The IT audits in the Spanish business sector: longitudinal analysis (2001-2011)

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Abstract:

In a society where Information Systems and Information are considered to be important assets for most companies, the performance of IT audits to measure their efficiency and prevent IT support breakdowns is required. To this aim, this study analyzes the evolution of the IT audit practice in Spanish companies, reporting the performance percentages and the amount of professionals that execute it, and how it correlates with the importance that these companies give to the Internet and the use of e-commerce. Our longitudinal study, encompassing the period of 2001-2011, has shown substantial increase in the awareness of Spanish companies towards the performance of these audits, with the percentage of companies that performed them in this decade having almost doubled. We have also found that the performance of IT audits usually involves various types of professionals of the same company and finally we were able to analyze the association between the adoption of the Internet and the use of e-commerce in surveyed companies, and the performance of these audits.

Keywords:

IT audit, Spanish business sector, Spanish companies, IT security, Information systems, ICT.

1. Introduction

In a society where Information Systems and Information Technology play an increasingly important role in business, it is necessary to conduct IT audits to measure efficiency and prevent computer problems in the company, but not all companies perform them.

In this paper we study the evolution of the IT audit's implementation within the Spanish business sector, both in its percentages and the professionals that perform it, and its link with the importance these companies give to the Internet and the use of e-commerce.

For this, we performed a longitudinal study from research group GITICE, which began 20 years ago and is still working today. Specifically, we performed macrosurveys on

Information Systems in Spanish companies with 211 variables every 10 years: 1991-92, 2001-02 and 2011-12. And for this paper we have selected 6 variables corresponding to 2001-02 and 2011-12.

In the next point, we frame the IT audit through a state of the art viewpoint. And we continue with the methodology and analysis of results in three points: 'IT audit', 'Relationship between Importance of Internet and IT Audit' and 'Relationship between e-commerce and IT Audit', concluding with the main features in the evolution of such IT audits' implementation in Spanish companies.

2. State of the art

The technological development in companies is increasing and it could create problems within them, as this technology is present in many of their activities (Infante, Martínez, García & Infante, 2014; Luna, 2013). And these problems, created by computer failures, are caused mainly by:

- Incorrect use of computers and computerized information, and poor storage of such information;
- Lack of security measures for the software's upkeep;
- Lack of a contingency policy for computer problems;
- Low speed and lack of optimization of computer networks;
- Security problems in e-commerce.

Therefore, companies act preventively through IT audits to determine if information systems safeguard business assets. In short, IT audits are preventive protocols, carried out in order to:

- Promote the efficiency of technological resources;
- Establish a preventive maintenance policy of Information Systems for the use of equipment;
- Establish a policy of using Information Systems for their employees;
- Analyze the efficiency of computer networks;
- Implement a policy of online security;
- Create an action plan in case of computer problems.

These are all carried out by professionals, either IT internal auditors who belong to their own company, IT auditors relating to the audit of accounts and IT external auditors.

All this information is the work of the authors who are mentioned in this paragraph, in which we focus more on this study, in the degree of implementation of computer audits and in the typology and origin of the professionals who perform it, something that has been studied for more than forty-five years, as the first association of professionals on this topic was created in 1966, to which we belonged for some time and have dedicated some of our research (Martínez, 1991). In this area, in our country, we can highlight the works of Poveda (1994, 1995), Piattini (Piattini & Del Peso, 2001; Piattini, 2008) or Calvo-Manzano (Calvo-Manzano, Carrillo, Cuevas, San Feliu & Tovar, 2002; Muñoz, Mejia, Calvo-Manzano & San Feliu, 2012). And, in academia, stand Ferreira, Fernandes & Souza (2013), Martins (2013), Ibarra (2014), Térmens (2014) and Faura, Momplet & López (2015).

3. Methodology

In the field of social sciences, it is necessary to have tools that provide primary and specifical information that will be studied, to allow us to work with empirical data. For this, we turn to the process of survey, as it represents one of the most important tools for advancing in the field of social sciences.

On this basis, and in order to fulfill the proposed goal stated above, we selected a part of the survey performed in the Spanish business sector (which we named in the introduction), in late 2001 and early 2002 and late 2011 and early 2012, that consists of 6 variables: importance of Information Systems and Information Technology in companies, level of importance of the Internet in companies, use of e-commerce to buy and/or sell, performing IT audits and the people responsible for such conduct in companies.

In the survey that we call SPANISH COMPANIES, we use sampling theory to get statistically significant data on the study population, which consists of Spanish companies located in the top 25,000 by turnover included in the database 'España 25.000' (in surveys performed in all the years, we have acquired the data from the same institution, the journal 'Fomento de la Producción').

In total, 395 companies participated in 2001-02 and we did 411 surveys in 2011-12, whose answers were validated in 2013. There was a lack of significant response due to the minimum number of variables, so qualitative variables were used which were then analyzed through non-parametric statistical model: X^2 association test (two qualitative variables).

The overview of the research can be seen in the following table (see Table 1):

	SPANISH COMPANIES	
SURVEY	**2001-02**	**2011-12**
Hypothetical universe	Spanish companies	Spanish companies
Target population	Spanish companies, whose turnover exceeds 1 million € annually	Spanish companies, whose turnover exceeds 2 million € annually
Population Mark	Database "España 25.000", *Fomento de la producción*	Database "España 25.000", *Fomento de la producción*
Sampling error	+/- 0.05	+/- 0.049
Confidence level	95.50%	95.50%
Hypothesis parameters	Z=2 and P=Q=0.5	Z=2 and P=Q=0.5
Sample size	395 companies	411 companies
Sampling procedure	Random sampling without replacement (random numbers)	Random sampling without replacement (random numbers)

Method survey	Questionnaire by email, postal mail, telephone contact, fax and in person	Questionnaire by email, postal mail, telephone contact, fax and in person

Table 1. Technical details of the research.

4. Discussion and Results

This study is divided into three main points: 'IT audit', 'Relationship between Importance of Internet and IT Audit' and 'Relationship between e-commerce and IT Audit'

4.1. IT audit

The high importance of Information Systems and Information in Spanish companies is observed even in 2001-02. It remained relatively constant, as 'essential' or 'a lot' in the last decade in the Spanish business sector (see Table 2).

LEVEL OF IMPORTANCE	SPANISH COMPANIES	
	2001-02	2011-12
Essential	67.59%	69.83%
A lot	24.30%	19.46%
Normal	6.58%	9.00%
Low	1.27%	0.73%
Nothing	-	-
No Answer	0.25%	0.97%

Table 2. Importance of Information Systems and Information Technology in the Spanish business sector.

So these companies have had to perform IT audits to measure the efficiency of these Information Systems and prevent computer problems, as more and more functions are used within these companies (Infante, Martínez, García & Infante, 2014).

In 2001-02, only approximately 30% of the sector performed IT audits, which has changed in 2011-12 with an almost double increase (exactly 26.82%) (see Table 3). Companies are increasingly aware of the importance of performing this task.

Perform IT audits	SPANISH COMPANIES	
	2001-02	2011-12
YES	29.87%	56.69%
NO	70.13%	42.09%
No Answer	-	1.22%

Table 3. Companies that perform IT audits.

These IT audits are performed by IT internal auditors who belong to their own company, IT auditors relating to the audit of accounts and IT external auditors. In 2001-02, concerning the performance of these audits, the Spanish companies showed a preference for IT internal auditors who belong to their own Companies and IT external auditors (see Table 4).

This trend did not change during this decade, since a preference for these professionals still prevails, but the performance of various IT audits by different types of

professionals in the same company appears. Although very few companies (only 25.86%) choose these varied options (see Table 4).

LEVEL OF IMPORTANCE	SPANISH COMPANIES	
	2001-02	2011-12
1	43.97%	22.84%
2	16.38%	18.53%
3	39.66%	32.76%
1, 2 and 3	-	5.60%
1 and 2	-	7.33%
1 and 3	-	8.19%
2 and 3	-	4.74%

1 - IT internal auditors who belong to their own company.
2 - IT auditors relating to the audit of accounts.
3 - IT external auditors.

Table 4. Professionals who perform IT audits.

4.2. Relationship between Importance of Internet and IT Audit

The importance of the Internet in companies has also increased in the last decade, and proof of this is the growth of companies that consider the Internet essential in their operations, by almost 30% (see Table 5).

LEVEL OF IMPORTANCE	SPANISH COMPANIES	
	2001-02	2011-12
Essential	12.91%	42.58%
A lot	24.05%	32.60%
Normal	42.78%	22.63%
Low	18.48%	1.70%
Nothing	1.27%	-
No Answer	0.51%	0.49%

Table 5. The importance of the Internet in Spanish companies.

But this level of importance that companies give to the Internet currently has no connection with the performance of IT audits, although this relationship existed in 2001-02, where it was observed that the higher the level of importance given to the Internet, the lower the number of companies that do not perform IT audits (see Table 6).

The performance of IT audits has become more widespread today, and even companies that give low importance to the Internet, mostly carried out such audits (see Table 6).

LEVEL OF IMPORTANCE GIVEN TO THE INTERNET	Companies that perform IT audits			
	SPANISH COMPANIES			
	2001-02		2011-12	
	YES	NO	YES	NO
Essential	49.0%	51.0%	59.2%	40.8%
A lot	31.6%	68.4%	56.0%	44.0%

Normal	28.4%	71.6%	54.9%	45.1%
Low	17.8%	82.2%	71.4%	28.6%
Nothing	40.0%	60.0%	-	-

Degree of Freedom	4	3
Confidence level	5%	5%
Critical X^2	9.49	7.81
Calculated X^2	14.501	1.129
Correlation	**YES**	**NO**
Margin of error	0.006	0.77

Table 6. Relationship between Importance of Internet and Performance of IT Audits in Spanish companies.

And we can also confirm there is no relationship between the importance that these companies give to the Internet and the election (by the company) of the professionals who perform these audits (see Table 7).

Also noteworthy in 2001-02 are the choice of 'IT internal auditors who belong to their own company' in companies where the importance of the Internet is considered essential or normal, and the choice of 'IT external auditors' in companies where the importance of the Internet is considered a lot.

Whereas in 2011-12, companies where the Internet is considered essential are opting for 'IT external auditors' and 'IT internal auditors who belong to their own company'. In addition, to start, the option of these IT audits will be performed by different types of professionals in the same company, but through no relation to the importance that companies give to the Internet (see Table 7).

LEVEL OF IMPORTANCE OF THE INTERNET	Professional who performs IT audits in company									
	SPANISH COMPANIES									
	2001-02			2011-12						
	1	2	3	1	2	3	1, 2 & 3	1 & 2	1 & 3	2 & 3
Essential	50.0%	20.8%	29.2%	27.2%	18.4%	33.0%	4.9%	5.8%	6.8%	3.9%
A lot	40.0%	13.3%	46.7%	23.0%	13.5%	27.0%	5.4%	8.1%	16.2%	6.8%
Normal	45.8%	16.7%	37.5%	16.0%	26.0%	38.0%	8.0%	10.0%	-	2.0%
Low	41.7%	16.7%	41.7%	-	20.0%	60.0%	-	-	-	20.0%
Nothing	-	-	100.0%	-	-	-	-	-	-	-

Degree of Freedom	8	18
Confidence level	5%	5%
Critical X^2	15.51	28.87
Calculated X^2	4.972	24.575
Correlation	**NO**	**NO**
Margin of error	0.761	0.137

1 - IT internal auditors who belong to their own company.
2 - IT auditors relating to the audit of accounts.
3 - IT external auditors.

Table 7. Relationship between Importance of Internet and Professionals who perform IT audits in Spanish companies.

4.3. Relationship between e-commerce and IT Audit

Regarding e-commerce, an increase is also observed in this activity. In its role of both purchasing and selling, it has grown in the last decade (see Table 8).

e-commerce	SPANISH COMPANIES	
	2001-02	2011-12
To Buy	23.54%	60.44%
To Sell	21.01%	43.46%

Table 8. Use of e-commerce to buy and sell in Spanish companies.

4.3.1. Companies that use e-commerce to buy

This growth in the use of e-commerce to buy can be studied as a possible relationship between this activity and the performance of IT audits by the company due to the use of Information Systems in economic transactions and the importance of these to work correctly. A relationship does exist: most companies do not use e-commerce to buy, and do not perform these audits. A situation that is disappearing over time, but is emphasizing its use with such embodiment (see Table 9).

Use of e-commerce to buy	IT audits			
	SPANISH COMPANIES			
	2001-02		2011-12	
	YES	NO	YES	NO
YES	40.9%	59.1%	65.7%	34.3%
NO	26.5%	73.5%	44.0%	56.0%

Degree of Freedom	1	1
Confidence level	5%	5%
Critical X^2	3.84	3.84
Calculated X^2	7.009	18.526
Correlation	YES	YES
Margin of error	0.008	0

Table 9. Relationship between e-commerce to buy and IT Audits in Spanish companies.

But of course, there is some relationship between the use of electronic commerce to buy and the choice (by the company) of professionals who perform such audits (see Table 10).

Use of e-commerce to buy	Professionals who perform IT audits in the company									
	SPANISH COMPANIES									
	2001-02			2011-12						
	1	2	3	1	2	3	1, 2 & 3	1 & 2	1 & 3	2 & 3
YES	52.6%	13.2%	34.2%	22.4%	19.3%	32.9%	5.6%	6.8%	10.6%	2.5%
NO	39.7%	17.9%	42.3%	23.2%	17.4%	31.9%	5.8%	8.7%	2.9%	10.1%

Degree of Freedom	2	6
Confidence level	5%	5%
Critical X^2	5.99	12.59
Calculated X^2	1.746	9.708
Correlation	**NO**	**NO**
Margin of error	0.418	0.137

1 - IT internal auditors who belong to their own company.
2 - IT auditors relating to the audit of accounts.
3 - IT external auditors.

Table 10. Relationship between e-commerce to buy and Professionals who perform IT audits in Spanish companies.

4.3.2. Companies that use e-commerce to sell

Regarding the use of e-commerce to sell, this relationship exists only in 2011-12, where there are significant differences in the performance of IT audits between those using e-commerce to sell and those who do not (see Table 11).

Use of e-commerce to sell	IT audits			
	SPANISH COMPANIES			
	2001-02		2011-12	
	YES	NO	YES	NO
YES	37.3%	62.7%	67.4%	32.6%
NO	27.9%	72.1%	50.0%	50.0%

Degree of Freedom	1	1
Confidence level	5%	5%
Critical X^2	3.84	3.84
Calculated X^2	2.803	12.118
Correlation	**NO**	**YES**
Margin of error	0.094	0

Table 11. Relationship between e-commerce to sell and IT Audits in Spanish companies.

And with all of this, we found no relationship between the use of e-commerce to sell and the election (by the company) of the professionals who perform such audits (see Table 12).

Use of e-commerce to sell	Professionals who perform IT audits in company									
	SPANISH COMPANIES									
	2001-02			2011-12						
	1	2	3	1	2	3	1, 2 & 3	1 & 2	1 & 3	2 & 3
YES	45.2%	12.9%	41.9%	23.3%	18.1%	31.0%	3.4%	10.3%	8.6%	5.2%
NO	43.5%	17.6%	38.8%	21.6%	18.9%	35.1%	7.2%	4.5%	8.1%	4.5%

Degree of Freedom	2	6
Confidence level	5%	5%

Critical X^2	5.99	12.59
Calculated X^2	0.381	4.548
Margin of error	**NO**	**NO**
Margin of error	0.826	0.603

1 - IT internal auditors who belong to their own company.
2 - IT auditors relating to the audit of accounts.
3 - IT external auditors.

Table 12. Relationship between use of e-commerce to sell and Professionals who perform IT audits in Spanish companies.

5. Conclusions

This study describes the evolution of the implementation of IT audits in the Spanish business sector, both in the percentages that it is conducted and the professionals that perform it, and its link with the importance that these companies give to the Internet and the use of e-commerce.

In a society in which Information Systems and Information Technology are considered essential for their companies, the performance of IT audits is required to measure their efficiency and prevent IT problems. We found that in the Spanish business sector the use of IT audits has experienced a boom in this decade, with the percentage of companies that performed it in 2001-02 almost doubling, demonstrating these companies' increased awareness of their efficiency and the important role these tools play. Ratified through the choice of professionals who perform this task, throughout the decade the choice of IT internal auditors of their own companies and IT external auditors has prevailed, but also increasingly the companies that choose to carry out such audits by different types of professionals within the same company (25.86% of these companies chose this option in 2011-12).

But we can not link this increase in the percentage of Spanish companies that perform IT audits with the importance of the Internet within them today, because this awareness of IT audits makes them almost indifferent to it, which was significant in 2001-02, where a greater performance of these audits would have been observed if these companies gave more importance to the Internet.

Instead, there is a relationship between the use of electronic commerce to buy and sell by the companies, and the performance of IT audits, except in 2001-02, when there was no relationship between e-commerce to sell and the performance of these audits on them.

And, datawise, we must also stress there is no link between the importance of the Internet in companies and the use of e-commerce to buy and sell, and the choice of professionals who perform IT audits.

This research is limited to companies whose turnover exceeded an annual high amount (1 million per year in 2001-02 and 2 million per year in 2011-12), and this amount varies with the increase of these companies' turnover in this decade: companies with sizeable information systems which play a key role in their operations give us these high percentages of performing IT audits. This limitation may be removed in future

studies, which may be extended to all companies (small, medium and big without depending on their level of turnover), and specific studies on sectors within Spanish business, for later comparison to Spanish companies in general, to better understand the situation of those IT audits in their markets.

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