Quality Scoreboard: a proposal

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Abstract

Purpose: The assessment of "macroquality" or the assessment of the degree to which the quality practices are implemented in a country or a region should not be only based on "tangible" indicators such as the number of certified companies according to the ISO 9001 or ISO 14001 standards, or others. By adopting only these two indicators (or similar ones) a large amount of companies, those ones that are not certified, are not considered when assessing the "macroquality". Less tangible features, such as the number of persons trained in quality management or the number of members of quality management associations among other features, contribute themselves and seem appropriate to assess the level of "macroquality". This paper intends to report a "macroquality" index that is composed by tangible and less tangible features, concerning the quality practices implementation concept- The Quality Scoreboard.

Design/methodology/approach: An expert's panel was conducted with the aim of evaluating a set of several indicators that could be used to assess and to monitor the "macroquality" level of a country. Nine tangible indicators were proposed and been analysed by the experts' panel according to an importance scale (1 to 5). Additionally, the experts were encouraged to propose other indicators that could reflect the quality state-of-the-art of a country or region.

Findings: Experts find that tangible indicators are not enough to express the level of "macroquality". According to the results, less tangible features should be considered too. A total of 43 indicators were suggested by the experts. Among them, the following suggested indicators should be highlighted: the number of persons trained in quality management, the number of members of quality management associations, the number of quality related courses at the universities and the number of certified auditors. Based on the survey results a Quality Scoreboard was developed.

Originality/value: As far as we were able to find out this is the first attempt to develop a Quality Scoreboard, as it had been already done to innovation. This new approach allows one to characterize the quality state-of-the-art of a region, based on a set of potential "quality indicators". Furthermore, the results provide an additional important contribution to the worldwide study of quality approaches diffusion and evolution.

Keywords: Macroquality, Scoreboard, Indicators

INTRODUCTION

Some concepts are intrinsically and inherently difficult to evaluate. This fact relates to the identification and the number of variables involved, to the lack of data concerning some variables, to scarce information concerning the relationships between them and to the relative weighing to be ascertained and ascribed to each variable. Among such concepts one may consider happiness, innovation, cleverness, quality of live and "macroquality".

Some tools have been developed, recently, to assess "macroquality" such as the I9S proposed by Sampaio *et al.* (2014). This tool is focused on the evolution and dissemination of ISO 9001 certified companies considering data from the current year and the last two previous years. A tool enabling the assessment of "macroquality" of a country or region enables benchmarking between the evaluated countries allowing the identification of features that impact on global quality. This tool should consider features concerning the actual "macroquality" and features that consider the roots of potential future "macroquality". Furthermore, all agents or players involved in quality practices should be present in that tool. No such embracing instrument, considering so many variables and features had been reported as of our days.

The initial attempts aiming at the assessment of the degree of quality of countries have been mainly performed by studying the diffusion of ISO 9000 certifications. On this matter one should mentioned the work developed by Franceschini *et al.* (2006) and Sampaio *et al.* (2009). Other studies, based on a similar methodology, focused on the ISO 14000 certifications diffusion (Corbett and Kirsh, 2001). These studies provided the authors with the data to develop forecasting models of the standards certifications diffusion as reported by Franceschini *et al.* (2004), Marimon *et al.* (2009) and Sampaio *et al.* (2011).

These methodologies were later found to be narrow approaches to evaluate the real "macroquality" concept since they do not consider other features than those concerning the certification of organizations. By one side, the adoption and certification by an organization of the ISO 9001 standard does not assure the quality of the products or services provided. The certification only assures that a peculiar organization is able to achieve the intended degree of quality fulfilling the customers' expectations and specifications. On the other side, a country or region is not solely the sum of the organizations within. Concerning the "macroquality" concept the organizations are just the "end product" and a set of aspects *a priori* should be considered.

The Innovation Union Scoreboard (IUS), previously known as the European Innovation Scoreboard, is an indicator aiming at the assessment of an equally notorious concept difficult to evaluate: the degree of innovation achieved by a country (IUS, 2014). This Scoreboard considers axes, dimensions and indicators to monitor the innovation between the European countries. The European Quality Scoreboard, reported in the current paper, adopts the same methodology and philosophy underlying the IUS.

MATERIALS AND METHODS

An expert's panel was conducted with the aim of evaluating a set of several indicators that could be used to assess and to monitor the "macroquality" level of a country. Nine tangible indicators were proposed and had been analysed by the experts' panel according to an importance scale (1- "Less important" to 5- "Most important"). Additionally, the experts were encouraged to propose other indicators that could reflect the quality state-of-the-art of a country or region. The assessed indicators are presented by Table 1.

Table 1: Assessed indicators by the experts group.

Indicator ID	Indicator
Indicator 1	Number of ISO 9001 certificates/1000 inhabitants
Indicator 2	Number of ISO 14001 certificates/1000 inhabitants
Indicator 3	Number of OHSAS 18001 certificates/1000 inhabitants
Indicator 4	Number of members of the national quality association
Indicator 5	Number of accredited laboratories/1000 inhabitants

Indicator 6	Number of persons with training in quality/1000 inhabitants
Indicator 7	Number of certified products
Indicator 8	ISO 9001 European Scoreboard
Indicator 9	Number of EFQM finalists prize and award winners

IBM SPSS version 21 was the software adopted to perform data analysis.

RESULTS AND DISCUSSION

Experts find that tangible indicators are not enough to express the level of "macroquality". According to the results, less tangible features should be considered too. A total of 43 indicators were suggested by the experts. Among them, the following suggested indicators should be highlighted: the number of persons trained in quality management, the number of members of quality management associations, the number of quality related courses at the universities and the number of certified auditors. Based on the survey results a Quality Scoreboard was developed. Table 2 summarizes the results achieved by each surveyed indicator. A total of 25 experts answered the questionnaire and 56% of them did proposed other indicators than those listed in Table 1. Table 2 presents the mean results and the corresponding standard deviation according to the variable transformation described in the previous section.

Table 2: Mean and standard deviation by indicator.

	Indicator ID								
	1	2	3	4	5	6	7	8	9
Mean	4,0	3,3	3,1	3,6	3,6	4,2	3,5	3,5	3,8
SD	0,91	0,84	0,81	1,04	0,87	0,91	1,05	0,92	1,19
Maximum	1	1	1	1	2	2	2	2	2
Minimum	5	4	4	5	5	5	5	5	5

According to Table 2, Indicator 6 (Number of persons with training in quality/1000 inhabitants) is rated as the most important whereas Indicator 3 (Number of OHSAS 18001 certificates/1000 inhabitants) is rated as the least important of the surveyed indicators. Considering the standard deviation concerning these indicators (low values) one may conclude that there is a considerable homogeneity between the experts opinion.

The assessed Cronbach α (estimation of the test scores reliability) is 0,824 which denote a high internal consistency of the scale.

Table 3 presents the Spearman correlation within variables. Spearman correlation was adopted over Pearson correlation since the data sets were based on less than 30 answers. It is worth noted the correlations between indicators 1 (Number of ISO 9001 certificates/1000 inhabitants), 2 (Number of ISO 14001 certificates/1000 inhabitants) and 3 (Number of OHSAS 18001 certificates/1000 inhabitants). This fact is somehow expected and may be justified since it concerns with different features from a same indicator (Number of ISO 9001/ISO 14001/ OHSAS 18001 certificates per 1000 inhabitants). A half of the correlations are meaningful at a 0,01 level. Strong correlations were also assessed between the indicators 2 (Number of ISO 14001 certificates/1000 inhabitants)↔8 (ISO 9001 European Scoreboard), 5 (Number of accredited laboratories/1000 inhabitants)↔7 (Number of certified products) and 6 (Number of persons with training in quality/1000 inhabitants)↔9 (Number of EFQM finalist's prize and award winners).

Table 3: Spearman correlation (*meaningful at 5%; ** meaningful at 1%)

Indicator ID	1	2	3	4	5	6	7	8	9
1	–	0,650**	0,449*			0,450*		0,447	
2		–	0,757**		0,402*			0,558**	
3			–						
4				–			0,447*		0,530**
5					–		0,674**	0,507**	
6						–		0,418*	0,537**
7							–		
8								–	0,404*
9									–

Figure 1 displays the non-summarized results by each indicator (counts per 1-5 scale). It should be pointed out that none of the respondents considered indicators 2 (Number of ISO 14001 certificates/1000 inhabitants) and 3 (Number of OHSAS 18001 certificates/1000 inhabitants) as the most important. In contrast, indicator 5 (Number of accredited laboratories/1000 inhabitants), indicator 6 (Number of persons with training in quality/1000 inhabitants), indicator 7 (Number of certified products), indicator 8 (ISO 9001 European Scoreboard) and indicator 9 (Number of EFQM finalists prize and award winners) were not classified as the least important by the respondents.

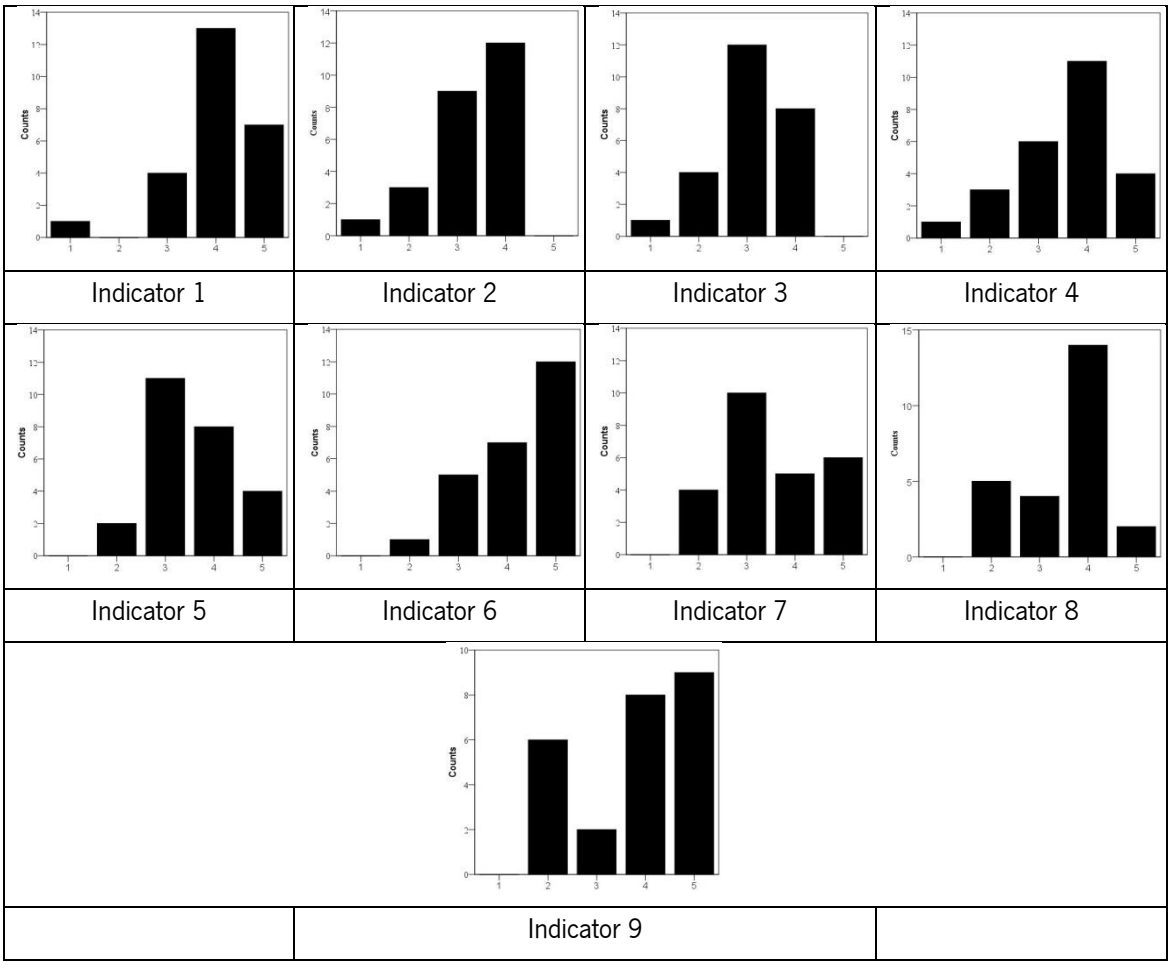

Figure 1: Results (number of answers) by surveyed indicator.

Figure 2 displays the stem and leaf diagram concerning the set of results achieved by each surveyed indicator. One may observe that respondent 10 classifications of the indicators 1 (Number of ISO 9001 certificates/1000 inhabitants), 2 (Number of ISO 14001 certificates/1000 inhabitants) and 3 (Number of OHSAS 18001 certificates/1000 inhabitants) are outliers considering the remaining classifications provided by the other respondents. Similarly, the assessment by respondent 15 regarding the indicator 4 (Number of members of the national quality association) and the assessment by respondent 2 regarding the indicator 6 (Number of persons with training in quality/1000 inhabitants) are outliers considering the remaining assessments.

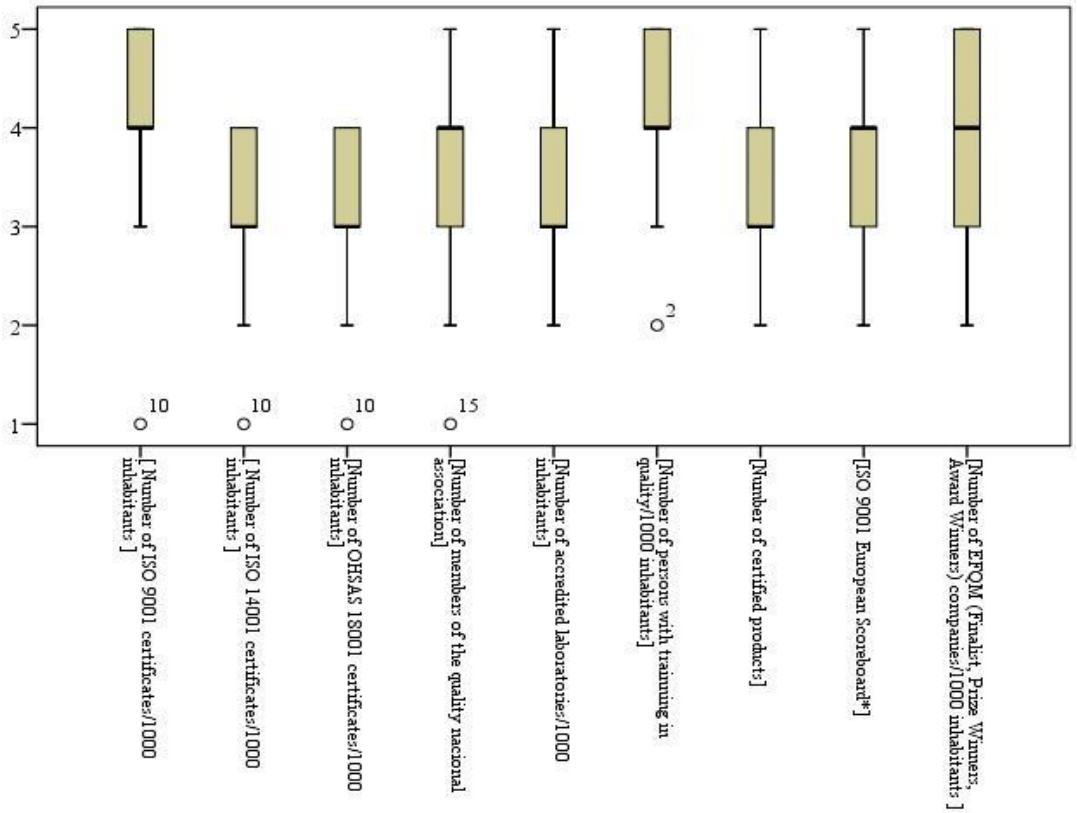

Figure 2: Stem and leaf diagram

Table 4 lists the alternative indicators proposed by the respondents. These indicators have been sorted in Table 4 according to some common features. Additionally, the number of respondents that proposed the indicator is also presented.

Table 4: Other proposed indicators.

Feature	Proposed indicator	Number of respondents	Total
Other management systems not related to the quality management system	Certification by other management systems	2	5
	Number of companies with integrated management systems	2	
	N° of ISO 9001, ISO 14001, OHSAS 18001 certificates per mil millions GDP	1	
Management systems related to quality	Number of quality specific certification (ISO TS, etc.)	1	13
	Number of ISO 9001 certificates/number of companies	1	

	Number of EFQM companies/Number of certified companies (QES)	1	
	Number of companies adopting ISO 9004	1	
	Number of EFQM candidates/1000 inhabitants	1	
	Number of companies certified ISO 9001 more than 10 years/1000 inhabitants	1	
	Number of companies using EFQM or CAF/1000 inhabitants	1	
	Excellence models awards	1	
	6 sigma adoption	1	
	Public certified companies	1	
	Services certification	1	
	Levels of customer loyalty	1	
	Number of companies adopting quality costs on their management	1	
Human resources	Number of quality management consultants	1	3
	Number of top management trained on quality management/1000 inhabitants	1	
	Number of certified auditors, consultants, managers, engineers	1	
Scientific publications	Number of quality magazines	1	5
	Technical publications and scientific publications	1	
	Number of patents	1	
	Number of scientific publications by recognized indexes	2	
Universities	Number of quality courses at universities	2	6
	Percentage (%) of post- quality management graduation courses/University	1	
	Quality training on the education system	1	
	Number of international projects and partnerships on quality related domains	1	
	Number of quality management researchers/1000 inhabitants	1	
Associations	Number of members at quality associations than the local one.	1	5
	Number of members of quality management associations/1000 inhabitants	1	
	Number of associations and NGOs related to quality	1	
	Number of national representatives on normalization technical committees	1	
	Number of events related to quality management	1	
Products	Index reflecting quality/confidence on the products of that country	1	3
	Methodologies used on non-conformity products/services complains	1	
	Number of product recalls or serious lawsuits	1	
Regulatory entities	Government responsibility concerning quality	1	2
	Fines from regulatory entities	1	
Accreditation	Percentage (%) of accredited methods/accredited laboratory	1	1
Monitoring	Quality related international barometers	1	1

Table 5 presents the requirements in order to ascribe weighing to each indicator. The main features considered were the average and standard deviation concerning the surveyed indicators and the number of respondents suggesting similar indicators concerning the proposed indicators.

Table 5: Indicators weighing.

Surveyed or proposed indicator	Mean value	Standard deviation	Weighing
Surveyed	Higher or equal to 4,0	—	15%
	Higher than 3,6 and lower than 4,0	—	10%
	Equal to 3,6	Lower than one	7,5%
	Equal to 3,6	Higher than one	7,5%
	Equal to 3,5	Lower than one	7,5%
	Equal to 3,5	Higher than one	5%
	Lower than 3,5		5%
Proposed	—	—	2,5%

Table 6 presents the axes, dimensions and indicators proposed for the Quality Scoreboard. The proposed axes intend to cover all the features that impact on the "macroquality concept". The weighing ascribed to each axis congregate the weighing from the dimensions whereas these latter summarize the weighing from each indicator. This latter value was developed considering the mean and standard deviation from the set of results (Table 2) as described in Table 5. Each indicator had been normalized by a factor of 1000 inhabitants.

Table 6: The European Quality Scoreboard.

Index	Axis	Dimensions	Indicators
EQS (100%)	Organizations (55%)	Certification (32,5%)	Number of ISO 9001 certificates/1000 inhabitants (15%)
			Number of ISO 14001 certificates/1000 inhabitants (5%)
			Number of OHSAS 18001 certificates/1000 inhabitants (5%)
			E9S/ 1000 inhabitants (7,5%)
		Accreditation (10,0%)	Number of accredited laboratories/1000 inhabitants (7,5%)
			Number of accredited methods/1000 inhabitants (2,5%)
		Excellence Awards (12,5%)	Number of EFQM finalists/1000 inhabitants (10%)
			Number of EFQM candidates/1000 inhabitants (2,5%)
	Universities (12,5%)	Qualification (7,5%)	Number of Quality related courses/1000 inhabitants (7,5%)
		Research (5%)	Number of Quality related researchers/1000 inhabitants (5%)
	Human Resources (25,0%)	Networking (7,5%)	Number of members of Quality Management Associations/1000 inhabitants (7,5%)
		Qualification (15%)	Number of persons trained in Quality Management/1000 inhabitants (15%)
		Certification (2,5%)	Number of certified auditors/1000 inhabitants (2,5%)
	Products (7,5%)	Certification (7,5%)	Number of certified products/1000 inhabitants (7,5%)

Table 6 presents the Quality Scoreboard developed according the methodologies described in the previous sections and in Table 5. The axes considered are the "Organizations", "Universities", "Human Resources" and "Products". The axis "Organizations" congregates the dimensions "Certification", "Accreditation" and "Excellence Awards". The axis "Universities" considers the dimensions "Qualification" and "Research", that is, the features that may impact on the potential future "macroquality". The ability to develop networking, the aspects concerning the qualification and further certification were the features found to be suitable to express the "Human Resources" axis. Concerning the "Products" axis, their certification was the dimension opted by. The weighing ascribed to the each dimension and subsequently to each axis is achieved through the sum of the weighing of the indicators and dimensions, respectively.

As one may see in Table 6 the reported EQS (European Quality Scoreboard) takes into account several features than solely the number of certified organizations. At this moment the EQS is a theoretically concept, open to discussion, which should be tested by the targeted countries in order to assess its validity.

CONCLUSIONS

The assessment of the degree to which quality practices are implemented by a country should consider tangible and less tangible indicators. In this paper a potential tool, the Quality Scoreboard, has been reported. This tool differs from others due to the fact that considers less tangible or easily measured indicators. Its wide scope, considering several axes and dimensions, enables that a great deal of features contributes to the assessment.

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