IMPACTS OF ISO 14000 CERTIFICATION ON BUSINESS PERFORMANCE

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ABSTRACT

The growing concern to maintain and improve the quality of the environment and to protect human health leads organisations to assume a larger responsibility of their activities. Nowadays, it becomes more and more important to achieve and demonstrate environmental performance by controlling environmental impacts of organisations' activities, products and services. The International Organisation for Standardisation (ISO) established the Technical Committee 207 with the responsibility to develop a set of standards in the field of environmental management tools and systems. Known as the ISO14000 series, these standards affect every aspect of a company's management and of its environmental responsibilities. Helping any organisation in addressing environmental issues in a systematic way, the ISO14000 standards should improve the companies' environmental performance. Embraced by over one hundred countries, adopted by some of the largest multinational corporations in the world, ISO14000 is considered increasingly as a vital component of the international business community.

In the context of international activities of the organisations and in the spirit of global status of the environment, we develop an international comparative analysis, pointing out how and to what extent investment in ISO14000 certification really helps the organisations and brings in returns.

The research is based on an international survey conducted in European and Asian countries. The measurement instrument is a standardised questionnaire mailed to a sample of certified organisations in the different countries.
Several dimensions are investigated in the potential impacts of ISO14000 certification on organisations: operational costs, environmental impacts, insurance rates, competitive advantage, corporate and marketing image, stakeholders' satisfaction...

Key words: ISO 14000, business performance, social commitment, Europe, Asia.

1. INTRODUCTION

By the 1960's, the concern for the environmental degradation began to approach a true international mass movement. A belief appeared that only government was capable of solving environmental and social problems. The first environmental movement was then centred on *government regulations* as the vehicle for change. In the 1970s, these regulations consisted in linear, reactive, end-of-pipe approaches, emphasising pollution control and adherence to legislative standards. Nothing encourages companies to go beyond compliance with the law.

Over time, the growing concern to maintain and improve the quality of the environment and to protect human health has led organisations to assume a larger responsibility of their activities. Pro-active firms desired to demonstrate to regulators and other stakeholders that continuous improvement in the environmental area can be achieved more effectively through *voluntary approaches*. In the late 1980s, codes of environmental management practice, partnership programs, self-regulation, codes of conducts, environmental agreements emerged as tools of environmental policy. A number of major companies had already built strong effective systems for managing their environmental activities. Most of them have shown outstanding environmental results with their individual management approach (Sunderland, 1996).

In order to address the growing need for international consensus, the International Organisation for Standardisation (ISO) established the Technical Committee 207 with the responsibility to develop a set of *international standards* in the field of environmental management tools and systems. Known as the ISO 14000 series, these standards affect every aspect of a company's management and of its environmental responsibilities. The ISO 14000 standards help any organisation in addressing environmental issues in a systematic way and thereby should improve its environmental performance.

Embraced by over one hundred countries, adopted by some of the largest multinational corporations in the world, ISO 14000 is considered increasingly as a vital component of the international business community.

Nevertheless, how important could seem the value of "conformance" to such standards and norms, many organisations are still hedging, unsure whether the benefits of implementation are worth their time, resources and attention. Limitations and caveats exist, that can explain reservations of organisations.

Consequently, in order to understand the different points of view related to ISO 14000, our study aims at pointing out how and to what extent investment in ISO14000 certification really helps organisations and *brings in returns*. More precisely, this research investigates which activities are developed by certified companies and which benefits are obtained through ISO 14000 certification.

The paper is developed on the following structure. The research theoretical framework is detailed in Part 2: the ISO 14000 features and requirements are presented first followed by a literature review about the potential costs and benefits associated with ISO certification. The research methodology concludes this second part. The empirical analysis and results

are discussed in Part 3. Finally, the conclusion gives an overview of the principal learning as well as the principal limitations of this research.

2. THEORETICAL FRAMEWORK

ISO 14000 certification is a *management* standard: this standard does not set requirements for environmental compliance nor does establish requirements for specific levels of pollution prevention or performance. It offers a general framework for guiding environmental management but companies are free to formulate their own environmental policies to bring their existing operations into conformance with standards. « *Many organisations engaged in similar activities may have widely different Environmental Management System and performance and may all comply with ISO certification* »[1]. Companies may choose the better-adapted means for achieving their self-defined goals thanks to the flexible implementation process (Stoesser, 1996; Sunderland, 1996; Börkey, 1996; Wallace-Jones, 1998).

This standard proposes a *holistic and systematic* approach, which permits to evaluate all environmental aspects of the business and to foster preventive solutions notably thanks to requirement for periodic audits. Indeed audits permit to identify potential improvements and foster preventive solutions because of becoming aware of inefficiencies. ISO fosters *continual improvement* and environmental *benchmarking* since companies have the possibility to compare their existing system with requirements of the standards and consequently, identify their weaknesses (Sunderland, 1996).

Furthermore, this standard has been written to accommodate diverse geographical, cultural and social conditions. This offers the advantage of facilitating international trade, since ISO is applicable in all countries. Moreover, all organisations from any type (manufacturing, service, governments department) and any size could ask to be certified ISO 14000.

However, the standard involves scepticism from public advocacy groups and the environmental community, which have been largely excluded from participation in the development of the standard. Some environmental groups and consumers often raise the risk of abuse: they do not believe that ISO 14000 would lead to improved environmental protection. Firstly, ISO is a management standard and not a performance standard, this offers the possibility to companies to use ISO certification only as a *public relations tool* without any assurances of environmental benefits (Pringle and Fitzgerald, 1998). Secondly, ISO 14000 does not require sufficient public disclosure of firms' environmental impacts. The level of stakeholder involvement is left to the discretion of the firm and this could be one of the standard drawbacks.

In the following parts, the ISO 14000 requirements will be detailed and the existing literature about the potential benefits and costs associated with ISO 14000 will be summarised. The last part presents our complete research framework as well as our methodology.

2.1. ISO 14000 requirements

ISO 14000 certification requires from companies the fulfilment of different activities that can be summarised by the ten following groups of actions:

- The creation of an *environmental policy*, supported by senior management, which includes a "commitment" to compliance both with environmental laws and with prevention of pollution.
- The identification of all relevant *environmental aspects* that may arise on the site and consequently the declaration of company's primary environmental *objectives* and *targets*, those that can have most environmental impacts.
- The creation of an *Environmental Management System* (EMS) that includes an *Environmental Management Program* (= the plan to achieve specific goals and targets that describes the means to reach those objectives) and that establishes procedures, work instructions, and controls to ensure that implementation of the policy and achievement of targets can become a reality.
- The *implementation and operation* of the EMS (how the program goes in practice, designation of environmental responsible, benchmarking activities…).
- The *internal and external communication* of the environmental policy. The internal communication enables people in the organisation to be aware of their responsibilities, of the environmental impacts of firm's activities and the importance of conforming to the firm's EMS… The external communication enables external stakeholders (community, consumers…) to be aware of the company environmental commitment.
- The *documentation* about environmental issues, about procedures for handling emergencies…
- The *training* provided for workers with potential environmental impacts,
- The *operational control*, which involves the identification of operations and activities, associated with significant environmental aspects and the development of procedures, which minimise the risk of environmental impacts.
- The *checking and corrective actions*: establishing procedures to monitor and measure operations and activities that have significant impact on the environment, establishing and maintaining procedures for preventing the recurrence of non conformance, establishing environmental record-keeping processes and periodic *audits* of the EMS to ensure that it is effective in operations and that the system continues to perform in accordance with relevant regulations and standards.
- The *Management review* of the system to ensure that it is suitable and effective in operations.

These different activities will be investigated in our research in order to evaluate to which degree certified companies implement these 10 different types of activities and which of these activities are prioritised and inversely less emphasised.

2.2. Benefits and costs of ISO 14000 certification

Benefits and costs of ISO 14000 certification are often admitted without proof. Managers and consultants presented them as going without saying. Some authors such as Perry Johnson (1997) argue: '*if you wait for proof that ISO 14000 is vital and effective before getting involved, (...) you will be bypassed and outclassed'*.

However, ISO 14000 certification is often cited by business as viable and efficient alternatives to regulations. Yet in practice, such approach implies for most companies a considerable effort in terms of human, financial and technical resources (Biondi et al., 1998).

Based on literature review, Table 1 presents different potential benefits and costs that managers, consultants and researchers allocate precisely to the ISO 14000 certification or generally to voluntary environmental approaches.

Table 1. Potential costs/benefits of using ISO 14000 certification.

Impacts of ISO 14000 on:	**Positive impacts (authors)**	**Negative impacts (authors)**
PRODUCTION		
Energy consumption	*Reducing* (Sunderland – Patney – Baylis et al.* – Biondi et al. – Belz et al.*)	
Waste management	*Reducing* (Patney – Biondi et al. - Belz et al.*)	
Innovation	*Foster innovative solutions* (Pringle – Biondi et al. – Johnson)	
Productivity	*Increasing due to process controls* (Johnson – Biondi et al.)	
Business interruption - Redesign, rework - Time to market	*Reducing* (Sunderland)	
Organisational and managerial efficiency	*Increasing* (Johnson – Biondi et al. – IISD, Global Green Standards)	
Incidents and liabilities	*Reducing* (IISD, Global Green Standards)	
Monitoring of compliance	*Continuous* (Johnson – Biondi et al.)	
Environmental protection	*Increasing* (Pringle – Kinsella – Biondi et al.)	*No direct impact* (Corbett– Nash*)
MARKETING		
Global market opportunities	*Positive factor* (Patney – Borghini and Vicini– Johnson – Sunderland - IISD, Global Green Standards)	
Competitive advantage	*Gained* (Kinsella - Patney- Belz et al.*)	
Sales	*Increasing* (Johnson - Belz et al.*)	
Marketability of company's products	*Increasing* (Johnson - Belz et al.*)	
Corporate image and goodwill	*Increasing* (Stoesser–Pringle – Kinsella – Patney – Gleckman and Krut – Sunderland – Johnson – Biondi et al. - Belz et al.*- IISD, Global Green Standards)	
Internal and external transparency	*Increasing* (Gelber et al.*)	*Lack of transparency* (Wallace-Jones*)
FINANCE		
Costs in operating and materials	*Costs savings* (Johnson – Börkey* and Nadaï*– Sunderland – Patney – Biondi et al. – Belz et al.*)	*Increasing* (Baylis* – Walley* and Whitehead* - Biondi et al.)
Costs due to the level of formality / Documents / Bureaucracy		*Important costs* (Sunderland – Patney- Biondi et al.)
Resale value of company's property assets	*Better resale value* (Pringle)	
Level of risks (due to multiple and conflicting environmental regulations)	*Minimisation* (Gelber et al.* – Sunderland - Belz et al.*)	
Barriers to international trade	*Reducing* (Pringle – Kinsella – Johnson)	
Environmental liabilities	*Minimisation* (Sunderland – Gleckman and Krut – Johnson – Belz et al.*)	

Prescriptive regulations and regulatory burdens	*Reducing* (Sunderland – Pringle – Patney[2])	
Profitability	*Increasing* (Johnson)	
Insurance premiums	*Lower* (Sunderland – Pringle – Patney – Kinsella – Johnson - Belz et al.*)	
Access to financial capital	*Facilitate qualifying for business loans* (Pringle – Patney – Johnson – Belz et al.*)	
Short-term profits		*Decreasing (*Belz and Strannegard*[3])
Long-term profits	*Increasing* (Belz et al.*)	
Financial incentives from governments	*Increasing* (Sunderland)	
SOCIAL COMMITMENT		
Employee awareness about environment, their initiatives or suggestions.	*Increasing* (Baylis et al.* – Johnson)	
The way employees perform their tasks	*More correct and efficient way* (Biondi et al. – Belz et al.*)	
Employee turnover	*Reducing* (Johnson)	
Employee recruitment	*Facilitate* (Johnson)	
Credibility among stakeholders and stakeholders confidence	*Increasing* (Borghini and Vicini – Johnson)	Conditions to be credible (Sunderland[4] – Pringle[5])
Co-operation among business, environmentalists, public and/or regulators	*Better* (Johnson – Sunderland – Gleckman and Krut – Biondi et al. – Belz et al.*)	

* These authors describe benefits and costs of utilisation of voluntary approaches in environmental area. They do not point out the particular effects of ISO 14000 certification.

As shown in Table 1, most of the authors conclude to positive impacts of ISO 14000 certification on business performance. However, a few points lead to controversies such as the ISO 14000 influence on costs and on environmental protection.

The effect of certification on costs is not so evident and it will be interesting to see the results of our research on this topic. Indeed, managers may expect cost savings (energy savings, higher productivity; Sunderland, 1996; Johnson, 1997) but the ISO 14000 certification brings also additional costs due to:

- the administrative and financial burdens (keeping updated documentation, writing detailed procedures, training employees who perform tasks with important environmental impacts…),
- the necessary in-depth analysis of the company itself (internal audits). In general, managers do not have the time and the technical resources to carry out such analysis and rely on costly outside assistance,
- the technological measures that have to be taken for guaranteeing the improvement of environmental performance (Biondi et al., 1998)…

In the same way, a lot of managers, researchers and consultants recommend the ISO 14000 certification as a means for achieving environmental protection and reducing pollution (e.g., Corbett and Kirsch, 1999), but some other researchers, environmental groups and consumers doubt it. Jennifer Nash (1998) for instance conducted a study to assess firm environmental performance over time and the impact of adoption of Responsible Care programs on environmental performance. She found evidence that firms that participate in Responsible Care are improving their relative environmental performance more slowly

than non-members. This quite amazing result should be tested in the case of ISO 14000 certification.

After this literature review, it seems obvious that there is a clear need for careful evaluation of how ISO 14000 certification does influence business performance. That's why this research will investigate costs and benefits of that certification.

2.3. Empirical research methodology

The measurement instrument is a standardised *questionnaire* to be mailed to a sample of certified organisations in 4 Asian countries (Hong Kong, Malaysia, Singapore, and Thailand) and 8 European countries (Belgium, France, UK, Germany, Norway, Sweden, Italy, and Spain). The questionnaire written in English consists of 75 items and is divided into 2 parts.

The first part of our questionnaire (Question 1 → 49) includes items concerning activities undertaken by certified companies in the environmental area. These different activities are regrouped in 10 categories that are briefly presented in Table 2 and inspired from the structure of the ISO 14000 certification. The objective of this first part is to highlight which of these groups of activities are emphasised by certified companies, and if differences exist among countries.

Table 2: Description of the different aspects that will be measured in the first part of the questionnaire.

PARTS OF THE QUESTIONNAIRE	ASPECTS TO MEASURE
The Environmental policy Question 1 → 6	• Commitment to compliance with applicable laws and to continual improvement, • Integration of environmental management in business strategy, • Effort to external communication.
The planning: - Environmental aspects - Objectives and targets Q 7 → 10	• Identify environmental aspects of activities with environmental implications that can be controlled or influenced by the company, • Derive objectives and targets consistent with environmental policy, • Consider legal and other requirements, the views of interested parties…
Environmental Management system Q 11 → 20	• Designation of responsibilities at each level of the organisation, • Means (time, budget) and timeframe to achieve objectives.
Implementation and operation Q 21 → 24	• Resources essential to the implementation and control of the EMS (human resources, technology, financial resources, time), • Frequency of reports on EMS performance to top management.
Training Q 25 → 28	• Determine the level of experience, competence and training necessary, • Train employee about the importance of conforming to the environmental policy and its procedures.
Communication Q 29 → 35	• Internal communication, • External communication with interested parties.
Documentation Q 36 → 38	• Describe procedures, instructions, emergency responses, • Documents' availability and location and periodically reviewed.
Operational control Q 39 → 44	• Procedures to minimise the risk of environmental impacts, • Stipulation of environmental criteria for the operational process, • Communication of procedures and requirements to suppliers and contractors.
Checking and corrective action Q 45 → 48	• Measures and controls, audits, • Detection of non-conformances, • Corrective and preventive actions.
Review and implementation Q 49	• Frequency of top management review.

The second part of the questionnaire (Question 50 → 76) has the objective to evaluate the economic and environmental results obtained by companies thanks to the environmental certification. We want to give some better arguments to companies that desire to get involved in the certification process. It is not sufficient to say "*Eco-Efficient companies are better managed companies and better managed companies are the most successful*" (Johnson, 1997). Impacts of ISO 14000 certification on companies' production (Q? 50 → 56: increased efficiency, reducing waste…), finance (Q? 64 → 67: costs saving, increased profits…), marketing (Q? 57 → 63: corporate image, consumers satisfaction…) and social commitment (Q? 68 → 75: preserve environment, stakeholders' satisfaction…) will be identified and measured.

Figure 1 summarises our complete research framework, including the possible activities put into place by companies due to certification and the potential impacts of the certification on four dimensions of business performance (production, finance, marketing and social commitment).

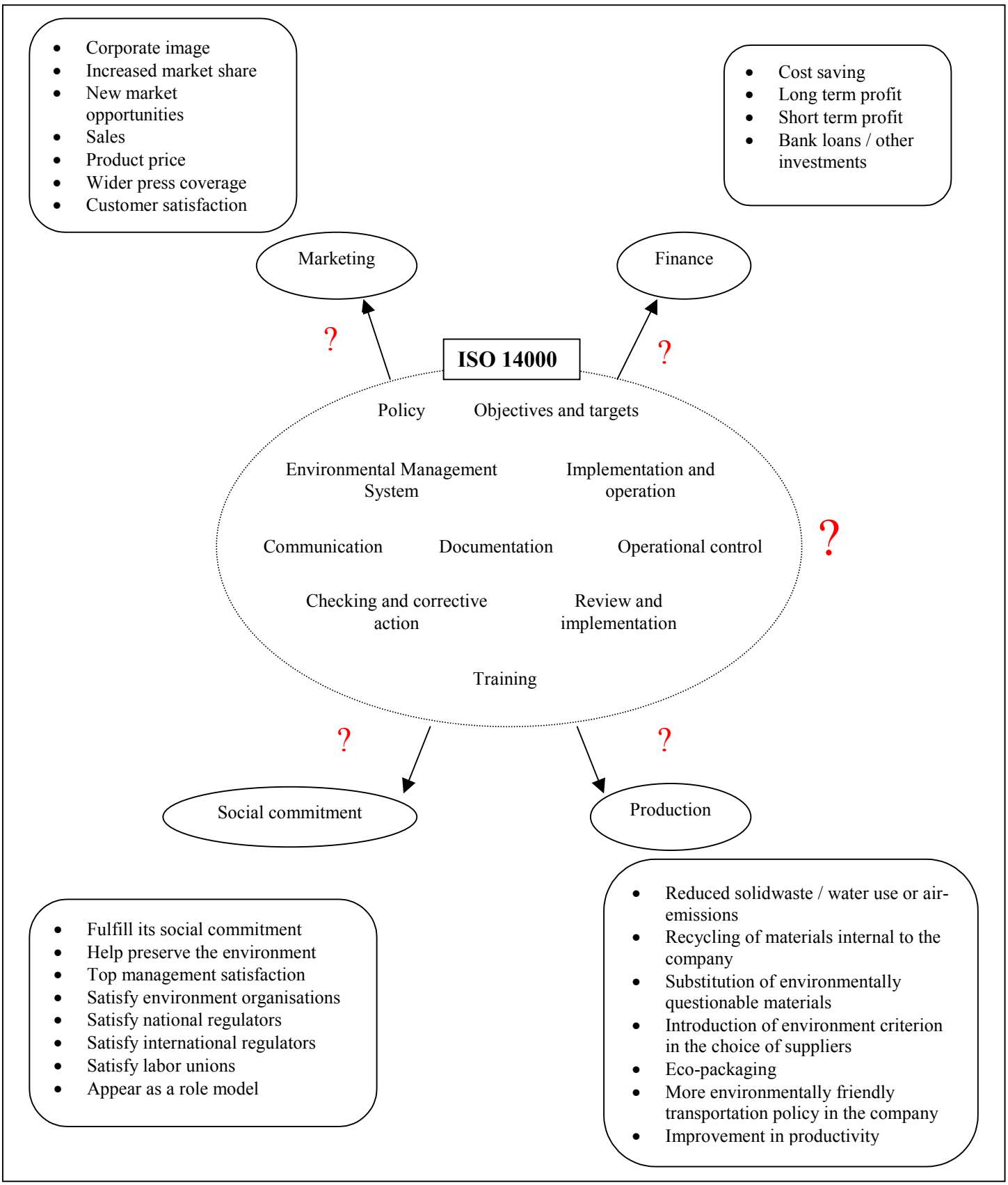

Figure 1: Our complete research framework

Managers of certified companies have to give their degree of agreement with proposed items (see appendix for the complete questionnaire) on a 4-point Likert Scale (strongly agree, agree, disagree, strongly disagree). This scale offers the opportunity for each respondent to give his opinion about the item. Moreover, as we intend to develop international comparisons, this is necessary to formulate each question to be well understood by each respondent from each region. Due to this, we decided to use this 4-point scale.

Data analysis has been developed with SPSS. Usual univariate and bivariate statistical procedure have been used. Descriptive analysis gives an overview of the sample answers; principal component analysis permits to identify factors that summarise information contained in the questionnaire; correlation analysis and regression analysis are used in order to analyse the potential relation existing between activities put into practice and results obtained.

3. RESULTS AND DISCUSSION

A total of 295 usable questionnaires were returned. Table 3 describes the sample composition.

Table 3: Number of responses in each country.

Countries	Number of responses
Hong Kong	18
Malaysia	44
Singapore	28
Thailand	36
Belgium	6
France	25
UK	60
Germany	45
Norway	20
Sweden	21
Italy	8
Spain	14
Total	**295**

Globally, Asian and European business answer to the set of questions with a similar pattern: no statistical differences appeared between Asian and European businesses[6]. The distributions of responses are very similar: answers are concentrated around the « Agree » and « Strongly Agree » options in each part of the questionnaire.

For the first part of the questionnaire (concerning the activities put into place by certified companies), to some extent it is not surprising that companies present a minimum of activeness: since they are all ISO-certified, they adopt comparable « behaviours ».

For the second part of the questionnaire (benefits of ISO 14000 certification), all the respondents consider ISO 14000 certification as a worthwhile investment with a lot of benefits in the 4 dimensions investigated (finance, marketing, production and social commitment).

If our survey could lead to interpret that the respondents are quite active in terms of Environmental Management Systems, and that they seem to perceive positive consequences of the ISO 14000 certification, we have to keep in mind a potential bias due to the administration procedure. As usual in such a survey with self selection of the respondents and perceptions that cannot be verified, we should avoid to generalise "overestimated" results".

Indeed, the population is quite homogeneous (certified companies only), companies that could have "bad" results of ISO 14000 certification maybe refrained to send the questionnaire back (autoselection bias) and due to "social desirability" in such topics, respondents can provide "better" answer, "nicer" view than the real case - that we cannot check -.

The following pages will deepen general conclusions we just give above. The activities put into place by certified companies will be first analysed; perceived costs and results of certification then will be investigated. The potential differences among countries are highlighted each time possible. Finally, relations between activities put into practice and results obtained by companies through ISO certification will be identified, in order to determine which activities lead to which results.

3.1. Analysis of the first part of the questionnaire : activities put into place by certified companies

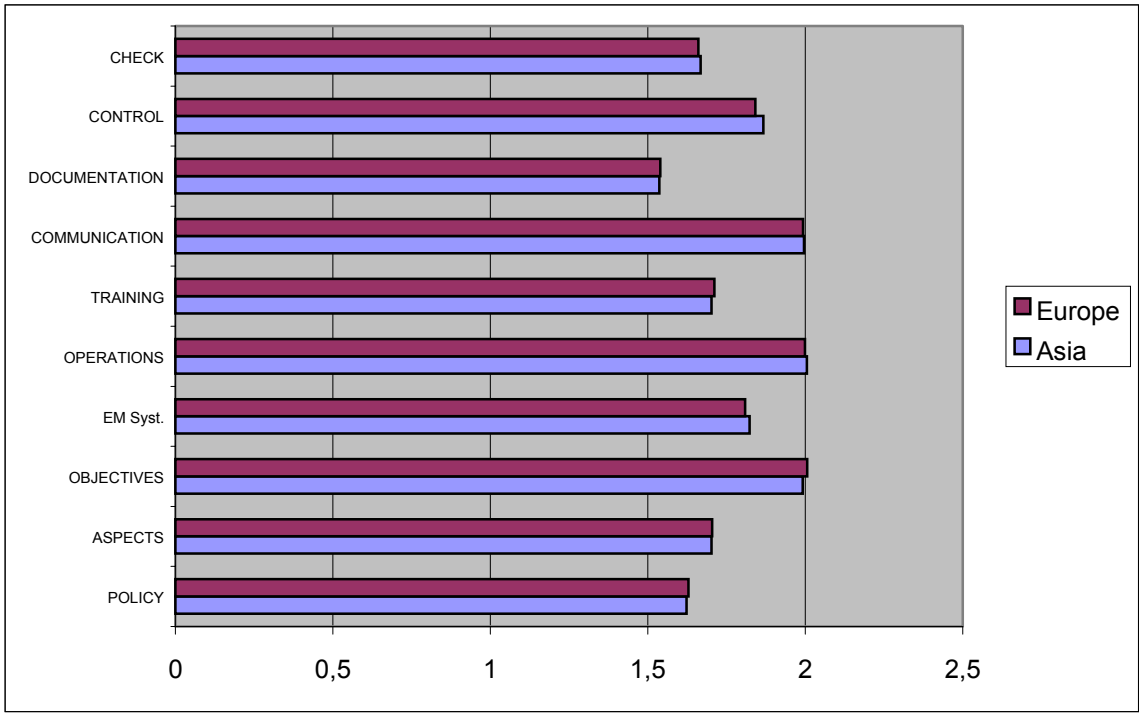

Figure 2: Average degree of agreement with the implementation of the 10 activities presented in the questionnaire (1 = strongly agree, 2 = Agree).

Figure 2 presents the average responses given by companies about the 10 groups of activities that can be undertaken parallel to ISO certification. The used grouping procedure

is to consider for each respondent the average of the answers he had given to the questions linked to the group.

Average measures are all in the area of agreement located between the alternative Strongly Agree and Agree. All these reflect a "positive" perception or evaluation, but we will enhance the differences.

The "ranking" of priorities is quite similar in Asian and European businesses. Operational control activities seem not to be the priorities given by the companies. In the same way, objectives, targets and communication are not so well developed. These are the last "activities" wherein the company "spend some time or energy or money". On the contrary, the companies are more involved in documentation, environmental policy and checking and corrective actions.

Further analysis has been done through principal component analysis with VARIMAX rotation. That permits to identify factors that summarise information contained in the 49 first items of our questionnaire. Results of this analysis is a two factors structure that explains 67% of the variance both in Asia and in Europe (Table 4).

Table 4: Principal component analysis on the first part of the questionnaire (activities)

Activities	**Globally**		**Asia**		**Europe**	
	Factor 1	Factor 2	Factor 1	Factor 2	Factor 1	Factor 2
Policy	0.471	**0.517**	0.467	**0.528**	0.475	**0.507**
Aspects	0.429	**0.682**	0.459	**0.656**	0.408	**0.699**
Objectives	0.162	**0.953**	0.168	**0.953**	0.159	**0.953**
EMS	**0.687**	0.425	**0.69**	0.413	**0.686**	0.433
Operational control	**0.784**	0.189	**0.79**	0.204	**0.779**	0.177
Training	**0.754**	0.37	**0.765**	0.365	**0.746**	0.374
Communication	**0.742**	0.242	**0.751**	0.233	**0.735**	0.248
Documentation	**0.763**	0.253	**0.747**	0.274	**0.774**	0.238
Control	**0.689**	0.36	**0.682**	0.348	**0.695**	0.369
Checking and corrective actions	**0.825**	0.292	**0.824**	0.293	**0.826**	0.291
α Cronbach	0.9126	0.7598	0.9134	0.7605	0.9121	0.7593
% of variance explained	43.744%	23.314%	44.1%	22.982%	43.544%	23.525%
Total variance explained	**67.058%**		**67.082%**		**67.069%**	

The first factor that explains 44% of variance is highly correlated with OPERATIONAL ACTIVITIES put into place after the strategy design, such as activities of documentation, training, nomination of environmental responsible, planning...

The second factor is much more related to STRATEGIC ACTIVITIES such as the establishment of company's environmental objectives, the evaluation of company impacts on the environment, the engagement to respect all environmental regulations…

At the global level, region level and country level, no statistical difference has been detected: the underlying factors are the same, explaining nearly the same portion of variance[7].

3.2. Analysis of the second part of the questionnaire : business performance

Differences between Europe and Asia and differences between perceived consequences are very small, as illustrated in Table 5. However benefits in the social commitment dimension seem to be slightly better than in the production, marketing and finance dimensions. This can be explained partly by the fact that ISO 14000 certification gives more social and positive visibility to the certified company and then has more influence on the social commitment indicators than on other dimensions. The lower level of agreement is on the financial dimension, maybe because a longer time horizon is necessary for managers to evaluate financial effects of certification.

Table 5: ISO 14000 impacts on the 4 dimensions of business performance
(From 1 = strongly agree to 4 = strongly disagree)

	In Europe, responses centred around :	**In Asia, responses centred around :**
Production	1.91	1.92
Marketing	1.88	1.89
Finance	1.98	2.01
Social commitment	1.57	1.57

Principal component analysis with VARIMAX rotation has been done on the 26 items about costs and benefits associated with ISO certification. As we identify theoretically four underlying factors (social, marketing, production and finance factors), we force SPSS to keep a four-factor structure. Results of this analysis are presented in Table 6.

Table 6: Principal component analysis on the second part of the questionnaire (benefits)

Items	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**
PRODUCTION				
Process Optimisation to reduce waste and air emissions	0.319	0.244	**0.543**	0.110
Internal recycling	0.087	0.16	**0.743**	0.196
Substitution of environmentally questionable materials	0.263	0.262	**0.414**	0.262
Environmental criterion in choice of suppliers	0.067	0.368	0.264	**0.623**
Eco-packaging	-0.079	-0.012	0.531	**0.557**
Environmentally-friendly transportation	0.169	0.239	0.038	**0.779**
Improvement in productivity	0.026	**0.457**	0.168	0.306
MARKETING				
Corporate image	**0.482**	**0.423**	0.14	-0.094
Increase in market shares	0.109	**0.896**	0.026	0.152
New market opportunities	0.074	**0.869**	0.027	0.111
Sales	0.081	**0.850**	0.142	0.145
Product price	0.182	**0.681**	0.16	0.345
Wider press coverage	0.209	**0.494**	0.133	0.176
Customer satisfaction	0.253	**0.675**	0.198	0.053
FINANCE				
Cost saving	**0.548**	0.136	**0.484**	0.024
Long term profit	0.443	0.34	**0.527**	0.045
Short term profit	0.368	0.033	**0.654**	-0.008
Bank loans and other investments	0.245	0.207	0.058	**0.584**
SOCIAL COMMITMENT				
Fulfil its social commitment	**0.626**	0.109	0.248	0.079

Helps preserve the environment	**0.727**	0.016	0.184	0.107
Top management satisfaction	**0.715**	0.086	0.259	-0.009
Satisfy environmental organisations	**0.762**	0.001	0.181	0.232
Satisfy national regulators	**0.794**	0.135	0.061	0.175
Satisfy international regulators	**0.762**	0.171	0.167	0.118
Satisfy labour unions	**0.631**	0.316	-0.017	0.384
Appear as a role model	**0.735**	0.263	0.013	-0.001
α Cronbach	0.9002	0.8828	0.7434	0.6939
% of variance explained	21.039%	17.662%	10.365%	9.012%
Total variance explained	**58.078%**			

The two first factors that explained the biggest part of the variance represent respectively the social and marketing dimensions, nearly with all the items theoretically chosen in the questionnaire design for these two dimensions.

The two last factors are more difficult to interpret: they represent a mix of items theoretically linked to the production dimension and to the financial dimension of business performance.

As for the previous principal component analysis, no statistical difference appeared between regions and between countries.

3.3. Correlations between activities put into practice and business performance

Table 7 gives the correlation matrix between the 10 groups of activities investigated in the questionnaire and the 4 dimensions of business performance.

Table 7: Correlation's between actions and results

ACTIVITIES	ASIA				EUROPE			
	PRODUCT.	MARK.	FINANCE	SOCIAL	PRODUCT.	MARK.	FINANCE	SOCIAL
POLICY	0,493	0,278	0,305	0,436	0,477	0,273	0,328	0,433
ASPECTS	**0,566**	0,301	0,280	0,410	**0,561**	0,328	0,294	0,409
OBJECTIVES	0,478	0,328	0,242	0,316	0,476	0,302	0,236	0,308
EMS	**0,571**	0,290	0,431	0,496	**0,587**	0,345	0,466	**0,526**
OPERATION	0,487	0,317	0,351	0,466	0,474	0,338	0,357	0,472
TRAINING	**0,641**	0,424	0,416	**0,549**	**0,659**	0,441	0,428	0,532
COMMUNIC	**0,573**	0,449	0,424	0,471	**0,572**	0,461	0,470	0,488
DOCUMENT.	**0,508**	0,382	0,421	**0,548**	0,499	0,387	0,412	**0,531**
CONTROL	**0,709**	**0,560**	**0,526**	**0,504**	**0,706**	**0,569**	**0,539**	**0,506**
CHECK	**0,647**	0,411	0,484	**0,563**	**0,658**	0,454	**0,503**	**0,576**

All these correlations are significative and positive and they are really comparable between Asia and Europe. Without any causal assumption, we can say that « the higher the activity, the higher the results ».

Correlations are higher for the production and the social dimensions of business performance than for marketing and finance. This can be explained by the fact that the effects of activities undertaken by companies to be certified are internally directly observed (clear effect on production) and externally visible (clear effect on social dimension). Conversely, consequences on marketing and financial results could need longer time to be identified and are maybe less evident to be observed by the respondents.

Table 8 presents the links that have been statistically established between elements of environmental actions and management, and consequences of ISO 14000 certification on business performance. The figures given in the Table 7 are the estimated coefficients for the linear relation between the "result" indicator and the activities mentioned in the same cells.

Table 8: Statistical links between activities and benefits

	Asia + Europe	Asia	Europe
Social	Documentation 0.1518		
Finance	EMS 0.18 Communication 0.16 Control 0.36	Control 0.367	Control 0.354
Marketing	EMS 0.25 Communication 0.29 Control 0.49	EMS 0.328 Communication 0.32	Communication 0.27 Control 0.47
Production	Aspects 0.09 Training 0.17 Control 0.32		Training 0.2 Check 0.18

All the coefficients are positive which means, "the more the company is involved in action or active, the best result the respondent observes in the business dimension". Let's analyse each business performance dimension separately:

Social commitment: On the global level[8], the development of documentation (on waste, on environmental management procedures and on specific procedures helps for social commitment) is related to the social dimension of performance. In fact, documentation provides information to the different stakeholders (internal and external) and these can become more satisfied.

Finance: Being active in EMS will conduct to positive financial results. This can be combined for still better financial results with communication and control activities. The most influencing element here is the operational control and its components. In Asia and Europe, only this element influences the financial results.

Marketing: EMS activities seem to have positive consequences on marketing. Communication is of course a tool for enhancing marketing specifications and operational control activities have the "highest" level of influence. Communication influence on marketing results is observed in Asia and Europe. The Asian and European specificities are seen through the fact that in Asia, still the EMS activities are seen as influencing positively the marketing results but developing the operational control does not seem to get an impact

on marketing. This is the contrary in Europe, where operational control is active on marketing and where EMS does not seem to have any influence.

Production: Taking into consideration environmental aspects for the identification of environmental costs and setting objectives and targets for improvement of the use of resources and for the generation of waste leads to significant results in operations. This is also confirmed when combining with training and operation control. Those influences do not appear in Asian countries and checking and corrective actions appear to provide positive influence in European countries.

4. CONCLUSION

In the context of international activities of the organisations and in the spirit of global status of the environment, we developed an international comparative analysis, pointing out how and to what extent investment in ISO 14000 certification really helps the organisations and brings in returns. This international analysis differs from most of existing studies that have been realised in a very limited scope (regional or national) with companies from specific sectors of activities (chemicals, electric utility…).

Essentially empirical, the research was conducted through questionnaires that have been mailed to a sample of certified companies from Asian and European countries. Ten groups of activities undertaken by certified companies have been analysed as well as four business performance dimensions in order to evaluate the potential impacts of ISO 14000 certification on organisations.

Before drawing conclusions from this analysis, let's remind the limits of this empirical study.

4.1. Limitations

This research has to be considered as exploratory with all the limitations of an exploratory process.

The target population is made of certified companies. Due to that, we can expect to have quite *homogeneous responses*, at least in the first part of the questionnaire.

The questionnaire was based on *perceptions and opinions:* the validity cannot be checked, we have to put trust in respondents. However, especially in such a topic, respondents would avoid giving bad image of their company and the bias of "*better estimation*" can be important.

Concerning the consequences of the ISO 14000 certification on business dimensions, some respondents could answer due to their *experience*, other could have answered on *future expectations*. This could give a very different image of ISO 14000 impacts on performance.

Furthermore, the sample has been constituted with the questionnaires that came back. The respondents' auto-selection can lead to bias.

4.2. Learnings

First of all, we detected very little sources of differences between countries. Concerning the questions related to the involvement of companies to the ISO 14000 process (first part of the questionnaire), since the companies of the sample are all certified, they have to meet the basic requirements of ISO 14000, becoming homogeneous. Also in the impacts of certification on the business dimensions (second part of the questionnaire), no specificity has been identified through the analysis in the different countries.

Linking "actions" and "results", only positive relations have been found. What can be the dimension, ISO 14000 certification provides or will provide results, leading to business performance. This link is higher in Production and Social dimensions. On one hand, the effect on the production results can be understood by the fact that being certified requires some environmental actions to the firm. A short-term view of these actions is in the production area. On the other hand, the effect on the social aspect can be explained by the fact that communication and information around the company environmental performance leads to stakeholders' satisfaction.

In Asia as in Europe, actions related to documentation and environmental policy design are priority, but the operational control, the definition of objectives and targets and communication are not so much developed[9].

Finally, we could propose a simple linear model linking the business results dimensions to the "environmental actions" developed by the company. This model is a first step for further investigation but at this level of information we observe that:

- Documentation has a positive impact in social commitment of the company. This is relevant as through actions of documentation, the company fulfils its social commitment, satisfying its stakeholders.
- Actions and characteristics related to Environmental Management System, actions of communication and operational control both lead to enhancement of financial and marketing results. The operational control has the highest impact in this relation. It seems natural that operational control that optimises material consumption, purchase, organises benchmarks, … has influence on costs and profits, increase sales, provides new markets opportunities, …
- Training, operational control and analysis of environmental aspects have positive influence in the production area. Again, these relations are not surprising; these actions being quite technical could have influence in production.
- In Asia and in Europe, operational control improves financial results and communication is important for improving marketing.
- Some differences appeared between Asia and Europe, in terms of factors of influences: no model could be proposed for explanation of social commitment; marketing results seem to be influenced by EMS activities and not by operational control in Asian business but this is the contrary in European business; production results could not be modelled in Asia but in Europe, training and checking and corrective actions are of influence.

This empirical analysis on the consequences of ISO 14000 certification on business performance gave some first insights for the equation: "better environmental management

will lead to better environmental performance, increased efficiency and a greater return on investment".

4.3. Directions for future research

In a next step, we plan to administrate and adapt the questionnaire to non certified companies in order to get a control sample, providing more variability in the sample and materials to infirm or confirm authors (e.g., Nash, 1998) who claim that certified companies improve their environmental performance more slowly than non certified companies.

ACKNOWLEDGEMENTS

The questionnaire was designed by Professor Purba Rao and Professor Burt Hamner from the Asian Institute of Management (AIM, Manila, The Philippines).
The data collection in Asia has been done thanks to the collaboration of the Regional Institute of Environmental Technology (RIET, Singapore).
We also want to acknowledge Hong Kong productivity Council for their assistance for the survey conducted in Hong Kong.

NOTES

[1] http://www.quality.co.uk/quality/ISO14000.html
[2] Government will inspect less frequently certified operating units.
[3] According to Belz, Srannegard et al. (1997), there is a neutrally or slightly negative correlation between environmental initiatives and short-term profits.
[4] It depends on the credibility of the certification process and of the certifiers.
[5] It depends on the level of stakeholders' involvement in the process.
[6] No statistical difference at level 5%, for the different tests that have been developed.
[7] This can be due to the sample low variability (since all companies are certified and have to respond to the same ISO requirements about activities to put into place).
[8] No specific influence appeared in Asia and in Europe.
[9] These comments are given for a marginal level.

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APPENDIX : Research questionnaire.

Policy	R23: EMS reports include the amounts of energy and water used, the waste being generated by the company, and the resulting costs.
R1: Our environmental policy addresses specific impacts of our activities (air/water pollution, solid waste, product impacts, etc).	**Training**
R2: Our environmental policy is focused on preventing pollution at the source through better operating practices, and not just on treating wastes to comply with government standards.	R25: Employees are trained to be competent in the best environmental practices appropriate for their positions (production, accounting, marketing, design, etc.)
R3: We are committed to compliance with the most stringent standards of all the countries in which we operate, not just to the local standard**s.**	R26: Employees are encouraged to stay up-to-date on the best environmental practices in their professions through professional associations, trade journals, meetings, etc.
R4: Our framework for setting and reviewing environmental objectives and targets is integrated with our setting of business objectives and targets.	R27: Training includes methods for analysing processes and identifying opportunities for improvement.
R5: We are particularly focused on communicating our environmental policy to our workers whose operations have some environmental impact.	R28: All employees have at least basic training in the concepts of environmental management.
R6: We make an active effort to communicate our environmental policy to public groups that are concerned about our environmental performance.	**Communication**
Environmental aspects	R29: Employees meet regularly to discuss environmental performance.
R7: Our system to identify environmental aspects includes identification of environmental costs created by our environmental impacts.	R30: Environmental accomplishments are publicised within the company.
R8: We set objectives and targets for improving our production and service processes to reduce the use of resources and the generation of wastes.	R31: Awards are given for good environmental performance.
Objectives and targets	R32: We publish a public report on our environmental performance.
R9: We set objectives and targets for improving the environmental design of our products.	R33: We maintain regular contact with various environmental management organisations.
R10: We set objectives and targets to improve our measurement of environmental costs.	R34: We subscribe to environmental management publications.
Environmental Management System	R35: We maintain a positive environmental relationship with external groups such as the community and the government.
R11: The environmental management program is a well-defined and widely recognised program in our company.	**Documentation**
R12: The environmental management program is comprehensive, covering our suppliers, production, products, and waste management.	R36: We maintain documentation that describes where, when and how much waste is generated from our processes.
R13: We know about and use the services of environmental management assistance organisations.	R37: Documentation of environmental management procedures is easily available to all employees.
R14: Environmental performance is a specific responsibility of a senior executive.	R38: Documentation of specific environmental procedures is located at the specific processes where the environmental problems (like waste or toxic chemical use) occur.
R15: Environmental performance is included in job performance evaluations of all employees whose work has or could have a significant impact on the environment.	**Operational control**
R16: Each major function of the company (production, accounting, marketing, etc.) has someone who knows about environmental aspects of that particular function.	R39: We have specific criteria for how much water and other materials should be used for each step in our processes.
R17: Someone in the company has the specific responsibility of staying up to date on environmental management issues and methods.	R40: There are benchmarks for process environmental performance that we try to constantly improve or exceed.
R18: We include environmental management as a specific item in our budget planning.	R41: Our purchasing department applies environmental criteria when considering new purchases.
R19: We plan ahead for at least two years in environmental management.	R42: We inform our suppliers about our environmental goals and ask them to provide more environmentally friendly products.
R20: Staff is given adequate time to do their environmental tasks; these tasks are not just added onto what they are already doing.	R43: We evaluate our suppliers' environmental performance.
Implementation and operation	R44: Contractors who work for us must comply with environmental protection requirements.
R21: Environmental management is a regular item on the agenda for top management committee meetings.	**Checking and corrective action**
R22: EMS performance is reported to top management at least every quarter.	R45: We measure our use of natural resources and generation of wastes in the production processes, not just at the end of the discharge pipe.

R46: We know how much our wastes cost us.	V12: Product price.
R47: When things go wrong or do not meet our expectations, we have a formal problem-solving approach to ensuring it does not happen again.	V13: Wider press coverage.
R48: Our environmental management system audit looks at the reasons why pollution is created, as well as the way we manage it.	V14: Customer satisfaction.
Review and implementation	**Finance**
R49: Top management regularly reviews our environmental performance and includes it in planning for the future.	V15: Cost saving.
Production	V16: Long term profit.
V1: Significant optimisation of processes to reduce solid waste/water use or air-emissions.	V17: Short term profit.
V2: Recycling of materials internal to the company.	V18: Bank loans/other investment.
V3: Substantial substitution of environmentally questionable materials.	**Social commitment**
V4: The introduction of environment criterion as a significant factor in the choice of suppliers.	V19: Fulfil its social commitment.
V5: Eco-packaging concept in the company.	V20: Help preserve the environment.
V6: A change for more environmentally friendly transportation policy in the company.	V21: Top management satisfaction.
V7: Improvement in productivity.	V22: Satisfy environment organisations.
Marketing	V23: Satisfy national regulators.
V8: Corporate image.	V24: Satisfy international regulators.
V9: Increased market share.	V25: Satisfy labour unions.
V10: New market opportunities.	V26: Appear as a role model.
V11: Sales.	