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## **THE ADDED VALUE OF THE ISO 9001:2015 INTERNATIONAL STANDARD FROM AN AUDITORS' PERSPECTIVE: A CB-SEM BASED EVALUATION**

***Abstract:** This research evaluates IRCA registered auditors' perspectives of the added value of ISO 9001:2015 to the organizations that adopt it and are certified accordingly, bringing a more independent perspective than previous studies based on quality managers or consultants' views. Supported by a worldwide survey among IRCA registered auditors and the adoption of a Covariance based- Structural Equation Modelling (CB-SEM) approach the results point out that the auditors' judgment regarding the ISO 9001:2015 value is influenced by their perceptions (regarding the document) and experience (auditing). The research results highlight the importance of selecting auditors with the appropriate ISO 9001:2015 knowledge and experience to assess ISO 9001:2015 Quality Management Systems (QMSs) within the certification process, therefore, contributing to the business and processes performance improvement and sustainable outcomes.*

***Keywords:** ISO 9001:2015; Quality Management System; Auditor; CB-SEM.*

### **1. Introduction**

In the quest to improve their business and processes performance, organizations rely on models, methodologies, and tools to achieve sustainable outcomes. Studies addressing Quality and its theoretical and practical issues are a central topic in the area of management research, with ISO-International Organization for Certification (standards, management systems, and certification) being one of the most relevant and consistent researched themes (Dereli et al., 2011; Domingues et al., 2016; Carnerud, 2018).

Standardization is a coordination and regulation mechanism (Brunsson & Jacobsson, 2000) and provide a basis for reducing information-related transaction costs being relevant for the promotion of the

overall economy (Nadvi & Wältring 2004). The successful diffusion of ISO MSs Standards is related to the worldwide globalization process, leading to the extension of global supply chains and to the still-growing importance of transnational corporations (Braun, 2005). Although QMS certification is not compulsory, ISO 9001 certification has a significant role in international business and is a highly visible proxy for QMS adoption and intensity (Fonseca & Domingues, 2017).

Research addressing ISO 9001 benefits and effects on organizational performance (Tarí et al., 2012; Sfreddo et al., 2019; Astrini, 2018) and bibliometric studies on the intellectual structure of research in ISO 9000 (Saraiva et al., 2019; Hussain et al., 2018), sustain the view that multidisciplinary fields, such as engineering, management sciences, social sciences, and behavioural sciences,

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contribute to the extensive existing ISO 9001 research field. ISO 9000 is a relevant research field in the topic of Quality Management with increasingly cumulative scientific knowledge (Hussain et al., 2018).

Studies addressed several factors regarding ISO 9000. Some of the most relevant themes are certification and organizational competitiveness, main motives behind seeking ISO certification, ISO 9000 certification as a roadmap for quality management, critical success factor and their measurement scales, lesson learned from ISO 9000 certified organizations, impact of ISO 9000 certification on organizational performance, challenges and perspectives of revised ISO 9000 standards and finally global diffusion of ISO 9000 standards (Hussain et al., 2018).

The recent research trend has been more vigorous, as ISO 9000 standards series have been periodically revised to ensure they remain updated and adjusted to the existing business environment and the relevant stakeholders' needs, resulting in the ISO 9001:2015 edition. Regarding the theoretical debate concerning revisions of ISO 9000 systems standards over time, relevant features include motivations, benefits and success factors of the revised standards deliberated in the context of quality improvement systems (Fonseca & Domingues, 2017; Fonseca & Domingues, 2018; Makolov, 2019).

The ISO 9001:2015 (ISO, 2015) International Standard Edition has the potential to offer substantial benefits to the certified organizations in areas that were previously considered to be "weak spots" of the ISO 9001:2008 edition (Fonseca & Domingues, 2017). However, there are still essential dilemmas regarding the degree to which organizations will be able to overcome several barriers of implementation (Anttila & Jussila 2017). One drawback of the standards' implementation, for instance, is to continue to follow the conventional quality audit process, which builds upon the

previous element-based QMS.

Since the auditing of MSs requires competence of individuals involved in the audit process (ISO 19011:2018, ISO, 2018), the new or reinforced ISO 9001 requirements may require new auditing approaches and competencies to assess organizational conformance, such as "the knowledge of culture and the organizational process" (Fonseca, Domingues and Sá, 2017). Hence, the "auditability" of some requirements may represent a significant challenge for Consultants and Certification Bodies Auditors. It is, therefore, critical that auditors ensure they have the proper training, education, and experience for each specific audit and that they allocate enough time to prepare for and perform the audit.

The selection of auditors, that are independent from the auditee organization, as the source for information, ensures more objectivity and rigour and less potential bias, than information collected from the management of the ISO 9001 certified organizations, which is particularly relevant when the research is based on perceptual variables (Pannirselvam & Ferguson, 2001; Bou-Lluser et al., 2005, 2009). In the case of IRCA (International Register of Certified Auditors) QM ISO 9001 Auditors, there is additional confidence that these third-party professionals are independent and competent to carry on their audit work.

This study follows the line of Fonseca & Domingues (2017) and aims to evaluate IRCA ISO 9001 auditors' perceptions and experience with the latest version (2015) of ISO 9001. Specifically, it focuses on the auditors' perspectives of the added value of this International Standard to the organizations that adopt and are certified accordingly. This research, therefore, contributes to the ISO 9001:2015 body of knowledge, and relying on third-party auditor's feedback brings a more independent perspective than studies based on quality managers or consultants' views.

The next sections are organized as follows.

Section 2 provides a brief literature review of the ISO 9000 MSs Standards revisions and the research addressing the new or reinforced ISO 9001:2015 approaches and requirements. Section 3 introduces the research methodology (materials and methods) and Section 4 presents the findings of the study and the discussion of the results. The last section 5 gives a systematic discussion of the results and the theoretical and practical implications as well as the shortcomings and future research directions.

## 2. Literature review

Management, in a broad sense, encompasses planning and implementing controls for organized activities to meet company goals rationally and efficiently. The ISO 9000 family addresses various aspects of quality management. The standards provide guidance and tools for companies and organizations who want to ensure that their products and services consistently meet customer's requirements and that quality is consistently improved. ISO 9001:2015 sets out the criteria for a QMS and is the only standard in the family that can be certified to (ISO, 2019).

Although the ISO 9000 family addresses various aspects of quality management, a QMS should not be structured solely to meet the requirements of a standard. Instead, it should exist to ensure that processes are operating under controlled conditions, internal operating effectiveness is achieved, and customer satisfaction is attained.

ISO 9001 is an internationally recognized QMS model that can be adopted by all types of organizations regarding their nature, size, and activity sector. The implementation of ISO 9001 International Standard requirements can be audited and certified by an independent external entity, a certification body, that audits the organization QMS to assess if it complies with the ISO 9001 requirements and achieves the intended results. The certification body should

demonstrate that it has competent management and staff and that it is impartial and free from conflicts of interest, namely by being accredited by an accreditation body, fulfilling the applicable accreditation requirements, and generating confidence to its stakeholders (Fonseca & Domingues, 2017). Although ISO 9001 certification is voluntary, the decision to seek ISO 9001 certification reflects organizational commitment to adopt a QMS for better performance and efficiency (Hussain et al., 2018).

The first edition of the family of the ISO 9000 QMS standards was published in 1987 and emphasized standardizing the activities of organizations through procedures. Therefore, in the introduction phase of ISO 9001 adoption, an organization seeking ISO 9001 certification was mainly focused on implementing a documented QMS to face the challenges of an ever-increasing global market (Yahya & Goh, 2001; Rodríguez-Escobar et al., 2006).

The second ISO 9001 edition was published in 1994, bringing the concern for non-conformity prevention and requiring organizations to monitor the product at all stages of the process, rather than just evaluating the finished product. The 2000 version introduced the concept of process management, making organizations manage their activities in an interconnected way to satisfy the requirements of their clients. This concept was reinforced in the 2008 version of the standard, which brought small changes in order to improve understanding of the requirements (Sfreddo et al., 2018).

As ISO 9001 adoption matured, the motivations for its implementation began to encompass process performance improving, enhancing customer satisfaction and business results and ensuring organizational sustainability (Poksinska et al., 2006; Han & Chen, 2007; Prajogo, 2011; Chatzoglou et al., 2015; Zimon, 2016; Fonseca et al., 2017). In summary, there are both internal and external motivations to seek an ISO

9001 certification (Sampaio et al., 2009).

To ensure ISO 9001 remains updated and reflects the needs of organizations and their relevant stakeholders, ISO issued in 2015, the latest version of the international standard. ISO 9001:2015 edition brought forth the concept of risk management, assessment of the organizational context, and reinforcing leadership roles and responsibilities to achieve the organization's

objectives (Ramphal, 2015; Fonseca & Domingues, 2017).

The revision of the ISO 9001:2015 standard has introduced significant differences when compared to the 2008 edition. As a field at an early stage of its implementation, most related literature activities are focused on discovery and description. Table 1 summarizes some of the new themes according to literature.

**Table 1.** New ISO 9001:2015 themes

New ISO 9001:2015 themes	Authors	Comments
Risk and opportunities determination and adoption of risk-based thinking	Fonseca and Domingues et al. (2018); Chiarini (2017); Hrbáčková and Tuček (2015); Rybski et al. (2017); Fonseca (2015); Ramphal (2015)	Risk-based thinking is ingrained in product and service planning processes for many organizations. It includes the identification of resources such as personnel qualifications, equipment, facilities, manufacturing processes, material suppliers and control of outsourced services needed to meet specified requirements (Aston 2016).
Organizational context determination - internal and external relevant issues	Makolov (2019; Fonseca and Domingues (2018); Chiarini (2017); Hrbáčková and Tuček (2015); Gigante and Ziantoni (2015); Fonseca (2015); Ramphal, (2015)	This subclause requires an organization to "determine external and internal issues that are relevant to its purpose and its strategic direction and that affect its ability to achieve the intended result(s) of its quality management system."
Determination of the relevant stakeholders and their relevant requirements	Fonseca and Domingues, 2018	Identifying relevant interested parties should consider anyone who has an impact on the business, for instance: suppliers, direct customers, employees, corporate partners, regulatory bodies owners/shareholders, insurance, society, service providers, competitors, government.
Organizational knowledge	Fonseca and Domingues (2018); Wilson and Campbell (2018)	There needs to be a strategic knowledge plan which systematically and comprehensively addresses, where possible, all areas of explicit and tacit knowledge. Knowledge should be considered broadly not solely with a focus on Clause 7.1.6; other areas of the standard need to be considered in relation to knowledge particularly 7.2 Competence, 7.4 Communication and 7.5 Documented Information (Wilson and Campbell 2018)
Change control	Fonseca and Domingues (2018)	When a business changes something, the impact of the change needs to be considered before a change is made.
Others	Fonseca (2015); Gigante and Ziantoni (2015)	The adoption of the High-Level Structure (HLS) Less prescriptive requirements Greater flexibility in relation to documentation Better applicability to services The requirement to define the boundaries of the QMS Increased emphasis on achieving process results to increase customer satisfaction Increased leadership requirements

Although ISO 9001:2015 is still a novel theme, several empirical studies addressed its implementation (including plan and design stages). Fonseca and Domingues (2017), based on a quantitative study among IRCA registered audits, posited that ISO 9001:2015 is in line with modern business and quality management concepts and will add organizational value. In another empirical research carried out in Germany Rybski et al. (2017) identified that there is a lack of training and knowledge concerning the new requirements of ISO 9001:2015, namely in risk-based thinking, which is also supported by Chiarini (2017) based on Certification Bodies and Quality Managers feedback. Fonseca and Domingues (2018), in a research encompassing Portuguese ISO 9001 certified organizations, identified risk-based thinking, mapping of the organizational context, and stakeholder identification as essential benefits reported for ISO 9001:2015. These conclusions were confirmed by Fonseca et al. (2019) with a similar research study covering Portugal, Romania, Switzerland, and Turkey. In a research among 493 Italian companies Bravi et al. (2019) posited that concerning the evolution of the standard from ISO 9001:2008 to ISO 9001:2015, companies seem to have perceived the main changes introduced with the latest revision, that helps to easily adopt its principles in companies. Anttila and Jussila (2017) also recognize that there are improvements in ISO 9001:2015 (e.g., the new harmonized structure, the adoption of risk-based thinking, and the reinforced business-centered focus on business processes). However, they claim that their research results point that ISO 9001:2015 is ambiguous, and the standard text has incomplete and imperfect text and requirements. In a nutshell, this first ISO 9001:2015 research works acknowledge that there is organizational value in adopting ISO 9001:2015, but also point out some shortcomings or unresolved issues.

The strong emphasis on the descriptive, theoretical contributions regarding ISO 9001

new themes by means that theory development regarding ISO 9001 implementation is still in its early stages. This suggests that further research work remains to be done aiming at developing further theoretical and practical insights for its successful application, and, in that sense, this research aims to contribute to the ISO 9001:2015 body of knowledge.

### 3. Method

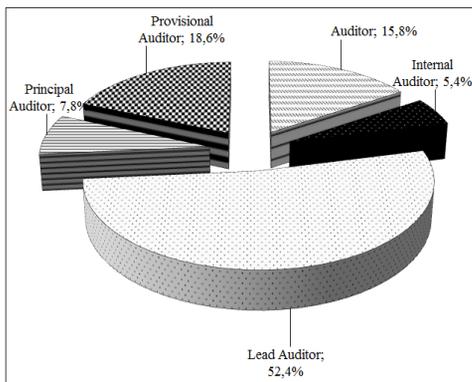
This research aims to study the auditor's perspectives of the added value of ISO 9001:2015 to certified organizations. The literature suggests that the auditor's global judgment regarding ISO 9001:2015 value can be influenced by their perceptions regarding the document itself (Hypothesis 1) and experience when auditing *in situ* (Hypothesis 2). If confirmed, these hypotheses will further stress the importance of selecting auditors with the appropriate knowledge and experience to assess ISO 9001:2015 QMSs within the certification process.

This research was supported by a survey (Table 3) held among QMS ISO 9001 certified IRCA (International Register of Certificated Auditors) auditors to ascertain their perceptions and experience regarding the new revision (2015) of the ISO 9001 standard. The contacts (E-mail) of the auditors were retrieved from the IRCA website ([www.irca.org](http://www.irca.org)). A total of 5459 auditors from 118 countries/economies were contacted in April 2016 through e-mail. The survey encompassed three groups of questions. Group 1 questions intended to ascertain the auditor features, Group 2 questions focused on the auditor perceptions regarding the changes introduced in the new standard revision (document), and group 3 questions aimed at the assessment of the auditor experience at the companies where the implementation of the ISO 9001:2015 standard is being carried out. An agreement five-point scale (Do not agree at all (1), ...,

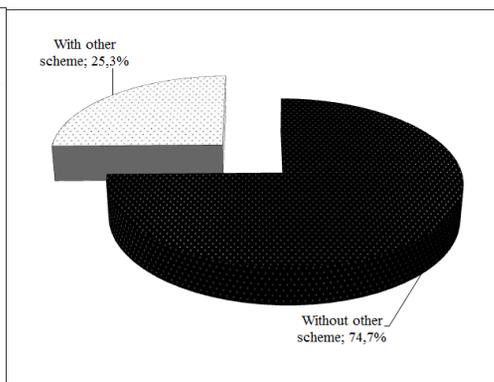
Totally agree (5)) was adopted to assess the structured type questions. The data collected (a total of 396 validated answers from 72 countries) was summarized through descriptive statistics. Exploratory factor analysis (EFA) identified/extracted two factors/components explaining nearly 65% of the variance. EFA was conducted with the IBM SPSS v. 24.0, and the CB-SEM (measurement and structural equation models) were developed with the AMOS software. In order to estimate the model, the SEM approach with the maximum likelihood method was employed. SEM is an approach within the General Linear Model that allows (among other things) performing confirmatory factor analyses and regression analyses with latent variables as well as with more than one dependent variable (Civelek, 2018; Davcik, 2014). The SEM in AMOS

software allows testing whether an *a priori* hypothesis on patterns of linear relationships among a set of observed and unobserved variables is valid (Shah & Goldstein, 2006).

Figures 1 and 2 depict the main characteristics of the targeted population. Concerning the grade hold by the auditors, it should be stated that mainly lead auditors encompass the population (Figure 1). Auditors and provisional auditors account for nearly a third of the population, and almost 75% of the auditors do not hold other IRCA certification scheme (Figure 2). Concerning the geographical diffusion, the auditors develop their activities mainly in East Asia and Pacific (36%) and Europe (28%) (not shown). Auditors from the United Kingdom (8,7%), Japan (8,3%) and the USA (8%), altogether, account for nearly a fourth of the population (not shown).



**Figure 1.** Grade hold by the auditor (population).



**Figure 2.** Certifications schemes attained by the auditor (population).

Considering both the number of IRCA QMS certified auditors and the data published by the ISO Survey of Certifications (ISO, 2015), it is possible to rank the countries according to the number of certified auditors per 100 issued ISO 9001 certificates (Table 2). Table 2 solely considered those countries with plus than 10 IRCA QMS auditors and, simultaneously, more than 1000 ISO 9001 issued certificates.

Based on the data presented in Table 2 one may highlight that Hong Kong, Singapore, Republic of Korea and Egypt attain the highest scores (higher than 3 auditors per 100 issued ISO 9001 certificates). China, Germany, Italy and Switzerland achieve the lowest scores (lower than 0,15 auditors per 100 issued ISO 9001 certificates).

**Table 2.** Number of auditors per 100 issued certificates according ISO 9001:2008 (data from 2014)

Africa	North America	Central and South America	Europe	Middle East	East Asia and Pacific	Central and South Asia
Egypt (4,35)	Canada (1,67)	Peru (1,95)	Ireland (1,79)	Saudi Arabia (3,61)	Hong Kong (7,58)	Pakistan (0,84)
South Africa (1,06)	USA (1,32)	Argentina (0,18)	UK (1,19)	United Arab Emirates (3,24)	Singapore (3,95)	India (0,77)
	Mexico (0,61)	Brazil (0,09)	France (0,93)	Iran (0,48)	Korea, Republic. (3,16)	
		Colombia (0,08)	Netherlands (0,69)		Philippines (2,19)	
			Bulgaria (0,61)		Taiwan (1,37)	
			Norway (0,50)		Malaysia (1,36)	
			Greece (0,40)		Indonesia (1,29)	
			Finland (0,38)		Japan (1,00)	
			Sweden (0,36)		Australia (0,50)	
			Russian Fed. (0,27)		Thailand (0,30)	
			Hungary (0,19)		China (0,04)	
			Poland (0,19)			
			Spain (0,19)			
			Romania (0,17)			
			Czech Republic (0,16)			
			Switzerland (0,14)			
			Italy (0,12)			
			Germany (0,12)			
Percentage of countries that do not have plus than 10 IRCA auditors and 1000 issued certificates						
96%	0%	89%	65%	79%	62%	86%

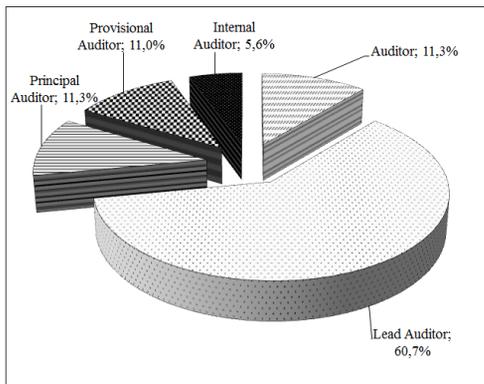
## 4. Results and Discussions

### 4.1. Research Sample

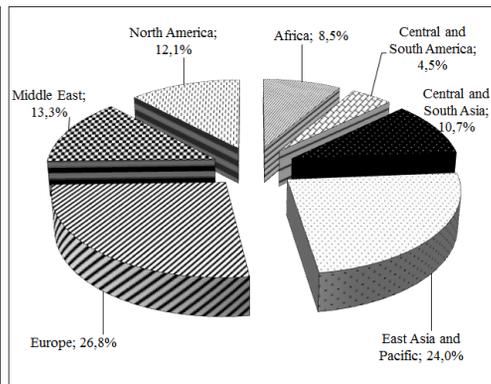
A total of 72 countries and 396 auditors (which accounts for nearly 7,0% of the original population) contributed by answering the survey (292 auditors holding experience auditing the ISO 9001:2015

standard). The analysis of the results collected through the survey, namely those aimed at the characterization of the sample, suggests that it matches, *i.e.*, properly represents the population. Mainly lead auditors completed the survey (61%). The answers provided by auditors, provisional auditors and principal auditors accounted for approximately 11% each (Figure 5). The

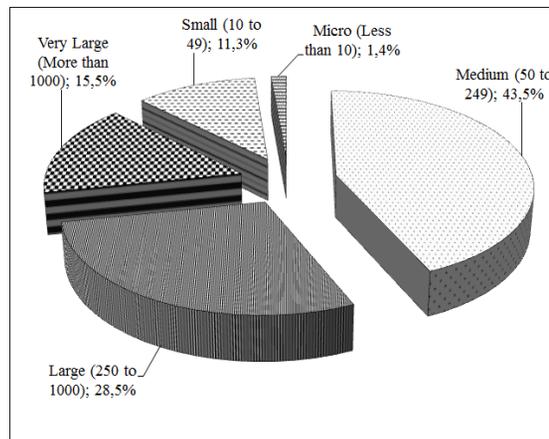
comparison of the results reported in Figure 3 with those depicted by Figure 1 highlight the similarity of the sampled auditors with the auditors from the original population in what concerns to the grade hold. Regarding the additional certification schemes hold by auditors one may stress that most of the respondents (68%) do not hold other certification scheme which concurs with those results reported in Figure 2.



**Figure 3.** Grade hold by the auditor (sample)



**Figure 4.** Percentage of auditors- breakdown by macro-region (sample)



**Figure 5.** Auditee companies' size

Concerning their experience, nearly 65% of the respondents developed auditing activities over the last 10 years. Less experienced auditors (less than 3 years) contributed with 4,5% of the total answers. Regarding the number of ISO 9001:2015 audits conducted

so far by the respondents; results point out that a great deal of auditors (46%) did not audited the revision 2015 of the ISO 9001 standard. Nevertheless, those auditors with more than 20 audits conducted account for 18% of the answers collected.

Most of the respondents conduct audits in the industry and services sectors. The remaining (10%) develops their auditing activities in the public administration, health and social and in non-specified activity sectors. Mainly large and medium companies are audited by the respondents (Figure 5). The remaining account for 28% of the total answers.

#### 4.2. Descriptive Statistics

Table 3 presents the summarized results (average, standard deviation and median) breakdown by variable. The highest rated variable was “Q4- Is more effective for organization MSs integration” (Average: 4,05; Median: 4) and the lowest rated variable was “Q5- Easier to audit than previous ISO 9001 versions” (Average: 2,93; Median: 3).

**Table 3.** Descriptive statistics

Variable ID	Variable	Average	Standard Deviation	Median	n	
Do you agree that ISO 9001:2015 is:						
Q1	More clear than previous ISO 9001 versions	3,57	1,03	4	292	
Q2	In line with modern business management concepts	3,91	0,96	4		
Q3	In line with modern quality management concepts	3,85	0,94	4		
Q4	Is more effective for organization MSs integration	4,05	0,96	4		
Q5	Easier to audit than previous ISO 9001 versions	2,93	1,13	3		
Q6	Taking an overall perspective ISO 9001:2015 will be most valuable to ISO 9001 certified organizations	3,69	1,09	4		
Based on your ISO 9001:2015 audit experience, do you agree that:						
Q7	"High level structure, identical core context, and common terms and common definitions" has been successfully implemented by the auditee organizations	3,18	0,90	3		
Q8	"Change management" has been successfully implemented by the auditee organizations	3,04	0,88	3		
Q9	"Understanding the organization and its context" has been successfully implemented by the auditee organizations	3,11	1,02	3		
Q10	"Understanding the needs and expectations of interested parties" has been successfully implemented by the auditee organizations	3,17	0,98	3		
Q11	"Adoption of Risk-based thinking" has been successfully implemented by the auditee organizations	3,07	1,01	3		
Q12	"Reinforced emphasis on process approach and intended results" has been successfully implemented by the auditee organizations	3,24	0,93	3		
Q13	"Less emphasis on prescriptive requirements and on documentation" has been successfully implemented by the auditee organizations	3,02	0,99	3		
Q14	"Improvement (previously "continuous improvement ") has been successfully implemented by the auditee organizations	3,28	0,90	3		

### 4.3. Reliability Analysis

A reliability analysis was carried out on the perceived importance (rated through a 5 point Likert type scale) comprising the 14 items that were assessed by the respondents (although not a unidimensional scale the items aimed, ultimately, at describing one

solely construct- the global assessment of the standard). Later, the reliability by dimension (component or factor) will be presented (Table 9). Cronbach's alpha (Cronbach, 1951) showed the questionnaire to reach acceptable reliability ( $\alpha = 0,92$ ) suggesting a high internal consistency and a reliable questionnaire (Table 4).

**Table 4.** Reliability analysis

Cronbach's alpha	Cronbach's alpha based on standardized items	No. of items
0,921	0,922	14

Additionally, none of the items results in an increase in the alpha if deleted (all items can be retained). Table 5 shows that, if deleted,

each item will output a decrease in the alpha (or at least in an equal value of alpha).

**Table 5.** Item Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q1	43,5430	80,318	0,629	0,916
Q2	43,1993	80,512	0,673	0,914
Q3	43,2577	80,537	0,688	0,914
Q4	43,0619	82,713	0,544	0,918
Q5	44,1787	80,389	0,561	0,919
Q6_Global	43,4158	78,637	0,689	0,913
Q7	43,9313	81,230	0,678	0,914
Q8	44,0722	81,633	0,678	0,914
Q9	44,0000	79,352	0,700	0,913
Q10	43,9381	80,775	0,643	0,915
Q11	44,0378	80,188	0,657	0,915
Q12	43,8729	81,049	0,670	0,914
Q13	44,0893	81,185	0,610	0,916
Q14	43,8316	82,009	0,634	0,915

### 4.4. Exploratory Factor Analysis

A factor analysis (extraction through the maximum likelihood method) of the results was carried out (Carvalho et al., 2015). The maximum likelihood method (ML) was used since it is a robust and capable method and, usually, produces reliable results when compared with other methods (Hair et al., 2010). Bartlett's test of sphericity (testing

the overall significance of all the correlations within the correlation matrix) was significant ( $\chi^2 (66) = 2075.87, p < 0,001$ ), suggesting the appropriateness of using the factor analytic model. The Kaiser-Meyer-Olkin (sampling adequacy) ( $KMO=0,901$ ) pointed out the solid (strong) relationships among the variables suggesting that was acceptable to proceed with the factor analysis (Table 6).

**Table 6.** KMO and Bartlett's Test.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,901
Bartlett's Test of Sphericity	Approx. Chi-Square	2075,866
	df	66
	Sig.	0,000

As previously stressed, several concepts that may impact on the assessment of the ISO 9001:2015 standard were analysed using principal component analysis (Varimax rotation). The communalities of each variable (Table 7) are acceptable (>0,5) and

none of the variables present an amount of variance less than 50% in common with the other variables. This suggest that the variables are strongly related among them, which is somewhat expected since they should reflect, ultimately, one construct.

**Table 7. Communalities**

	Initial	Extraction
Q1	1,000	0,674
Q2	1,000	0,822
Q3	1,000	0,807
Q4	1,000	0,626
Q7	1,000	0,562
Q8	1,000	0,625
Q9	1,000	0,727
Q10	1,000	0,623
Q11	1,000	0,647
Q12	1,000	0,599
Q13	1,000	0,502
Q14	1,000	0,565

Extraction Method: Principal Component Analysis.

The KMO and Bartlett’s test of sphericity both suggest that the set of variables are at least adequately related for factor analysis meaning that two clear independent patterns were identified (*i.e.*, not correlated patterns).

The analysis yielded two components explaining a total of 64,82% of the variance for the entire set of variables (Table 8). The first component (explaining 38,77% of the

total variance) was labelled “ISO 9001:2015 Standard Perceptions” since respondents were asked solely to rate some of the novel issues introduced to the document. The second factor was labelled “ISO 9001:2015 Experience” since respondents were asked about their experience when auditing some of the new requirements brought forth in this new edition (Table 8).

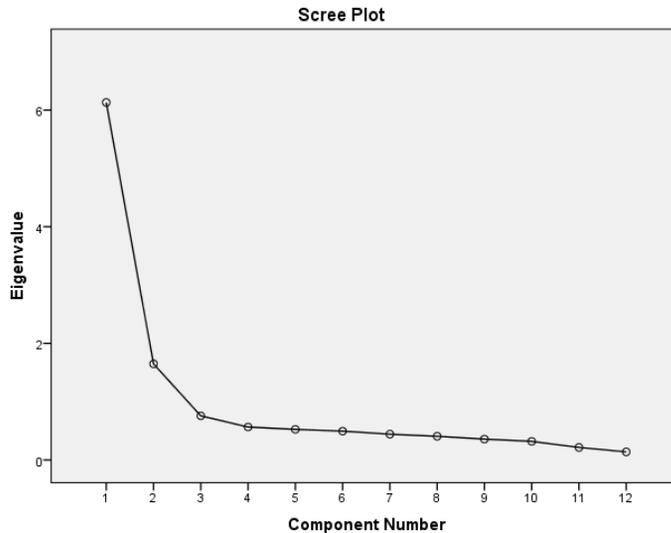
**Table 8. Total Variance Explained**

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6,130	51,084	51,084	6,130	51,084	51,084	4,652	38,770	38,770
2	1,648	13,736	64,820	1,648	13,736	64,820	3,126	26,050	64,820
3	0,757	6,306	71,126						
4	0,565	4,709	75,835						
5	0,525	4,371	80,206						
6	0,494	4,120	84,327						
7	0,442	3,686	88,012						
8	0,407	3,390	91,402						
9	0,358	2,983	94,386						
10	0,320	2,664	97,050						
11	0,215	1,793	98,843						
12	0,139	1,157	100,000						

Extraction Method: Principal Component Analysis.

The scree plot (Figure 6) shows that from the second component onwards the line is almost flat suggesting that each successive component is accounting for not relevant amounts of the total variance (components

with eigenvalues less than 1). So, the scree plot depicted in Figure 6 backs up the data from Table 8, *i.e.*, it is possible to extract two components based on the available data.



**Figure 6.** Scree plot of the eigenvalues of factors

The Cronbach alpha (by component) is presented in Table 9. It is possible to highlight that none of the components presents a poor Cronbach Alpha score. Cronbach’s alpha suggests a high internal consistency of each component and that the items adopted to assess each component seem appropriate.

**Table 9.** Reliability assessment by component (Cronbach Alpha)- SPSS

Component	Cronbach Alpha
ISO 9001:2015 Standard Perceptions	0,876
ISO 9001:2015 Experience	0,905

The rotated component matrix (Table 10) clarifies the number of components and the variables clustered within. It is possible to distinguish two components and all the variables load highly in solely one factor. It should be emphasized that it is not possible to observe even slight cross loadings.

**Table 10.** Rotated Component Matrix

	Component	
	1	2
Q1	0,246	0,783
Q2	0,247	0,873
Q3	0,289	0,850
Q4	0,170	0,773
Q7	0,667	0,342
Q8	0,757	0,228
Q9	0,836	0,168
Q10	0,773	0,161
Q11	0,775	0,215
Q12	0,723	0,276
Q13	0,680	0,198
Q14	0,720	0,216
Extraction Method: Principal Component Analysis.		
Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

**4.5. Confirmatory Factor Analysis (CFA)- Measurement Model**

Figure 7 presents the Covariance-Based measurement model and Table 11 presents the model fit indices. All the variables load

acceptably on the correspondent component which entailed that none of the variables was removed from the measurement model. Relevant correlations were detected among

the two latent components (0,55) and between some of the measured variables.

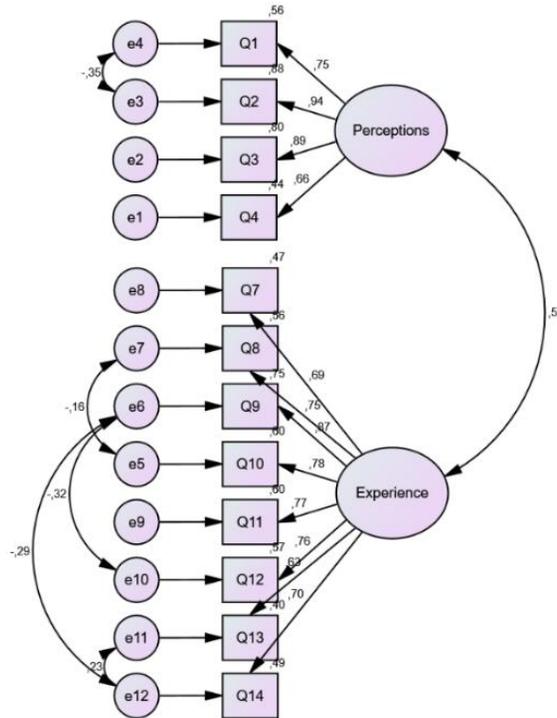


Figure 7. Measurement model (CFA)

The indices presented in Table 11 suggest an appropriate fit of the model to the data. A great deal of publications adopt the following criteria: CFI (Comparative fit index)  $\geq 0,90$ ; RMSEA (Root Mean Square Error of Approximation)  $< 0,08$ ; AVE (Average Value Explained)  $> 0,5$ , i.e., the scores achieved by the measurement model are in line with the established criteria among the mainstream literature.

**4.6. Covariance Based- Structural Equations Modelling**

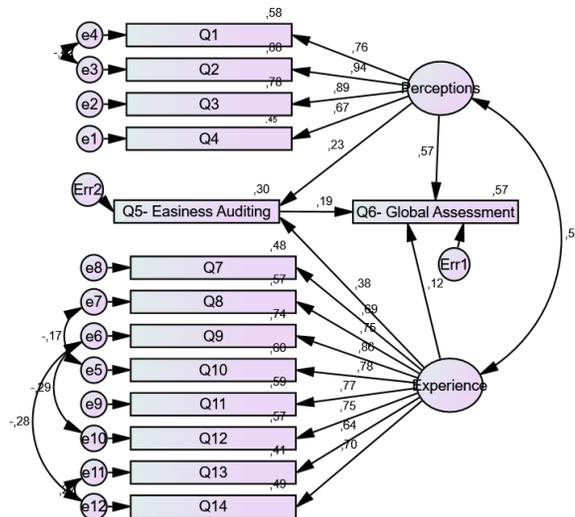
Figure 8 (Structural model) presents the relationships between the two dimensions that impact on the global assessment of the standard by the IRCA auditors. “ISO 9001:2015 Standard Perceptions” was measured by four survey questions. Looking at the loadings of individual measurement items on their respective constructs, the order of decreasing influence of “ISO 9001:2015 Standard Perceptions” are “Q2- In line with modern business management concepts” (0,94), “Q3- In line with modern quality management concepts” (0,89), “Q1- Clear than previous ISO 9001 versions” (loading 0,76) and “Q4- Is more effective for organization MSs integration” (0,67). “ISO

Table 11. Measurement Model Fit

Index	Score
CFI	0,969
RMSEA	0,067
90% I.C.	[0,051; 0,083]
$CM_{in} = S - \chi^2_{df}$	110,458; $p < 0,001$
$CM_{in}/df = \frac{S - \chi^2_{df}}{df}$	2,301 $< 5$
$AVE_{Perceptions}$	0,67 $> 0,5$
$AVE_{Experience}$	0,56 $> 0,5$

9001:2015 Experience” is measured by eight items. Of the eight, “Q9- “Understanding the organization and its context” has been successfully implemented by the auditee organizations” (0,86) is the most influential followed by “Q10- “Understanding the needs and expectations of interested parties” has been successfully implemented by the auditee organizations” (0,78), “Q11- “Adoption of Risk-based thinking” has been successfully implemented by the auditee organizations” (0,77), “Q12- “Reinforced emphasis on process approach and intended results” has been successfully implemented by the auditee organizations” (0,75), “Q8-

“Change management” has been successfully implemented by the auditee organizations” (0,75), “Q14- “Improvement (previously “continuous improvement”) has been successfully implemented by the auditee organizations” (0,70), “Q7- “High level structure, identical core context, and common terms and common definitions” has been successfully implemented by the auditee organizations” (0,69), and “Q13- “Less emphasis on prescriptive requirements and on documentation” has been successfully implemented by the auditee organizations” (0,64).



**Figure 8.** Structural model of the factors influencing the perception of the add-value of the new ISO 9001:2015 standard

The indices presented in Table 12 suggest an appropriate fit of the structural model to the data according to the common adopted criteria previously listed.

**Table 12.** Structural Model Fit

Index	Score
CFI	0,952
RMSEA	0,077
90% I.C.	[0,064; 0,090]
$S - \chi^2_{68}$	184,824; p<0,001
$\frac{S - \chi^2_{df}}{68}$	2,718<5

The structural reflective model (Cavaco, 2016; Monecke & Leisch, 2012; Peng & Lai, 2012; Vasconcellos & Alves, 2016) presented in Figure 8 displays the statistical relevant path coefficients and one may observe that two latent constructs contribute, directly and indirectly, to the “Q6- Global Assessment”. The structural model shows that about 57% of the variance on the “Q6- Global Assessment” is due to the two latent variables and the measured variable “Q5- Easiness Auditing” in the model. So, both partial and full mediation (Latan et al., 2017)

occurs between the “ISO 9001:2015 Standard Perceptions” and “ISO 9001:2015 Experience” constructs and the “Q6- Global Assessment” dependent variable. Partial mediation occurs through the variable “Q5-

Easiness Auditing”. Table 13 shows that all the regressions weights are statistical relevant at  $p\text{-value} < 0,05$ . Hypothesis 1 and 2 are, therefore, confirmed.

**Table 13.** Regression Weights

			Estimate	S.E.	C.R.	P	Label
Q5	<---	Perceptions	0,325	0,120	2,708	0,007	
Q5	<---	Experience	0,681	0,117	5,801	***	
Q4	<---	Perceptions	1,000				
Q3	<---	Perceptions	1,329	0,099	13,485	***	
Q2	<---	Perceptions	1,379	0,101	13,624	***	
Q1	<---	Perceptions	1,160	0,104	11,129	***	
Q10	<---	Experience	1,000				
Q9	<---	Experience	1,156	0,070	16,537	***	
Q8	<---	Experience	0,954	0,078	12,176	***	
Q7	<---	Experience	0,934	0,081	11,531	***	
Q11	<---	Experience	1,129	0,092	12,325	***	
Q12	<---	Experience	0,988	0,083	11,891	***	
Q13	<---	Experience	0,995	0,090	11,060	***	
Q14	<---	Experience	0,926	0,080	11,533	***	
Q6_Global	<---	Perceptions	0,963	0,110	8,753	***	
Q6_Global	<---	Experience	0,190	0,091	2,097	0,036	
Q6_Global	<---	Q5	0,190	0,046	4,171	***	

## 5. Conclusion

This research sheds new light on the assessment and value of ISO 9001:2015. The results suggest that the auditors' perceptions and experience regarding ISO 9001:2015 International Standard influence their judgment regarding ISO 9001:2015 value.

The importance of selecting auditors with the appropriate ISO 9001:2015 knowledge and experience to assess ISO 9001:2015 QMSs within the certification process is, therefore, highlighted. As ISO 9001:2015 certified organizations aim to improve their business and process performance and achieve sustainable outcomes, this choice of the competent and experienced auditors is essential to ensure a credible and accountable certification process to all stakeholders involved. The conclusion that proper training, and auditors' competences and experience, are of major importance, is aligned with Fonseca et al. (2019) conclusions, that found that organizations that adopt early planning, carry on ISO

9001:2015 training, and ensure they have the necessary competences, reported the soundest benefits and fewer difficulties in successfully implementing ISO 9001:2015. These conclusions are relevant both for the management of the certified organizations, and for the auditors and certification bodies, in their quest to ensure credibility, and value added ISO 9001:2015 implementation and certification processes, contributing to the business and processes performance improvement and sustainable outcomes.

This research evaluates IRCA registered auditors' perspectives regarding the added value of ISO 9001:2015 and contributes with a more independent perspective than previous studies (based on quality managers or consultants' views). The adoption of the CB-SEM approach ensures its reliability and validity. However, since this study is supported by data gathered in 2016, additional and more recent data collection should be carried out in order to ascertain at which extent these conclusions are valid.

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