

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) DEVELOPMENT IN THE SPANISH INDUSTRY

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Abstract

Information and communication technologies (ICT) are nowadays a fundamental factor of development and competitiveness within international and local companies. Countries such as United States of America (USA), Canada, or Sweden are pioneers in the implementation of such technologies, leading their businesses to be the most profitable ones. In Spain, the expansion of Internet and, in general, telematic tools, is still taking off. Nevertheless, the rate at which the modernization of the Spanish industry grows up is encouraging. In this paper, the current situation of industrial ICT in Spain is analyzed through the last statistics published by the Spanish National Statistics Institute (INE) and other official organizations such the Organisation for Economic Co-operation and Development (OCED). On the other hand, advantages and disadvantages of some ICT are commented, as well as the main handicaps for their exploitation. Finally, an evaluation of the new legislation, as well as a review of the ICT manufacturing and services sector is made, in order to predict the future impact and role of ICT in the Spanish production systems of the next generation.

Keywords: *Information and communication technologies (ICT), industrial modernization, e-trade, teleworking, telematic tools.*

1 INTRODUCTION

Information and communication technologies (ICT) have become a crucial success factor in the constitution of modern companies. Since the so called “Globalization” is a fact, firms are forced to enhance their networks, implementing specific interaction tools. New distributed plants and processes, and diversified products and markets, are absolutely incompatible with the old methods, especially within international enterprises, which are highly dependant on feasible and fast information-sharing and decision-making. The European ICT, including the production of ICT goods (manufacturing) and ICT services, is a main contributor of prosperity and growth to the European Union (EU). Effective uptake of ICT in the production process is considered the main factor to push productivity. Its use throughout the value chain enables firms to increase their overall efficiency and makes them more competitive. With regard to Spain, the integration of ICT, both industrial and domestically, is the late link of a modernization impulse initiated by the middle of the 20th century. This country has experienced a remarkable industrialization for the last 50 years, changing from a basically rural country into a first world state. The main economic indicators of 2005 are an irrefutable

proof, as shown in Table 1, where Canada, considered one of the most developed countries in the world is taken as a reference.

ECONOMIC INDICATOR	UNITS	SPAIN	CANADA
Gross domestic product	2000=100	117.2	113.4
Gross domestic product per capita	€	20838	31500
Consumer prices index	2000=100	117.2	112.2
Private consumption	2000=100	118.7	117.1
Public consumption	2000=100	126.8	116.7
Population	millions people	44.71	32.11
Labour force	millions people	19.31	17,33
Unemployment rate	%	9.2	6.8
Exports	2000=100 sa - 2000=100 csv	116.4	102.9
Imports	2000=100 sa - 2000=100 csv	135.1	116.8
Exchange rate	US dollar	111.8	119.3

Table 1 - Main economic indicators [1], [2]

In spite of the good figures, there are still many improvements to achieve in order to equal some of the most advanced production strategies, including ICT. In this paper, it is reviewed the current stage of ICT implementation in the Spanish industries. Some crucial statistics are correlated with economical and financial results in order to find some clues about the direction of the efforts. In section 2, ICT products more industrially employed are analyzed, including commercial websites, e-trade and teleworking. In section 3, security assurance is evaluated, whereas in section 4 the legal frame of this technology is reported. In section 5, ICT manufacturing and services industry is detailed and section 6 listed the Spanish most relevant institutions on e-transaction. Finally, conclusions based on the information collected by the paper are formulated in section , together with a reflection about the future.

2 ICT PRODUCTS INDUSTRIALLY EMPLOYED

The concept of ICT can involved a large list of very different technologies. Industrially, the most important ones are personal computers (PCs), local area networks (LAN), Wireless LAN, Internet, Electronic mail (e-mail) and websites. Nowadays, it is extremely difficult a find a single company, which does not base its whole system in a web of PCs. Actually, less than 2%. On the contrary, still few enterprises make an extensive use of Wireless LAN (an average of 17.2%), while the rate for normal LAN is about 71%. Internet is, without a doubt, the most common ICT of any kind. 92.7 % of the Spanish industries have gained access in the last years, with a powerful associate: e-mailing. In terms of usage, more than 90% of all firms have practically substituted phones and faxes for e-mails. Additionally, the range of companies with a website reaches 50 % [3]. The rates above vary depending of the size of the company. Small and Medium Enterprises (SME)¹ large-sized (usually international) companies have very different profiles, also with regard to ICT implementation. In general, bigger companies have are forced to incorporate high-tech solutions as soon as possible in order stay competitive. At the same time, they are provided with enough resources to

¹ A definition of SME could be found in Recommendation 2003/361/EC of the European Commission.

undertake such incorporation. The relationship between ICT products and companies size is represented in Figure 1:

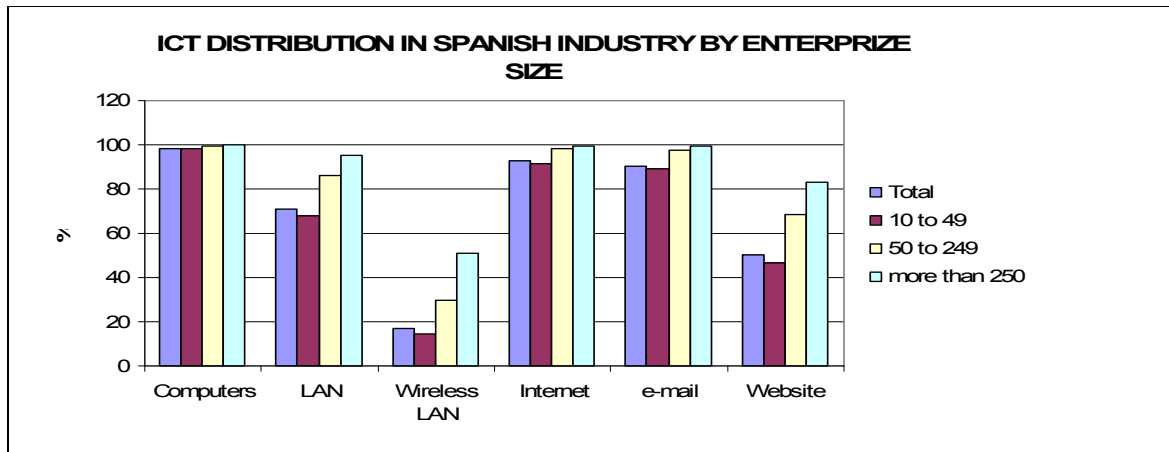


Figure 1 - ICT distribution in Spanish industry by enterprise size

2.1 E-mail

As said, e-mail is the most used internet service in enterprises, but not the only one. Information research is also widely requested. 95.9% of the Spanish enterprises are thought to communicate thanks to electronic mailing as a standard. Most of the time, employees are interested in international news and brief descriptions of technical or simply unfamiliar concepts. When it comes to find anything in the web, search engines permit to get a correct answer in milliseconds. However, not well focused search parameters lead to frustrating results. Fortunately, advanced research is improving the accuracy of these engines greatly. Financial services are massively on-line consulted as well (85.1%), since it is impossible to personally check a bank account without being out of work. Other digital services, such as translation and photo editing hold the third position (36.7%). E-learning, after-sales services and business designed on-line applications cover the rest of the chart. At the same time, administrative communications through internet (68.2%) has speeded up the general bureaucratic interactions, which is a very important novelty, especially in the case of R&D related centres, from the publication of calls for proposals and resolutions; to the on-line submission of documentation, including formularies and graphs. Documents are many times real-time checked for the most habitual form mistakes, preventing defective papers from being introduced in the system. With regard to the quality of the access, the 94% of the Spanish enterprises have at their disposal broadband. The most used technologies come from the family of x-DSL (Digital Subscriber Line) solutions. Modem connexion is consequently losing market, with just a 16.1%, and also ISDN (Integrated Services Digital Network). The interest that companies are paying to the reliability and rapidity of their systems clearly displays the increasingly demanding requirements of the industrial ICT, above all for big companies. Amazingly, the average downloading speed remains between 144 Kb/sec and 2Mb/sec.

2.2 Commercial websites

Internet is nowadays a determinant information input for enterprises. Transforming it into an output source is getting more and more usual, thanks to customised websites. In Spain, the 50.2% of the companies that have internet connexion have a web space in the “Network of Networks”. These webpages are basically used to introduce the company products services to Internet users (97.4%). Although the massive presence of all kind of companies (even small ones) in Internet, only the 44% of the times, provide these sites access to catalogues and price lists, which is the most valuable information for the general public. After-sales services are on-line managed about 20% of these firms, but less than 10% actually sells through electronic orders [3]. This issue is analyzed in depth in the following section.

2.3 E-trade

According to the last statistical results, dated from 2005, 8.9% of the Spanish companies carried out e-trade, a figure that, despite of being low compared with the rates of other countries such as the United Kingdom or Norway, is five points higher than in 2004. The global turnover due to telemathic deals achieved 95.613 M€. It is twice as much as in the last period. Telemathic sales accelerates the business process, but also improve the company corporate identity, allows it to stays at the concurrence level, and gains access to new and, more important, remote customers. The activity sector in which e-trade has a broader presence is tourism, specifically hotels and camping sites (56.4%). Nevertheless, companies with the best on-line sales share belong to the equipment manufacturing industry (15.4%). The most of this trade has been made on the Internet. The so called B2B (business to business) relationships represented 87.8% of the total, while B2C (business to costumers) got only 11.7%. Finally, B2G (business to Government) sales reached the remaining 0.5%. Geographically, Spanish e-trade had mostly national destinations, with just a 9.7% of exportation, mainly to other UE countries (6.1%). As per purchasing, 17.3% of the Spanish companies bought good or services telemathically in 2005, an increase of 63% with regard to 2004. These movements have involved 85.500 millions of €, meaning a rise of 120%. The most active branches were computer science activities (57.9%), vehicles sales and repairs (35.4%), mail and telecommunication (29.5%) [3].

2.3.1 Electronic Data Interchange Systems

Taken into account B2B e-trade, the EDI system (Electronic Data Interchange) provides an excellent platform for business to implement electronic interactions secure and efficiently. It is important to differentiate between EDI and electronic commerce. Electronic commerce encompasses all aspects of electronic business exchanges, including person-to-person interaction (collaboration), money transfers, data sharing and exchange, or website merchant systems, by means of standardized electronic forms. On the other side, EDI is a set of protocols for conducting electronic business over computer networks. Traditionally, these networks have been private WAN (Wide area network); but EDI is now done over the Internet. EDI defines the electronic exchange of structured business data, such as purchase orders, invoices, and shipping notices, typically between one organization and another. The relationship is usually between vendor and customer [4]. EDI is undergoing a period of growth in Spain. Automotive international companies (sector in which EDI was first developed and implanted in 1970), have literally dragged their suppliers into the system. Otherwise, contracts are not given. At the same time, 1st level suppliers (those who directly interact with

the main company), gradually force 2nd level suppliers in the same way, and so forth, extending the web to SME.

2.4 Teleworking

The possibilities of the new ICT concepts are, as described above, many. Making use of all them, this new technological society reveals an important field of improvement: Teleworking. This work variant, also known as telecommuting, allows employees to complete their duties from home, avoiding travelling from the residence to the workplace. In a middle solution, workers develop their tasks at a local telework center, usually intensively, that is to say, a couple of days per week. Formal communication is accomplished by phone, fax, modem, and teleconferencing. Estimates of teleworking vary very widely because of differences in definitions and methods of collecting the data. The European Commission (EC) has adopted a very broad definition: "the use of computers and telecommunications to change the accepted geography of work". This would include people working in telecentres, in multi-site teams, as mobile workers on the road and in many other ways, as well as home-based teleworkers. At the other extreme, some surveys at national level in the European Union have only investigated "employed people who work at home more than three days a week in an organised telework programme managed and supported by their employer". This very narrow definition misses out the many employed people who telework at home through informal agreement with their manager in the absence of a company scheme, and those who work at home regularly but less than three days a week, as well as the many self-employed people who use technology to deliver services to their customers and regard themselves as teleworkers. USA is said to be the country with the highest range of teleworking worldwide, with about 20 million of remote employees. In Europe, the EC established recently that approximately 4,5 millions of people are teleworkers, with a forecast of 17 millions for 2010. In Spain, just 3% of the workforce is habilitated to work from home nowadays. Surveys on teleworking, although not very frequent these days, have documented some interesting results. The Telework Coalition (USA) conducted an on-line study between February and April 2003 to determine the attitudes and thoughts of private sector employers in the Washington DC Region concerning using Telework/Telecommuting and whether it was considered part of their overall management strategy. The main benefit of Telework were referred by business managers as higher workforce morale (17%) and productivity improvement (14%) [5]. Essential component of operational continuity plan providing, quality employees' attraction and retaining, employees concentration improvement, and reduction of unexcused absences, office space requirements and commuting costs were also rated, as showed in Figure 2. Complementary, The main reasons given for implementing a program are the financial benefits to the company and requests from employees.

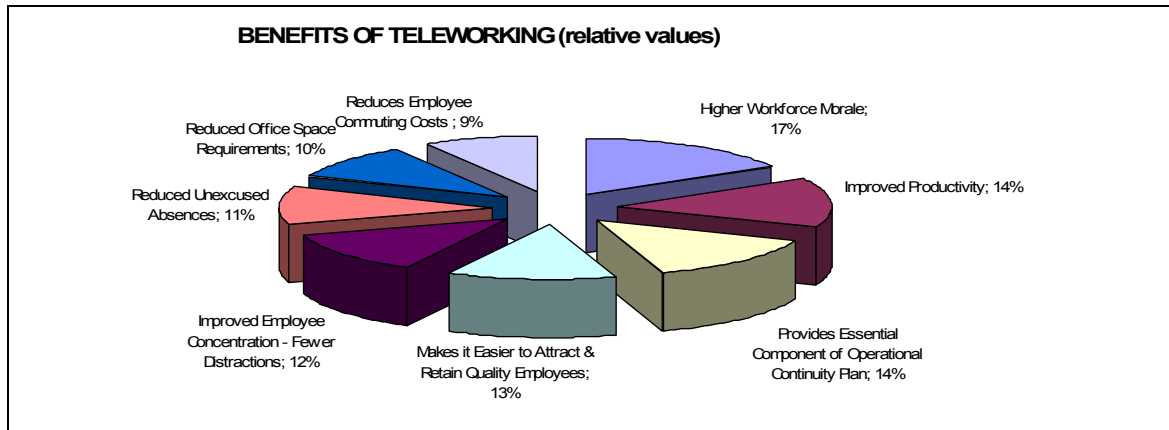


Figure 2 - Benefits of Teleworking (relative values)

Despite the interesting advantages of teleworking, current programs suffer from too much informality, meaning not having related policies, procedures and agreements. Similarly, no previous training is provided. Taken together, these findings indicate a considerable gap in risk management practices, especially in terms of FLSA (Fair Labour Standards Act), security of information and OSHA (Occupational Safety & Health Administration) /Health/Safety and asset tracking. Either insufficient financial or time resources, or a lack of understanding that potential risks exist and need to be addressed, may cause the little of attention paid to these potential areas of exposure.

3 SECURITY ASSURANCE

Since the beginning of the general implementation of internet solutions in enterprises, security has been a main concern and a priority. From electric breakdowns to amateur or professional hackers, information lost could cost lot of money, work and reputation. When it comes to e-trade, the measures got stricter. Six are said the most relevant measures to solve security problems in this field: confidentiality, integrity, authenticity, non repudiation (ensuring that the originator of the message cannot deny that he/she sent the message), protection of copyright of digital contents and defence for unauthorized access. Secure communication protocols have been specially designed for e-trade, such as SSL (Secure Socket Layer) and SET (Secure electronic transaction). SSL guaranties not only confidentiality but also integrity and authenticity. SET is the protocol with high level safety, using two types of cryptographic schemes. Because SET is made only for payment, especially credit card payment, additional security function for commodity application and agreement is needed. On the other side, to guarantee authenticity, the methods fall into three types. The first is biometrics type of fingerprint and handwriting. The second is token type of driver's license and credit card. The third is secret information type of password and digital signature. Certification authority (CA) organization is essential for register of public key, in case of using digital signature with public-key cryptography. Finally, there are several ways for cutting off the access of unauthorized people. These are using Firewall, stopping the unnecessary service of server computer, and removing security hole which is defect of server software [6]. In Spain, the most security systems employed by enterprises are anti-virus software (97%), firewalls (68.8%), and systemic back-ups (59.4) [3].

4 E-TRANSACTION LAWS AND REGULATIONS

Legislation regulating electronic operations is relatively young and, sometimes, inconsistent. As a matter of fact, the technological environment in which costumers and enterprises have to survive changes at a much higher rate than legislators are able to produce suitable laws. The lack in-between could be advantageous for some, and normally confuses the most. E-commerce-related activities are now beginning to be regulated more specifically by Spanish legislation. Apart from these specific laws, it is also necessary to look to the general legislation on civil and commercial contracts. In any event, the Spanish legislature is currently making resolute headway in regulating transactions of this nature. Examples of its aim to include the Preliminary Bill on Electronic Commerce, recently submitted by the Ministry of Science and Technology, and the Royal Decree-Law on Electronic Signatures, the review of which is currently in full swing. A fundamental point to bear in mind when undertaking any initiative in the area of electronic transactions is that the applicable legislation varies depending on the potential recipient of the related offer. Consequently, differences are noticeable between B2B and B2C communications, since, among others, consumer protection legislation will apply in the latter case, namely Standard Contract Terms Law 7/1998 and Consumer and User Protection Law 26/1984. In this connection, e-commerce is specifically regulated in Royal Decree 1906/1999, on telephone or electronic contracts with standard terms, which implements Article 5.3 of the Standard Contract Terms Law. With regard to telematic billing, the relevant legislation is contained in the Order of the Ministry of Economy and Finance dated March 22, 1996, establishing the rules for applying the telematic billing system provided for in the VAT (Valued Added Tax) Law. Although the Order mainly deals with tax matters, it also establishes a number of provisions on issuing invoices by telematic means that must be complied with if invoices of this nature are to be as effective and valid as traditional paper based invoices. In response to the main security concerns, the Royal Decree-Law 14/1999 on electronic signatures was approved. This law has turned to be a key stimulus in the growth of electronic commerce in Spain. Its aim is to regulate the use of electronic signatures and make them legally effective, as well as regulate the provision of certification services to the public. "Electronic signature" is defined by the Royal Decree-Law as a set of data, in electronic form, attached to or logically associated with other electronic data, and used as a method for formally identifying the author or authors of the document which includes it. Another aspect that may have e-commerce implications is the possible processing of any personal data under transactions of this nature. Personal Data Protection Organic Law 15/1999 regulates the processing of an individual's personal data (any information concerning identified or unidentified individuals) obtained by public and private entities in the course of their duties. Under the Law, personal data cannot be used indiscriminately and there are penalties in the event of a breach of the statutory obligations. The legal protection of intellectual property is hugely important when engaging in e-commerce in the information society. For this reason, it is essential to determine as clearly as possible the ownership of the rights which can flow from content and information based on new technologies. The key Spanish legislation in this area is Legislative Royal Decree 1/1996, approving the Revised Intellectual Property Law. Article 10 of the Revised Law establishes that all original literary, artistic or scientific creations expressed by any means or on any medium, whether tangible or intangible, currently known or invented in the future, are intellectual property. Accordingly, any creations meeting the originality requirement are capable of being protected, including graphic designs, source codes, and information contained on websites.

When engaging in e-commerce, regard should also be taken to industrial property matters. Inventions can be patented and, with respect to e-commerce, patents on encryption and compression algorithms may be established. However, Article 4.c of Patents and Utility Models Law 11/1986 provides that plans, rules, and methods for conducting a business, as well as software, cannot be patented. The approval of Directive 2000/31/EC of the European Parliament and of the Council of June 8, 2000 on certain legal aspects of information society services, in particular electronic commerce, in the Internal Market, is a starting point for the specific regulation of e-commerce, since it provides the general framework for any future legislation approved in Spain in this area. The Directive requires Member States to transpose its provisions into their national laws by January 17, 2002. In Spain, progress in legislative work to transpose the Directive has currently reached the point where a Preliminary Bill on Information Services and Electronic Commerce has been drafted.

[7].

5 THE ICT SECTOR IN SPAIN: TECHNOLOGY MANUFACTURING

Vital to understand the level of integration of ICT in our society is the analysis of their manufacturing tendency and repercussion.

In 2003 ICT sector value added amounted to about 400 billion € with ICT services holding the share of 80%. Respectively, the number of enterprises was around 520 000 in the ICT service sector and 63 000 in the ICT manufacturing sector. Total ICT sector employment amounted to 5.3 million persons [8] The ICT manufacturing industries contributions to aggregate labour productivity growth are much larger in these countries than in the EU with the exceptions of Finland and Ireland. This is explained by both the relatively larger sizes of ICT manufacturing and the higher labour productivity growth rates in these countries. With regard to ICT services, Europe also stays under the hegemony of USA and Asia. Just Slovakia and Ireland enjoy comparable records [9] In Spain, the relative size of ICT manufacturing achieves just about 0.7%, whereas ICT services represents a slightly more than 4%. Both percentages are low if considered absolutely. Nevertheless, the average for the European Union is 5.5% and 1.3 respectively. Ireland is, regarding these rates, the country with the higher proportion of ICT companies, scoring 11.5% and 5.2%. [9] On the other hand, the productivity per hour of ICT manufacturing has grown annually in Spain, from 1998 to 2003, a 14.4%, just 3.4 points below the European Union rate. However, with regard to ICT services, the growth of the Spanish providing has reached a 5.3%, that is to say, 0.2 more than the European average. [9] Combining the sector's share of the economy with its labour productivity growth rate, provides a picture of the sector's contribution to economy wide labour productivity growth; as shown in Figure 3.

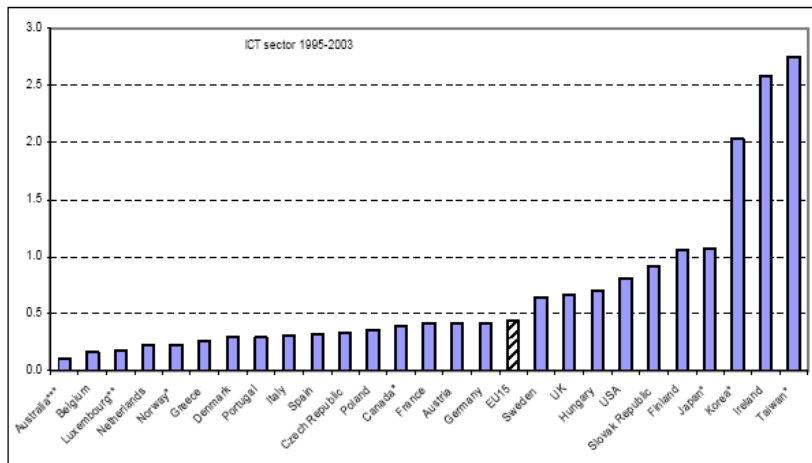


Figure 3 - ICT sector contributions to total aggregate labour productivity growth 1995-2003. (Average annual percentage units). [10].

6 ICT DEVELOPMENT KEY FACTORS: ASSOCIATIONS

Public and private associations constitute powerful mechanisms to enhance new trade systems. Regarding electronic transactions, the FECEMD (Spanish electronic commerce and direct marketing federation) represent more than 350 enterprises and therefore constitutes an important core of development and broadcasting. This non-profit organization was funded in 1977 and has lead the growth and consolidation of the sector in all its ambits: electronic trade; direct, relational, interactive and telephonic marketing; personal publicity; databases and remote or distance sales [11]. Together with the FECEMD, some other groups play a role in the improvement and spread of ICT in industries, for instance, AECCEM (Spanish Electronic Commerce and Relational Marketing Association), AEMT (Telemarketing Enterprises Association), AGEMDI (Direct and Interactive Marketing Agencies Association), AOMD (Non-governmental and Non-profit Marketing Users Association), AVAD (Spanish Distance Sales Association) and PD&BD (Direct Publicity and Databases Association). As a common factor, they all maintain portalwebs with updated contents on legislation, network security and market statistics. This information turns out to cover, exactly, the most usual concerns businessmen consider before to undertake any electronic change. In fact, legal issues are reported to be the most problematic issues.

7 CONCLUSIONS

ICT have become a crucial success factor in the constitution of modern companies. In Spain, the modernization of the companies in this field have just began, but with a very promising start. While Internet and e-mail are already consolidated technologies, e-trade and teleworking still find serious obstacles to be implemented. ICT manufacturing and services Spanish industry is struggling to stand out and so the dependence on foreign know-how and technology is always an obstacle in terms, at least, of timing and need comprehension. However, the experienced gained in other countries, and the high positive results will hopefully change this tendency. This new picture is supported by a se of recent legislation on electrical commerce, involving security.

In short, it can be concluded that ICT are being integrated in the Spanish industrial sector at increasing speed, adding value to production chain greatly.

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