relationship was set up to reach.

McDonough *et al.* (2001) and Grönroos (2000) point up that ICT support favours correct leadership of the relationship, reducing management costs, and with it, agents start to form social links that lead to a deepening of the relationship. Moreover, Argyres (1999), Gurviez (1997) and O'Malley and Tynan (1997) consider that ICT support allows to create an atmosphere of trust and commitment between agents that enables behavioural cooperation and participation even at the expense of losing some independence.

Social theories formulated around the creation of agreements, social psychology, organisational theory, and theories of social relationships all reinforce the idea that trust and commitment are elements on which long-term relationship success is built (O'Malley and Tynan, 1997). Highlighting the affective-emotional aspect, these authors justify the predominance of trust and commitment in the construction of agreements and the future development of the relationship. Consequently, it is difficult to imagine relationship continuity in the long term, if the parties involved do not show any positive attitude based on affinity and affection towards the other party over time. A relationship characterised by trust and commitment is extremely beneficial for all parties, and will cause them to work to maintain it. As Andaleeb (1996) shows, the absence of trust can produce suspicion between parties, lowering their level of commitment and making the relationship a mere short-term transaction.

Some works prove that ICT use increases an organisation's ability to set up and maintain relationships over time between different functional areas and agents, both inside and outside the organisation. Thus, Leenders and Wierenga (2002) McDonough

et al. (2001) and Rothwell (1994) conclude that ICT strengthen collaborative links between different functional areas within an organisation (e.g. Marketing, R&D and Design). While outside the organisation, ICT increase communication and the level of cooperation with those agents who form part of the relationship, enabling their integration in the organisation.

When relationships are established with external agents, ICT can reinforce the company's ability to coordinate these activities, causing the members of that relationship to fully participate (Kahn, 1996, 2001). McDonough *et al.* (2001) and Smith and Blanck (2002) show that when the partners do not work in the same place or share culture, history or a common future, ICT can stimulate collaboration, transference and the use of knowledge between members. Even, Roberts, 2000 concludes that intensive ICT use has made possible to construct virtual working parties world-wide. Analysing the will and ability to co-operate, Robers suggests that ICT use increases the level of integration of members in two ways. First, it makes the transfer of knowledge easy and quick, and second, it strengthens trust and commitment previously created at face-to-face meetings between group members.

To sum up, ICT can be considered an endogenous element of the company, and a key part of management and marketing practice today (Brady *et al.*, 2002). As a vital marketing factor, ICT enhance the NPD process by shortening distances and saving on costs and time, as well as facilitating information transfer and the promotion of collaborative behaviour that favours organisational knowledge and improves the quality of decision-making (Sorensen and Lundh-Snis;, 2001). ICT use constitutes an innovation in itself that can be designed and used to facilitate the physical NPD process. But ICT use also adds to other processes associated with NPD and decision-making. By Modifying innovation determinants, behaviours and the nature of NPD, ICT promote internal and external cooperation and a company culture that is market-oriented as well.

Research hypotheses, sample and variables

The extensive review of the literature in the previous section highlights the role of ICT use in the process of product innovation undertaken by a company. Taking into consideration the effect that ICT use in marketing function has on the participation of different agents in the product innovation process, and the benefits that its use offers in terms of cooperation and breaking down of barriers to innovation, we propose the following hypotheses:

H1. ICT use in marketing directly or indirectly favours the development of new company products.

H1.1. ICT use in marketing favours new product development.

H1.2. ICT use in marketing reduces obstacles to innovation.

H1.3. ICT use in marketing enhances the development of differentiated products.

H2. ICT use in marketing foments collaboration within the processes of innovation.

H2.1. ICT use in marketing promotes cooperation with other agents in order to innovate.

H2.2. ICT use in marketing favours the creation of flexible working groups with a high degree of communication between them.

H3. Cooperation brings with it the development of new company products.

In order to test these hypotheses, we developed a process of descriptive investigation based on a sample of 2,038 companies in Catalonia (Spain). The sample represented all sectors of economic activity and was stratified according to business sector and company size (defined by number of employees). The selection of firms was made randomly using previous fixed marginal quotas. The error margin, with a predefined level of confidence of 95.5 per cent for the inference analysis derived from sample results (fixed by weighting), is ± 2.22 ($p = q = 50$).

The fieldwork was done between January and May 2003. Expert interviewers carried out the process by means of a questionnaire and personal interviews with directors or those responsible for the companies concerned (see Table I).

Table II describes the variables used in this study (see Table II). Note that ICT use in marketing was created according to the availability and use made by the company of various tools or specific software. In short, we observe:

- the availability and use of email to promote actions of communication;
- the availability and use of the web to develop actions of communication and the search for information;
- the availability of files and data bases on clients;
- ICT use as part of the sales drivers;
- the development of market research processes;
- Consumer Relationship Management (CRM) availability;
- the availability and use of systems of data exchange with suppliers and clients; and
- the closing of sales to clients through the web.

Universe	Companies developing their activity in Catalonia
Range	2,038 personal interviews with businesspeople and managing directors
Error margin	From +2.22 for global data with maximum intermediation ($p = q = 50$), for a confidence level of 95.5 per cent
Quotas	By size according to employee numbers and by business activity sector
Margin of error	Between +4.20 and 5.46 for the different sizes according to employee numbers and from +4.82 and 5.67 for the different business activity sectors, with maximum indetermination ($p = q = 50$) for a trust level of 95.5 per cent
Resultant sample	Fixed by weighting
Date of fieldwork	From January to May 2003
Simple selection	Procedure by marginal quotas. Random selection of companies

Table I.
The questionnaire technical file

Variable	Measure	Definition
Flexible workteams	Dichotomic	Company is organised around flexible and adaptable working groups
Share of information	Dichotomic	Team members share and exchange information
Differentiation strategy	Dichotomic	Company develops strategies of product differentiation based on technology, brand or product quality
Product innovation	Dichotomic	Company has developed a new product or service in the last two years
ICT use in marketing	Discontinuous metric	Degree of ICT use made by the company in marketing
ICT effects on the lowering of obstacles to innovation	Dichotomic	Company perceives that ICT use breaks down barriers to innovation
ICT effects on initial cooperation in innovation	Dichotomic	ICT use favours the setting-up of the first cooperative relationships with other agents for the development of new products
ICT effects on cooperation in innovation	Dichotomic	ICT use enables the maintenance of co-operative relationships for the development of new products, when they are already established
Cooperation with other agents for innovation	Dichotomic	Company has cooperated with other external agents during the process of product innovation
Cooperation within the value chain for innovation	Dichotomic	Company has co-operated with distributors, suppliers and clients in the development process of new products
Horizontal cooperation	Dichotomic	Company has co-operated with competitors in the development process of new products
Scientific cooperation	Dichotomic	Company has co-operated with universities or non-university centres of research in the development process of new products

Table II.
Variables used in the study

By means of the development of a hierarchical cluster, four groups of companies were identified according to their levels of ICT use in marketing. Thus, four levels of ICT use in marketing were defined:

(1) those companies that did not have and/or make use of ICT;

(2) low level of ICT use, applicable to those companies that had files or data bases on clients, and also had and used email and the web for communicative actions;

(3) medium level of ICT use, indicating companies that not only had and utilised the above-mentioned tools, but also carried out market research and had a sales force that used ICT in their sales activity; and

(4) advanced ICT use, referring to companies that not only had and made use of the tools already mentioned (at low and medium level), but also possessed and

employed CRM systems, systems that exchanged data with suppliers and clients, and sold to consumers directly on the internet.

Finally, it is important to note that the extracted data were analysed using contingency tables, confirming or rejecting the significance of relationships detected via the Chi-squared statistic. Later, in order to define the innovative company better, we applied a Chi-squared Automatic Interaction Detector (CHAID) using SPSS' Answer3 software.

Results and discussion

The data analysis indicates the existence of a significant relationship between ICT use in marketing and product innovation. In the last two years, only 53.1 per cent of companies have undertaken product innovation, but as organisations increased their use of ICT in marketing, so the level of product innovation raised. While only 26.0 per cent of organisations involved in product innovation made a low use of ICT, the percentage raised to 34.8 per cent for those companies with a medium ICT use, and up to 35.2 per cent when ICT use in marketing was advanced. Based on these results (see Table III), the relationship between product innovation and ICT use in marketing can be classified as direct and positive, so we can consider sub-hypothesis 1.1 to be demonstrated.

The strong relationship between ICT use in marketing and innovation is explained to a large extent by the benefits that ICT offers when the organisation develops product innovation processes. As literature on the subject testifies, organisations see ICT as an extremely useful instrument in the innovation processes. ICT help establish and maintain communicative and cooperative relationships both inside and outside the organisation, and makes NPD processes quicker, simpler and less risky.

The percentage of organisations that recognised cooperating with other agents is high when this practice was established with the aim of developing new products. Data analysis proved the existence of a direct relationship between cooperation and innovation. As Table IV shows, up to 74 per cent of organisations acknowledged that product innovation has taken place with the support of other agents. In addition, the relationship between cooperation and product innovation was significant for different types of cooperation. 88.4 per cent of organisations involved in product innovation declared to cooperate with scientific institutions. Additionally, horizontal cooperation and cooperation with agents within the value chain also score high, 81.9 per cent and 73.6 per cent respectively, although reached the level of scientific cooperation. Thus, we can confirm *H3*.

ICT use in marketing	% Innovative companies	% Non-innovative companies	Pearson chi-square	*p*-value
Non-ICT use	4.0	5.4		
Low ICT use	26.0	40.4		
Medium ICT use	34.8	33.4	59.602	0.000
Advanced ICT use	35.2	20.8		
Total	100.0	100.0		

Table III.
Companies by ICT use in marketing

On the other hand, Table V shows a significant relationship between ICT use in marketing and cooperation with agents in the environment which confirms sub-*H2.1*. As organisations increased their ICT use in marketing, they also strengthened their cooperation with agents for innovation. 40.9 per cent and 42.8 per cent of organizations with medium and advanced ICT uses in marketing, respectively, declared to cooperate with other agents. Again this relationship was maintained for the various types of cooperation that an organisation can establish; so, sub-hypothesis 2.1 is validated further. 44.8 per cent of companies with a medium ICT use sustained relations of cooperation within their value chain, 36.9 per cent with their competitors, and about 33.3 per cent with scientific institutions. On the other hand, 45.5 per cent of companies with an advanced ICT use in marketing sustained relations of cooperation within their value chain, 57.1 per cent with competitors, and 45.0 per cent with scientific institutions.

ICT use in marketing could be seen as a factor that breaks down barriers to innovation, and enhances the cooperation process. In 72 per cent of cases where the company innovated, ICT use lead to the clearance of obstacles to innovation. Thus, 76.5 per cent recognised that ICT use favoured the setting-up of first-time collaborative relationships, 73.3 per cent indicated that ICT had helped to maintain already established relationships of cooperation. These percentages remained constant for companies that had medium and advanced ICT use. Of these, 75 per cent recognised

Table IV.
Companies by types of cooperation

	% Innovative companies	% Non innovative companies	Total (%)	Pearson Chi-Square	*p*-value
Cooperation with others agents	74.4	25.6	100.0	95.247	0.000
Scientific cooperation	88.4	11.6	100.0	58.988	0.000
Horizontal cooperation	81.9	18.1	100.0	28.700	0.000
Cooperation within the value chain	73.6	26.4	100.0	60.569	0.000

Table V.
ICT use in marketing by different types of cooperation

	ICT use in marketing						
	Non-ICT use (%)	Low ICT use (%)	Medium ICT use (%)	Advanced ICT use (%)	Total (%)	Pearson chi-square	*p*-value
Cooperation with others' agents	0.0	16.3	40.9	42.8	100.0	110.405	0.000
Non-cooperation with others agents	4.7	37.8	32.8	24.7	100.0		
Cooperation within the value chain	0.0	9.7	44.8	45.5	100.0	122.513	0.000
Non-cooperation within the value chain	4.4	35.6	32.7	25.4	100.0		
Horizontal cooperation	0.0	6.0	36.9	57.1	100.0	48.498	0.000
Non-horizontal cooperation	3.9	34.5	34.4	27.2	100.0		
Scientific cooperation	0.0	21.6	33.3	45.0	100.0	20.655	0.000
Non-scientific cooperation	3.9	34.0	34.5	27.7	100.0		

that ICT use in marketing allowed them to overcome obstacles to innovation while more than 80 per cent admitted that ICT use in marketing enabled the development of new processes of cooperation, as well as the maintenance of those that were already in place. In sum, direct and positive connection seems to exist between ICT use in marketing and the benefits that ICT bring to the maintenance of relationships of cooperation and to the reduction of obstacles to innovation. Thus, sub-hypotheses *H1.2* and *H2.1* can be accepted.

But ICT use's benefits are not limited to the process of cooperation. In fact, ICT use in the innovation process has two other benefits. On the one hand, it enhances the creation of flexible work teams in which members communicate easily, and it also allows for the development of new highly differentiated products. In 52.3 per cent of cases, the companies that innovated developed their processes through flexible work teams and they placed a very high value, some 91.5 per cent, on the communication and transfer of information between group members.

We also observed a direct, positive and significant relationship between the variables that proves sub-hypothesis 2.2. As shown in Table VI, companies that made medium and advanced use of ICT in marketing recognised that in 73.1 per cent of cases they were organised around flexible work teams, and in 64.2 per cent of cases communication among members of these groups was fluid. In 88.8 per cent of cases companies that innovated stated that they sought product differentiation in the marketplace. Literature on the subject sees product innovation as one of the strategies that allow the organisation to obtain an advantageous position in the market, based on the differentiation that the new product confers. In this sense, ICT use in marketing is defined as a tool that allows the development of strategies of differentiation based on product innovation. ICT is also responsible for the acquisition of market data and its use during the innovation process, enabling the development of new products that are totally adapted to the needs and requirements of demand.

In fact, the analysis of data reveals a direct, positive relationship between the level of ICT use in marketing and the development of differentiation strategies, which confirms sub-hypothesis H.1.3. As Table VI shows, when organisations increased of their ICT use in marketing, they tended to adopt a strategy based on product differentiation. Specifically, 77.3 per cent of companies with medium and high ICT use in marketing acknowledged the development of differentiation strategies.

	Organization characteristics		
ICT use in marketing	Flexible work teams	Workers share information	Competitive strategy of differentiation
Non-ICT use	3.2%	4.2%	2.6%
Low ICT use	23.7%	31.6%	20.1%
Medium ICT use	43.0%	34.0%	33.1%
Advanced ICT use	30.1%	30.2%	44.2%
Total	100.0%	100.0%	100.0%
Pearson Chi-square	98.900	38.485	72.288
p-value	0.000	0.000	0.000

Table VI. Organizational characteristics by ICT use in marketing

To summarize the former analyses, the results show that the innovative company can be characterised by its medium to advanced use of ICT in marketing as a tool that enhances cooperation, lowers the barriers to innovation and fosters production of differentiated goods and services.

In order to more precisely establish the profile of the innovative company, and to confirm whether this profile coincided with that obtained from the former data analysis, we applied a Chi-squared Automatic Interaction Detector (CHAID) analysis to the sample of companies. Product innovation was taken as the dependent variable, and the other variables used in the former analyses of contingency were taken as explanatory variables. Through a sequential analysis of the variance, the CHAID allowed us to establish the variable in each iteration that best explained the dependent variable, and within that, the participation between categories of the same variable that maximised and minimised the inter-group variance. Therefore, in each repetition the *F*-statistic and its level of significance are noted.

Given the use of binary ramification, the application of the technique called for a modification of the scale of some of the variables employed in the analysis. So, the variable of ICT use in marketing was transformed into a dichotomic variable, in which the value of 0 was given if ICT use was low or medium and the value of 1 if ICT use was high.

The results, after interpreting the decision tree obtained by the CHAID, ratified previous findings, and confirmed some of the hypotheses proposed in this study. Thus, if at first we recognised that 53.1 per cent of companies were involved in product innovation, we observed, following the first repetition, that it was possible to establish two groups of companies based on the most discriminating variable, which was cooperation with agents in the environment. The first identifiable group was made up of companies that did not co-operate (Node 1), while the second group was formed by companies that co-operated (Node 2). As we can see, the percentage of innovative companies in both groups varied significantly in terms of the average value shown in the sample (Node root) 53.1 per cent. Thus for Node 1, the percentage of innovative companies was 47.7 per cent while in the second group (Node 2) the percentage of innovating companies was 74.4 per cent. These results would confirm *H3*.

The application of a second repetition led to the division of Node 2 into two sub-groups based on the level of ICT use in marketing. The first sub-group detected was formed by companies that innovated products and co-operated, but which had low or medium ICT use (Node 3), while the second sub-group (Node 4) was made up of those companies that innovated, co-operated and used ICT in marketing intensively. Again, the percentage of innovative companies in both sub-groups was different from that seen in Node 2, at 74.4 per cent. So, for companies in Node 3 the percentage of innovators was 60.9 per cent, while for Node 4 it stood at 92.6 per cent. These results would confirm the relationship between cooperation and ICT use in marketing.

Finally, the sub-segment of companies that innovated co-operated and made intensive use of ICT in marketing (Node 4) was re-segmented on the basis of their work organisation. Thus, variable of organisation through flexible work teams was the one that showed a greater capacity for discrimination. The first sub-group identified after the third repetition was formed by companies that innovated, co-operated and made intensive use of ICT in marketing and which did not organise themselves around flexible work teams (Node 5). The percentage of innovative companies that fell within

this segment was lower than that in Node 4, at 84.8 per cent. On the other hand, the second sub-segment identified was that of companies that innovated, collaborated and made intensive use of ICT in marketing and organised themselves around flexible work teams (Node 6). In this segment, the percentage of companies that innovated was high, at 97.2 per cent, surpassing the 92.5 per cent of Node 4. These results would confirm sub-hypothesis 2.2 (see Figure 1).

In summary, the results suggests that innovative company tends to co-operate wit others companies, make advanced use of ICT in marketing, and organises itself around flexible work teams.

Implications, limitations and future lines of research

In the last decade, literature has emphasised the importance of cooperation and the availability of market intelligence for the development of product innovation. This explains the strategic role that marketing plays in the innovation process, and has enabled us identify cooperation and market intelligence as two of the key factors in the success of the new product.

Nowadays, relatively few studies have examined the role of ICT use in marketing in the processes of innovation. This is surprising when we consider that one of the features that characterise marketing activity in today's organization is the implantation and widespread use of ICT. ICT use has brought about significant changes in organisations and produced important benefits, including in the areas of marketing and innovation. Many works highlight the importance of ICT as a key element in integrating marketing into the NPD process. ICT raise the level of innovation within a company through the development of new products that are adapted to market needs, and reduce technological, strategic and marketing risk.

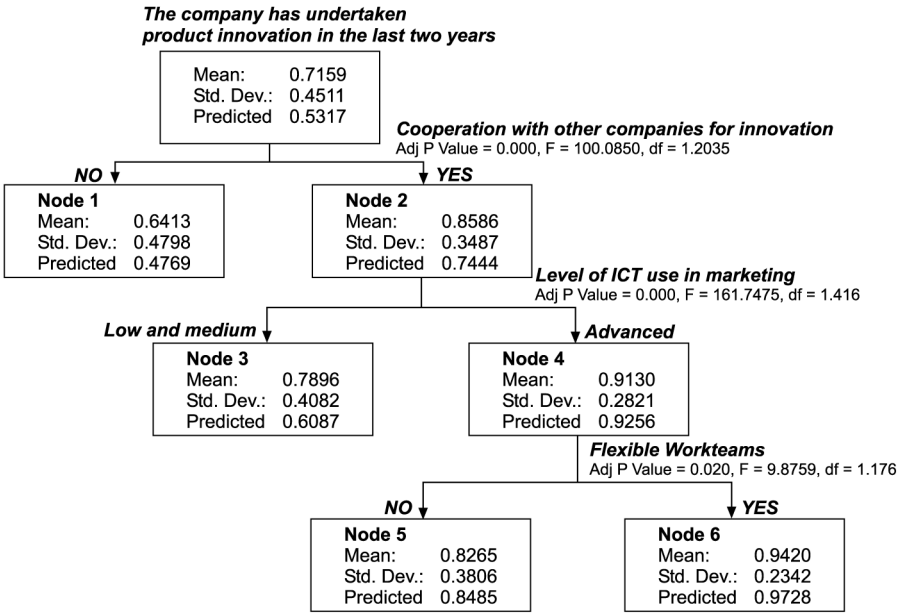

Figure 1.
Characterisation of the innovative company

ICT are shown to be a source of data acquisition and generation. Works by Argyres (1999) or Tzokas and Saren explain how ICT constitute one of most appropriate means for getting close to the environment and developing extensive knowledge about the different agents operating in the field, and so, they allow a company to access a huge quantity of important and up-to-date information in a simple, quick and economic way. As well, ICT are a vital element in the generation, transmission, diffusion and use of knowledge within the organisation. Thus, ICT not only give companies the necessary means to treat, manage, analyse and store information (Swan *et al.*, 1999), but they also make it easier to transmit and diffuse that information throughout the company, for its later use in the strategic process of decision-making.

Finally, various authors have also indicated the importance of ICT as an element that improves the integration of different agents at work in the innovation process, enabling their cooperation and communication in such a way that many barriers to innovation are eliminated. As a source of information, ICT prior to the establishment of a relationship, help to identify and determine the degree of attractiveness of possible strategic partners. Also, as a communication channel, ICT are the means by which the company sets up fluid communication with its cooperation partners, through the transmission – or even creation – of knowledge, and the breaking-down of barriers of time, space and economy that limit the effectiveness and efficacy of the process. Lastly, as a combination of all these, ICT act as a socialising factor that enables the foundation of the relationship by permitting continuous and intense communication among their members, and provide the basis for agreements and consensus, and the development of a climate of trust and commitment grounded on social and affective values.

To check whether these ideas were true, we proposed a descriptive research based on the study of a sample of companies that represent all sectors of economic activity in Catalonia. The data analysis through contingency tables showed the existence of significant, direct and positive relationships between the variables in our study, which led us to accept all the hypotheses proposed in the third section. This confirmed that the use of ICT in marketing directly or indirectly favours the development of new company products, the integration of different agents within that process, the reduction of obstacles to innovation and the differentiation of the new product in the market.

The existence of a positive direct relationship between the level of ICT use in marketing and collaboration was also proved. ICT use not only seems to enable the development of co-operative relationships with agents of the environment, but also allows their full integration in the processes of innovation by the formation of flexible working groups with a high degree of communication between its members. In addition, our results also confirmed the relationship between the level of ICT use in marketing and the development of innovation processes. As organisations increase their use of ICT in marketing to a medium and advanced degree, so their innovative activity augments via the development of new products.

Specifically, among the benefits related to ICT use in marketing that stimulate companies to product innovation are the lowering of obstacles to innovation, which to a large extent is a result from the raising of agent integration within the relationship, and from the possibility of developing differentiated products. As marketing literature indicates, the increase in cooperation leads the agents involved in the innovation process to raise their level of trust in their partner and to commit more resources and

effort with the aim of achieving a common strategic goal. The greater the cooperation, the higher the degree of communication and interaction between agents, and consequently, more fluid and frequent the transfer of information and knowledge, making the innovation process faster, more agile and efficient. Also, the organisation acquires a more ample knowledge of the market, which it puts to use in the process of product design and development. It can then quickly launch new products that are adapted to market needs and that stand out from the competition.

Lastly, the characterisation of the innovating company through the application of the CHAID analysis again allows us to prove the validity of our hypotheses, in particular, the relationship between innovation and collaboration, the intensive ICT use in marketing and organisation through flexible work teams. Thus, the company that innovates is characterised by its close collaboration with agents of its environment, its intensive use of ICT and its organisation around flexible work teams.

In conclusion, we can state that intensive ICT use in marketing makes the company's product more innovative. Companies can to reduce technological, strategic and marketing risk associated at process innovation as well as new products are highly adapted to market requirements thanks to the use of market information and the development of cooperation relationships.

However, we cannot end without mentioning certain factors that may have affected the results and conclusions of this investigation. Specifically, the use of dichotomic scales to measure variables, or restricting the study sample to any type of new product regardless of its degree of novelty or intangibility in company and market terms.

Finally, these results arise from a first attempt to evaluate the effect of ICT on the process of product innovation. The following steps should open up different lines of research that complement or diverge from this work, that contribute to the study of the relationship between ICT use and the innovation process. For example, it is worth reflecting on the interest that the sector of activity or size of the organisation has on the use of ICT in marketing, as a key factor in the development of new products. In addition, the analysis of the effects of ICT in marketing and of the cooperation involved in different types of new products, according to their degree of novelty and intangibility, could be of interest in terms of establishing a profile for the innovative company.

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Further reading

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