
Benefits of ISO14001 certification in the Republic of Macedonia

Aleksandar Jolevski

Graduate Program in Quality and Safety Systems,
University 'St. Kliment Ohridski',
1vi Maj bb, 7000 Bitola, Republic of Macedonia
and
Faculty of Biotechnical Sciences,
Partizanska, nn, 7000 Bitola, Republic of Macedonia
E-mail: a_jolevski@yahoo.com

Abstract: ISO14001 is an international management system with main goal to help all types of organisations in improving their environmental performance. ISO14001 is a relatively new security system in Macedonia. This study presents the experiences of managers about ISO14001 implementation, obtained through the survey in a sample of industrial firms. Most ISO14001 certified firms are small or medium-sized organisations. ISO14001 certification is more intense in the last four, five years. The ISO14001 registered organisations have increased effectiveness in terms of: the commitment to preventing pollution and environmental management, estimated environmental risks, the overall competitive advantage, compliance with environmental regulations, access to new markets and the involvement of key stakeholders. The ANOVA method does not determined significant differences in the effectiveness of ISO14001 between different types of business activities, except for the performance: public education, involvement of key stakeholders, insurance costs, access to capital and access to new markets.

Keywords: ISO14001; EMS; management; benefits; ANOVA; effectiveness; industrial firms; Republic of Macedonia.

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Biographical notes: Aleksandar Jolevski is an Industrial, Production and Environmental Engineer. He received his BSc from University of Skopje in Food and Biotechnology Science and MSc on Quality and Safety Systems from University of Bitola, Republic of Macedonia. His research interests include total quality and environmental management, sustainable development, environmental responsibility, performance evaluation, data envelopment analysis and application of mathematical and statistical concepts in management and engineering.

1 Introduction

ISO14001 is an international voluntary management system for environmental protection. ISO14001 can be applied to all types of firms, regardless of their size or activity

(Hart, 1995; Sharma and Vredenburg, 1998; Bansal and Hunter, 2003). ISO14001 can be integrated with other management functions. ISO14001 meets the requirements of EMS (environmental management system) for each firm, by:

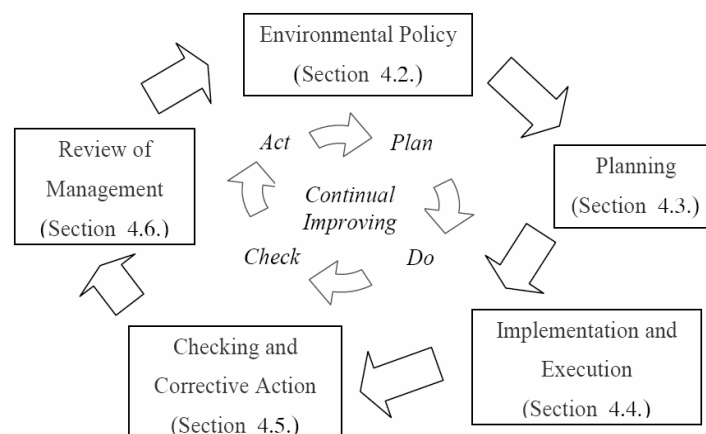
- identification and control of the environmental impact of the activities, products or services of the company
- continuous improvement of environmental performance
- implementing a systematic approach to setting environmental objectives and intentions towards achieving them, and proving that they are achieved (http://www.iso.org, accessed 18 August 2011).

The environmental impact is a change of environment. This change can be a positive or negative. Environmental impact is a consequence of environmental aspects. A list of the most significant environmental aspects should be made for each type of activity, product or service – those that have or could have a significant environmental impact (ISO14001, Section 4.3.1.). The better the company manages the environmental aspects, the improved environmental performance will be presented. For this purpose, environmental performance must be measurable.

Today, environmental management system is an integral “part of the overall management system which includes: organisational structure, planned activities, responsibilities, practices, procedures, processes and resources in the development, the implementation, execution, audit and maintenance of environmental policy” (ISO14001, Section 3.6). This system does not replace government environmental regulations, but rather complements them.

ISO14001 is based on the method planning, implementation, evaluation, action (‘Plan-Do-Check-Act’), which is known as the PDCA cycle or Deming’s circle (William Deming, 1900–1993). PDCA cycle, that is typical for all management systems based on ISO standards, for ISO14001 is expanded and includes five phases: environmental policy, planning, implementation and execution, checking and corrective action, and finally, review of management (Figure 1) (Martin, 1998; Sarkis, 1998).

Figure 1 Basic components of ISO 14001 EMS



Environmental policy defines the scope of application of ISO14001 in the firm, as a writing document. All legal requirements related to managing the environmental aspects should be met. Section 4.2 highlights the need for understanding of the policy of all persons working for, or on behalf of the firm, not just employees.

Planning involves setting of goals and processes in line with ISO14001. Before the implementation of ISO14001, an examination or GAP analysis of processes in the firm must be made, in order to identify all elements of the current and likely future operations that may have an impact on the environment. These procedures should be used promptly and documented, and environmental determinants should be measurable.

The implementation and execution includes: providing resources for installation, implementation and maintenance of EMS, delegating responsibility and execution of training, setting a method of communication in the firm, as well as with external parties, documentation of all procedures and processes and their control, establishment of procedures and processes for emergencies.

The checking and corrective action involves regularly measuring and monitoring the results of processes and reports in order to gain assurance that the firm's environmental objectives are met.

Regular management review determines the extent to which environmental goals are met. In this way, circle of Deming is constantly moving forward and realise continuous improvement of the EMS.

2 ISO14001 – realised advantages from its implementation

The requirements of CIP (continual improvement process) in EMS are different from the requirements of the CIP in quality management system (QMS). ISO14001 in the CIP has three dimensions (Gastl, 2009):

- 1 distribution: more and more business areas are covered by the implementation of EMS
- 2 enrichment: more and more activities, processes, products, programmes, resources, etc., are managed through the implementation of EMS
- 3 upgrading: structural and organisational framework of the EMS are improved through know-how technology, when is dealing with environmental challenges.

Studies (Hart, 1995; Christmann, 2000; Rondinelli and Vastag, 2000) confirm that the implementation of ISO14001 in EMS increases the environmental awareness of employees in the firm and the competitive position of the firm.

ISO14001 was developed primarily to assist firms in reducing their environmental impact, but as a consequence of that, organisations can reach a number of economic benefits including higher conformance with legislative and regulatory requirements (Sheldon, 1997).

Through the research of Zeng and Wang, (2002), five factors are extracted as most important from a variety of competitive advantages of ISO14001 implementation, including: environmental awareness of the leader and top management, definite responsibility on environmental management, legal system and legal incentives.

ISO14001 standard provides guidance to those who are responsible for establishing of the EMS in the firm, which helps firms to publicly demonstrate their commitment to

environmental protection. These guidelines are based on three principles: pollution prevention, continuous improvement and voluntary participation (Bansal and Hunter, 2003). Empirical analysis of Tien et al. (2005), point to: intrinsic motivation, communication with stakeholders, continuing education and constant innovation, as important factors for the implementation of ISO14001 and the competitiveness of certified firms.

The studies of Murillo-Luna and Solans-Prat (2008) highlight the competitive advantages of ISO14001 certified firms by: improving the internal efficiency, complying with the requirements of stakeholders (better access to insurance, financial support and government subsidies), improved competitive market position, as well as differential advantages [redesign of the packaging in order to reduce the volume of used natural resources, development of 'green' products, advertising the environmental attributes of products, life cycle analysis (LCA) approach, etc.]. It would have gotten an enormous and continually growing consumer segment, which would highly appreciate such practices (Bansal and Roth, 2000).

Investments in environment quality sometimes simply look like costs, but benefits do exist and these are often economically quantifiable (Alberti et al., 2000). Ironically, firms are reluctant to adopt the standard because of relatively few benefits, and yet those benefits will never be fully realised unless more firms adopt the standard (Bansal and Hunter, 2003). The international market still considers price and quality as the paramount factors in selection of suppliers, but EMSs are an important feature that is frequently taken into consideration (Belessi et al., 2005). From the other side, by implementing of ISO14001 organisations are becoming more environmentally aware, often identifying ways for saving energy and materials, thus reducing both costs and adverse environmental impacts (Schaarsmith, 2005).

Studies (Shrivastava, 1995; Bansal and Roth, 2000; Delmas, 2001; Zutshi and Sohal, 2004) confirm the benefits of ISO14001 certification, through a variety of competitive advantages: financial savings, improving relationships with stakeholders (regulators, investment and insurance companies, government bodies), meeting the future environmental challenges, leniency of international trade barriers, and all of that thanks to the position of 'first' in the sector ('environmental leader').

Considering the facts related to global human activity and environment, and the results of research on the benefits of ISO14001 certification worldwide, this research was performed in order to exchange experiences and benefits of implementing ISO14001 in the economic sector in the Republic of Macedonia.

For this purpose, in the following sections of this paper will be covered:

- the goals and hypotheses of the research
- the methodology of research (which is represented by: sample, data collection and statistical methods used in research)
- the results, obtained from the analysis of managerial experience about the ISO14001 certification
- the discussion about these results
- the conclusions derived from this research.

3 Research objectives and hypotheses

The implementation of ISO14001 within the EMS in a firm entails verifying and supplementing, not replacing the existing environmental policy. With its implementation, the firm is obligated to accurately monitor the overall activities, procedures and processes that can cause pollution (ISO14001, Section 4.5.1).

The relevance of this topic is closely correlated with the importance of environmental awareness and consciousness. It certainly emerged as one of the most important topics of XXI century. Providing conditions for clean air, soil and water, and production of environmentally healthy and safe food and drinking water are our obligation and responsibility in front of the future generations. All these facts underline the validity of this research.

In 2011 a small anniversary was celebrated – 15 years from the first publication of ISO14001 in 1996. However, ISO14001 is a relatively new security system in the Republic of Macedonia. Around 60 firms with different sizes and dealing with different industrial activities have implemented ISO14001 or they are under its implementation. The scope of this research covers the firms with ISO14001 certified businesses from the industrial sector, construction, transport and storage, ICT sector and the sector of trade-service activities in the Republic of Macedonia.

This research includes several objectives:

- 1 The trend and the annual growth of ISO14001 certification in the first decade of XXI century were investigated.
- 2 Obtaining initial indicators of efficiency and competitive advantages that this system offers in terms of previously existing EMS in the firms from the economic sector in the Republic of Macedonia. For this purpose, the degree of impact of ISO14001 on management variables was tested in six areas of organisational activity, including:
 - environmental performance
 - technological performance
 - organisational performance
 - regulatory performance
 - financial performance (the cost advantages)
 - competitive performance.
- 3 Investigation of the differences between the manager's perceptions from the various economic sectors, in terms of the benefits of ISO14001 certification and implementation in the existing EMS. The purpose of this additional research was to determine which variables (performance), through the implementation of ISO14001, are becoming more important in the particular economic sectors.

According to the principles of ISO14001, the international experiences of ISO14001 certification collected through the literature review process and taking into account the objectives of the research, three hypotheses were defined:

- Hypothesis A There is a positive trend of the ISO14001 certification process in the first decade of XXI century in the Republic of Macedonia.

- Hypothesis B ISO14001 has an impact on the effectiveness of the management variables, identified in each of the considered performance: environmental, technological, organisational, regulatory, financial and competitive performance, in terms of previously existing EMS.
- Hypothesis C There are no differences between the various economic sectors in terms of realised impact of ISO14001 on each of the considered management variables.

4 Methodology of research

4.1 Sample of research and data collection

The focus of this research was directed towards ISO14001 certified firms in the Republic of Macedonia, regardless of their activity and size. Using the lists of ISO14001 certified firms, obtained from the Ministry of Environment, the Ministry of Economy, the Economic Chamber of the Republic of Macedonia, ISO certification agencies and Internet search engines, a list of 51 ISO14001 certified firms in the territory of the Republic of Macedonia was composed.

The survey was conducted between October 5, 2010, and January 15, 2011. Twenty-six firms accepted to participate in the survey, representing 51% of total ISO14001 certified firms in the Republic of Macedonia, during the study.

The research was initiated through telephone contact with each of the firms. The interview was carried out with persons responsible for the implementation of ISO14001 in EMS in the firm. The purpose of the research was presented to each person and after that the questionnaire was sent to them.

The questionnaire was compiled based on literature findings, in terms to test the management variables. These variables were associated with the changes in the effectiveness of the overall performances of the firm (changes resulting from implementation of ISO14001, and compared with previously existing EMS).

The questionnaire included a brief history of the firm, in terms of firm size (by turnover and number of employees) and year of ISO14001 certification. The information, regarding the size of firms, is presented in Table 1. Most of the ISO14001 certified firms are SMEs, whether the size is considered through the annual turnover (82.6%) or the number of employees (73.1%).

Table 1 Description of the surveyed firms

<i>Indicator</i>	<i>Description*</i>	<i>%</i>
Size of the firm in terms of annual turnover: (N = 23)	Small: < 7 million euro in denars	43.48
	Medium: 7–40 million euro in denars	39.13
	Large: > 40 million euro in denars	17.39
Size of the firm in terms of number of employees: (N = 26)	Small: < 50 workers	30.77
	Medium: 50–250 workers	42.31
	Large: > 250 workers	26.92

Note: *Official Gazettes of the Republic of Macedonia, No. 49, April 12, 2010.

4.2 *Statistical methods for data processing*

The variables, which relate to overall firm performance, were defined in the questionnaire. A process of defining the variables was made in accordance with the literature findings on this matter. Managers were asked to provide answers about the changes in each of the 29 variables (the variables presented in Table 4). These changes were occurred after the implementation of the ISO14001 and were assessed on a scale of 1 to 5 (1 – ‘decreased’, 2 – ‘slightly decreased’, 3 – ‘no change’, 4 – ‘slightly increased’, 5 – ‘increased’).

The answers of the survey were statistically processed in Excel. The programme was developed so that for each variable in the survey a formula was compiled for calculation of statistical parameters, such as: percentage, cumulative percentage (CP), arithmetic mean, variance and standard deviation. The distribution of responses was perceived through these index methods, and the central tendency and its quality for each variable was determined through the static parameters, i.e., arithmetic mean and standard deviation. Thus, the indicators for benefits of ISO14001 certification were obtained and by doing that, certain conclusions for this research were adopted.

The survey covered firms that are occupied with different activities. In order to identify differences or similarities between the experiences of managers (firms) from different types of activities (and thus to verify the hypothesis C, previously set in the objectives of the study), the ANOVA method was used.

For this purpose, a division of the surveyed firms was made into five groups, namely:

- group A: construction activity
- group B: production of electrical, mechanical and fireproof materials
- group C: technology for food, biotechnology, pharmacy and services
- group D: ICT sector
- group E: graphic activity.

This division is formed in the Excel programme and the responses (assessments x_{ij}) from the managers, about the influence of ISO14001 on each management variable (on the scale of 1 to 5), were allocated in such groups, as is shown in Table 2.

After compiling the table, the calculations of the F-test statistics, for each of the 29 management variables, were performed in Excel. Formulas were composed for calculation of: the total sum of squares (TSS) of the variations, the sum of squares for within-sample (SSW) variation and the sum of squares for between-sample (SSB) variation, as well as formulas for calculation of: mean square between (MSB) and mean square within (MSW). At the end F-test statistic was calculated as the ratio between explained (MSB) and unexplained variation (MSW).

Comparison of the F-test statistics was performed at the level of significance of 5% and 1%. Through the application of this method conclusions were drawn about the existence or absence of differences between the various business activities in relation to the importance of the influence of ISO14001 for each variable.

Table 2 Comparison of the significance of management variables between different business activities through the application of ISO14001 (calculation of F-test statistics)

$j \backslash i$	A	B	C	D	E	$Total$
1	x_{11}^*	x_{12}	x_{13}	x_{14}	x_{15}	
2	x_{21}	x_{22}	x_{23}	x_{24}	x_{25}	
3	x_{31}	x_{32}	x_{33}	x_{34}	x_{35}	
...	
n	x_{n1}	x_{n2}	x_{n3}	x_{n4}	x_{n5}	
Total	$\sum_{i=1}^n x_{i1}$	$\sum_{i=1}^n x_{i2}$	$\sum_{i=1}^n x_{i3}$	$\sum_{i=1}^n x_{i4}$	$\sum_{i=1}^n x_{i5}$	$\sum_{j=1}^k \sum_{i=1}^n x_{ij}$
Average	$\bar{x}_{.1}$	$\bar{x}_{.2}$	$\bar{x}_{.3}$	$\bar{x}_{.4}$	$\bar{x}_{.5}$	$\bar{x}_{..}$

Calculation of test statistics

N (total number of units)	26	$SST = \sum_{j=1}^k \sum_{i=1}^n \left(x_{ij} - \bar{x}_{..}\right)^2$
k (total number of treatments)	5	$SST = \sum_{j=1}^k \sum_{i=1}^n \left(x_{ij} - \bar{x}_{.j}\right)^2$
N – k (degrees of freedom of the denominator)	21	$SST = \sum_{j=1}^k n_j \left(\bar{x}_{.j} - \bar{x}_{..}\right)^2$
k – 1 (degrees of freedom of the nominator)	4	$MSW = SSW/(k - 1)$ $MSB = SSA/(N - k)$

$F_{ANOVA} = MSB/MSW$

Note: x_{ij} – the influence of ISO14001 system on management variable in the firm *i* (*i* = 1, 2, 3, ..., *n*) with business activity *j* (*j* = A, B, C, D, E), where *n* is a total number of the firms in the business sector A, B, C, D or E.

5 Results

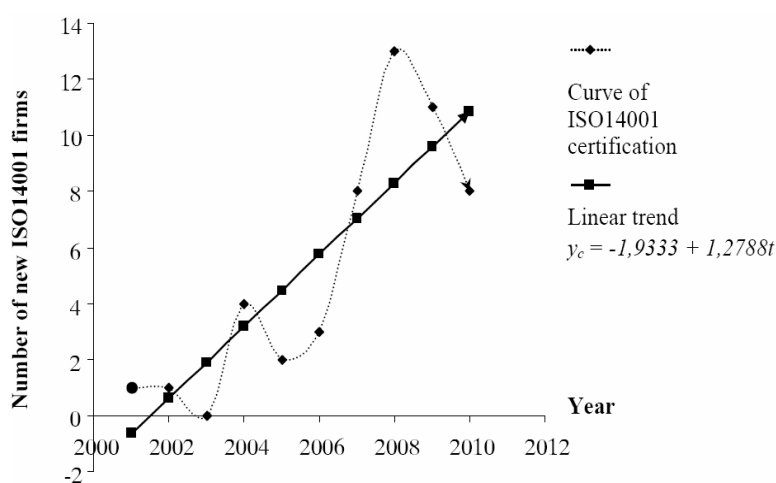
5.1 Trend of ISO14001 certification

Table 3 was created through the information received from the firms about the year of ISO14001 certification. The table shows: the number of new ISO14001 firms at the end of each year in the first decade of this century, the number of total ISO14001 firms at the end of each year, and the annual growth of ISO14001 certification.

The linear trend of ISO14001 certification was determined based on the mathematical fitting of the numbers of new ISO14001 firms at the end of each year (Figure 2).

Table 3 ISO14001 annual growth in the economic sector in the Republic of Macedonia

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Number of new ISO14001 firms	1	1	0	4	2	3	8	13	11	8
Number of total ISO14001 firms	1	2	2	6	8	11	19	32	43	51
Annual growth (%)	/	100	0	200	33.33	37.50	72.73	68.42	34.38	18.60

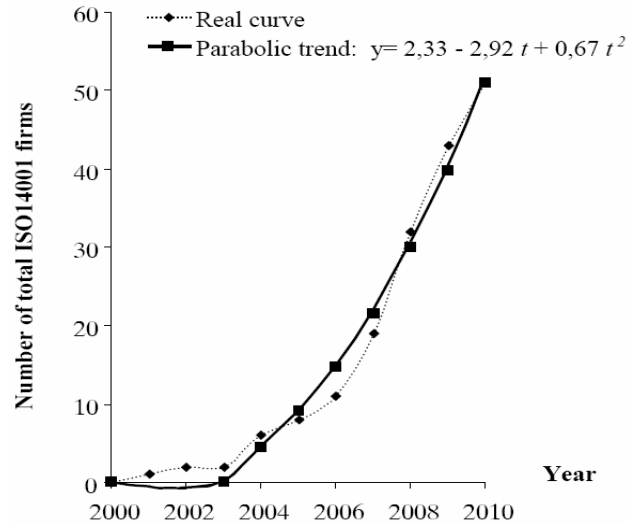
Figure 2 Trend of ISO14001 certification in Republic of Macedonia

This trend is positive (trend of growth) and according to the value of the coefficient b ($b \approx 1.28$), it could be made a conclusion that at the end of each year in the first decade of the XXI century have appeared from 1 to 2 new ISO14001 firms more than in the past year.

In terms of the total number of ISO14001 certified firms at the end of each year, an intensive trend of growth was established (Figure 3).

If we make an analysis of the annual growth of ISO14001 certification for the last decade, then we will conclude that the most intensive growth is made in 2007 and 2008, before the world economic crisis (73% and 68.5%, respectively), as it is shown in the Table 3 (if it does not take into account the initial years of certification). In any case, there is a positive annual growth, which in 2010 is accounted for approximately 19%, as was the global average in 2009 (The ISO survey of certifications 2009, e-product, <http://www.iso.org>).

These results support the Hypothesis A, i.e., there is a growth of ISO14001 certification process, whether it is reviewed by trend or by the annual growth.

Figure 3 Trend of the total number of ISO14001 firms in Republic of Macedonia

5.2 Effectiveness of ISO14001

Table 4 shows the influence of ISO14001 implementation on some management variables. This influence was studied by arithmetic mean and CP (progression) and the variations or dispersions from the average were measured by standard deviation. CP is represented by answers 'slightly increased' and 'increased', except where is otherwise indicated in Table 4.

Table 4 The influence of ISO14001 on performance of the firms

Variables		\bar{A}	σ	CP	F_{ANOVA}^{**}
<i>Environmental performance</i>					
1	Commitment to pollution prevention	4.65	0.83	96.15	1.0910
2	Environmental responsibility	4.63	0.63	91.67	1.9300
3	Estimated environmental risks	4.20	1.10	88.00	0.2199
4	Quantity of waste recovered	3.92	0.98	72.00	1.2620
5	Quantity of total waste recycled	3.35	1.52	61.54	0.1932
6	Number of identified environmental impacts	3.54	1.37	57.69	0.2664
7	Number of environmentally friendly production processes	3.72	0.92	48.00	1.5730

Notes: *The value of the CP shows the percentage of the respondents who believe that ISO14001 does not made any changes (positive or negative) on the respective variable.

**Comparison of the F-test statistics was performed at the level of significance of 5% ($F_{0.05;4;21} = 2.845$) and 1% ($F_{0.01;4;21} = 4.37$)

Table 4 The influence of ISO14001 on performance of the firms (continued)

<i>Variables</i>	\bar{A}	σ	<i>CP</i>	F_{ANOVA}^{**}
<i>Technological performance</i>				
8 Development of new environmental technologies	3.81	1.04	69.23	1.3700
9 Environmental libelling of the activities and products	3.73	1.26	65.38	1.6310
10 Funding of environmental research	3.46	1.15	46.15	0.9258
<i>Organisational performance</i>				
11 Marketing and public relations	4.00	0.88	84.62	1.6800
12 Communications with the public and public education	4.04	0.81	76.92	4.2520
13 Synergies with other management systems (ISO9000)	3.73	0.98	73.08	0.9038
14 Involvement of key stakeholders	4.15	0.82	80.77	4.6020
15 Involvement of employees	3.85	0.72	65.38	1.4410
<i>Regulatory performance</i>				
16 Compliance with environmental regulations	4.46	0.84	84.62	2.4950
17 Rationalisation of regulation	4.00	0.92	65.38	0.7161
18 Number of regulatory inspection	3.24	1.07	32.00	0.7207
<i>Financial performance (the cost advantages)</i>				
19 Total costs for regulatory compliance	3.25	1.10	40.00*	1.1300
20 Total costs for regulatory penalties	2.56	1.13	48.00*	1.4200
21 Insurance costs	3.38	1.11	42.31*	3.5030
22 Legal fees	3.30	1.08	52.17*	0.7014
23 Access to capital	3.85	0.91	50.00*	4.7560
24 Overall operative costs	3.96	0.94	73.08	1.8500
25 Foreign investment	4.00	0.83	65.22	1.3640
<i>Competitive performance</i>				
26 Access to new markets	4.15	0.77	76.92	3.4150
27 Access to international markets	4.16	0.83	72.00	2.0630
28 Market share	4.17	0.85	70.83	2.8070
29 Overall competitive advantage	4.31	0.72	84.62	1.1290

Notes: *The value of the CP shows the percentage of the respondents who believe that ISO14001 does not made any changes (positive or negative) on the respective variable.

**Comparison of the F-test statistics was performed at the level of significance of 5% ($F_{0.05;4;21} = 2.845$) and 1% ($F_{0.01;4;21} = 4.37$).

ISO14001 has achieved increased influence on the environmental and competitive performance, as well as on some organisational and regulatory performance in the sample firms. Regardless of which statistical parameter is selected ($\bar{A} > 4$ or $CP > 75\%$) and

taking into account the standard deviation ($\sigma < 1$), as a measure of the quality of the central tendency, the results show increased effectiveness of the following variables:

- commitment to pollution prevention (environmental performance)
- environmental responsibility (environmental performance)
- compliance with environmental regulations (regulatory performance)
- overall competitive advantage (competitive performance)
- access to new markets (competitive performance)
- marketing and public relations (organisational performance)
- communications with the public, public education (organisational performance)
- involvement of key stakeholders (organisational performance)
- estimated environmental risks (environ. performance: $\bar{A} = 4.20$; $\sigma = 1.1$; CP = 88%).

The survey confirms some positive changes in the environmental and technological performance of the firms, included into the survey, through the ISO14001 implementation [$(3 < \bar{A} < 4)$ or $(50\% < \text{CP} < 75\%)$], such as:

- 1 the quantity of waste recovered and the total waste recycled
- 2 the number of identified environmental impacts
- 3 the development of new, innovative environmental technologies (through inclusion of LCA approach, guidelines defined by the ISO14040 series and ISO Guide 64:2008)
- 4 the environmental labelling of the activities and products or practicing 'eco-design' of the activities and products (guidelines defined by the ISO14030 series).

Little impact of the ISO14001 is registered only on the financial investments in environmental research and development ($\bar{A} = 3.46$; $\bar{A}\sigma = 1.1$; CP = 46.15%), which, at the other hand, is closely related with the number of environmentally friendly production processes ($\bar{A} = 3.72$; $\sigma = 0.92$; CP = 48%).

Also, significant positive changes are identified in the rest of the competitive performance, namely: the market share ($\bar{A} = 4.17$; $\sigma = 0.85$; CP = 70.83%) and the access to international markets ($\bar{A} = 4.16$; $\sigma = 0.83$; CP = 72%).

Most of the firms, included into the sample, confirm the existence of synergy between the ISO9000 system and the ISO14001 (CP = 73.08%) and the involvement of the employees in the protection of the environment through the ISO14001 (CP = 65.38%). There is slightly increased influence of ISO14001 on the rationalisation of regulation (CP = 65.38%). Most of the firms, included into the sample, consider that ISO14001 has no influence on the number of regulatory inspection.

Most respondents confirm the invariability of most financial performance (or very little impact of the ISO14001), such as: total costs for regulatory compliance, total costs

for regulatory penalties, insurance costs, legal fees and access to capital (observed through the CP).

On the other hand, 'slightly increased' to 'increased' influence of ISO14001 is seen in terms of overall operative costs and foreign investment ($50\% < CP < 75\%$).

These results support the Hypothesis B of the realised impact of ISO14001 on the effectiveness of most management variables, except for the variables: the number of regulatory inspection, total costs for regulatory compliance, total costs for regulatory penalties, insurance costs, legal fees and access to capital.

5.3 *Significance of management variables in particular economic sectors*

A comparison of the answers of managers from different types of activities, performed by ANOVA method, showed insignificant differences for most performances ($F_{ANOVA} < F_{0.05;4;21}$ and $F_{ANOVA} < F_{0.01;4;21}$), as it is shown in column five in Table 4. The calculation of F-test statistics shows significant differences only for the following variables:

- communications with the public and public education
($F_{ANOVA} = 4.25 > F_{0.05;4;21} = 2.85$)
- involvement of key stakeholders
($F_{ANOVA} = 4.6 > F_{0.05;4;21} = 2.85$ and $F_{ANOVA} = 4.6 > F_{0.01;4;21} = 4.37$)
- insurance costs
($F_{ANOVA} = 3.5 > F_{0.05;4;21} = 2.85$)
- access to capital
($F_{ANOVA} = 4.76 > F_{0.05;4;21} = 2.85$ and $F_{ANOVA} = 4.76 > F_{0.01;4;21} = 4.37$)
- access to new markets
($F_{ANOVA} = 3.4 > F_{0.05;4;21} = 2.85$).

Accordingly, Hypothesis C will be rejected only for these five variables.

The influence of the ISO14001 on the first two variables (the communications with the public and public education, and the involvement of key stakeholders) is not a significant only for the firms from the food and the biotechnology sector, as well as from the industry for the production of electrical, mechanical and fireproof materials.

In firms with graphics and construction activity are noted increased access to capital and reducing total cost of insurance; otherwise in firms with the other activities, ISO14001 has done a insignificant change (or no change) on these variables.

ISO14001 has not realised an impact on 'access to new markets' only in the firms from ICT sector; this performance is a competitive advantage for the firms of all other sectors.

6 Discussion

The results of this study provide initial and very important experience for the changes in the EMS of the firms from economic sector in Macedonia, as a consequence of the ISO14001 certification. These data can find application in economy, science, government, as well as in those firms that are intended to do or change something in this field, as a part of their action, on regional or global level.

ISO14001 certification increases the effectiveness of the work of Macedonian firms, primarily in terms of environmental performance. This is consistent with international research, confirming that ISO14001 enhances the environmental performance of firms (Hart, 1995; Van der Veldt, 1997; Bansal and Hunter, 2003; Chavan, 2005).

As one of the most important benefits stands 'compliance with environmental regulations'; this improves the interception of future environmental challenges (Sheldon, 1997; Zeng and Wang, 2002).

Worldwide experiences suggest (Hutchens, 1999; Delmas, 2001), and this study confirmed that ISO14001 certification increases the overall competitiveness of firms and access to new markets, and for those firms that are participating on an international level – by taking a better position in the international market.

An important segment of ISO14001 in the work of Macedonian firms is the demonstration of responsibility and commitment to environmental protection. These environmental performance are not present only on the internal level and to key stakeholders, but specifically highlighted towards the community. For these reasons, communication and public education, as well as public relation, are very important performance (Van der Veldt, 1997; Poksinska et al., 2003). For example, the survey showed that 40% of firms publish an annual public report on environmental protection. ISO14001 certification is more intense in recent five years, so this percentage indicates that there has been a progress in public demonstration of environmental responsibility.

Communications with key stakeholders are preserving and are improving by ISO14001 certification and by the meeting of the requirements of the customers (Sturm, 1998; Poksinska et al., 2003; Zutshi and Sohal, 2004; Tien et al., 2005). The research showed that the Macedonian firms can have significant advantage by this variable.

This research shows that managers do not consider ISO14001 as a powerful tool for financial savings (insurance cost, regulatory cost, legal fees) (Murillo-Luna and Solans-Prat, 2008), unlike the other experiences (Bansal and Roth, 2000; Delmas, 2001). Through the ANOVA method is confirmed that the sectors with construction and graphic activities have realised the cost advantages through the insurance, while the other sectors have not. These results raise the question why the rest of the sectors have not realised such benefits through the ISO14001 implementation. Further studies should answer this question. It is interesting that ISO14001 has not achieved an influence on the total cost for regulatory penalties and legal fees; at the other side, the firms from UK and Japan through the adoption of EMS (BS 7750 and EMAS-the eco-management and audit scheme) have avoiding the fines and penalties (Bansal and Roth, 2000). Future studies could be directed towards the cost advantages in order to see whether anything has changed, and if not, what are the reasons for it.

7 Conclusions

ISO14001 certification in the industrial sector in the Republic of Macedonia is more intense in the last four or five years. In the first decade of XXI century intense trend of growth of the total number of the ISO14001 firms in the Republic of Macedonia is registered. Most of the ISO14001 firms are small or medium sized firms, either in terms of the annual turnover or in terms of the number of employees. There is integration between ISO14001 and ISO9001 systems in the firms.

The Macedonian firms have improved their environmental performance through the ISO14001 certification, achieving a higher commitment to pollution prevention and more efficient managing of the environmental risks, in terms of the previously existing EMS. Also, ISO14001 allow them to demonstrate to all key stakeholders the compliance with environmental regulations. By meeting these challenges, the firms have increased their own overall competitiveness through the increased market share and access to new markets (especially international ones). Only for ICT sector, ISO14001 has no influence on the access to new markets.

The study showed that the cost advantages are not achieved, except the reducing of the insurance costs and better access to the capital (but only in the sectors with construction and graphic activities). However, there is a reducing of the total cost for reducing of pollution.

Among the various types of business activities there are no significant differences in terms of the effectiveness of ISO14001 on the most of the management variables.

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