Modeling the impact of an ISO 9001 certified quality management system on the organizational performance of Moroccan services firms

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Abstract

Statistical modeling serves as a valuable tool for analyzing and resolving complex issues through the application of mathematical and statistical techniques. In the Moroccan context, where the services sector contributes more than 50% to the national wealth, there is a noticeable absence of such applications to gauge the impact of the ISO 9001 certified quality management systems on the organizational performance of companies.

To address this gap, we have constructed a causal model to quantify the strength of cause-and-effect relationships among the following key elements:

- processes within a quality management system and their impact on organizational performance,
- the influence of management responsibility process on all aspects of the quality management system, and
- the relationship between the organizational and financial performance.

This model is developed using Structural Equation Modeling (SEM) and estimated through the Partial Least Squares (PLS) approach, utilizing the XL-Stat software.

The research involved a sample of 55 Moroccan service firms certified with ISO 9001 across various sectors. Face-to-face surveys were the primary data collection method, engaging multiple executives within the organizations.

The findings of this research validate our conceptual model, revealing that:

- certain processes within the quality management system positively and weakly correlate with the organizational performance,

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- the 'Management Responsibility' process has a positive influence on all aspects of the quality management system, and
- the organizational performance strongly and positively impacts the financial performance.

Moreover, our model facilitates the computation of direct and indirect effects among its components, transforming cause-and-effect relationships into structural equations. Our research contributes to enhancing the understanding of the dynamics between quality management systems and the organizational performance in the Moroccan service sector.

Key words: statistical modeling, PLS approach, organizational performance, Quality Management System (QMS), ISO 9001 certification.

1. Introduction

Increased globalization of markets, intensified competition and a turbulent economic environment make the current reality of the world in which companies must operate. Therefore, these firms must be agile enough to seize opportunities and manage risks well. In other words, only 'performing' enterprises have a chance of succeeding in a world where perpetual change is the norm. Performance is hens the mark of excellence that shareholders and managers are seeking. It is this importance that the business world gives to performance that makes the latter a concept worthy of observation and research. Practitioners and theorists have made its definition an object of reflection and we know today, thanks to their efforts, that performance is a complex notion, and difficult to define and measure. One thing is certain: performance, and whatever its nature, is merely a reflection of the company's ability to satisfy its customers and anticipate their needs. As a strong QMS (Quality Management System) can lead to business competitiveness and viability, it is easy to imagine the importance of an ISO 9001 certification while operating in highly competitive environments. [El Moury et al, 2023]

This standard is currently one of the most widely used ISO norms in the world. It is recognized as the most important reference for quality management and allows the establishment of relationships of trust with customers and prospects. However, the analysis of the impact of ISO 9001 certification is relatively little studied regarding the considerable financial and organizational investments made by organizations to meet the requirements of this standard.

The observations mentioned above are the main motivation for this article. The latter is particularly interested in studying: the impact of a certified QMS on the organizational performance of the Moroccan service firm, the effect of Management responsibility on this QMS, and the correlation between organizational and financial performance.

2. Conceptual Framework

The conceptual framework of our research is based on the study of the interrelationships existing between two structures:
- processes of an ISO 9001 certified QMS;
- firm performance: Organizational and financial performance.

2.1. Certification of Quality Management System according to ISO 9001 Standard

The creation of value for stakeholders in service provision can be managed in different ways. One possible strategy is to design and develop a quality management system (QMS) that will direct and control an organization in terms of quality. (Rönnbäck et al., 2009). QMS can be designed to include certain principles, additional practices, and techniques (Dean and Bowen, 1994). It often follows the substance of Deming's plan-do-check-act (PDCA) cycle (Deming, 1986), and provides support to organizations for the assurance and improvement of quality. Within an organization, or business network, there are internal processes that aim to manage and support the operative processes.

ISO defines it as a "management system to direct and control an organization with regard to quality". This system is defined as a formalized system that documents processes, procedures, and responsibilities for achieving quality policies and objectives. A QMS helps coordinate and direct an organization's activities to meet customer and regulatory requirements and improve its effectiveness and efficiency on a continuous basis.

Therefore, we can consider it as a means of controlling processes along with the quality of products (or services) which, in return, allows customer satisfaction and the achievement of the economic objectives pursued by the organization. [El Moury et al., 2020].

The purpose of this system is to establish an organization's policies and to realize the contents of these policies through short and long-term goals (Nilsson, 2000). The substance of a QMS often follows PDCA cycle. The cycle is a continuous quality improvement model consisting of a logical sequence of four repetitive steps for continuous improvement and learning (Deming, 1986). The main purpose is to start by planning and formulating concrete goals for the organization. The next step is to put the action plans or programs into action to reach the goals, check that the goals have been obtained, evaluate, and then further improve the organization's processes (ISO 9001: 2015).

A QMS is made up of correlated and interactive processes that use resources to achieve the desired results and provide value (product, service, etc.)

International Organization for Standardization 'ISO' is an independent, non-governmental international organization, bringing together experts to share knowledge to develop consensus-based, market-relevant, voluntary international standards that support innovation and provide solutions to global challenges.

ISO 9001 is defined as the international standard that specifies requirements for a quality management system (QMS). Organizations use the standard to demonstrate the ability to consistently provide products and services that meet customer and regulatory requirements. It is the most popular standard in the ISO 9000 series and the only standard in the series to which organizations can certify.

According to this Organization implementing a conformant Quality Management System is the source of numerous benefits:

- Allows an overall assessment of the business context and helps determine the expectations that need to be met. The overall result is the ability to define relevant goals and identify new business opportunities.
- Being customer-centric: the customer is placed at the core of any business strategy which guarantees a positive customer experience and hence long-term relationships.
- Work more efficiently because all processes will be aligned and understood by all the staff of the business or organization. The latter will then gain in productivity and efficiency, while reducing its internal costs.
- Being compliant with legal and regulatory requirements.
- Conquer new markets, because in certain sectors and for certain customers, compliance with the ISO 9001 standards is an essential criterion.

For [Chebir et al., 2022] among benefit of the ISO 9001 certification is that the company enjoys a competitive advantage that reinforces its position in front of the competition while gaining customers' confidence.

According to [Echour and Nbigui, 2021] the adoption of ISO 9001 is a voluntary approach, certification is a fashion effect for companies that want to be recognized for their quality and resist in an increasingly competitive market. For [Isuf et al., 2016] ISO 9001 standards do not refer to the compliance with a given goal or result. In other words, they are not performance standards measuring the quality of a firm's products or services or a firm's environmental results, rather, they are standards setting out the need to systematize and formalize many corporate processes within a set of procedures, and to document such implementation.

ISO in its ISO/IEC guide defines the standard as "A document, established by consensus and approved by a recognized body, that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context". [ISO/IEC GUIDE 2, 2004].

ISO defines certificate of conformity as follows: "A document issued under the procedures of a third-Party certification System and a product, or a Service is in conformity with specific Standards or other technical specifications". [ISO/IEC GUIDE 23-1982]. Thus ISO 9001 certification attests that an organization has a quality management system that complies with the ISO 9001 standard. Note that the other standards of the series 9000: vocabulary (ISO 9000), guidelines (ISO 9004) do not contain requirements and cannot be used as a basis for certification.

2.2. Organizational and financial performance

Performance is at the heart of the company's social, economic, and financial balances. In other words, it constitutes the turning point of all decisions (strategic and operational) and must be based on an evaluation criterion to understand its evolution. According to [Renaud and Berland, 2010] performance has been used to assess the company's implementation of sustainable development strategies.

The Axcion lexicon (2019) defines performance as: "The result obtained in a specific area and considered as a successful outcome. It can be the result of human action or a material or process, etc. To be appreciated, it is subject to measurement." Performance measurement focuses mainly on creating value for shareholders. It is therefore not surprising that corporate management is focused on this value creation and the way to manage it. Recent studies show that 200 companies listed by Fortune magazine currently use an indicator based on the value created for shareholders to evaluate performance. [Patrick Jaulient, 2012].

According to [Serhan, 2019] firm performance entails three areas of the company including product market, shareholder return, and financial performance. The improvement of this performance includes business re-engineering activities, processes for continuously improving the business and the quality of services or products offered. To ensure that the organization is efficient it is necessary to analyse the main performance indicators. [Barna, and Roxana, 2021].

For [Rafoi, 2016] a company's performance indicators can be classified as follows: Strategic indicators: market share, turnover, customer satisfaction, return (profit), managerial indicators: availability of resources, costs, budget, operational indicators: individual performance, processes performance, products, efficiency.

For [Moulai Ali, 2012] Organizational performance "is about how the business is organized and managed to achieve its goals". Organizational performance determines the ability of the firm to implement effective processes to reach its operational and strategic projections. [El Moury et al., 2024]. The pillars of this efficiency can only be: The development and respect of a process-oriented approach, relations between the managers of the different compartments of the organization, the quality of the flow of information, and the degree of flexibility of the organization.

Because organizational effectiveness is difficult to express in a concrete formula, [Hadini, 2020] emphasized the need of indicators to keep objective achievements at the forefront of decision making.

Regarding financial performance, [Farrukh el al, 2016] consider it as the extent to which a company's financial health over a period is measured. In other words, financial performance is a composite of an organization's financial health, its ability and willingness to meet its long-term financial obligations, and its commitments to provide services in the foreseeable future. In a broader sense, financial performance refers to the degree to which financial objectives are accomplished. [Ganyam and Ivungu ,2019]. Cost-related performance is measured by quantitative indicators such as return on investment and sales, profitability, productivity, return on assets, efficiency, etc.

3.   Research model and hypothesis

3.1.   First research construct: Processes of an ISO 9001 certified QMS:

A quality management system (QMS) is the set of activities by which the organization defines, implements, and reviews its quality policy and objectives in accordance with its strategy. An organization's QMS is made up of interrelated and interactive processes that use resources to achieve intended results and deliver value (product, service, etc.). The QMS processes form our first research construct:

- management Responsibility Process: MRP;
- service Realization Process: SRP;
- measurement, Analysis, and Improvement Process: MAIP;
- resource Management Process: RMP.

3.2.   Second research construct: Performance of the firm:

- organizational performance: OP;
- financial performance: FP

3.3.   Presentation of the research model

The objective of this research work is to test and validate a conceptual model (causal) allowing to measure the impact:

- of the processes of quality management system an 'ISO 9001 certified' on organizational performance;
- organizational performance on financial performance;
- Management Responsibility Processes on these three processes: Service Realization Process 'PRS', Measurement, Analysis, and Improvement Process 'PMAA' and Resource Management Process 'PMR'.

This model is developed using Structural Equation Modeling (SEM) and estimated through the Partial Least Squares (PLS) approach, utilizing the XL-Stat software. The research involved a sample of 55 Moroccan service firms certified with ISO 9001 across various sectors. Face-to-face surveys were the primary data collection method, engaging multiple executives within the organizations.

Our model is based on 6 criteria which are divided into 2 families: 4 criteria refer to the means (QMS process), the other criteria refer to the results (financial and organizational performance), (Figure 1). We assume that there is a causal relationship between the criteria of means and the criteria of results. In other words, the means in place are the causes of the given results. It should be noted that for each causal relationship a hypothesis has been formulated. Since the proposed conceptual model has 8 causal relationships, 8 hypotheses have been formulated.
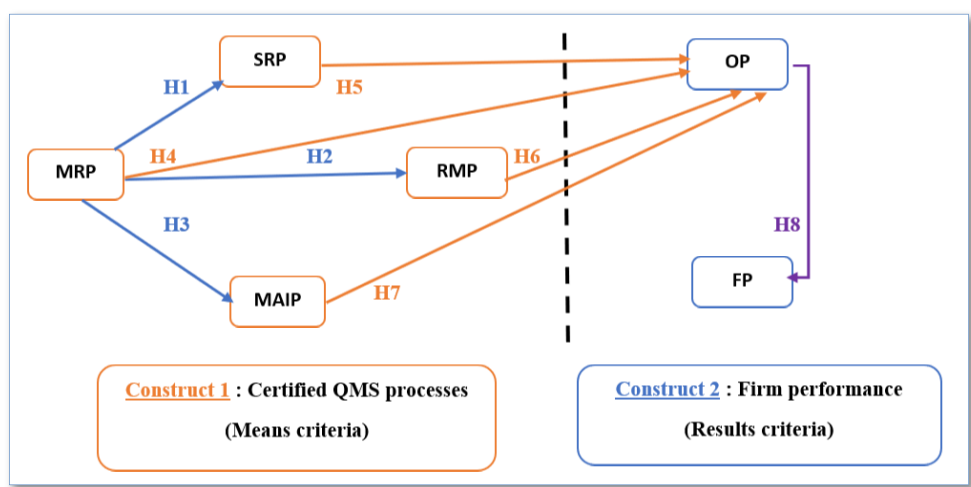

Figure 1: Proposed model

Table 1: Variables codes used in the research model

Model Construct proposed	Code	Title
Certified QMS processes (Means criteria)	MRP	Management Responsibility Process
	SRP	Service Realization Process
	RMP	Resource Management Process
	MAIP	Measurement, Analysis, and Improvement Process:
Firm performance (Results criteria)	OP	Organizational performance
	FP	Financial performance:

Thus, for each causal relationship, we have formulated a hypothesis (total: eight hypotheses).

3.4. Formulated hypotheses:

We intend through our study to validate or invalidate the eight Hypotheses below:

Table 2: List of hypotheses

Hypothesis Number	Causal Relationship	Hypothesis Formulated
H1	MRP→ SRP	We suppose that MRP has a positive impact on SRP
H2	MRP→RMP	We suppose that MRP has a positive impact on RMP
H3	MRP→ MAIP	We suppose that MRP has a positive impact on MAIP
H4	MRP→OP	We suppose that MRP has a positive impact on OP
H5	SRP→ OP	We suppose that SRP has a positive impact on OP
H6	RMP→ OP	We suppose that RMP has a positive impact on OP
H7	MAIP→OP	We suppose that MAIP has a positive impact on OP
H8	OP→FP	We suppose that OP has a positive impact on FP

4. Methodological framework of the research

Our empirical study is conducted via questionnaires, administered face-to-face, to the Directors, quality managers of this enterprises. We sent the questionnaire to 220 companies, and 55 agreed to respond. All these firms are part of the service industry and range from medium-sized to large companies.

4.1. Sampling

This research was conducted on a sample of 55 Moroccan service firms certified ISO 9001 operating in various sectors: passenger transport, goods transport, telecommunication, banking, insurance…

We asked several questions to test the strength and sense of the various causal links between the variables of our research constructs. For instance, questions concerning the contributions of an ISO 9001 certified QMS to organizational performance.

Example: Do you believe that your QMS has a positive impact on:
- The formalization of procedures?
- The standardization of processes?
- The improvement of process understanding?

4.2. Choice of modelling

To analyse our results, we used structural modelling according to the PLS approach. Two families of modelling structural equations were concerned [Gefen et al., 2000]: the methods based on the covariance, represented among other things by LISREL, and the methods based on variance whose PLS approach is the most representative of these techniques. For [Hulland,1999] and [Chenhall, 2005], the PLS approach is particularly suited for the analysis of small samples and when the analysis is exploratory in nature. Note that this approach is recommended when the theory is more approximate, and

the measurements are less well developed as it maximises the possibility of interpreting both the measurement model and the structural model. That is the case for this study. Hence, the choice of the PLS approach.

4.3. Evaluation of the proposed model

There are 6 variables in the research model 4 of which are reserved for QMS process and 2 are reserved for the performance. The variables of our model are operationalized by different items. These items are collected on fifth degree Likert scales: (Strongly disagree, somewhat disagree, moderately agree, somewhat agree, strongly agree). Note that the total number of items is 50 (items/questions).

4.3.1. Reliability of measurements

The reliability of measurements is concerned with the reduction of the random part of the measurement error: if the same phenomenon is measured several times by the same measuring instruments, the results should be as close as possible. To do this, we will use 'Cronbach alpha' and 'rho D.G.' indexes.

Table 3: Reliability of measurements

Latent Variable	Items	Cronbach's alpha	D. G Rho
MRP	9	0.939	0.912
SRP	6	0.829	0.932
RMP	6	0.849	0.958
MAIP	11	0.920	0.952
OP	9	0.923	0.947
FP	5	0.842	0.902

According to the results in Table 3, the Cronbach alpha and rho D.G. indexes calculated for each latent variable are above 0.7 and with reference to the recommendations of [Nunnally and Bernstein ,1994] and to the instructions of [Fornell and Larker,1981], these results are satisfactory (reliable). Similarly, the results in Table 3 also show satisfactory results where rhô D.G. > 0.8 for all measurement models according to the instructions of [Fornell and Larker, 1981].

4.3.2. Evaluation of the measurement model

Note that there are three ways of linking the manifest variables to the latent variables whose scheme can be formative, reflective, or MIMIC. The evaluation of the (external) measurement models then depend on the nature of the selected schema or pattern (formative, reflective or MIMIC) [Jacobowicz, 2007].
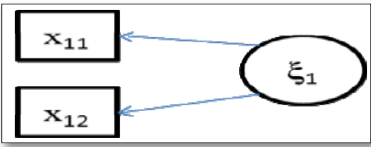
Figure 2: Reflective schema

The same author has confirmed that the reflective type of schema (Figure 2) is the most suitable in most structural equation models and that such a choice is mainly based on the subjectivity of the researcher. This is the scheme that has been chosen and followed in this study. Each manifest variable is connected to a latent variable with simple regression.

The relationship between the latent variable and all the manifest variables that are associated with it, can be written as follows: $x_{kj} = \pi_{kj}{}^*\xi_k + \varepsilon_{kj}$

- x_{kj} vector associated with the *jth* manifest variable of the latent variable ξ_k
- ξ latent variable, *k* index of latent variables. *kj* index of manifest variables of block *k*.
- π loading associated with x_{kj} .ε_{kj} error term (measurement errors of manifest variables)

4.3.2.1. Convergent validity

The convergent validity means that the same items should share more variances with their latent construct than with their measurement errors. To test this validity, we calculate the index of the average variance extracted (AVE) associated with each latent variable:

$$\text{AVE} = \frac{\sum[\gamma_i^2]var(VL)}{\sum[\gamma_i^2]var(VL) + \sum[var\ (\varepsilon_i)]}$$

Along with:

- VL latent variable,
- γ_i^2 Factorial contribution (loadings),
- ε_i variance of errors

Table 4: Quality index of measurement models

Latent variable	Average variance extracted (AVE)	D. G Rho
MRP	0.729	0.912
SRP	0.665	0.932
RMP	0.792	0.958
MAIP	0.710	0.952
OP	0.665	0.947
FP	0.713	0.902

According to guidelines of [Fornell and Larcker, 1981], we can talk of a good convergent validity if AVE > 0.5. The results in Table 4 clearly confirm the good convergent validity of our measurement model. The D.G. rho coefficient is equally significant for all the measurement models, which confirms again the good convergent validity (D.G. rho > 0.7) [Nunnally and Bernstein, 1994].

The manifest variables form the blocks in goshawks of the latent variables. Given that the measurement models are of the reflective type, the blocks must be one-dimensional to ensure that the manifest variables are the reflection of their latent variable.

Table 5: Eigenvalues latent variables causal model

MRP	SRP	MAIP	RMP	OP	FP
7.285	**4.656**	**7.806**	**4.754**	**5.987**	**2.852**
0.933	0.886	0.875	0.471	1.137	0.565
0.400	0.639	0.684	0.389	0.700	0.394
0.372	0.376	0.417	0.168	0.396	0.190
0.289	0.195	0.344	0.132	0.254	
0.251	0.167	0.236	0.085	0.182	
0.186	0.082	0.194		0.169	
0.154		0.169		0.103	
0.082		0.110		0.071	
0.049		0.088			
		0.076			

To do this, the first eigenvalue for each block must represent at least 50% of the sum of all values in the same block. This is the case for the results depicted in Table 5. This confirms the one-dimensionality of the blocks.

4.3.2.2. Discriminating validity (divergent)

The Items of a construct must be weakly correlated with the items of other constructs. That is to say, the divergent validity is retained only if the items belonging to a single construct do not contribute significantly with the others constructs. This will be tested in accordance with the recommendations of [Chin ,2010]. To do this, we compare the square root of the AVE of each latent variable with the correlations of the different latent variables (two by two). If the square root of the AVE is greater than the correlations between the different dimensions of our model, the divergent validity is ensured. The results of Table 6 show that the square root of the AVE of each latent variable exceeds the correlations between the latent variables (two by two), which confirms the discriminating validity of the external model.

Table 6: The discriminating validity

	MRP	RMP	MAIP	SRP	OP	FP	AVE
MRP	0.853*						0.729
RMP	0.618	0.889					0.792
MAIP	0.614	0.737	0.842				0.710
SRP	0.711	0.631	0.678	0.815			0.665
OP	0.321	0.274	0.368	0.299	0.815		0.665
FP	0.454	0.452	0.460	0.434	0.521	0.844	0.713

Note: *the square root.

Convergent validity and divergent validity confirm that our measurement **Model is Valid**.

4.3.3. Validation of the structural model

The structural model defines the nature of the relationships existing between the latent variables. To test the validity of adjusting our internal model, we will resort the following:

4.3.3.1. Goodness of fit index (GoF)

This index considers both the performances of the structural model and the measurement model [Tenenhaus and Esposito Vinzi, 2005]. It is defined by the geometric mean of the average of the communities (or AVE) on all the latent variables (H^2) and the average of R^2 associated with the endogenous latent variables $\bar{R}^2$

$$\text{GoF} = \sqrt{\bar{H}^2 \times \bar{R}^2}$$

According to [Wetzels et al., 2009], the usual values of this index are 0.1, 0.25 and 0.36. They correspond respectively to weak, medium, and large adequacy of the model. So according to the results obtained (Table 7), the research model can be retained in terms of the threshold (GoF > 0.5), and this, according to the instructions of [Wetzels et al.,2009].

Table 7: Adjustment Index

	GoF	GoF (Bootstrap)	Standard error	Critical Ratio (CR)
Absolute	0.670	0.677	0.061	11.071
Relative	0.837	0.813	0.055	15.325
External Model	0.991	0.978	0.041	24.083
Internal Model	0.845	0.830	0.029	28.780

4.3.3.2. The coefficient of determination (R²)

On the one hand, the usual values of R^2 are 0.67, 0.33 and 0.19. These are respectively considered as substantial, moderate, and weak [Chin, 1998]. On the other hand,

the structural model is retained when $R^2 > 0.67$ [Chin, 1998]. From what preceded, the results of R^2 and R^2-adjusted (Table 8) are substantial to moderate.

The formula of this coefficient is as follows:

$$R^2 = 1 - \frac{SSR}{SST} = 1 - \frac{\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2} = \frac{\sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2}{\sum_{i=1}^{n}(y_i - \bar{y})^2}$$

- SSR relative to the sum of squares of the residuals (Residual variance)
- SST relative to the sum of total squares (Total Variance Explained)
- y_i Measurement values
- $\bar{y}$ The average of the measurements
- $\hat{y}_i$ The predicted values.

Table 8: Results R^2 and R^2 – adjusted

	MRP	RMP	MAIP	SRP	OP	FP
R^2	-	0.618	0.768	0.757	0.392	0.655
R^2adjusted	-	0.618	0.764	0.752	0.357	0.627

4.3.3.3. Effect size (f^2)

This index allows us to ensure the validity and magnitude of structural coefficients.

Table 9: Research hypothesis tests

Causal relationship	Path coefficient (β)	Effect size (f²)	T* student	Hypothesis validation
H1: MRP→ SRP	0.571	0.514	5.169	Valid
H2: MRP→RMP	0.785	1.615	9.252	Valid
H3: MRP→ MAIP	0.284	0.134	2.635	Valid
H4: MRP→OP	0.163	0.028	1.977	Valid
H5: SRP→ OP	0.156	0.000	0.057	Invalid
H6: RMP→ OP	0.150	0.004	-0.459	Invalid
H7: MAIP→OP	0.175	0.079	1.987	Valid
H8: OP→FP	0.457	0.378	4.305	Valid

Its usual values are 0.02, 0.15, and 0.35 corresponding respectively to a weak effect, medium and strong [Cohen, 1988]. According to Table 9, we can conclude that:
- MRP has a strong effect on SRP and RMP;
- MRP has a weak effect on MAIP and OP;
- SRP has a weak effect on OP;
- RMP has a weak effect on OP;
- MAIP has a weak effect on OP;
- OP has a strong effect on FP.

The results of our survey clearly show the validity of the measurement model (external) and the validity of the structural model (internal).

4.4.4. Structural equations of the conceptual model

Our model has a single exogenous variable that is the 'management responsibility process' and owns five endogenous variables. Each endogenous variable is explained by one or more variables and an error term. The internal model is defined by linear equations linking the latent variables between them.

For all ξ_k endogenous, we have a $\xi_k = \sum_{i:\,\xi_i \to \xi_k} \beta_{kj} + \xi_k$ where β_{kj} represents the coefficient associated to the relationship between the variables ξ_k and ξ_i. ξ_k is an error term. $\xi_i \to \xi_k$: ξ_i explains ξ_k in the model. This model has five equations that were tested using the PLS approach through the Xlstat software. The structural equations of the conceptual model are presented as follows:

1) RMP = 0,78590*MRP ;
2) MAIP = 0,28436*MRP ;
3) SRP = 0,57199*MRP ;
4) OP = 0,16327*MRP+0,15063*MRP+0,17575*MAIP+0,15649*SRP;
5) FP = 0,45734*OP.

5. Results analysis

5.1. Hypotheses testing

For each causal relationship, we have formulated a hypothesis and since we have eight causal relationships, we have setup eight hypotheses. These hypotheses were also subjected to tests of confirmation (Table 9).

Table 10: Results of hypothesis testing

Hypothesis	Results
H1: We suppose that MRP positively influences SRP	Valid
H2: We suppose that MRP positively influences RMP	Valid
H3: We suppose that MRP positively influences MAIP	Valid
H4: We suppose that MRP positively influences OP	Valid
H5: We suppose that SRP positively influences OP	Invalid
H6: We suppose that RMP positively influences OP	Invalid
H7: We suppose that MAIP positively influences OP	Valid
H8: We suppose that OP positively influences FP	Valid

According to Table 9, we can confirm the validity of all hypotheses (|T-value| > 1.96) except for Hypotheses 5 and 6: |T-value| = 0.057< 1.96. |T-value| = -0.459< 1.96
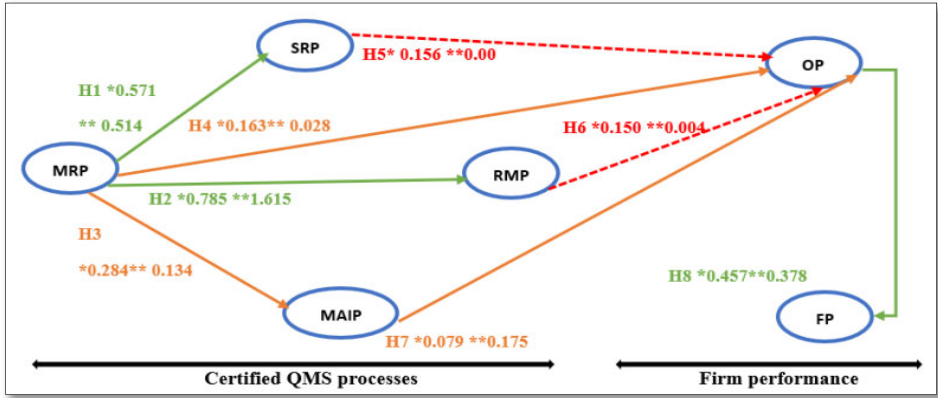
Figure 3: Final model estimated by the PLS

Notes:
o   *Structural coefficient (path coefficient)
o   **Effect size [0.02: weak, 0.15: medium, 0.35: large (strong)] according to Cohen (1988).
o   Large importance of the effect.
o   Weak importance of the effect.
o   Invalid link.

The final model can be represented as Figure 3.

5.2. Direct effects between the axes of the means criteria and the axes of the results criteria:

Based on the results in Table 9 and Figure 3, we underline the following:

- The exogenous latent variable 'Management Responsibility Process' has positive and statistically significant influences (T > 1.96). It has a strong importance of effects on the latent variables: 'Service Realization Process', and 'Resource Management Process'. (β = 0.571, f^2 = 0.514, t = 5.169), (β = 0.785, f^2 = 1.615, t = 9.252).

- The exogenous latent variable 'Management Responsibility Process' influences weakly 'Measurement, Analysis, and Improvement Process' in a positive way and statistically significant. (β = 0.284, f^2 = 0.134, t = 2.635, p <0.01).

- The exogenous latent variable 'Management Responsibility Process' influences weakly 'Organizational performance' in a positive way and statistically significant. (β = 0.163, f^2 = 0.028, t = 1.977).

- The latent variable 'Measurement, Analysis, and Improvement Process' influences weakly 'Organizational performance' in a positive way and statistically significant. (β = 0.175, f^2 = 0.079, t = 1.987).

- The latent variable 'Service Realization Process' has statistically insignificant influences on 'Organizational performance', proving the invalidity of that relationship. (β = 0.156, f^2 = 0.000, t = 0.057).
- The latent variable 'Resource Management Process' has statistically insignificant influences on 'Organizational performance', proving the invalidity of that relationship. (β = 0.150, f^2 = 0.004, t = -0.459)
- Finally, the latent variable 'Organizational performance' has positive and statistically significant influences (T > 1.96). It has a strong importance of effects on the latent variables 'Financial performance'. (β = 0.457, f^2 = 0.378, t = 4.305).

5.3. Indirect effects between the axes of the means criteria and the axes of the results criteria

We can note as well with reference to Table 11:
- The latent variable 'Management Responsibility Process'' has positive indirect effects on 'Measurement, Analysis, and Improvement Process' and 'Service Realization Process'. This exogenous latent variable has 'quite large' indirect effects on the Organizational performance' and 'Financial performance'.
- The latent variable 'Resource Management Process' has a low indirect effect on the Organizational performance' and 'Financial performance'.
- The latent variables 'Measurement, Analysis, and Improvement Process' and 'Service Realization Process' have a low indirect effect on the 'Financial performance'.

Table 11: Indirect effects between latent variables

	MRP	RMP	MAIP	SRP	OP	FP
MRP						
RMP	0.000					
MAIP	0.374	0.000				
SRP	0.346	0.000	0.000			
OP	0.388	0.154	0.000	0.000		
FP	0.532	0.238	0.080	0.072	0.000	

6. Discussion

When improvement is the purpose that governs the thoughts of an entrepreneur or a manager, performance becomes the concept that is constantly referred to. Both theorists and practitioners agree that this concept is multidimensional and often confusing. However, its understanding can only be comprehended based on the context in which it is used: organizational, commercial, or financial performance for instance.

It is agreed that performance, and whatever its nature, is merely a reflection of the company's ability to satisfy its customers and anticipate their needs. As a strong QMS (Quality Management System) can lead to business competitiveness and viability, it is easy to imagine the importance of an ISO 9001 certification while operating in highly competitive environments. Thus, it is very important to analyse and measure the impact of an ISO 9001 certified QMS on organizational performance.

In Canada, researchers have studied the impact of ISO 9001 on organizational performance, [Thaver and Wilcock, 2006]. They concluded that an ISO 9001 certified QMS has a positive impact on organizational performance, and they confirmed that among the benefits of the implementation of this system: reduction of defects and losses, improvement of customer satisfaction and better perception of product quality.

In the Australian context, [Singh, 2008] has shown that the ISO 9001 standard has a positive effect on process control. Again, in the same context, the results of several researchers have proven the positive impact of the ISO 9001 standard on the operational efficiency of the company's processes [Chuong et al., 2010]. For their part, [Terziovski and Guerrero, 2014] demonstrated through a study conducted in 2014 on 220 companies in Australia that ISO 9001 certification statically does not have a significant impact on product innovation, but a significant positive impact on process innovation.

According to [Valmohammadi and Kalantari, 2015] the ISO 9001 certified companies have a more relevant organizational performance than companies not certified. It is a tool to help integrate total quality, develop the quality culture, and improve the internal organization as well as the production process that generates, for example, indirectly the improvement of the quality of the final product. [Katerina et al., 2002].

With regards to the kingdom of Morocco, and from an economic environment perspective, [Ben Ali et al ,2020] measured the impact of an ISO 9001 certified quality approach (case: young manufacturing companies in growth phase, located in the north of Morocco) on the organizational performance, the results showed that there is a positive relationship between these two elements. In addition to this upshot, [Barrijal et al., 2021] added another layer to the building blocks of this study: organizational performance (i.e. process, organizational learning and innovation) may well mediate between quality approach and corporate social responsibility.

However, [Hadini, 2020] proved that the practices of an ISO 9001 certified quality approach (case: multinational firm located in Morocco) have a weak impact on the axes of 'non-financial performance'.

In a business environment where an economic downturn and financial crisis dominates (Greece to be precise). [Evangelos and Dimitrios,2014] concluded that the ISO 9001 certified companies significantly outperform the non-certified regarding product quality, customer satisfaction, operational performance.

[Matheus et al., 2021] have proven that ISO 9001 certified QMS has a positive impact on the organizational performance of several Brazilian companies.

According to our exploratory study, the results show that:

- Although the criteria 'Management responsibility' and 'Measurement, analysis and improvement' displayed a statistically positive influence, our conceptual model has nevertheless suggested a weak effect on organizational performance. To shed light on the meaning of this finding, we take the example of a cross-functional procedure that is of paramount importance to bring an ISO 9001 certification to fruition. This procedure is yet to be crafted and to meet a well-defined deadline; the CEO appointed a task force and:
  - o Asked the appointed team (board of directors) to craft a fitting procedure,
  - o Appointed his executive secretary to spearhead the coordination and secure a steady follow-up along with a monthly status report.

  First highlight: without the will and strategic thinking of the CEO, this procedure would not have existed. The same could be said about all subsequent control and monitoring tools that his executive was tasked to devise→ This explains why our conceptual model has considered that the influence of the leadership team was 'Positive and statistically significant'.

  Second highlight: If the CEO and his executive team have succeeded in provoking a chain reaction, this involvement can be the guarantor of positive results. In other words, producing success is tightly linked to other levers. For instance, the level of motivation of the company's staff. The latter was indeed quite absent among the sample. --> We can hence understand why the conceptual model considers that the leadership team's involvement produced 'weak impact' on the organizational performance.

- The relationship between the 'Service realization' criterion and organizational performance is invalid.

  Having just procedures does not guarantee an efficient realization of a service. Indeed, other means of support must intervene (e.g.: periodic audits, permanent controls, continuous training, etc.). In short, these are the elements that force the involvement of the human element in the execution of the procedures) → We therefore share the invalidity finding suggested by the conceptual model.

- The relationship between the criterion 'Resource management' and organizational performance is invalid.

  The example of the Executive Secretary appointed to spearhead the coordination and control of procedures requiring technical expertise can only be seen as a real-life example of unfitting profiles instrumental in the execution process. Several interviewers have indeed pointed this surprising fact during our sense-making discussions. It is in this sense that the model considers that the criteria

'Resource Management' and 'Organizational Performance' are not correlated (invalid link).

- Organizational performance has a positive and strong influence on financial performance.

According to [Ataseven et al., 2015], managers must invest their efforts in the proper integration of the requirements of the international standard ISO 9001 and not in obtaining certification. And [Jang and Lin, 2008] confirm that thorough QMS implementation significantly determines firm performance.

The efficiency of the management responsibility process within a firm result from:
- A clear dissemination of the principles of its mission, vision, values, and ethics.
- Disseminating to its team the knowledge to be put into practice to improve the implementation and the quality of the services rendered to clients and other interested parties. [El Moury et al., 2023]

The criterion of Management Responsibility aims at assessing the action of the leaders and the excellence of their behaviour, in the accomplishment of their mission, as well as their vision of the organization through the implementation of values and systems necessary for sustainable success. In accordance with the research of [Calvo-Mora et al., 2005], this criterion has effects on the criteria of resource and process management.

Thus, the results of our study prove that this criterion positively influences in a strong way 'Service realization' and 'Resource management'. However, that impact is feeble when it comes to 'Measurement, Analysis, and Improvement'.

In consideration of the analysis of the observations made by the authors mentioned above and the results of our study, we realize that the commitment of the leaders to manage the processes of the ISO 9001 certified QMS efficiently must be visible, permanent, "proactive" and exist at all levels of management. In addition, managers must invest their efforts in the appropriate integration of the requirements of the international standard ISO 9001 and not just in obtaining certification.

7. Conclusion

Statistical modelling, employing mathematical and statistical techniques, provides a robust framework for analysing and solving complex problems. This article delves into an extensive exploration of structural equation modelling, aiming to assess the strength of cause-and-effect relationships within our research model.

The findings indicate that:
- Positive relationships exist between various components, such as:
  - Management Responsibility Process and Service Realization Process, Management Responsibility Process and Resource Management Process,

Management Responsibility Process and Measurement, Analysis, and Improvement Process,

- o   Management Responsibility Process and Organizational Performance, Measurement, Analysis, and Improvement Process and Organizational Performance,
- o   Organizational Performance and Financial Performance.
- Some links are found to be invalid, including those between the Service Realization Process and Organizational Performance, as well as the Resource Management Process and Organizational Performance.
- Among the eight cause-and-effect relationships, three exhibit a substantial effect, while five show a weaker effect.

The model facilitates:

- The calculation of direct and indirect effects among the various components, offering a comprehensive understanding of their interplay.
- The transformation of cause-and-effect relationships into structural equations, providing predictive and anticipatory capabilities that support informed decision-making.

This study's results contribute to advancing researchers' knowledge and promoting scientific evolution. Additionally, practitioners gain heightened awareness of the impact of an ISO 9001 certified quality management system on organizational performance, empowering them to enhance managerial practices through the adoption of such an approach.

It is crucial to acknowledge the inherent limitations of research endeavors like ours. For instance, the data collection method using a questionnaire has inherent constraints, primarily allowing for the gathering of subjective data and information based on the perceptions of managers.

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