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Analysis of the Propensity to implement the Shingo and the EFQM Models in Portuguese organisations through Structural Equation Modelling

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Dissertation presented to the School of Engineering to fulfil the requirements necessary to obtain a Master's degree in Mechanical Engineering carried out under the guidance of Professor José Carlos Vieira de Sá and co-supervised by Professor Vanda Marlene Monteiro Lima.

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ABSTRACT

Markets have become more and more competitive. To cope with the daily challenges of organisations and the permanent and rapid transformation, organisations seek to achieve a threshold of excellence that not only increases their levels of quality and performance but also provides sustainable results. Currently, there are numerous excellence models, including the EFQM Model and the Shingo Model. The EFQM model was created in Europe and is widely used in this continent, namely in Portugal, to the detriment of the Shingo model. In turn, this dissertation aims to analyse the criteria and assumptions on which the models were built, concluding on what potentially best fits the Portuguese context. Another focus of this dissertation is to investigate how the models are embedded and promote the three pillars of sustainability in organisations. In order to answer these research questions, a literature review was conducted on the topics. A total of 143 articles, mainly from the Web of Science platform, were analysed, from 27 November 2022 to 30 December 2022, following the PRISMA Methodology. Also, a bibliometric co-occurrence network was created to understand the link between the topics, using the VOSViewer software for the purpose. From the results obtained from the literature review, it was possible to conclude that effectively the new version of the EFQM Model and the Shingo Model guide organisations towards achieving sustainable economic, social, and environmental results. Also, a Conceptual Model for Excellence in Business Towards Sustainability is proposed, based on the relationship between the models in the study, their relationships with sustainability, and supporting core concepts that enable to promote the Environmental Policy for sustainable development with Stakeholder Engagement.

In order to assess the Propensity of Portuguese organisations to implement whether the Shingo or the EFQM Models, analysing which one fits the most the reality of Portugal, a conceptual model was proposed. To test the hypotheses operationalised in the model, a survey was planned and therefore sent to the 37730 Portuguese organisations. The data was collected for 6 weeks, from 15 June 2023 to 24 July 2023, in which it was possible to obtain 789 answers, a number above the minimum level required with a confidence level of 95%. From the initial sample, a total of 731 responses were considered valid and consequently, the data extracted from them was treated and analysed, in order to draw the respective conclusions concerning the previously mentioned objectives, using a Structural Equation Modelling (SEM) approach. Results from the hypothesis testing indicate that Portuguese organisations have the Propensity to implement the Shingo Model. Furthermore, these organisations that show great Propensity for the Shingo Model revealed to be positively related to six important pillars of organisational maturity: strategic alignment, stakeholders' management, culture, internal processes, and use of technology. Also, it was concluded that the Propensity to implement the Shingo Model is positively related to environmental, operational, and social performance, thus indicating the right path of Portuguese organisations towards excellence and the implementation of the Shingo Model.

KEYWORDS

EFQM Model; Shingo Model; Sustainability; Structural Equation Modelling; Portuguese organisations

RESUMO

Os mercados têm-se tornado cada vez mais competitivos. Para fazer face aos desafios diários das organizações e à permanente e rápida transformação, as organizações procuram atingir um patamar de excelência que não só aumente os seus níveis de qualidade e desempenho, como também proporcione resultados sustentáveis. Atualmente, existem inúmeros modelos de excelência, entre os quais o Modelo EFQM e o Modelo Shingo. O modelo EFQM foi criado na Europa e é amplamente utilizado neste continente, nomeadamente em Portugal, em detrimento do modelo Shingo. Por sua vez, esta dissertação tem como objetivo analisar os critérios e pressupostos sobre os quais os modelos foram construídos, concluindo sobre o que potencialmente melhor se adequa ao contexto português. Outro foco desta dissertação é investigar como os modelos são incorporados e promovem os três pilares da sustentabilidade nas organizações. Para responder a estas questões de investigação, foi efetuada uma revisão da literatura sobre os temas em questão. Foram assim analisados 143 artigos, principalmente da plataforma *Web of Science*, no período de 27 de novembro de 2022 a 30 de dezembro de 2022, seguindo a Metodologia PRISMA. Foi ainda criada uma rede de coocorrência bibliométrica para compreender a ligação entre os temas, utilizando para o efeito o *software VOSViewer*. A partir dos resultados obtidos da revisão da literatura foi possível concluir que, efetivamente, a nova versão do Modelo EFQM e do Modelo Shingo orientam as organizações para a obtenção de resultados económicos, sociais e ambientais sustentáveis. É ainda proposto um Modelo Conceptual de Excelência Empresarial para a Sustentabilidade, baseado na relação entre os modelos em estudo, nas suas relações com a sustentabilidade e nos conceitos centrais de suporte que permitem promover a Política Ambiental para o desenvolvimento sustentável com o Envolvimento das Partes Interessadas.

Com o objetivo de avaliar a propensão das organizações portuguesas para implementarem o Modelo Shingo ou o Modelo EFQM, analisando qual deles se adequa melhor à realidade portuguesa, foi proposto um modelo conceptual. Para testar as hipóteses operacionalizadas no modelo, foi planeado e enviado um inquérito a 37730 organizações portuguesas. Os dados foram recolhidos durante 6 semanas, de 15 de junho de 2023 a 24 de julho de 2023, em que foi possível obter 789 respostas, um número acima do nível mínimo exigido, com um nível de confiança de 95%. Da amostra inicial, um total de 731 respostas foram consideradas válidas e, consequentemente, os dados extraídos das mesmas foram tratados e analisados, de forma a extrair as respetivas conclusões relativamente aos objetivos anteriormente mencionados, utilizando uma abordagem por Modelação de Equações Estruturais (MEE). Os resultados do teste de hipóteses indicam que as organizações portuguesas têm maior Propensão para implementar o Modelo Shingo. Para além disso, estas organizações que apresentam maior Propensão para o Modelo Shingo revelam estar positivamente relacionadas com seis importantes pilares da maturidade organizacional: alinhamento estratégico, gestão de *stakeholders*, cultura, processos internos e utilização de tecnologia. Concluiu-se ainda que que a Propensão para a implementação do Modelo Shingo está positivamente relacionada com o desempenho ambiental, operacional e social, indicando assim o caminho favorável das organizações portuguesas em direção à excelência e à implementação do Modelo Shingo.

PALAVRAS-CHAVE

Modelo EFQM; Modelo Shingo; Sustentabilidade; Modelação de Equações Estruturais; Organizações portuguesas.

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LIST OF ABBREVIATIONS

5S	*Seiri, Seiton, Seiso, Seiketsu, Shitsuke*
AC	Adhocracy Culture
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
BEMs	Business Excellence Models
C	Culture
CC	Clan Culture
CE	Circular Economy
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CR	Composite Reliability
CS	Corporate Sustainably
CSR	Corporate Social Responsibility
df	Degrees of freedom
DP	Deming Prize
EFA	Exploratory Factor Analysis
EFQM	European Foundation for Quality Management
EMAS	Eco-Management and Audit Scheme
EMS	Environmental Management Systems
EOSP	Environmental, Operational, and Social Performance
EP	Environmental Performance
GFI	Goodness Fit Index
GMM	Generalized Method of Moments
GRI	Global Reporting Initiative
H	Hypothesis
HC	Hierarchy Culture
HTMT	Heterotrait-monotrait
I4.0	Industry 4.0
IP	Internal Processes
ISEP	Instituto Superior de Engenharia do Porto
ISO	International Organisation for Standardization
IT	Information Technology
JIT	Just In Time
KBIs	Key Behavioural Indicators
KMO	Kaiser-Meyer-Olkin
KPIs	Key Performance Indicators

MBNQA	Malcolm Baldrige National Quality Award
MC	Market Culture
ML	Maximum Likelihood
MVN	Multivariate Normality
N	Total number of observations
n	Final numbers of publications
NUTS	Nomenclature of territorial Units for Statistical purposes
OEE	Overall Equipment Effectiveness
OLP	One Point Lesson
OSP	Operational and Social Performance
P.Porto	Polytechnic Institute of Porto
PCA	Principal Component Analysis
PCFI	Parsimony-adjusted CFI
PDCA	Plan, Do, Check, Act
PE	Propensity to implement EFQM Model
PGFI	Parsimony-adjusted GFI
PLS	Partial Least Squares
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-analyses
PS	Propensity to implement Shingo Model
RADAR	Results, Approach, Deployment, Assessment and Refinement
RH	Research Question
RMSEA	Root Mean Square Error of Approximation
SA	Strategic Alignment
SDGs	United Nations Sustainable Development Goals
SEM	Structural Equation Modelling
SM	Stakeholders' Management
SMED	Single Minute Exchange of Die
SMEs	Small and Medium-sized Enterprises
SPC	Statistical Process Control
SPSS	Statistical Package for the Social Sciences
SRW	Standardised Regression Weights
T	Use of Technology
TLI	Tucker-Lewis Index
TPM	Total Productive Maintenance
TQM	Total Quality Management
UN	United Nations
UVN	Univariate Normality
VSM	Value Stream Mapping

1. INTRODUCTION

This chapter presents an introduction to the research conducted on the study of the analysis of the propensity to implement the Shingo and the EFQM Models in Portuguese organisations and on the analysis of the impact of these excellence models on the sustainability of organisations. Consequently, it is indicated the motivation for the investigation developed, its objectives, an explanation of the methodology adopted, and ultimately, the structure in which the current dissertation is organised.

1.1. Overview

The urge to be constantly prepared in a world of permanent change and competition leads organisations to the concept of excellence, to improve their quality and performance (Zapletalová, 2022). This search for excellence resulted in many excellence models worldwide (Muhammad Din et al., 2021), such as the European Foundation for Quality Management (EFQM), in Europe, the Malcolm Baldrige National Quality Award (MBNQA), in the United States, the Deming Prize (DP), in Japan, and the Shingo Model. These models inspired the creation of many others and essentially differ in the weights given to criteria or in the application framework, as each model is adapted to the sociocultural and economic perspectives where it was created (Periañez-Cristobal et al., 2020). According to Sampaio et al. (2012), Business Excellence Models (BEMs) should be considered a management philosophy, a set of guiding principles, criteria, and approaches that produce the best results in the medium and long-term, promoting sustainable future development, and therefore, to attain excellent performance, the best practices in terms of leadership, strategy, human resources, customer management, operations, and social responsibility should be embraced. Consequently, business excellence allows for the development and strengthening of management systems and processes, in order to enhance organisational performance and create great value for its stakeholders (Zapletalová, 2022), becoming a threshold that many organisations aim to achieve.

EFQM Model provides guidance to implement a TQM culture and attain sustainable results (Calvo-Mora et al., 2018). This model can be implemented in various sectors of activity (Dobrovič et al., 2019; Laurett & Mendes, 2019; Liu et al., 2021) and works as a self-assessment tool, allowing organisations to periodically assess their results, being able to permanently seek for improvement, building their way towards excellence (Rodríguez-González et al., 2020; Sá & Oliveira, 2013). In Portugal, the EFQM Model is implemented precisely as a way to implement TQM practices and achieve excellence (Araújo & Sampaio, 2014). Another important model, but yet not very widespread, mainly in Europe, is the Shingo Model. Shingo Model comprises a set of principles that shape culture, leading to organisational and operational excellence (Shingo Institute, 2020b). Globally, more than 350 organisations have been awarded with a Shingo Prize, recognising their efforts towards organisational excellence (Shingo Institute, 2022).

Many organisations still measure their performance based on financial results. However, in order to sustain excellence, social and environmental performance must also be considered (Teixeira et al., 2022). Incorporating socially responsible practices in organisations leads to multiple benefits that can be attained, such as increasing profits, productivity and quality, image improvement, ease in retaining quality employees, better response to market demands, etc. (Střihavková et al., 2021). Moreover, organisations should increase efforts in order to meet the 17 Sustainable Development

Goals (SDGs) adopted by all members of the United Nations, in 2015, to be fully achieved in 2030 (Rosati & Faria, 2019). Excellence models have been promoting cultural, social, and environmental factors as one of the keys to success (Sampaio, 2017). However, it is important to understand how these models inspire organisations to promote the best sustainable practices and how they perceive them. Consequently, in the literature review of this dissertation, scientific evidence on the incorporation of economic, social, and environmental pillars on the EFQM and the Shingo Models will the searched for, helping to answer the first research question (RQ).

Both the EFQM and the Shingo Models possess a dynamic nature and are constantly subject to revision and enhancement. Consequently, these models were recently updated, and some of the first-sight changes consist of the structure of the EFQM model, which undertook deep changes and the concept of operational excellence in the Shingo Model which evolved to organisational excellence (Plenert, 2021), becoming a more comprehensive model. EFQM Model is widely implemented in Portugal due to being a European framework, even though the Shingo Model has started gaining relevance in Europe (Shingo Institute, 2022). Despite being conceived from different constructs and having a completely distinct structure, both of the models share common aspects. Hence, it is paramount to understand what the convergent and divergent points between the models are, regarding their latest versions. Furthermore, as previously reported it is crucial to understand what model criteria in practice would fit better in the Portuguese context, fulfilling the needs and ambitions of Portuguese organisations, and leading them to the desirable sustainable results.

1.2. Objectives

Within the scope of the elaboration of this Master's dissertation, and concerning the shortcomings previously stated in the Overview, this investigation aims to answer the following research questions (RQ):

RQ1: *How do excellence models promote the sustainability of organisations?*

RQ2: *Which of the excellence models do Portuguese organisations reveal better propensity to implement?*

Thereby, this investigation endeavours to understand how excellence models inspire the sustainability of organisations, as well as to understand which Model criteria adapt the most to the Portuguese context (EFQM Model or Shingo Model).

To achieve these objectives, the subsequent secondary objectives must be accomplished:

i. Build deeper knowledge regarding the EFQM Model, the Shingo Model, and Corporate Sustainability through a systematic literature review.

ii. Identify the relationships between the models mentioned above and Corporate Sustainability, by understanding how sustainability is embedded and promoted in both the EFQM Model and the Shingo Model.

iii. Analyse the criteria and assumptions on which both of the models are built, in order to propose distinct and specific questions in the survey to conclude on which potentially best fits the Portuguese reality.

iv. Identify the hypotheses that will support the research and development of a conceptual model.

v. Collect the data through a survey sent to Portuguese organisations.

vi. Statistical analysis of the data and drawing of the respective conclusions regarding the structural model and hypotheses tests.

This dissertation aims to accomplish both of these questions and fill the gap concerning the lack of practical studies on the latest version of the EFQM and the Shingo Models, as well as to fulfilling the gap in the literature regarding the lack of practical studies evolving the EFQM and the Shingo Models and its relationship with Corporate Sustainability.

1.3. Methodological options

The methodology can be defined as the research strategy on which the research is going to be developed (Melnikovas, 2018), i.e., the approach to systematically solve the research problems (Kothari, 2004), based on the beliefs of the researcher and philosophical assumptions. One of the frameworks used to design the research methodology is the "Research Onion", created by Saunders et al. (2019), in which each "onion layer" allows to progressively describe the methodology used, helping to formulate a proper methodology (Melnikovas, 2018). Firstly, it defines the main philosophy followed by, the approaches, the methodological choice, the strategies used, the time horizon, and the techniques and procedures of data collection and data analysis. This framework is popular because it is simple and easy to understand and can be used in distinct areas and disciplines (Mardiana, 2020).

Regarding the purpose of this dissertation, the main philosophy is interpretivism, as it is expected to deepen understanding and interpretations of a certain context (Saunders et al., 2019), in this case specifically, the Portuguese context in what concerns the excellence models. Also, an inductive approach supports this research methodology, as data is collected, and is developed a theory as a result of data analysis. The quantitative method is the main used in the survey, even though qualitative data is gathered, for supplementary purposes (multi-method). The research strategy in this case is a survey, and the research is cross-sectional (study located in a time), in what concerns the time horizon. The survey was sent to organisations and the quantitative data provided was statically analysed, in order to understand which model criteria fits best in the Portuguese context. Survey research was chosen as it is a helpful approach to describe and explore variables. However, it is important to remark that a rigorous strategy must and will be followed in order to minimize errors and provide high-quality outcomes (Brant et al., 2015).

Moreover, after setting the purpose and the objectives of this dissertation, a literature review was conducted, following the PRISMA Methodology. This methodology allows to refinement of the eligible publications to accomplish a transparent literature review. The publications selected to be analysed, as well as the inclusion and exclusion criteria, are exhaustively described in Chapter 2.1.

1.4. Structure of the work

The dissertation is organized into nine chapters. The first chapter is the *Introduction*, where the context, objectives, and methodologies adopted are described.

In the second chapter - *State of the Art*, a literature review is conducted, divided into five sub-chapters: firstly, it is fully described the methodology used to select the publications eligible to be analysed, then a literature review on the topics EFQM Model, Shingo Model, Corporate Sustainability, and on the relationship between the Excellence Models and Corporate Sustainability is carried out.

Subsequently, the third chapter - *Critical Analysis of the Literature Review* addresses to conclusions made concerning the literature review previously presented.

The fourth chapter - *Model of Research* presents the proposed conceptual model and the theoretical support for the formulated assumptions. Subsequently, the *Research Methodology* comprises the fifth chapter, divided into three sub-chapters, on which it is reported the survey structure, the measuring scale used, and the validation process by the experts in the field. Afterwards, a description of the operational variables is conducted, i.e., it is explained how questions in the survey were formulated and it is described the theory that is under those formulations. To conclude this chapter, it is explained the data collection process and it is characterised by the sample in the study.

The sixth chapter - *Results of the Survey*, as stands, it is presented the results obtained from the survey in what concerns the demographic profile, the characterisation of the organisations and respondents in order to assess the legitimacy of answers received, and it is also assessed the organisational maturity of Portuguese organisations. Statistical analysis of variables is conducted, followed by the examination of data in terms of missing values, outliers, and the normality of the sample data. This chapter ends by assessing the reliability and one-dimensionality of constructs operationalised.

The chapter that follows - *Structural Equation Modelling* is divided into two sub-chapters that correspond to the two major components of SEM models: the Measurement model, which contains all the information on criteria and options taken to assess the adjustment of the measurement model, and the Structural model, which comprises the results of the structural model and hypothesis testing.

This dissertation ends by presenting the chapter - *Conclusion*, which contains the final conclusions regarding this investigation, the contributions attained to deepen the existing knowledge on the subject under analysis, the limitations faced, and the future research avenues, leading to prospective research lines that may be pursued in the future.

2. STATE OF THE ART

In this chapter, a systematic literature review will be conducted. Firstly, the methodology used to identify the publications will be explained and, subsequently, the results from the analysis will be presented, organized into the following sub-chapters: EFQM Model, Shingo Model, Corporate Sustainability, and Excellence Models and Corporate Sustainability.

2.1. Characterisation of publications selected in databases

In order to understand the evolution of scientific knowledge and production regarding the abovementioned topics, this literature review was accomplished following the PRISMA (Preferred Reporting Items for Systematic reviews and Meta-Analyses) Methodology (Figure 1), to select the final number of publications (n). This methodology was developed to report transparency in the reviews and was recently updated to its 2020 version (Page et al., 2021).

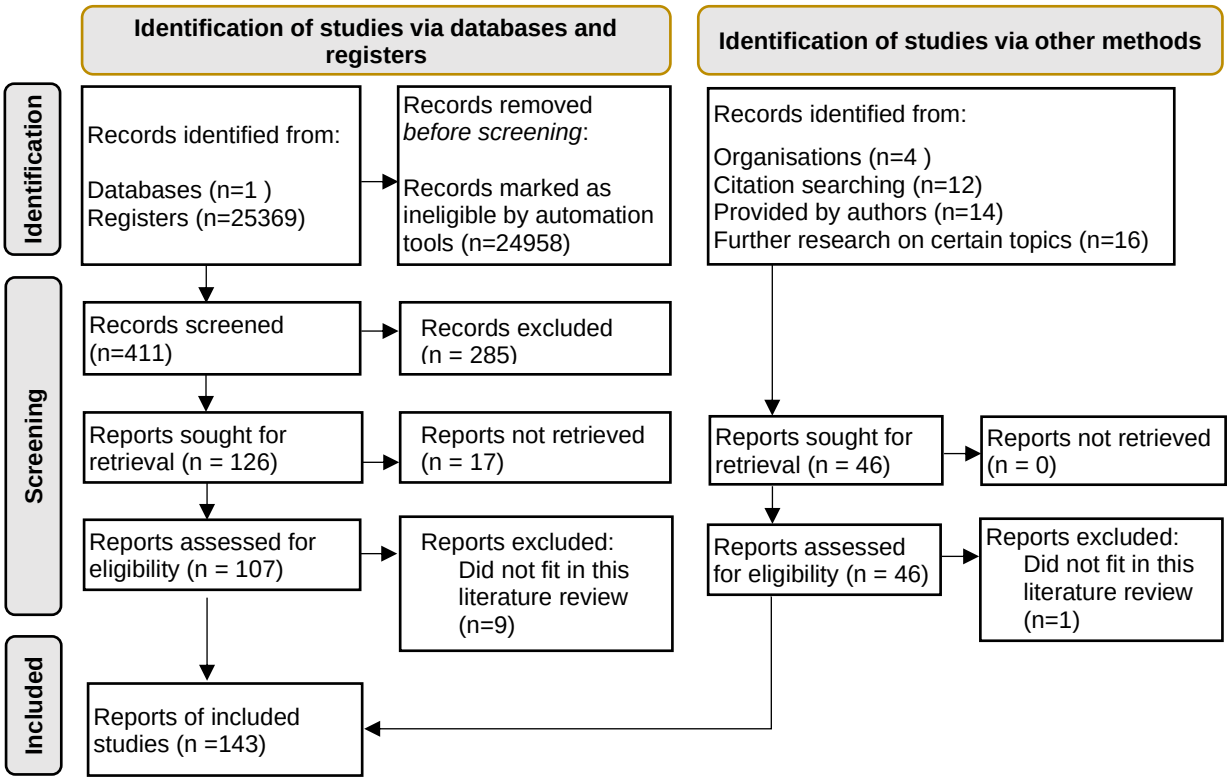


Figure 1 – Selection of the final number of publications according to the PRISMA Methodology

The research was conducted from 27 November 2022 to 30 December 2022. The main database used for the purpose was the Web of Science, and the publications were searched by topic i.e., the words were searched by title, abstract, author keywords, and in the keywords plus of publications. Due to the lack of publications regarding the latest model versions of the EFQM and the Shingo models, as well as the lack of publications regarding studies evaluating the relationship of these models with Corporate Sustainability (CS), comprehensive research was conducted. Thus, the searched words were only "EFQM *" or “Shingo *”, where after applying the automatic filters all the abstracts of articles were read for the publications to be selected. Consequently, they were

organised into three chapters: two chapters to present the main considerations regarding each of the models and the last chapter addressing their relationship with Corporate Sustainability.

A scarcity in articles about the EFQM 2020 Model version was found, as well as a scarcity in articles related to the Shingo Model, as previously mentioned. Therefore, the literature was selected from the last 10 years, from the period 2013-2022. Proceeding papers were also considered to complement this literature review. The problem regarding the scarcity of articles on the EFQM Model is additionally highlighted by Fonseca et al. (2021). The quantity of articles addressing the Shingo Model is even more marginal. The problem underlying the lack of articles on Operation Excellence was reported by Carvalho et al. (2019) and Khatib et al. (2022). The minimum number of articles existing that relate Operational Excellence with CS was also studied by Wojtkowiak & Cyplik (2020) who report the same situation. These obstacles emphasise the relevance of this dissertation.

Moreover, a chapter on Corporate Sustainability to contextualise this topic and analyse its scientific evolution was considered. However, the number of publications regarding this subject is substantially higher, thus the inclusion criteria were different. The following table (Table 1) summarises what criteria were applied to select the final number of publications.

Table 1 – Inclusion criteria to select the publications

	EFQM Model and Shingo Model		**Corporate Sustainability**
i.	Searched by topic (title, abstract, author keywords, and keywords plus): "EFQM *" or “Shingo *”	i.	Searched only by keywords: "Corporate sustainability" or "Corporate social responsibility" or "CSR"
ii.	From 2013 – 2022	ii.	From 2018-2022
iii.	Articles and proceedings	iii.	Articles
iv.	English Language	iv.	English Language
		v.	Only Highly Cited Papers

After applying automatic tools in the database, according to the inclusion criteria, it was reached a total of 411 publications, as can be observed in Figure 1. Consequently, after reading the abstract only 129 appeared to be according to what was being searched. 17 publications were disregarded as access to them was unable and 9 publications were not considered relevant after reading the whole paper. Due to the lack of publications as already emphasised, despite including grey literature (conference proceedings), some documents were also accessed through the webpage of organisations (which was the case of the booklets of EFQM and Shingo Models), through citation research, and some were provided by authors on this subject, as well as some of them were searched in Web of Science and Google Scholar additionally, to complement specific topics, whenever it was necessary throughout the literature review.

Figure 2 represents the evolution of articles concerning Corporate Sustainability on the Web of Science. As can be observed, Corporate Sustainability is a subject gaining more and more prominence, over time, as exponential growth in studies on this matter is verified.

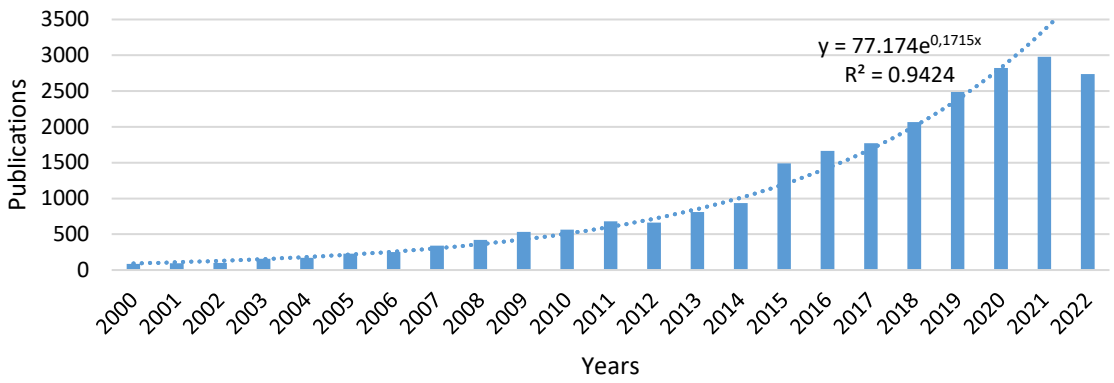


Figure 2 – Evolution of studies on corporate sustainability (Author's own elaboration)

Using the software VOSviewer it was possible to construct and visualise bibliometric networks of author's keywords co-occurrence (Figure 3), using the publications selected to study from the Web of Science platform, characterised on the left side of the PRISMA Diagram, in Figure 1.

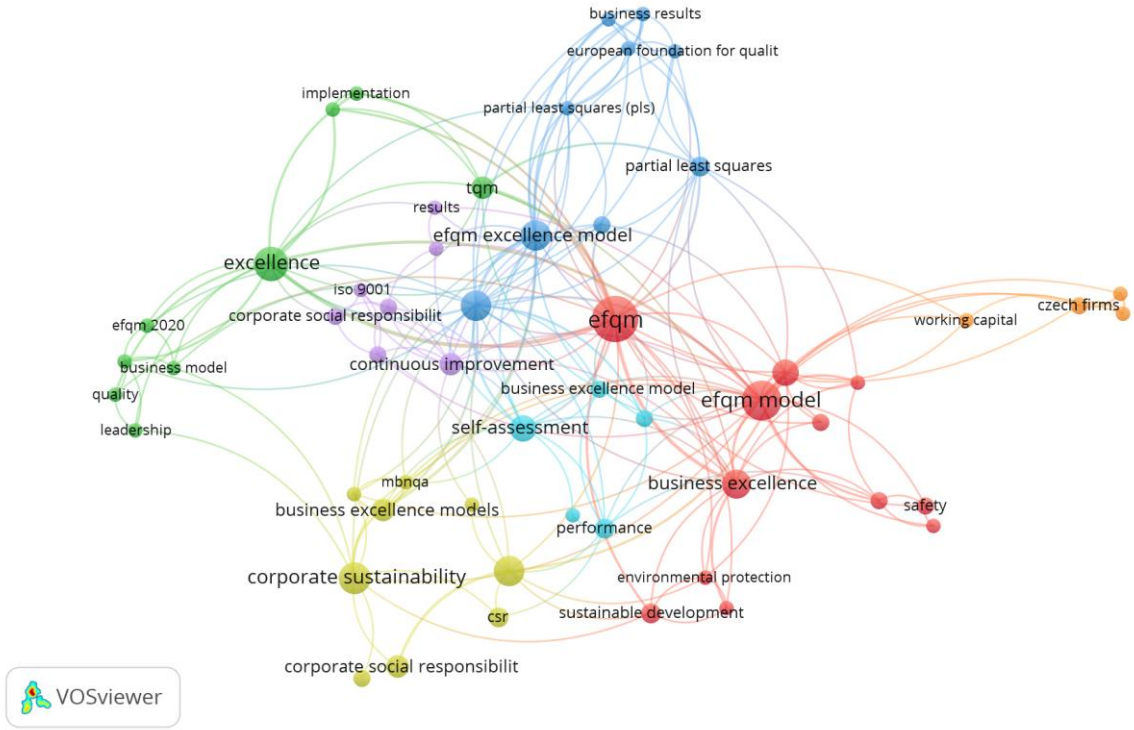


Figure 3 – Bibliometric network

The bibliometric network presents 54 terms organised into 7 clusters, each identified with a colour according to its map of relationships. It can be seen from the analysis in Figure 3 that the most cited terms are related to the EFQM model (the model with the highest percentage of articles selected for the investigation, due to the lack of articles on the Shingo model). Hence, keywords such as "EFQM", "EFQM Model", and "EFQM Excellence Model" are more relevant in the network.

The importance of the keywords "excellence", and "self-assessment" is also emphasised, as both models consist of assessment tools. Concepts such as "partial least squares", "dummy variable" and "GMM" are directly related to the homogeneity of the methods used to carry out studies in the

field of excellence models. The relevance of the words “business excellence” and "continuous improvement" also stands out.

In this bibliometric network, great emphasis is placed on concepts related to sustainability, which is a very important focus of this dissertation. Thus, especially in the yellow/red clusters, "corporate sustainability", "corporate social responsibility", "CSR", "environmental protection" and "sustainable development" are highlighted.

The terms "MBNQA", "ISO 9001" and “TQM” occur in a significant number of articles, due to their expressiveness, since either the MBNQA model, ISO 9001, or the “TQM” are frequently studied, mainly in association with the EFQM model. It is also important to highlight the terms that are more distant in the network presented above (Figure 3) and which are, therefore occurring with less frequency, but still enough to be part of the network – those terms are "leadership", "safety", "Czech firms", "business results” and "implementation".

The seven clusters obtained from this analysis and their keywords in detail are displayed in Table 2.

Table 2 – Clusters and keywords obtained from the bibliometric network

Clusters	Keywords
Cluster 1	Business excellence, business performance, EFQM, EFQM 2020 model, EFQM model, environmental protection, excellence models, quality management, safety, social responsibility, strategic planning, sustainable development
Cluster 2	Business model, EFQM 2020, excellence, implementation, leadership, quality, Spain, strategy, TQM
Cluster 3	Business results, critical factors, EFQM excellence model, European foundation for quality management, partial least squares, partial least squares (PLS), social factors, technical factors, total quality management
Cluster 4	Business excellence models, corporate social responsibility (CSR), corporate sustainability, CSR, Deming prize, financial performance, lean, MBNQA, sustainability
Cluster 5	Continuous improvement, corporate social responsibility, enablers, ISO 9001, operational excellence, results, Shingo model
Cluster 6	Business excellence model, factor analysis, performance process, self-assessment
Cluster 7	Czech firms, dummy variable, GMM, working capital

Note: TQM – Total Quality Management; MBNQA – Malcolm Baldrige National Quality Award; GMM-Generalized Method of Moments.

All the keywords are intrinsically linked with the purpose of this dissertation. However, two words may seem outliers “Spain” and “Czech firms”. Rotta & Pérez Rave (2017) found the same conclusions in their literature review. In fact, Spain and the Czech Republic are the countries that produce more studies on the EFQM Model. Also, Spain is the European country with more applications and recognitions of the EFQM Model (Menezes et al., 2021).

The following figure (Figure 4) precisely shows the distribution of the selected publications by their country of origin, where the previous premise can be corroborated. Spain contributed 32% of the selected publications and the Czech Republic with 11%, followed by Portugal with 6%.

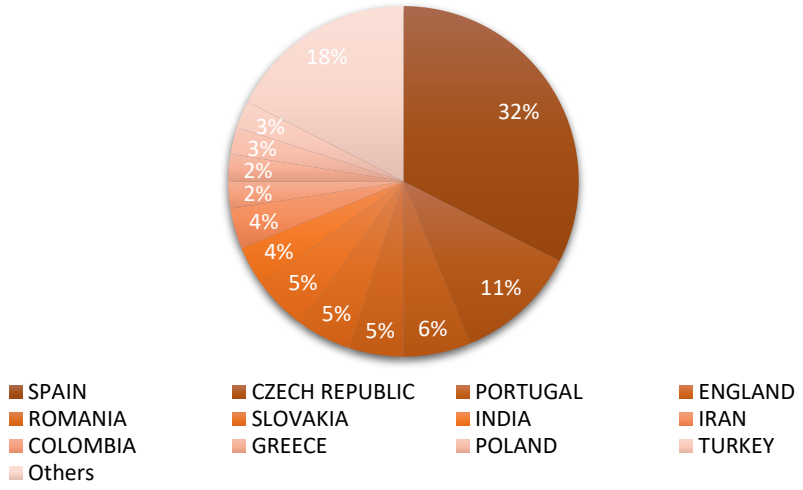


Figure 4 – Distribution of publications by country of origin (Author's own elaboration)

The Shingo Model only occurs in the fifth cluster with not as much relevance as the EFQM Model. Consequently, this can be explained because publications on the Shingo Model only represent 7% (9 publications) of the publications considered to be analysed, even though it is important to refer that within the selected publications, Portugal and the USA are the countries which have published more on Shingo Model (3 articles each).

The publications were also characterised in terms of their publishers (Figure 5).

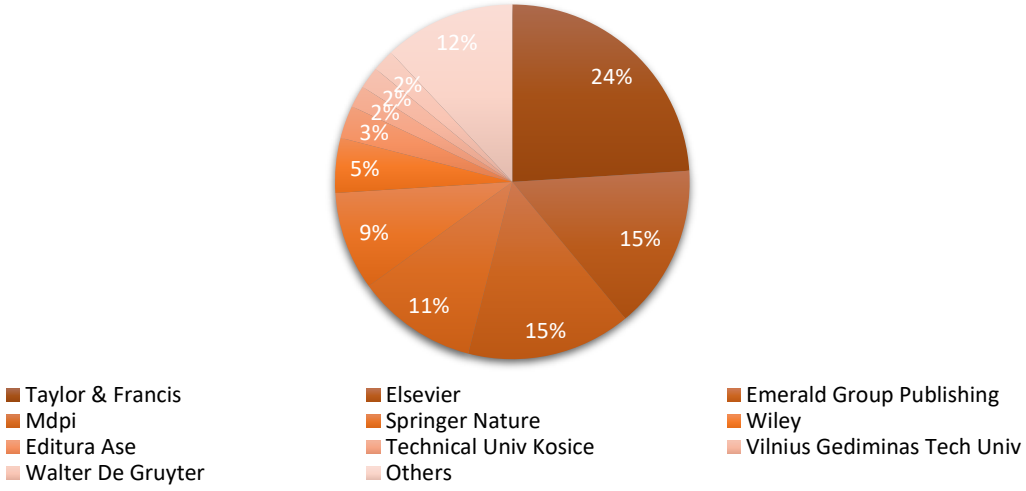


Figure 5 – Characterisation of publications by their publisher (Author's own elaboration)

Results illustrated in the chart above (Figure 5) indicate that Taylor & Francis, Elsevier, and Emerald Group Publisher are the ones that most publish on the topics related to this dissertation.

2.2. EFQM Model

The European Foundation for Quality Management (EFQM) is an organisation established in 1989, which was responsible for creating the EFQM Excellence Model, a globally recognised framework first published in 1992. Due to the rise of TQM (Total Quality Management) in Japan and the MBNQA (Malcolm Baldridge National Quality Award) being a recognition of excellent performance, in the United States, Jacques Delors along with 14 European leaders felt the need to give a response in terms of quality and excellence in this region of the globe, resulting in the EFQM Model (Murthy et al., 2021a)

The EFQM model is a comprehensive tool that aims to "support leaders as they manage cultural change and transformation to deliver performance improvements and benefits for their key stakeholders" (EFQM, 2019, p. 3). EFQM model is dynamic, and constantly subject to revision as it must be improved to accompany the progress and transformation in organisations (Fonseca et al., 2021; Hussain et al., 2020). Over the years, the EFQM model has shaped the quality of organisations and has identified areas of improvement, as this model constitutes a self-assessment tool that can be used to detect the strengths and weaknesses of an organisation (Zapletalová, 2022). Improvement of the image, client satisfaction, commitment and satisfaction of employees, more profits, innovation, and optimisation of the use of the information systems are some of the benefits that can be achieved when implementing this model (Al-Majali & Almhirat, 2018; Suárez et al., 2017). Besides, the EFQM Model can also be considered a model to manage human resources, helping to improve the results of organisations regarding the employees (Garbarova, 2017).

There are still some barriers to the implementation of the EFQM Model, such as a lack of knowledge about the model, lack of leadership, lack of physical or financial resources, the complexity of the model, etc. These barriers can be characterised mainly in three groups – cultural and behavioural barriers, organisational barriers, and resource barriers (Gómez-López et al., 2017; Suárez et al., 2017). Regarding the results of the EFQM model implementation, they can be divided into three groups: Internal results, Economic results, and Human resource results. Highly results-oriented organisations usually increase the efficiency of internal processes, which leads to an improvement of image and improvement of administrative procedures. Moderately results-oriented organisations tend to increase the involvement of employees, whereas lowly results-oriented organisations present better internal and human resource results than economic ones (Gómez-López et al., 2019).

The EFQM Model can be implemented independently of the type of activity (Calvo-Mora et al., 2015; Suárez et al., 2017), such as in manufacturing, banking, finance, education, management, consultancy, and many others (Wierzbic & Martusewicz, 2019), and whether it is a public, private or third sector industry (EFQM, 2019) or regardless of its dimensions (Fonseca, 2022). However, it is important to emphasise that private organisations are more prone to achieve excellence through the implementation of the EFQM model (Zapletalová, 2022).

Moreover, the EFQM Model is gaining great prominence in the health sector and higher education (Rotta & Pérez Rave, 2017; Yousaf & Bris, 2020). In papers of Matthies-Baraibar et al. (2014) and Sütőová et al. (2022) are reported case examples of EFQM Model implementation in health and education, respectively. Portuguese higher education institutions also using the EFQM model as a quality management system (Zgodavová et al., 2015).

Being a comprehensive model, comprises a disadvantage according to investigators, as some of them consider that criteria and/or self-assessment weightage does not fit properly in all sectors of activities. As a consequence, some authors, such as Vukomanovic et al. (2014), proposed adaptations of the EFQM model, regarding some types of specific industries, in this case specifically the construction industry.

Certified firms generally perform better than non-certified ones, as pointed out by Yousaf (2022a) despite most certified companies not being yet sufficiently efficient (Yousaf, 2022b). However, Yousaf et al. (2021) did not confirm the results attained by some other authors that certification on this model increases the profitability of organisations, as contrary results were experienced. Many organisations have already started their journey towards certification previously with ISO 9001, ISO 14001, B Corp, etc. Fonseca et al. (2022) concluded that these certifications also address corporate social responsibility and lead organisations towards sustainable development. The same conclusions were taken by Bravi et al. (2020) regarding ISO 14001. Furthermore, Fonseca (2015) compared ISO 9001 with the EFQM Model, enabling to reach the conclusion that ISO 9001 incorporates many EFQM principles. Also, it was concluded that companies with higher years of ISO 9001 certification tend to have better results in the assessment and recognition of the EFQM Model.

In Portugal, the organisations from the public sector are considered the most suited to implement the EFQM Model, and only large companies from the private sector adopted the EFQM Model, as SMEs (small and medium-sized enterprises) do not see advantages regarding the implementation of this model (Araújo & Sampaio, 2014). The EFQM model is a self-assessment tool, comprising a better motivation a motivation rather than winning properly a prize, in Portuguese organisations, as it enables to assess the evolution of organisations towards TQM and excellence practices (Araújo & Sampaio, 2014).

Over the years, researchers have agreed that TQM philosophy inspired and is incorporated in the formulation of this excellence model, despite having subsequently, evolved by integrating other aspects such as social responsibility, which was not part of the TQM principles initially (Gómez et al., 2017). Literature provides a huge panoply of definitions for TQM. According to Ho (1997), TQM provides an integrated and consistent perspective, involving everyone and everything, which promotes continuous improvement in all the systems and processes of an organisation. Taking a closer look at the words that create the abbreviation for TQM, *Total* represents all the individuals that contribute/promote continuous improvement (such as employees, customers, and suppliers); *Quality* pertains to the demands of customers perfectly met and, finally, *Management* refers to the managerial commitment (Hietschold et al., 2014; Ho, 1997).

TQM benefited from the contributions of quality gurus, especially Deming, Juran, Crosby, Feigenbaum, and Ishikawa. These pioneers owned distinct definitions, perceptions, and approaches on this topic, concerning quality management, despite sharing some common opinions, predominantly on the importance of continuous improvement by having a proper management system of an organisation as a whole, leading to customer satisfaction (Neyestani, 2017).

Saraph et al. (1989), Flynn et al. (1994) and Ahire et al. (1996) were some of the TQM precursors and researchers who conceptualised reliable and valid studies to measure the implementation of TQM. Saraph et al. (1989) identified eight critical factors that “must be practised to achieve effective quality management in a business unit”, whether it is a manufacturing or a service

organisation. Flynn et al. (1994) developed an instrument based on seven dimensions to be used in fabrication and assembly operations, even though after deeper study of the model it could be adapted for use in service and process industries and in different cultures or countries. Ahire et al. (1996) proposed a framework after a detailed literature review and further testing in 371 companies in the automotive components manufacturing industry, based on twelve dimensions (constructs) whose analysis of the correlations revealed a positive impact on product quality and therefore, on Quality Management implementation. Hence, many frameworks were developed according to the background of authors and their experience on the issue. There are three types of implementation frameworks: those based on the opinions and experience of consultants and experts; the frameworks based on awards/excellence models for organisations who wish to be recognised as excellent in the quality management area, and those based on academic research (Yusof & Aspinwall, 2000).

The dimensions of the three models stated previously (Ahire et al., 1996; Flynn et al., 1994; Saraph et al., 1989) are summarised and presented in Table 3.

Table 3 – Dimensions of TQM, according to different authors.

Authors	TQM dimensions
Saraph et al. (1989)	The role of management leadership and quality policy; Role of the quality department; Training; Product/service design; Supplier quality management; Process Management; Quality data and reporting; Employee relations
Flynn et al. (1994)	Top management support; Quality information; Process management; Product Design; Workforce management; Supplier involvement; Customer Involvement
Ahire et al. (1996)	Top management commitment; Customer focus; Supplier quality management; Design quality management; Benchmarking; SPC usage; Internal quality information usage; employee empowerment; Employee involvement; Employee training; Product quality; Supplier performance

Note: SPC- Statistical Process Control

Magd et al. (2021) emphasise the importance of implementing TQM practices in order to enhance organisational performance and business sustainability, i.e. to achieve overall success. However, implementing TQM is an utterly complex process as it involves changing the working cultures and has an impact on people (Yusof & Aspinwall, 2000). Consequently, measuring the critical factors is extremely relevant to controlling the success of TQM implementation (Hietschold et al., 2014). Many authors divide these critical factors into two groups – soft and hard factors. Soft factors include social and behavioural aspects (organisational culture, leadership and top management commitment, human resources, customer, and stakeholder orientation), whereas hard factors are related to technical aspects (quality planning, continuous improvement, supplier management, processes management, and control, material resources and information management and products and services design) (Calvo-Mora et al., 2014a).

In EFQM Model there is no distinction between both TQM factors. However, Calvo-Mora et al. (2014b) concluded that Management and Human Resources can be considered the soft factors, while Strategic Management of Partners and Resources, as well as Process management, can be considered hard factors of TQM. Rosak-Szyrocka et al. (2019) reached the same conclusions.

"TQM Models" were the first models introduced in businesses that briskly evolved to the term "Models of Excellence", with the appearance of the MBNQA and the EFQM models, raising the question about whether or not TQM and Excellence Models were similar (Gómez et al., 2017). Consequently, many authors have studied the convergence points between both models. Some of the important studies on the topic are presented in Table 4.

Table 4 – Influence of TQM in the EFQM Model

Author(s)	Article	Findings/Results
Calvo-Mora et al. (2015)	Contextual and mediation analysis between TQM critical factors and organisational results in the EFQM Excellence Model Framework	116 Spanish organisations, including SMEs and larger companies, as well as firms from different sectors and activities, participated in a study that allowed to the following conclusions: when the intensity or effectiveness of a TQM factor increases, consequently the operation efficiency increases; The size of firms has implications on TQM implementation and key results, especially for the SMEs; TQM implementation is not affected by the sector of activity, even though, service companies show better results in social factors and customer results, while industrial companies have better scores in technical factors. Furthermore, this research led to the conclusion that the EFQM Model consists of "a valid and viable framework for the design, implementation and improvement of TQM".
Gómez et al. (2017)	EFQM Excellence Model and TQM: an empirical comparison	The author concluded after a study conducted with 199 companies that, notwithstanding there is a high correlation between the TQM dimensions and the EFQM enablers, some TQM elements are omitted from the content of EFQM enablers. In other words, implementing the EFQM Excellence Model is a means to achieve TQM, but not sufficient. Hence, if organisations seek improvement and excellence in pursuing the TQM principles, the application of the EFQM Model should be highly considered.
Gómez-López et al. (2016)	Motivations for implementing TQM through the EFQM model in Spain: an empirical investigation	A survey was conducted to understand what were the motivations for implementing TQM through the EFQM. It was concluded that the motives can be organised into three groups: External market reasons, External reasons for requirements, and Internal reasons. In most cases, the decision of TQM implementation (through EFQM) was taken by top management - internal reason, while when the decision arises from the need to show how effective the management practices are, it constitutes an external reason. Firm profiles allowed also to conclude that when the decision comes from top management we are talking about highly motivated companies, whereas the second case comes from moderately motivated companies, as they wish to improve the internal organisation and productivity.

Author(s)	Article	Findings/Results
Calvo-Mora et al. (2020)	TQM factors and organisational results in the EFQM excellence model framework: an explanatory and predictive analysis	This study aimed to develop a causal-predictive analysis of the relationships between soft and strategic-hard EFQM factors and the organisational results - customers, people, society, and key results. This research presented the following outcomes: Soft EFQM factors have a strong direct relationship with customer and people results and an indirect relationship with society and key results, whereas these two variables (society and key results) show a strong direct relationship with strategic-hard EFQM factors; Soft factors (leadership and people) have high importance in the management systems and must be disseminated as a mean to develop strategic-hard factors in organisations.
Goméz-Gómez et al. (2016)	Weighting the dimensions in models of excellence – a critical review from a business perspective	This paper aimed to verify if organisations when implementing EFQM Model are indirectly using TQM, by making the correspondence between TQM dimensions and EFQM enablers. According to them, despite some dissimilarities, Top Management Support can be considered analogous to Leadership; Customer Relationships in encompassed in Strategy and Processes, Products and Services; Product Design Process is also partially included in the previous enabler; Supplier Relationships can be considered similar to the content in Partnership and Resources; Workforce dimension is included in People enabler and, finally, the dimension Processes is also included in Processes, Products and Services enabler. Companies with high scores in the EFQM model have high scores with TQM.

To spread the implementation of this Model, EFQM created a recognition mechanism in which organisations around the world that showed the adoption of management practices under the criteria of the model could be awarded (Escrig-Tena et al., 2019).

As previously reported EFQM Model has been evolving over the years. The first version of the model (1992) consisted of five enablers criteria and four results criteria, as shown in Table 5. During this period, it was established what to expect from an exceptional organisation and created a benchmark for measuring organisational excellence and the organisational processes that drive excellence, as well as identified society as a key stakeholder. Hence, in the second phase of the model (1999) the extension to the public sector was considered, the popularity of the model increased, and the RADAR logic was introduced. In 2003, the principle “Public Responsibility” changed to “Corporate Social Responsibility” and some major changes in the RADAR tool were introduced, as well. The next version of the model was highly oriented to the future results and a new award category was introduced – three recognition levels depending on the maturity of the organisation (3 to 5 stars) (Ghicajanu et al., 2015). Awards are given to the best outstanding companies and non-profit organisations, whose purpose is to promote and recognise innovation and success, inspire the business community, and allow debate (Aydin et al., 2012; Ghicajanu et al., 2015) to ensure the continuous improvement of organisations. In 2013, an updated version of the model was released with a better focus on flexibility and agility, changes in the RADAR tool and fundamental concepts (Fonseca, 2015; Murthy et al., 2021a; Rosak-Szyrocka & Roszak, 2019). RADAR tools consist of a self-assessment tool that can be used by organisations to find their strengths and opportunities, thus promoting the continuous improvement process, and will further

be explained in this dissertation. The figure below (Figure 6) shows the EFQM 2013 model version. The structure was the same until 2013.

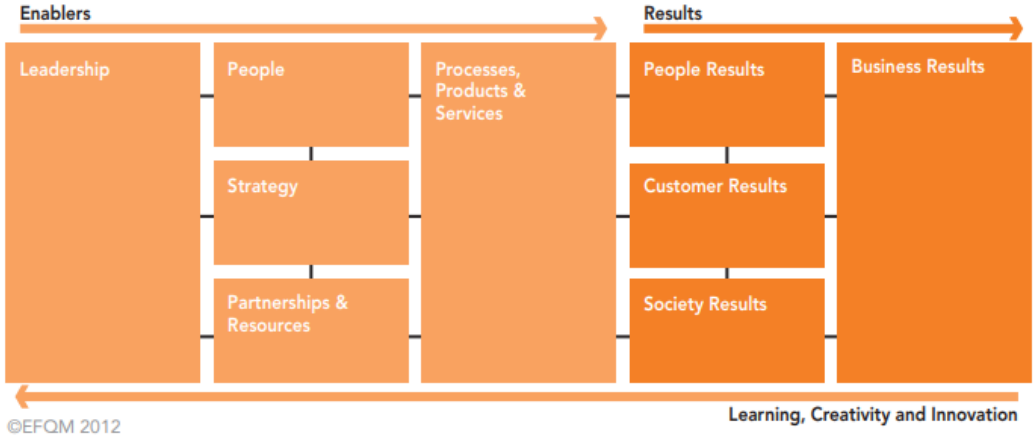


Figure 6 – EFQM 2013 Model structure (EFQM, 2012)

The structure of the model is accompanied by an arrow stressing its dynamics (Murthy et al., 2022). In the two first model versions, it was displayed "Innovation and Learning". In 2010, "Creativity" was added, to help to improve the enablers that originate the best results (Murthy et al., 2021a). Even though the structure of the models until 2019 was the same, the enabler's criteria and results underwent changes as displayed in Table 5.

Table 5 – Enablers and results criteria of the EFQM Model over its versions over the years

	1992 model version	1999 and 2003 model versions	2010 model version	2013 model version
ENABLERS	**1.** Leadership **2.** Policy and Strategy **3.** People Management **4.** Resources **5.** Processes	**1.** Leadership **2.** Policy and Strategy **4.** People **4.** Partnership and Results **5.** Processes	**1.** Leadership **2.** Policy and Strategy **3.** Partnership and Results **4.** Resources **5.** Products, Processes and Services	**1.** Leadership **2.** Policy and Strategy **3.** Partnership and Results **4.** Resources **5.** Products, Processes and Services
RESULTS	**6.** People Satisfaction **7.** Customer Satisfaction **8.** Impact of Society **9.** Business Results	**6 .** People Results **7.** Customer Results **8.** Society Results **9.** Key Performance Results	**6.** People Results **7.** Customer Results **8.** Society Results **9.** Key Results	**6.** People Results **7.** Customer Results **8.** Society Results **9.** Business Results

Note: Author's own elaboration

Regarding the influence of criteria in sub-criteria, Murthy et al. (2022) concluded that Leadership has a strong influence on Strategy and Process Management, but less influence on People and Partnerships; Strategy influences Partnerships but does not influence Process and People; In turn, people have weak influence on Partnerships and Processes, but Partnerships possess a strong influence on Processes. Also, Escrig & de Menezes (2016) reinforce that for large organisations to achieve the best results, efforts should be placed mainly on Leadership and systems. The importance of Leadership in achieving the best results is also emphasised by Doeleman et al. (2014).

After having surveyed about 2000 experts, having provided 24 workshops, and after having spoken directly with over 60 leaders of organisations (EFQM, 2019), on October 23, 2019, at the EFQM

Forum, in Helsinki, a new version of the model (Figure 7) was released (Wierzbic & Martusewicz, 2019).

Figure 7 – EFQM 2020 Model structure (EFQM, 2019)

EFQM Model consists of a comprehensive approach (Akyuz, 2015; Pop & Pelau, 2017), i.e., to reach excellent results, an integrated / holistic perspective of the model criteria must be considered (Suárez et al., 2014). Moreover, Kafetzopoulos et al. (2019) showed evidence that enablers criteria have a strong and positive impact on innovation performance if implemented together rather than individually. The positive relationship between the EFQM model and innovation is also assessed and confirmed by Para-González et al. (2022).

As suggested in Figure 7, the model is compounded by 3 dimensions, namely Direction (Why?), Execution (How?), and Results (What?) (EFQM, 2019). According to Ferreira, L. (2020), the structure of the model version has some similarities with other business models, such as Simon Sinek's Golden Circle. This perspective consists of three concentric circles in which each of them matches a dimension, from inside to outside – Why, How, and What. Sinek states that everything starts with Why – companies must understand their purpose, cause, and beliefs, in other words, "Why companies do What they do" – hence, Why was identified as being the most difficult dimension for companies, then they must know "How they do What they do". Simply put, it is the "differentiating value preposition" and finally What – "What does a company do" – the easiest dimension, the one everybody usually can comfortably describe (Sinek, 2009). The EFQM 2020 Model explains that in order to build an outstanding organisation it is crucial to create sustainable value while preparing for the future. Thus, in this Model the dimension "What" refers specifically to what is carried out "now" and what can be accomplished in the future (EFQM, 2019).

The EFQM Model is mainly composed of fundamental concepts (principles) that guide and help organisations to accomplish outstanding and sustainable results, the criteria, and the RADAR assessment tool. In this model version particularly, the framework is structured into 7 criteria, 23

criterion parts, 2 results criteria, 112 guidance points, and the RADAR assessment tool (Fonseca, 2022).

Each dimension is divided into criteria (7 in total) and each criterion on its sub-parts (23 in total), as shown in Table 6.

Table 6 – EFQM 2020 model dimensions, criterion, and criterion parts

Dimensions	Criterion	Criterion Parts
Direction	Purpose, Vision & Strategy (100 points)	1.1 Define Purpose & Vision 1.2 Identify & Understand Stakeholders Needs 1.3 Understand the Ecosystem, own Capabilities & Major Challenges 1.4 Develop Strategy 1.5 Design & Implement a Governance & Performance Management System
	Organisational Culture & Leadership (100 points)	2.1 Steer the Organisation's Culture & Nurture Values 2.2 Create the Conditions for Realising Change 2.3 Enable Creativity & Innovation 2.4 Unite Behind & Engage in Purpose, Vision & Strategy
Execution	Engaging Stakeholders (100 points)	3.1 Customers: Build Sustainable Relationships 3.2 People: Attract, Engage, Develop & Retain 3.3 Business & Governing Stakeholders – Secure & Sustain Ongoing Support 3.4 Society: Contribute to Development, Well-Being & Prosperity 3.5 Partners & Suppliers: Build Relationships & Ensure Support for Creating Sustainable Value
	Creating Sustainable Value (100 points)	4.1 Design the Value & How it is Created 4.2 Communicate & Sell the Value 4.3 Deliver the Value 4.4 Define & Implement the Overall Experience
	Driving Performance & Transformation (100 points)	5.1 Drive Performance & Manage Risk 5.2 Transform the Organisation for the Future 5.3 Drive Innovation & Utilise Technology 5.4 Leverage Data, Information & Knowledge 5.5 Manage Assets & Resources
Results	Stakeholder Perceptions (200 points)	Examples of results on this topic: Customer Perception Results; People Perception Results; Business & Governing Stakeholders Perception Results; Society Perception Results; Partners & Suppliers Perception Results
	Strategic & Operational Performance (100 points)	Examples of results on this topic: Achievements in delivering its Purpose and Creating Sustainable Value; Financial Performance; Fulfilment of Key Stakeholders Expectations; Achievement of Strategic Objectives; Achievements in Driving Performance; Achievements in Driving Transformation; Predictive Measures for the Future.

Note: Adapted from EFQM (2019)

Detailing the dimensions in this Excellence Model, *Direction* concerns defining an inspirational purpose for the organisation, creating a vision (long-term expectation), developing a strategy taking into consideration the creation of sustainable value, as well as to build a winning culture by introducing a set of norms and values shared by the people who are under the organisation influence. However, in order to meet or exceed the expectations of stakeholders and sustain the best possible results it is crucial to *Execute* an effective and efficient strategy by identifying the key stakeholders, gathering their perceptions, involving them in implementing the strategy and in the creation of sustainable value (imperative to sustain long-term success and financial security), and take appropriate actions to ensure key stakeholders' future. Moreover, an organisation must deliver its current business operations and be prepared to cope with permanent changes. Finally, the last dimension - *Results* states that it is important to supply information on the results of

Stakeholders' perceptions and Strategic and operation performance. Examples of metrics for these result topics and presented in Table 6 (EFQM, 2019).

Providing a more in-depth explanation of RADAR tool, RADAR stands for Results, Approaches, Deployment, Evaluation, and Refinement and consists of an evolution of the PDCA cycle (Plan-Do-Check-Act) and consists of a crucial tool to bring systematic improvements and transparency in the each area of organisations (Murthy et al., 2021a). The RADAR tool is extremely important as it can be used to find strengths and opportunities; to have external recognition - a team of assessors uses the information provided by the three RADAR scoring matrix charts (one for direction, another for execution and another for results) to assess the company; to compare the performance with other organisations that implemented the EFQM model and the RADAR logic, as well as it provides the possibility to measure the progress of an organisation. The 1000 points in total are distributed by the criteria as mentioned in Table 6 (EFQM, 2019). There is a positive relationship between the self-evaluation process, as emphasised by Özmen et al. (2017), and the increase of performance in an organisation (Dubey, 2016), whose organisation in order an outstanding, does not necessarily need to score a minimum level in all the criteria. Organisations can prioritise certain points (Escrig & Menezes, 2015). However, in order to be considered a high-performing organisation, more than 500 points must be achieved (Sütőová et al., 2022).

Moreover, Gómez-Gómez et al. (2016) state that all BEMs have self-evaluation tools by weighting the different criteria, to show the "degree of excellence" of the organisation. However, none of them report what is the logic behind the weight given to each criterion.

Concerning the EFQM Model, the RADAR tool lays on its basis the principle of a systematic continuous improvement, whose logic can be clarified as shown in the figure below (Figure 8).

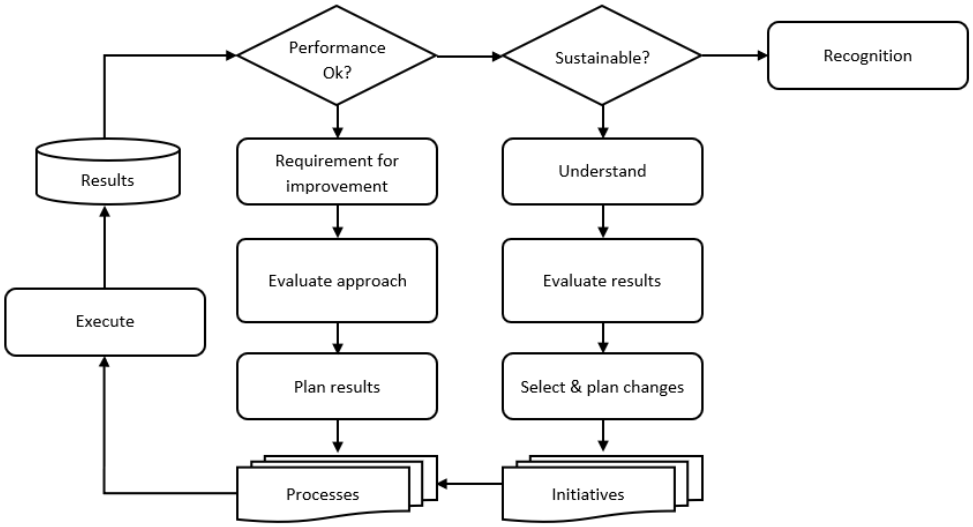


Figure 8 – RADAR Logic (adapted from Turisová et al. (2021))

Some studies conclude that there is a positive correlation between practices and results, which confirms the internal structure of the model. However, a few remarks must be noted. Firstly, gaining a quality award is not directly linked to the increase in performance in a specific organisation, likewise, some EFQM enablers do not affect results directly (Escrig & Menezes, 2015; Rosak-Szyrocka & Roszak, 2019). Nonetheless, the model was designed under the assumption that

"excellent results in key stakeholders are achieved through excellence in enablers" (Escrig & Menezes, 2015).

Gómez-López et al. (2016) explain that the credibility of some prizes has been compromised, as some companies face bankruptcy after gaining the award, leading to the conclusion that winning a prize is not the solution to fix all the issues of an organisation. The same author also states that sometimes the model tends to highlight more the scoring process, while alternatively, the model should provide the right means to attain a specific result. Besides, some criticism lies in the lack of transparency in the prizes awarded.

Escrig-Tena et al. (2019) emphasise the importance of internalising the EFQM model, since a frequent cause of failure lies in the lack of incorporation of good management practices on the people directly connected to the organisation, as sometimes an organisation can be more focused on obtaining recognition rather than embedding the best practices. Moreover, the author concluded that to have a proper internalisation of the model, internal reasons are more significant than external ones.

To ensure sustainable (long-term) results, organisational culture is a key aspect (Wijethilake et al., 2023). In what concerns organisational culture, hierarchical, or market type are the ones that have a positive relationship with the the EFQM enablers (Giménez Espín et al., 2022). Higher levels of employee satisfaction led to the successful implementation of the EFQM Model, as Matthies-Baraibar et al. (2014) concluded. Process Management and Quality Policy / Planning are the criteria with a bigger influence on employee satisfaction (Álvarez-García et al., 2016), since it was also concluded that the worst outcomes are obtained from organisations with low results in People Results criteria. In turn, better organisations have higher scores in Business Results and People Results. Also, it has been concluded that ownership, size, the criteria Process, Products and Services, and Leadership do not determine if an organisation is successful or not, but rather its strategic vision, proactively fulfilling the expectations of stakeholders and understanding of the importance of human resources - results are coherent with the orientations of the new EFQM Model (Periañez-Cristobal et al., 2020)

To conclude this chapter, it is also important to mention that despite being conceived to be implemented in organisations regardless of their size, studies conclude that the EFQM Model depends on the size of organisations, benefiting the larger ones (Calvo-Mora et al., 2015; Veselova, 2018). SMEs face a huge challenge in the implementation of the EFQM model, mainly due to four reasons: i) the definition of the model is abstract (raising the need to create and adapt a model concerning SMEs); ii) lack of transparency in the cause-effect relationships between enablers and results; iii) lack of specification on how to implement the model in certain types of organisations; and iv) absence of subsequent guidelines on what changes or what practices should be implemented after an organisation self-assessment (Jaeger & Matyas, 2016), even though SMEs show more flexibility than larger organisations (Veselova, 2018), which constitutes an advantage.

2.3. Shingo Model

The EFQM Model along with the MBNQA or Deming Prize own a comprehensive perspective on Business Excellence, as it was detailed in the earlier chapter of this literature review. However, these models do not appear to be centred on what Operational Excellence really is (Khatib et al., 2022).

Operational Excellence focuses on making improvements at the operational level to achieve a competitive advantage. It can be considered a philosophy of leadership, teamwork and problem-solving on meeting customer expectations, employee empowerment and optimisation of processes, and comprises four dimensions: Cultural Enablers, Continuous Process Improvement, Enterprise Alignment, and Results. Many authors dedicated to developing a model for Operational Excellence, however, it is not possible to specify a certain model as being the most propitious, as the diversity of models available ensures sustainable competition and stimulates enhancements (Carvalho et al., 2019; Rusev & Salonitis, 2016; Sony, 2019).

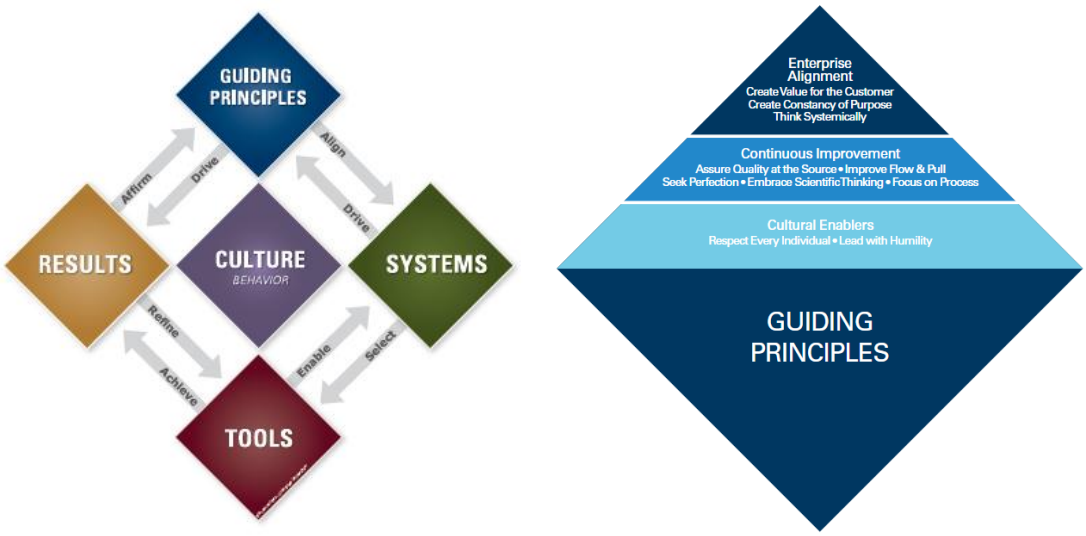
The most recognised model for Operational Excellence is the Shingo Model (Khatib et al., 2022). The Shingo Model was developed by the industrial engineer Shigeo Shingo, whose contributions were considered crucial to enhance the performance of automobile manufacturing, in Japan and the United States (Keate, 2013). The Shingo Institute awarded the Shingo Prize to 360 organisations worldwide, between 1989 and 2022 (Shingo Institute, 2022), at the time of this literature research. The awards assigned are based on the assessment of the organisation's results and behaviour, by external examiners from Shingo Institute (Bhullar et al., 2014). Those results must indicate outstanding (world-class) outcomes regarding the manufacturing and service processes, productivity, quality, and service to the customer (Chakravorty et al., 2008; Toussaint et al., 2020). The winners of the Prize belong to the most diverse areas, such as medical, healthcare manufacturing, nutrition, pharmaceutical, consumer goods, electronic, logistics, automotive, food and beverages, military, defence, financial, chemical, aviation, and aerospace, etc. (Shingo Institute, 2022). Hines et al., (2020) report the case of a nickel refinery organisation, in Wales, which won a Shingo Prize, in 2014, due to performing characteristics of advanced Lean.

It must be emphasised that the Shingo Model should not be seen as a short-term approach, but instead, a set of principles and behaviours that shape organisational culture and, in its turn, lead to organisational and operational excellence i.e., the best long-term results, promoting a continuous and sustainable improvement (Carvalho et al., 2019; Shingo Institute, 2020b). Snyder & Edgeman (2021) warn of the importance of permanently "improving the process of improvement".

Another aspect that must be taken into consideration is that the model does not form a solution to all the problems of organisations. Sony (2019) and Carvalho et al. (2019) warn of the difficulties in maintaining outstanding long-term results. Furthermore, the authors report that some companies that won awards, including the Shingo Prize, declared bankruptcy shortly after receiving it.

According to the Shingo Model (2020), for an organisation to have durable success, continuous improvement must be searched, and improvements can only be possible if there is a culture in which everyone in the organisation is committed. Thus, this model consists of a framework that presents some guidelines (rather than being a program to be implemented, as previously referred) bearing in mind cultural transformations within an organisation to reach the best results.

These guiding principles are related to four dimensions: Results, Culture, Systems, and Tools, like it is shown in the diamond diagram, in Figure 9 a). There are ten guiding principles divided into three dimensions: Enterprise Alignment, Continuous Improvement, and Cultural Enablers, as shown in Figure 9 b). Guiding principles are considered to be the foundation of a culture that lasts and allows to achieve Organisational Excellence (Shingo Institute, 2020b). Leading a cultural transformation is not an easy task for managers and/or leaders, however, according to the Shingo Model, the process must start by understanding the Guiding Principles and their relationships with results and therefore spread them into the organisation. Culture can be defined as being "the common set of ideas, values, attitudes, and norms" shared by a group of people that rule inside an organisation (Haukelid, 2008). A Tool is a device or solution that achieves a certain task, and a System is a collection of tools that work together to accomplish a specific result, while Results comprise the "measurable outcomes" of endowing a specific organisation with tools and systems (Shingo Institute, 2020b).



a) b)

Figure 9 – Shingo Model: a) Components; b) Guiding principles (Shingo Institute, 2020b)

As it can be seen in Figure 9 a), the model owns a cyclical nature. One of the cycles rotates clockwise and the other one counterclockwise, highlighting the relationships between all dimensions in the model and emphasising that the model consists of a holistic approach (Edgeman, 2017) i.e., it must be seen as dimensions working in an integrated manner, as only a full view of the model will lead to the ideal results taken.

Guiding principles are "universal and timeless", even though they can be manifested differently according to the culture and era (Edgeman, 2018). Shingo Model guiding principles are grouped into three bigger dimensions (Figure 9 b)). At the base of the pyramid, the dimension "Cultural Enablers" comprises the "supra-principles" Respect Every Individual and Lead with Humility. It is easy to fathom that Respect between all the extensive community regarding an organisation brings a set of positive outcomes to itself, as everyone appreciates working in an environment where respect prevails (Rogers & Ashforth, 2017). Moreover, it is important to have a sense of humility to listen and learn with the team members in pursuit of permanent improvement. Thus, ensuring a safe environment, developing, empowering, and involving people, and being a learning organisation are considered to be the keys to this dimension (Edgeman, 2017; Shingo Institute, 2020b). This way, people will coordinate efforts and work in a collective and collaborative

environment, aligned with the vision and goals of the organisation, which lead to continuous improvement and, consequently, excellent results, reinforcing the cyclicity and interrelationships inherent to the model (Edgeman, 2018).

Additionally, the middle of the dimension "Continuous Improvement" holds the following guiding principles: Seek Perfection, Embrace Scientific Thinking, Focus on Process, Assure Quality at the Source, and Improve Flow and Pull. Firstly, constantly seeking perfection, according to the Shingo Institute (2020b), is the key to creating a culture of continuous improvement. Also, experimenting, observing, and learning are essential to innovate and improve. Likewise, it is important to understand that only good processes lead to ideal results and perfect quality comes from the source, exclusively when every element that compounds a product and a service is "done right the first time", that is every error detected must be promptly corrected in order to achieve the final desired quality (Năftănăilă et al., 2013; Shingo Institute, 2020b). Finally, it is crucial to guarantee continuous flow, according to the real demand to increase the value for customers and eliminate waste. Some important concepts that must be realised about this dimension consist of standardised processes and work (consistent and repeated processes and work), direct observation, high focus on value stream, keeping things simple and visual, identifying, and eliminating waste, identifying defects, and correct the problem in its roots, improvement integrated with work and finally, rely only on data and facts as a mean to attain continuous improvement (Shingo Institute, 2020b).

The last dimension observed is "Enterprise Alignment" and it comprises the guiding principles: Think Systemically, Create Constancy of Purpose, and Create Value for the Customer. It is vital to understand the relationships within a system, so that the best results can be achieved; understand the purpose of the organisation, its vision, how to attain certain desired results, and how to innovate, adapt and take risks, for instance (Shingo Institute, 2020b). Also, according to this model, to achieve long-term sustained results, the value must be aligned with the desires of the customer. Some supporting concepts to this dimension consist of seeing reality exactly how it is, aligning systems regarding everyone involved in the organisation, and people's behaviours with performance, policy deployment, measuring only what matters, identifying exactly the customers and, finally, identifying the cause-effect relationships (Shingo Institute, 2020b).

In the previous version of the Shingo Model, there was a fourth dimension named "Results" at the top of the pyramid, whose Guiding Principle was "Create Value for the Customer" (Saeed et al., 2022; Shingo Institute, 2014). Later, this guiding principle was incorporated into the dimension of "Continuous improvement".

Table 7 presents the results of studies regarding the implementation of the Shingo Model.

Table 7 – Studies regarding the implementation of the Shingo Model

Author(s)	Article	Findings/Results
Kelly & Hines (2019)	Discreetly embedding the Shingo principles of enterprise excellence at the Abbott Diagnostics manufacturing facility in Longford Ireland	Abbott Diagnostic Longford implemented the Shingo Model for Operational Excellence as it was thought it would fit better a cultural transformation in the organisation, leading to "world-class" performance. Consequently, results measured during an 8-year period showed savings in the order of 22 million dollars, due to the reduction of raw materials and energy, automation, optimisation of the batch size, and project improvement. Moreover, the morale of employees rose, the test volume grew by 576%, and productivity increased - 807% output of units per hour of work, in an efficient way as costs per unit were reduced by 60%. Non-conformance rates, lead times, and inventories also decreased significantly. These remarkable results led the organisation to win multiple awards, including a Shingo Prize for Operational Excellence.
O'hagan et al. (2019)	Banking on a Culture of Continuous Improvement: A Financial Services Shingo Journey towards Excellence	Rabobank, in Ireland, had already success due to the implementation of some tools and techniques to attain improvements. However, to reach "Enterprise Excellence" it started the Shingo journey, in ESC (European Service Centre – which provides operations, finance, and IT service to 7 Rabobank offices in Europe). Hence, by focusing on Continuous Improvement, the bank aligned and developed the strategic systems, developed leadership and the capabilities of people, bearing in mind the obligation to deliver the best value to the customers. Excellent results were achieved from this study – customer sentiment rating increased significantly, as well as "Right First Time" results. Moreover, 230 improvements were implemented, 150 thousand euros regarding direct costs were saved and 267 hours of capacity per month were also saved, which allowed to do tasks and project work without needing to employ more staff.
Edgeman (2017)	Routinizing peak performance and impacts via virtuous cycles	The Shingo Model was examined in order to develop the ability of organisations to achieve systematically peak performance, as well as produce positive social and environmental impact, via virtuous cycles. Results show that people "routinely and voluntarily" cooperate when the culture of the organisation is embedded in people and their practices. These results contain important results that help organisations to implement the Shingo Model and permanently continue the search for excellence.

2.4. Corporate Sustainability

Nowadays, balancing financial results with non-financial practices, such as management, innovativeness, the satisfaction of customers, employees, suppliers, and broader society, quality of life and work and even shorting the working process is imperative (Škafar, 2019). Hence, terms such as Corporate Sustainability, and Corporate Social Responsibility (CSR) are gaining prominence over time. This premise can be corroborated by visualising the chart in Figure 2, which portrays the exponential rise of publications regarding these topics.

Sustainability and corporate sustainability comprise an immensity of definitions in the literature, which reinforce their ambiguity and flexible interpretations (Landrum & Ohsowski, 2018). According to the Commission of European Communities (2006), Corporate Social Responsibility (CSR) "is a concept whereby companies integrate social and environmental concerns in their business operations and their interaction with their stakeholders voluntarily", being most times, the social dimension considered the most vulnerable pillar, as stated by Meseguer-Sánchez et al. (2021). The social pillar comprises aspects such as labour relations, occupational health and safety, diversity, and equal opportunity, non-discrimination, child labour, human rights assessment, customer privacy, etc. (Global Reporting Initiative, 2021).

The majority of the time, it is the constant pressure by the stakeholders of organisations that leads them to raise concerns regarding social, economic, and ecological aspects, emphasising the role of stakeholders' engagement in the quest for sustainable practices (Calabrese et al., 2019; Freudenreich et al., 2020; Meseguer-Sánchez et al., 2021). Stakeholders' engagement is more emphasised when the dimension of firms is bigger and when its legal form is a corporation (Carvalho et al., 2020). Bigger firms usually tend to disclose sustainable practices more frequently, as a strategy to enhance their reputation towards stakeholders (Santos et al., 2018). Regarding the social pillar, Teixeira et al. (2022) concluded that operational and social performance has a positive impact on competitive advantage, thus, this pillar must be seen as an investment rather than a cost. Moreover, the same author claims the urge to improve the performance of sustainability pillars using a holistic approach (integrated manner), to promote competitive advantage.

About the environmental pillar, CSR also aims to reduce the environmental impact, giving rise to the concept of the Circular Economy - a way to extend the lifetime of products and reduce the waste of natural resources, which is considered a key to achieving corporate sustainability (Khan et al., 2020). Stewart & Niero (2018) state that Circular Economy is beginning to gain more attention, consequently, companies have begun the journey towards its implementation, mainly concerning the recyclability of their products and packaging.

Consequently, concerning the economic pillar, although studies are confirming that positive financial results allow the implementation of CSR, leading to social and environmental improvements within the organisation, it was also proven the contrary i.e., CSR induces a better financial performance (Meseguer-Sánchez et al., 2021). Nirino et al. (2021), Platonova et al. (2018), and Kim et al. (2018) present case studies, whose findings report positive relationships between these two constructs.

CSR is related to organisational values that must be embedded in the vision and strategy of organisations (Calabrese et al., 2019; Pedersen et al., 2018). Concerning the employees of organisations, motivated, satisfied, committed, and comfortable ones, help improve economic

results (Manresa & Escobar Rivera, 2021). Also, regarding the employees, it was concluded that employee creativity - an important construct to foster organisation performance (Mitreva et al., 2017), is likewise an outcome of CSR (Ahmad et al., 2022). Moreover, Latif et al. (2022) refer that perceived CSR by employees is positively associated with the pro-environmental behaviour of employees, enhancing the performance companies, as well.

Highly innovative organisations are more likely to set a sustainability agenda (Pedersen et al., 2018). Rosati & Faria (2019) stated that reporting on Sustainable Development Goals (SDGs) is essential, as businesses play a crucial role in attaining the goals set out in the 2030 Agenda for Sustainable Development, and that the organisations which address SDGs in their sustainability reports are, in most cases, large organisations which aim to show commitment with sustainable practices, organisations that possess many intangible assets, competences to fulfil the proposed goals, and organisations whose directors are mainly younger, and with a high proportion of female members. Supanti & Butcher (2019) also concluded that relationships between CSR and Organisational Citizenship Behaviour are different according to the generation, with being generation Y the one with helping behaviour, over Generation X. Also, entrepreneurial leaders can easily achieve durable sustainable development, as they adapt faster to changing environments (Su et al., 2022).

Findings show evidence that successful organisations in the matter of CSR have certifications in environment and quality; the main barriers are the lack of information on the concept of CSR, the lack of immediate and direct return of investment, and the lack of work capacity (Střihavková et al., 2021). Sadegh Amalnick & Zarrin (2017) warn of the importance of evaluating integrated health, safety, and environmental systems. Environmental Management Systems (EMS) incorporated into their Integrated Management System perform better and increase long-term corporate sustainability, comparatively to non-EMS adopters (Ikram et al., 2019). Even though, 90-95% of the largest world companies, report, using GRI (Global Reporting Initiative) framework, some of them do not see value in doing that (Landrum & Ohsowski, 2018). Moreover, it was concluded that mandatory reports on CSR increase political and social pressure on the CSR activities of organisations, generating positive social externalities, but a decrease in the performance of firms. (Chen et al., 2018).

2.5. Excellence Models and Corporate Sustainability

Sustainability was not considered a relevant topic in the majority of excellence models, as they were not created focusing on sustainability but rather on economic issues by improving organisational performance through TQM principles and concepts (Rocha et al., 2015), however, over the years, as models are constantly being adapted and improved “to maintain its timeliness and relevance” this dimension has been incorporated (Fonseca, 2022). Nowadays, the concept of being an excellent organisation is not only related to having business success but also to the concept of Corporate Social Responsibility (CSR) (Wierzbic & Martusewicz, 2019).

According to some authors, the previous EFQM model version already showed a positive direct and indirect orientation towards sustainability (Adamek, 2018; Menezes et al., 2021; Río-Rama et al., 2017). Jankal & Jankalova (2016) affirmed that the EFQM model was already embedded into CSR practices. However, those opinions are divergent among authors, as some emphasise the model barely referred to this topic, creating themselves a different model version, fulfilling the

requirements of the EFQM model, but in a modified more sustainable-oriented way (Pelantová & Šlaichová, 2017).

In turn, the newest EFQM model version is highly oriented towards promoting sustainability (Muhammad Din et al., 2021; Val et al., 2020). Also, it incorporates the United Nations' 17 Sustainable Development Goals (SDGs) and the United Nations Global Compact (2000) – ten principles for sustainable and socially responsible business (EFQM, 2019). Sustainability is emphasized throughout this Model version, specifically in criteria 1.1, 1.2, 1.3, 1.5, 2.1, 3.1, 3.4, 3.5, 4.3, 5.1, 5.2, 5.3, 5.4, 5.5, 6, and 7, reaffirming the urge to innovate, promote creativity, develop a "disruptive thinking" and promote the use of technology (Fonseca, 2022; Martusewicz et al., 2022; Politis & Grigoroudis, 2022).

Digital transformation enhances sustainability, as it allows, for example, to reduce costs, improve efficiency, and labour productivity (Zhang et al., 2022), also there is a positive relationship between digital transformation and the achievement of Sustainable Development Goals, within the UN 2030 Agenda (Camodeca & Almici, 2021). Consequently, studies addressing Industry 4.0 (I4.0) and Quality 4.0 related EFQM 2020 Model version (Fonseca et al. (2021b), Murthy et al. (2021b), Nenadál (2020), Turisova et al. (2020)) are also analysed in Table 8. Yu et al. (2022) concluded that I4.0 has a positive impact on the implementation of a circular economy (CE), and, in turn, a CE has a positive impact on operational and economic performance. Hence, it is crucial to emphasise that, as reported by Martusewicz et al. (2022), the concept of CE is mentioned in the EFQM model in criteria 5.5 and 6.

Quality 4.0 allows processes to be controlled and decisions to be taken in real-time (Zgodavova et al., 2020), being positively related to economic, social, and environmental performance (Antony et al., 2022). Střihavková et al. (2021) findings show evidence that successful organisations in the matter of CSR have certifications in environment and quality. Also, it was proved, as previously referred, that there is a synergy between the management systems regarding quality, environment, security, and occupational health and the EFQM model, thus, if they are already implemented in a company, it will be easier to meet the requirements of the EFQM model, in terms of CSR (Quintero-Garzón et al., 2015).

In literature, there is a big gap concerning articles about Shingo Model and its relationship with sustainability and sustainable development. However, Shingo Model gives great emphasis on the organisational culture, on well-being and empowerment of its employees, on development and safety of people, thus it can be concluded that this model promotes enthusiastically the social pillar. The Shingo Model incorporates the Lean philosophy (Sá et al., 2022) in its principles. The Shingo-Lean alliance is highlighted in papers of Kelly & Hines (2019) and Carvalho et al. (2022). These lean practices and tools (for instance 5S, Jidoka, JIT, and SMED) help organisations to attain better environmental and economic performance (Singh et al., 2022; Teixeira et al., 2022), consequently, it can be concluded that the environmental and economic pillars of sustainability are also promoted in the model. Also, these two pillars (the economic and environmental) are interrelated as, for example, "Identify and Eliminate Waste" (one of the Shingo principles) is not only related to the environmental pillar, as evident, but as it also improves the flow process, it also has a positive influence on the economic pillar and so on (Rajab et al., 2022; Silva et al., 2020).

Moreover, according to this model, sustainability is achieved due to a cultural shift, where principles and behaviours allow the excellent results to endure (Plenert, 2021).

Studies on the link between the EFQM Model, the Shingo Model and their relationship with Corporate Sustainability are presented in Table 8.

Table 8 – Studies on the link between EFQM, Shingo Model and Corporate Sustainability

Author(s)	Article	Results/Findings
Fonseca et al. (2021)	Quality 4.0: The EFQM 2020 Model and Industry 4.0 Relationships and Implications	The purpose of this paper article was to identify the relationships between EFQM 2020 Model and Industry 4.0. According to the authors, there is a link between Industry 4.0 and the model criteria and guidance points, despite specific references to the I4.0. pillars are not clear, as a result of the non-prescriptive nature of the model.
Nenadál (2020)	The New EFQM Model: What is Really New and Could Be Considered as a Suitable Tool with Respect to Quality 4.0 Concept?	EFQM 2013 and 2020 model versions were analysed in order to present considerations concerning Quality 4.0. 2020 model version brings a series of challenges, as it is not only oriented toward people engagement, education, training, and motivation, but rather it focuses on achieving organisational excellence while preparing the organisation for the future. Despite the current model does not mention how to achieve long-term Quality 4.0, it is implicitly included in the model, as it is referred the necessity to transform the organisation for the future and it is also referred that the organisation must have a wide range of perceptions (feedbacks) from its stakeholders.
Turisova et al. (2020)	Application of the EFQM Model to Assess the Readiness and Sustainability of the Implementation of I4.0 in Slovakian Companies	The readiness of 53 Slovak companies was evaluated in terms of the integration of safety and security into management systems and the impact of digitalization on occupational health and safety, based on EFQM model enablers. Results show that contrary to what would be expected, the lowest degree of preparation is perceived in organisations with a high degree of automation. Furthermore, it was concluded that the EFQM Model can be used as a self-assessment tool to assess the readiness of organisations in implementing I4.0, in a specific area.
Martín-Gaitero & Escrig-Tena (2018)	The relationship between EFQM levels of excellence and CSR development	This paper aims to analyse the level of CSR development that can be attained when implementing the EFQM model and to understand how it can improve CSR development. It was chosen one organisation per level of recognition, within the same business area. Results suggest that a positive relationship between implementing the EFQM model and CSR development was found, even though the level of CSR development differed from the analysed organisations, as organisations prioritise their practices according to their impacts on organisations. Moreover, better levels of excellence do not necessarily imply proactive management of CSR.

Author(s)	Article	Results/Findings
Neri et al. (2019)	Top executives' perceptions of the inclusion of corporate social responsibility in quality management	This study aimed to ascertain the perceptions of top executives concerning CSR and quality management implemented through the EFQM Model. A survey-based survey was conducted and the answers from the top executives, from 15 different countries of the same company were analysed. Results show that value generation, industry forces, institutional and stakeholder pressures, and organisational values and beliefs are the main factors that influence top managers. Furthermore, the company lifecycle, changes in ownership structure, and orientation of owners towards CSR influence its adoption through the EFQM Model.
Aryanasl et al. (2016)	Can excellence management models encompass cleaner production'' and sustainable business'' revolution? (European Foundation for Quality Management as a case study)	The previous EFQM model was analysed in order to understand if it was suitable for businesses preferably centred on cleaner production and sustainability. Results showed that only four concepts were aligned with a sustainable business model (creating a sustainable future, managing with agility, succeeding through the talent of people, and sustaining outstanding results). Also, environmentalism needed to be added to the five enablers. The lack of some criteria regarding this topic leads the authors to propose a suitable model.
Murthy et al. (2021b)	Tracing evolution of EFQM and its relationship with Industry 4.0	Despite understanding what changed in the newest EFQM model version, this paper also aims to point out the relationship between this model and Industry 4.0, through a literature review. A “strong” relationship between the model and Industry 4.0. was found, concluding that EFQM 2020 model version would help implement industry 4.0 and monitor its impact.
Quintero-Garzón et al. (2015)	Corporate social responsibility and the EFQM excellence model as a frame work for integration of management systems in organisations	In this paper, the authors confirmed that there is a synergy between the management systems regarding quality, environment, security, and occupational health and the EFQM excellence model. Thus, if they are already implemented in a company, with will be easier to meet the requirements of the EFQM model, in terms of CSR. Consequently, in these cases, the level of maturity in an organisation’s management system can also determine its performance on CSR.
Carvalho et al. (2022)	Development of a conceptual model integrating management systems and the Shingo Model towards operational excellence	This paper proposes a conceptual model relating the ISO Management Standards (namely ISO 9001:2015, ISO 14001:2015, ISO 45001:2018 and NP 4469:2019) and lean tools and concepts contained in the Shingo Model, for the organisation to assess its level of maturity regarding the adoption of practices and behaviours inherent to the Shingo Model. A Portuguese organisation from the automotive sector validated the model, which can be extended effectively to organisations from other different sectors, allowing also to evaluate of its corporate sustainability practices.

Author(s)	Article	Results/Findings
Sá et al. (2022)	The Development of an Excellence Model Integrating the Shingo Model and Sustainability	Authors emphasise that in order to achieve operational excellence, all pillars of sustainability must be met. Thus, this paper presents a conceptual model which helps to identify the tools necessary to attain results in the economic, social, and environmental pillars, regarding operational excellence. As these lean tools are comprised in the guidelines of the Shingo Model it can be concluded that the Shingo Model promotes the sustainability of organisations.
Martusewicz et al. (2022)	The Environmental Protection and Effective Energy Consumption in the Light of the EFQM Model 2020-Case Study	Using an international manufacturing company that had already implemented EFQM 2020 Model, the authors aimed to demonstrate how a strategy for environmental protection and energy consumption conservation can be made based on the EFQM model. Results show that the model in the analysis is a valuable tool to "create, implement and monitor strategies" regarding environmental practices. Also, measurable benefits of the implementation of these practices based on the EFQM model can be noticed, through monitoring appropriate KPIs in this area.
Politis & Grigoroudis (2022)	Incorporating the Sustainability Concept in the Major Business Excellence Models	This paper intended to understand how implementing the latest Business Excellence Models (BEMs) - EFQM model, MBNQA and Deming Prize can be a mean to attain corporate sustainability. A qualitative examination of the BEMs framework and literature regarding the topic allowed for some conclusions. According to these authors, in what concerns the EFQM model, it specifically addresses the subject of corporate sustainability (CS). One negative point is that, due to being a comprehensive and generic model, it does not suggest what would be the better indicators to measure these results, thus, further modifications would be necessary for this model to be considered a sustainability framework.

3. CRITICAL ANALYSIS OF THE LITERATURE REVIEW

This chapter aims to present the final conclusions regarding the literature review in the previous chapter.

Excellence Models consist of crucial tools that help organisations to achieve excellent performance and to be permanently prepared to cope with change, as well as to be more prepared for future uncertainties. The EFQM Model and Shingo Model are constantly evolving and adapting to current needs (EFQM, 2019; Shingo Institute, 2020b), which is a positive remark. However, being extremely inclusive can be a negative point. The models can be implemented in larger organisations or SMEs and in many different sectors of activity. Thus, authors claim attention to the problem of SMEs in implementing these models, as small companies face huge challenges/barriers to the implementation of EFQM or Shingo models (Bhullar et al., 2014; Sternad et al., 2019). Moreover, authors have been developing adaptations of these models, in order to specify them to a certain type of organisation size or activity (Liu et al., 2021).

Despite being designed from different constructs, with this literature review, it was possible to find some convergence points between the EFQM and Shingo models towards their relationship with CS. Firstly, both models consist of a holistic approach and hence, to achieve outstanding results an integrated perspective of the model must be taken (Akyuz, 2015; Kafetzopoulos et al., 2019; Pop & Pelau, 2017). Also as pointed out by Marques et al. (2019), Özmen et al. (2017) and Rosak-Szyrocka & Roszak (2019) both the EFQM and Shingo models' assessment allows to identify strengths, weaknesses, and opportunities for improvement, helping to assess the maturity of an organisation.

In what concerns the top management, findings from the literature indicate that models warn of the importance of high commitment by top management in all domains and effective leadership, in order to attain the best possible results (Doeleman et al., 2014; Escrig & de Menezes, 2016). Thus, the best management practices, principles, and behaviours must be implemented and embedded into the organisation's culture (Escrig-Tena et al., 2019; Jengwa & Pellissier, 2022) to achieve the desired results. Moreover, Rosati & Faria (2019), Su et al. (2022), Supanti & Butcher (2019), and Villalba-Ríos et al. (2022) concluded that CEOs and leaders of the best-performing organisations in terms of corporate responsibility show a specific profile that must be taken into account by managers, as top management positions and decisions inside an organisation are crucial to promoting sustainable practices and attaining world-class results.

Some studies (Carvalho et al., 2019; Gómez-López et al., 2016; Sony, 2019) show that certified companies from EFQM Model or Shingo Model perform better, but certification does not promise long-term sustainable results. Outstanding results will only persist if an organisation is committed to the social and environmental aspects, rather than the economic one exclusively, and by permanently seeking continuous improvement, i.e., successful organisations worry about and promote practices under the three pillars of sustainability, which must coexist "harmonically" (Gomes Silva et al., 2022; Teixeira et al., 2022), besides as noted by Gao & Wan (2023), corporate environmental responsibility positively and directly affects financial results.

Employees that perceive that the organisation is proactively involved in environmental protection are more willing to cooperate in environmental protection activities (Ahmad et al., 2021), and employees cooperate when the culture of the organisation is embedded in them and their practices

(Edgeman, 2017), consequently, it is crucial to understand the importance of human resources and empower them as they constitute a critical key to organisational success. Models show the utter importance of promoting prominent levels of satisfied employees, by empowering and developing them, in whom values of responsibility and commitment will be developed, leading the organisation to achieve durable and sustained results (Kelly, 2016; Matthies-Baraibar et al., 2014). EFQM Model requires "building a winning culture" (EFQM, 2019) while Shingo Model requires beginning a progressive "cultural transformation" (Shingo Institute, 2020b).

Having into consideration the aspects abovementioned, a conceptual model is presented (Figure 10) in order to highlight the major constructs found in the literature and their relationships, in what concerns the EFQM and the Shingo Models, to achieve excellence in business towards sustainable development.

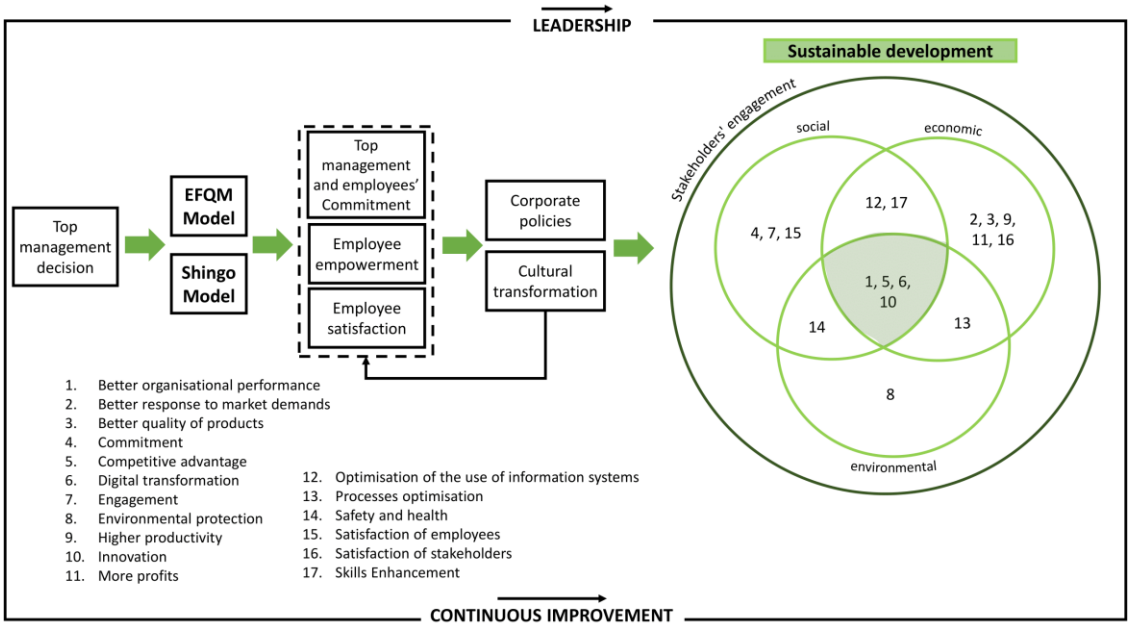


Figure 10 – A new conceptual model for excellence in business towards sustainable development

Whether the reasons for the implementation of the EFQM Model or Shingo Model are internal or external, it all comes from the ultimate decision of top management. The models will promote adopting the best management practices to attain the desired sustainable results. In order to achieve them, the objectives, mission, and vision of the organisation must be aligned with the business strategy. Thus, it is important to have a synergy between processes, resources, and people inside the organisation. As we live in a dynamic world and organisations pursue excellence, it is natural that the strategy changes over time, however, it is essential that the organisation is always fully aligned with the designed strategy, in order to achieve the desired sustainable outcomes (Ghonim et al., 2022).

A cultural transformation will be required to have long-term durable results, whose focus must be directed to the most important assets of organisations – their employees. Thus, empowering them will be crucial to make employees committed to their tasks and the organisation as a whole, as they feel more valued. It will also make employees less resistant to changes, allowing them to promote innovation inside an organisation, as concluded by Santos-Jaén et al. (2021). Satisfied employees are a crucial key to promoting sustainable economic and environmental results. The more

embedded employees are in the organisational culture and the more empowered they feel, the best possible results can be achieved, as well as higher levels of commitment and satisfaction, and so on. One of the key aspects of the model is precisely commitment. Top management commitment is crucial to promote employee commitment, as highlighted by Pellegrini et al. (2018), when an organisation shows great commitment towards sustainability, its employees are more prone to promote sustainable behaviours. A cultural transformation along with implementing the best corporate policies, which encompasses, for example, the quality policy, the environmental policy, the occupational health and safety policy, and the integrated management system policy will lead to the sustainable development of an organisation.

Engaging in CS practices comes from a strategic choice (Santos et al., 2018) as a means to achieve prominent results in each sustainability pillar. From the literature review, 17 results can be achieved with the implementation of the models. Those results were divided into social, economic, environmental, social-environmental, economic-environmental, and socio-economic results, as shown in Figure 10. The ultimate challenge to all organisations is to ensure that stakeholders' expectations and needs are fully met, thus identify, prioritise, and engage them is paramount (Vieira Nunhes et al., 2022). Also, stakeholders' engagement is positively connected with corporate sustainability performance, as they can lead companies to operate towards more sustainable approaches (Manning et al., 2019; Rodriguez-Melo & Mansouri, 2011). Finally, it is important to highlight that both the EFQM and the Shingo Models focus on seeking continuous improvement and promoting the best leadership practices, so that sustainable results may endure (EFQM, 2019; Shingo Institute, 2020b).

To conclude this chapter, it was possible to understand that both the EFQM and the Shingo Models share a high percentage of common foundations. Hence, the following table (Table 9) presents the correlations between the EFQM criteria, and the Shingo Model dimensions, according to literature. Intersections between the two previous versions of the models have already been accomplished by Jonsdottir et al. (2021), however, Table 9 presents updated information according to the new format of both of the excellence models.

Table 9 – Comparison between the EFQM and the Shingo Models

		Shingo Model Dimensions		
EFQM Dimensions	**EFQM Criteria**	Cultural enablers	Continuous improvement	Enterprise alignment
Direction	Purpose, Vision & Strategy			
	Organisational Culture & Leadership			
Execution	Engaging Stakeholders			
	Creating Sustainable Value			
	Driving Performance & Transformation			
Results	Stakeholder Perceptions			
	Strategic & Operational Performance			

High correlation Medium correlation No correlation

Note: Author's own elaboration

4. MODEL OF RESEARCH

To assess the Propensity of organisations in implementing whether the EFQM or the Shingo Model, a conceptual model was designed, based on the following factors: organisational culture, needs/strategy of the organisation, organisational maturity, and corporate performance (environmental, operational, and social performance).

This chapter describes the hypotheses formulated to be assessed through the conceptual model. According to Marôco (2010), the analysis of structural equations must be based on theoretical assumptions previously established. Hence, this chapter aims to conceptualise the theoretically support for the hypotheses operationalised in the structural model. In addition, the last subchapter of this chapter presents the visual schematic of the conceptual model proposed, for the better understanding of readers.

4.1. Organisational culture

Having a proper organisational culture in order to achieve sustainable results is referred by both of the models in study (EFQM, 2019; Shingo Institute, 2020b). Culture consists of a set of principles and core values that are shared by all individuals of an organisation which have an influence on organisational performance (Serpa, 2016). Organisations that have a rare and imperfectibly imitable culture are more prone to achieve and sustain superior financial performance (Barney, 1986). Those which do not have a proper deep-rooted culture that supports their individuals, fail to exploit individual creativity and do not maximize productivity (Khedhaouria et al., 2020). Cameron & Quinn (2006) proposed a model – Competing Values Framework, which aims to assess and ease change in organisational culture. The four core values were established under opposite and competing conjectures, as showed in the following matrix (Figure 11).

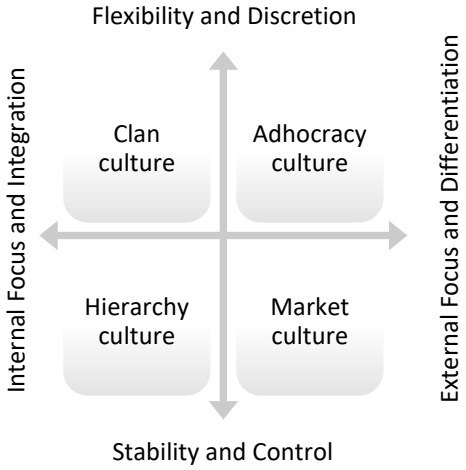


Figure 11 – Types of organisational culture (adapted from Cameron & Quinn (2006))

Giving a more in-depth explanation for each type of culture presented above according to Cameron & Quinn (2006):

i. Clan culture represents organisations which behave as an "extended family", where preference is given to teamwork, employee involvement, empowerment, and development, promoting their participation, commitment and loyalty, and corporate commitment to all employees, rather than formal and restricted rules, procedures, and hierarchies. This type of culture sees customers as partners, promotes autonomous work, and listens to its employees' suggestions as a manner of improvement and leaders are seen as facilitators, mentors, and team builders.

ii. Adhocracy culture rules in organisations that are pioneers, innovative, and creative. They are characterised to be dynamic, flexible, and adaptive to new opportunities, redesigning most of the time due to being in an environment surrounded by uncertainty and ambiguity. This type of culture highlights the individuality and risk taking. Leaders are innovators, entrepreneurs and visionaries, and leadership changes over time depending on the leading-edge project that is being currently addressed.

iii. Organisations where Hierarchy culture is prevalent are characterized to be a formalized and structured to work. Leaders are seen as coordinators, monitors, and organisers who aim to maintain a smooth-running organisation (efficiency, consistency, and uniformity) through formal rules and procedures. The long-term concerns are stability, predictability, and efficiency.

iv. The Market Culture is highly oriented towards ambitious and measurable results with external focus, which is its competitive advantage is translated into conducting profitable exchanges, sales, and contracts. Employees and leaders are competitive. In this type of culture competitiveness along with deeply customer focus produces the desired effectiveness.

The Shingo model highlights that in order to sustain and promote continuous improvement the key remains in the people and culture (Msekiwa & Benjamin, 2015). The change in the organisational culture occurs when leaders recognise and accept responsibility for creating a deep and long-lasting culture of quality improvement (Pramjeeth & Mutambara, 2022).

Shingo model can be used as an extensive guideline of a cultural change (Ali Maasouman & Demirli, 2015; Buzzo & Mazzoni, 2019), as this model was designed to guide organisations that wish to transform the organisational culture to attain overall sustainable results, by understanding and embracing each of its guiding principles which guides organisations towards the ideal behaviour (Shingo Institute, 2020b). Right and consistent key behavioural indicators (KIBs) inform leaders about how the organisation approaches the desired organisational culture, i.e., one of the fundamentals of the Shingo Model is to have a principle-based culture in order to attain sustainable results, by improving its KPIs through improving KBIs (Plenert, 2021; Shingo Institute, 2020b). As referred in the literature review, the first dimension of the Guiding Principles consists of the Cultural Enablers, whose principles are "respect every individual", from employees, to customers, suppliers, the community, and the whole society and "lead with humility" being a leader that listens and promotes a respectful environment. To attain these principles the model highlights the importance

of assuring a safe environment; developing, empowering, and involving people and being a learning organisation (Shingo Institute, 2020b, 2020a). Hence, taking the aforementioned premises into consideration, the following hypotheses is operationalised:

H1: Clan Culture has a positive impact on the Propensity to implement the Shingo model.

Certainly, theoretically the hierarchy culture would partially be adjusted to what the Shingo Model promotes, namely, for example, due to the need of standard work in order to achieve continuous improvement. Standard work allows to control processes better, reduce variability, enhance quality, flexibility, stability, and controlled creativity (Shingo Institute, 2020b) – characteristics under the influence of hierarchy culture. However, as throughout the model a culture of involvement, empowering and commitment is immensely promoted (characteristics of a clan culture) and in lack of practical evidence of the culture which better adjusts to the Shingo Model, as these subject has never been studied before, only the hypothesis presented before – the one that the Clan culture is positively related to the implementation of Shingo model was formulated to be tested. Furthermore, changing organisational culture can be challenging (Austin & Ciaassen, 2008), thus if an organisation already fits into the clan culture it is easier to implement measures to control adequately the processes under the characteristics of the hierarchy culture than otherwise.

To successfully implement the EFQM model it is important to assess what is the prevailing culture (Bolboli & Reiche, 2015), as it is not possible to achieve excellence without having a proper organisational culture implemented (Pimentel & Ramos Pires, 2017). Some authors have already evaluated what are the cultures which produce the best results in terms of EFQM model implementation. Paper of Giménez Espín et al. (2022) presents practical evidence supporting that hierarchical and market types of culture drive to successful EFQM results. Organisational culture is fully mediated by entrepreneurial orientation that supports innovative and proactive behaviours being the adhocracy and market cultures the ones which most contribute to increase their financial performance (Khedhaouria et al., 2020). The newest model version emphasis the need for innovation, creativity and to adopt a disruptive thinking (EFQM, 2019), characteristics in line with what is advocated by the adhocracy culture (Job & Bhattacharyya, 2007; Khurosani, 2013). Also, despite the lack of practical studies on the topic, the paper of Giménez Espín et al. (2023) suggest that besides hierarchy and market culture, adhocracy culture also has a positive relationship with excellent EFQM results. Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H2: Adhocracy culture has a positive impact on the Propensity to implement the EFQM model.

H3: Market culture has a positive impact on the Propensity to implement the EFQM model.

H4: Hierarchy culture has a positive impact on the Propensity to implement the EFQM model.

4.2. Organisational maturity

Organisational maturity refers to the evolution, that is the stage of maturity of an organisation is considered to be predictable enough to be translated into a model, which represents the capabilities of organisations in a "stage-by-stage manner along an anticipated, desired, or logical path" (Röglinger et al., 2012; van Looy et al., 2011).

There are hundreds of maturity models, specified for different situations/sectors, which differ on the stages of evolution and the factors/constructs and items evaluated. As reported in the previous chapter both the EFQM and the Shingo models assessment tool allows to evaluate the maturity of an organisation (Castka et al., 2003; Hüner et al., 2009; Marques et al., 2019; Özmen et al., 2017; Rosak-Szyrocka & Roszak, 2019). In order to assess if the Shingo Model and the EFQM Model are actually, in practice, positively related to the achievement of organisational maturity, a generic maturity model was designed to be tested in the final model, i.e., research was conducted in order to determine what are the most important and relevant topics/constructs that must be evaluated generically in organisations. For that, the combination of words "Maturity model" were searched in Web of Science, by its title and abstract. 692 results were considered. Some restrictions were applied: it was only considered articles from the last 10 years (2014-2023) and in English Language, totalling 444 articles to be analysed. From this number of publications, only 6 of them addressed enablers of maturity models generically. According to the conclusions of the authors in the articles, 5 main constructs were selected to be part of the maturity model. Table 10 describes comprehensively the main requirements that must assessed in each construct.

Table 10 – Main factors that constitute a maturity model and description of main requirements for each construct

Constructs	Description of main requirements	Authors
Strategic alignment	The strategy is translated into goals; actions are fully aligned with the strategic direction of the organisation; managers and employees understand the strategy and help to improve performance.	(Gomes & Romão, 2015; Jurczuk, 2016; Looy, 2020)
Stakeholders' management	Frequent communication and periodically measurement of the satisfaction of stakeholders, mutual expectations are set between the organisations and the stakeholders; stakeholders are mapped according to their urgence and legitimacy; actions taken to engage stakeholders.	(Gomes & Romão, 2015; Jurczuk, 2016; Looy, 2020)
Culture	Leadership, direction, employee integration/satisfaction/rewarding/training and empowerment; employees cooperate to achieve the organisation goals.	(de Boer et al., 2015; Gomes & Romão, 2015; Jurczuk, 2016; Looy, 2020; Ongena & Ravesteyn, 2020)
Internal processes	Processes are mapped, documented, assessed regularly, and optimised; resources are managed efficiently; compliance with external regulations and organisational policies; processes and continuously improved; KPIs; process innovation; assessment and risk management; minimise, and eliminate the impact of risks; maximise opportunities.	(Bhattacharya et al., 2020; de Boer et al., 2015; Gomes & Romão, 2015; Jurczuk, 2016; Looy, 2020)

Constructs	Description of main requirements	Authors
Use of technology	IT systems support and help improve business processes; IT systems monitor processes to visualise real-time process performance information and analyse unplanned deviations from the process; where possible and necessary processes are automated.	(Bhattacharya et al., 2020; Gomes & Romão, 2015; Jurczuk, 2016; Looy, 2020; Ongena & Ravesteyn, 2020)

Theoretical evidence supports that all the constructs previously selected, which are according to the authors above and that must be accurately assessed in a generic maturity model, are also extremely relevant to both the Shingo and EFQM models.

In the Shingo Model, it is possible to observe that the top of the diamond pyramid dimension is precisely Enterprise Alignment, under the principles of Think Systemically, Create Constancy of Purpose, and Create Value for the Customer. Hence, the model address to the importance of having a purpose, mission, and vision, and correctly aligning each value stream, in order to ultimately fulfil the expectations of stakeholders, by providing effective and efficient outcomes, achieving long-term sustainable results (Edgeman, 2018; Edgeman & Barker, 2019; Shingo Institute, 2020b). Also, it is crucial that both managers and employees correctly understand the strategy to proactively cooperate in the improvement of performance (Shingo Institute, 2020b).

In turn, the EFQM Model advocates that to achieve those sustainable goals, there is also the need for Strategy Alignment (Fonseca, 2022; Vukomanovic & Radujkovic, 2013), as reported by first criterion Purpose, Vision and Strategy, in the Direction dimension. Thus, it is important to understand what is the purpose the organisation is fulfilling, in order to not only proper delivering sustained value, and align a strategy that fulfils the purpose, but also to outline the path towards future ambitions – vision (EFQM, 2019). Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H5 – The Propensity to implement the Shingo Model has a positive impact on Strategic Alignment.

H6 – The Propensity to implement the EFQM Model has a positive impact on Strategic Alignment.

In what concerns the Stakeholders' Management - another important construct when assessing the organisational maturity, both the Shingo and the EFQM models incorporate references to this dimension. The Shingo Model refers frequently to Customers, however, according to the Shingo Institute (2020b) (page 36), "customers" refers to the multiple stakeholders (supply and value chain, producers, providers, consumers, policymakers, the environment, etc.). Thus, this model highlights the need to create value for the customers, to assess the impact on the internal and external customers daily (Shingo Institute, 2020b), to involve customers in product or service design (involve customers in continuous improvement), and to regularly meet the customers to assess their needs and listen to their opinions (Shingo Institute, 2020a).

The EFQM model focus great attention on creating sustainable value for its key stakeholders (Menezes et al., 2021; Murthy et al., 2021b; Nenadál, 2020; Sütőová et al., 2022) existing in the environment in which the organisation is operating, hence, it is essential to identify, meet and exceed their expectations, engage and involve them, and maintain a relationship based on

"transparency, accountability, ethical behaviour and trust" with the key stakeholders (EFQM, 2019). Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H7 – The Propensity to implement the Shingo Model has a positive impact on Stakeholders' Management.

H8 – The Propensity to implement the EFQM Model has a positive impact on Stakeholders' Management.

As previously reported in the conceptualisation of hypotheses to the different types of organisational culture towards the models in the study, and in the conclusions extracted from the literature review, both models vigorously emphasise the indispensable urge of having the ideal culture, i.e., the one which allows attaining the goals set by the organisation. In the Shingo Model "Cultural Enablers" precisely constitute the base of the pyramid, as it was understood as being the foundation of change to whatever objectives the organisation aims to achieve (Shingo Institute, 2020b), thus an environment of commitment and cooperation between managers and employees must be accomplished, as well as training, development, empowerment, rewarding, recognition, and involvement of employees (Edgeman, 2018; Edgeman & Barker, 2019; Plenert, 2021; Shingo Institute, 2020b).

Moreover, the second criterion of the EFQM Model is Organisational Culture and Leadership emphasising the need to set values, norms and, principles commonly shared by all individuals of the organisation, in order to create a "winning culture", supported by effective leadership (EFQM, 2019). Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H9 – The Propensity to implement the Shingo Model has a positive impact on Culture.

H10 – The Propensity to implement the EFQM Model has a positive impact on Culture.

Both the Shingo and the EFQM models highly promote the need to manage internal processes accordingly in order to achieve better outcomes (Cavaco & Machado, 2015). In what concerns the internal processes, the Shingo model recognises the significance of attaining leadership engagement as the initial step towards operational excellence (Bhullar et al., 2014). Even though the Shingo Model nowadays comprehends a more holistic perspective (Plenert, 2021), its foundation lies on the urge to attain operational excellence, thus an utterly important focus of this model is the internal processes, addressed in the second dimension in the guiding principles in the diamond pyramid, under the constructs of seek perfection, embrace scientific thinking, focus on process, ensure quality at the source and improve flow and pull, highly supported by concepts, such as "identify and eliminate waste" and "no defect passed forward", for instance (Shingo Institute, 2020b). The Shingo model warns of the necessity of having the right KPIs to assess and constantly improve processes, to rely on factual data to optimise processes, to map and document processes, to manage risk, and comply with regulatory policies (Shingo Institute, 2020a, 2020b).

Due to the comprehensive manner of the EFQM Model, this model does not provide specific guidelines for accomplishing an improvement in internal processes, such as the Shingo model does or, in other words, while the Shingo model provides instructions (principles that must be followed) to achieve efficiency and effectiveness in more industrialised processes, EFQM model provides generic guidance towards this subject.

Consequently, in the second dimension of the EFQM model - Execution, it is mentioned that success in whatever area this model is being implemented, regardless of whether it is a service, education facility, industry, etc., it is crucial to engage the key stakeholders, create sustainable value (regardless of being a product, service or solution), manage the current business operations successfully (Drive Performance) and constantly thinking about and managing transformation, so that results may endure in the future (Drive Transformation). Moreover, to achieve these core criteria, the accomplishment of core concepts such as Manage Risk, Maximise Opportunities, Drive Innovation, Utilise Technology, Manage Assets and Resources are required (EFQM, 2019). Also, the EFQM model consists of a tool that enables to continuously improve processes, mainly due to its self-assessment nature, thus, best practices and improvement areas can be constantly identified (Samuelsson & Nilsson, 2002; Vukomanovic & Radujkovic, 2013). Some papers report precisely that the EFQM implementation increases the efficiency of internal processes (Gómez-López et al., 2019; José Tarí & Molina-Azorín, 2010). Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H11 – The Propensity to implement the Shingo Model has a positive impact on Internal Processes.

H12 – The Propensity to implement the EFQM Model has a positive impact on Internal Processes.

The use of information and communication technology tools partially moderates the relationships between organisational culture and people and customer results (Kassem et al., 2019). In the Shingo Model, it is referred to the Information Technology as a key system to achieve Enterprise Alignment (Shingo Institute, 2020b). Also, Edgeman & Barker (2019) concluded that information and communication technology system is present in the Shingo Model (Edgeman, 2018).

Moreover, the EFQM Model abundantly refers to the use of technology are a manner of transforming, innovating, and providing data, information, and knowledge crucial to ensuring sustainable development of processes and services (Altamony, 2017; EFQM, 2019; Fonseca et al., 2021; Sadeh et al., 2013).

Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H13 – The Propensity to implement the Shingo Model has a positive impact on Technology.

H14 – The Propensity to implement the EFQM Model has a positive impact on Technology.

4.3. Environmental, Operational and Social Performance

In order to corroborate the knowledge previously found as a result of the literature review with regard to the promotion of the pillars of sustainability through the models of excellence under study, the research model presents items that also aim to evaluate this situation in practice. In the literature review in the second chapter of this dissertation it was found theoretical evidence that models enthusiastically promote practices under the influence of the three pillars of sustainability – social, economic, and environmental, for the purpose of developing long-term consistent and durable results. As economic benefits arise through the culmination of the implementation of the best Environmental, Operational and Social practices as mentioned in the last chapter, those three constructs were selected to be tested in the model.

The Shingo Model promotes sustainable practices (Plenert, 2021) under the influence of its principles. Environmental concerns, decrease operational wastes, better efficiency in assets and resources management, and health and safety of employees are issues on which the model is based, vigorously promoting the pillars of sustainability (Shingo Institute, 2020a, 2020b).

The EFQM Model promotes social responsibility (Jancikov, 2009) and its most recent update version, as reported in the two previous chapters, is highly focused on sustainable performance, thus assessing the economic, environmental, and social conditions in the ecosystem covered by the organisation is paramount. Evidence on the relationship between the EFQM Model and sustainable practices is reported in scientific papers (Akkucuk & Gencer, 2017; Menezes et al., 2021; Fonseca, 2022; Martusewicz et al., 2022; Rivera et al., 2021).

Hence, taking the aforementioned premises into consideration, the following hypotheses are operationalised:

H15 – The Propensity to implement the Shingo Model has a positive impact on Environmental/Operational/Social Performance.

H16 – The Propensity to implement the EFQM Model has a positive impact on Environmental/Operational/Social Performance.

4.4. Conceptual Model

This subchapter aims to present the conceptual model (Figure 12) that expresses the theory previously reported in a more attractive manner.

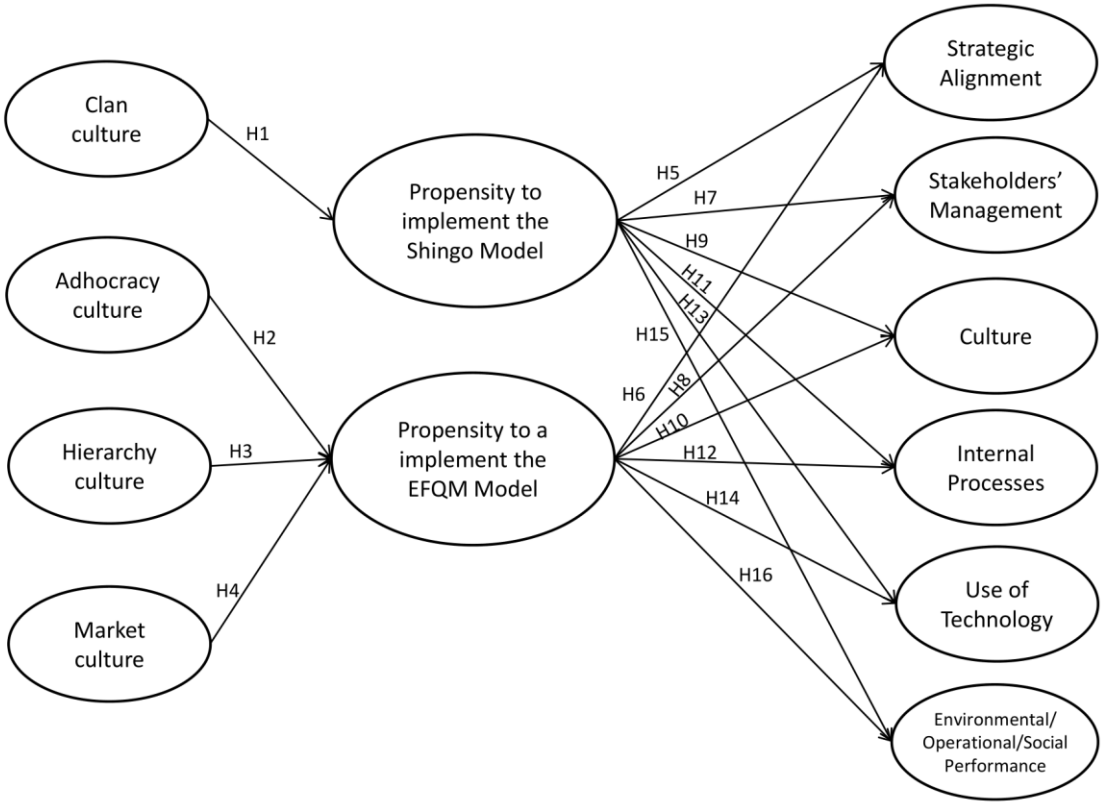


Figure 12 – Conceptual Model

Clan culture, Adhocracy culture, Hierarchy culture, and Market culture are exogenous constructs (or independent variables), i.e., they are only used to predict other constructs and no hypotheses predict these four constructs, whereas the other eight constructs are endogenous (dependent variables) as they are outcomes or both outcomes and predictors at the same time (Hair et al., 2018).

The type of culture prevalent within the organisations is hypothesised to have a positive influence on the Propensity to implement a specific excellence model, and in its turn, adopting Shingo or EFQM is theoretically positively linked to the Propensity of sharing high maturity levels expressed through the following constructs: Strategic Alignment, Stakeholders' Management, Culture, Internal Processes, Use of Technology and Environmental, Operational and Social Performance.

The Propensity to implement the Shingo model or the EFQM model is translated into questions, as will be explained shortly, which assess the needs and strategies of organisations that are more suited to a particular model.

5. RESEARCH METHODOLOGY

Survey research allows to collection of information from a sample through the responses of individuals to specific questions. Data collected is only useful if it accurately and consistently conveys information about the subject in matter (Jones et al., 2013). Nowadays, surveys consist of a more rigorous approach as data goes through "scientifically tested strategies" to ensure the sample in study characterises the population in question and to assure reliability and validity of data provided by those responses to be subsequently carefully analysed so that accurate conclusions are extracted from the investigation (Ponto, 2015). Galobardes (2002) proposes the following steps (Figure 13) when conducting survey research:

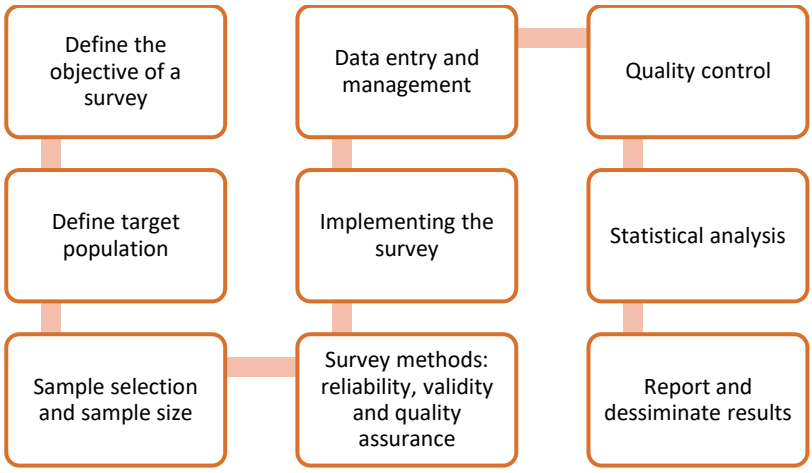


Figure 13 – Key steps in planning a survey (adapted from Galobardes (2002))

This chapter presents the structure of the survey designed to attain the objectives of this investigation, the measuring scale used, how the instrument was validated, and a description of the operational variables, i.e., clear information is given on how each variable was effectively measured on the survey. Furthermore, it is provided a description of how the data was consistently collected and a characterisation of the sample in the study.

5.1. Survey Structure, Measuring Scale, and Experts Validation

To conduct the research and in order to test the hypotheses already described, a survey was created through the Microsoft Forms, as a form of data collection. As already mentioned, surveys must undergo a hefty process of development, testing, and validation, so that the credibility and legitimacy of questions can be assured (Kelley et al., 2003). Pretesting and validation is the process of identifying questions that respondents find difficult to comprehend or misinterpret in a way that differs from what the researcher intended (Krosnick, 1999). This survey was pre-tested by professionals in the areas of industry and education and was validated by a panel of four experts in the field.

This survey received a positive judgment from the DPO (Data Protection Office) of P.PORTO - it was analysed if the survey fulfilled the obligations arising from the General Regulation on Data Protection and it was verified the applicability of the Data Protection Policy of P.PORTO. Furthermore, all respondents were required to agree to a declaration of consent, without which

the survey could not be fulfilled, reminding all respondents that their answers were only for statistical purposes and that their responses were anonymous and confidential.

The survey is organised into distinct groups. Throughout the survey, a similar structure is maintained with similar measurement scales. The survey was developed using a Likert scale, in order to measure a series of attitudes or perceptions towards particular propositions (Chyung et al., 2017). Even though a 7-point Likert item is more representative of a respondent's true subjective assessment of a survey usability item, as opposed to a 5-point item scale (Finstad, 2010), 5-point scales are less confusing and enhance the likelihood of response rate (Taherdoost, 2019). Also, it was the scale that best fitted the purpose of this investigation, helping clearly to evaluate the Propensity of organisations to adopt a specific model. Thus, the scale from 1 to 5 represents the following: 1- "Strongly disagree", 2- "Disagree", 3- " Neither agree nor disagree", 4- "Agree" and 5- " Strongly agree". The conversion of a 5-point Likert scale into Propensity will further be explained in this dissertation. Also, to measure the constructs, preference was given to already existing scales, previously tested in other studies.

The majority of questions are closed-ended questions as respondents have a tendency to only select among those listed, even if the best answer is not listed, rather than writing an answer in full (Krosnick, 1999). Only in some questions, when the respondent chose the option “Other(s)”, he/she was invited to write an answer in full providing more detail on the subject. In the remaining survey, the questions are all closed-ended.

The survey is divided into seven sections, with 31 questions, some of which are still divided into more specific questions, as can be observed in APPENDIX IV.

The first group of questions “Information on the respondent” aimed to legitimate the data collected by characterising the respondents in terms of their position in the organisation, the length of time they worked in the organisations, and their academic qualifications. According to Ponto (2015), surveys must be administered by professionals in the field of what is being tested and must include demographic questions in order to assess and interpret the validity and reliability of responses. Consequently, the second group of questions “Information on the organisation” aimed to provide some generic information on important aspects in order to characterise and distinguish the organisations that participated in the survey. Respondents were asked to answer on the sector of activity of the organisation, the age of the organisation, how many employees work in the organisation, its geographic location, to inform whether the organisation is public, private, or public-private, and to superficially assess the maturity level. Respondents were also asked to inform on the benchmarks/standards adopted by the organisation and to indicate if on a daily basis some lean tools/practices are adopted. In case of a positive response, respondents must select which of the listed lean tools/practices are currently implemented in their organisation and in the case of a negative response the Propensity to their adoption is assessed, thus, respondents are asked if their organisations are planning to implement them in short term (within a year), medium term (within 1 to 3 year), long term (more than 3 years from now) or if they do not implement either of them, but still are not planning to do so.

It is also important to emphasise that, as it will be further explained in the next subchapter, only small, medium, and large organisations were considered in this investigation, i.e., organisations with more than 10 employees, whose number of employees was grouped into four categories: 11 – 50, 51 – 100, 101 – 249 and more than 250. Also, respondents were asked to report their

geographic location based on NUTS II, which consisted of a strategic choice. NUTS is an acronym that stands for "Nomenclature of Territorial Units for Statistical purposes" which subdivides the Portuguese territory into 3, 7, or 25 regions, respectively, whether it is according to NUTS I, NUTS II or NUTS III (PORDATA, n.d.). Hence, NUTS II was considered the most adequate and suitable option for this survey.

In what concerns the benchmarks/standards adopted by organisations, only the most common ones were listed (ISO 9001, ISO 14001, ISO 45001, and ISO 50001). As this investigation aims to assess the Propensity of the adoption of excellence models and their relationship with the pillars of sustainability, SA 8000, EMAS, GRI, and B CORP were equally listed to extract conclusions on this matter.

The third group of questions “Organisational culture” aimed to assess the distinct cultures adopted by Portuguese organisations. The section is subdivided into four questions, each implicitly representing a type of culture, in which each type of culture is composed of 4 items (16 questions). These questions are answered based on a 5-point Likert scale. The next group of questions “Organisational maturity” was also answered based on a 5-point Likert scale and it was organised into five subgroups, in order to assess the strategic alignment, stakeholders’ management, culture, internal processes, and perception of technologies, having a total of 16 questions.

The fifth group of questions “Needs/Strategy of the organisation” was created to indirectly evaluate the Propensity of organisations to adopt the EFQM Model and the Shingo Model, thus questions differencing them were shown to the respondent. In the first place, for each of the affirmations, the respondent had to answer if the organisation already is aware of the affirmation or uses the practice described - “Yes” or does not use the practice - “No”. In case of responding “Yes” that answer is converted into a 5, on the Likert scale used, as it can be translated in high Propensity to implement the model concerning that specific question. In the case of responding "No”, the respondent must say if the organisation is planning to implement the practice in the short term (within a year), medium term (within 1 to 3 years), long term (more than 3 years from now) or if the organisation does not implement it, but still is not planning to do so. Hence, in what concerns the Propensity to implement a specific model, in the case the organisation is planning to shortly implement in practice, it is translated in a 4 on the Likert scale, in the medium term corresponds to a 3, in the long term corresponds to a 2, and if the organisation has no plans in its implementation, it is converted into a 1 – that organisation has no likelihood of adopting a specific model based on that question. There are 7 particular questions to the EFQM model and 5 to the Shingo model.

The sixth group of questions aims to assess the “Environmental, Operational, and Social performance” and it is also answered based on 5-point Likert scale. However, an additional option was added “Not Applicable”, due to the immensity of different organisations from utterly different sectors not sharing the same environmental issues.

The last group of questions “Excellence Models” has only one question and asks respondents if they have already adopted the Shingo or the EFQM models, and if yes, for how long. Since the purpose of this research is to verify the Propensity of organisations to adopt the Shingo model or the EFQM model, in order not to induce respondents to have a tendency towards a certain type of model, at no point were the questions relating to the needs and strategies of the organisation, which differentiate the two models in group 5, distinguished. On the other hand, there was also the intention of preventing organisations from taking part in this survey, since the inclusion of a

question relating to the applicability of a model that they had not implemented in the first place could cause them to give up answering the survey, making this research unfeasible.

5.2. Description of the Operational Variables

This subchapter aims to operationalise the constructs included in the proposed research model, for a better understanding of the scope of the study. To measure these constructs, preference was given to existing scales previously tested in other studies, although this investigation has undergone some adaptations.

The questions proposed on the Organisational Culture were extracted from Cameron & Quinn's (2006) book (pp. 26 and 27). The items proposed by the authors consist of an Assessment Instrument to identify the type of culture prevalent in an organisation (clan, hierarchy, adhocracy, or market) based on its dominant characteristics, organisational leadership, strategic emphases, and management glue. For each of these groups, there are 4 questions, equalling a total of 16 questions on Organisational Culture, as previously reported. Moreover, a study on the type of culture that mostly has a positive influence on EFQM results has already been conducted (Giménez Espín et al., 2022), using exactly the same questions as this investigation and using also a 5-point Likert scale, allowing this way to further compare results on this matter.

To operationalise the items regarding the Propensity to implement the Shingo Model or the Propensity to implement the EFQM Model, further research was conducted in order to identify the main differences between the two models, so that unequivocally respondents would be able to give information on this matter. The purpose was always to produce distinguish affirmations regarding the needs and the strategy of organisations according to both models separately, without at any point conveying the information that a specific affirmation is linked to a specific model, in order not to create bias in the answers or the abandonment of the survey if the respondent realised that his/her organisation did not indeed adopt any of these models of excellence.

However, as analysed in the Critical Analysis of the Literature Review, the models in the study share a high degree of similitude, in what concerns the essence of the models and their purposes. Thus, the differences are utterly specific. The seven questions on the EFQM model concern the use of technology to deal efficiently in environments of change, uncertainty, risk, or threat, to achieve a sustainable future, and to analyse the opportunities brought by innovation and technology. The newest version of the EFQM model enthusiastically promotes the use of technology, innovation, and creativity, in order to always be prepared to manage risk and prepare for the future (sustainable results) (EFQM, 2019). Furthermore, a question on the comparison of results with other organisations was added, as the EFQM model is a great benchmarking tool, helping to benchmark their performance against other organisations (Samuelsson & Nilsson, 2002; Vukomanovic & Radujkovic, 2013). The EFQM model 2020 model version warns of the concept of the ecosystem and the need to get involved and seek to maximise opportunities to learn and grow with others within the ecosystem of the organisation (EFQM, 2019), and also to monitor and access the contribution of the organisation to the society. All the questions proposed for the EFQM model are in compliance with the EFQM model assessment tool (AssessBase) available online, which enables a diagnosis to be made of whether the practices used by an organisation are in accordance with the model, helping also to assess and monitor its maturity within the practices mentioned in the survey (EFQM, 2023a).

In what concerns the latest version of the Shingo Model, as a result of a detailed reading of the documentation (Plenert, 2021; Shingo Institute, 2020a, 2020b), it was possible to identify five crucial differentiating aspects of this model, namely the need to identify the systems that constitute an organisation and how they interact with each other; the importance of 5S/Standard work, because "you cannot improve something that is not standardised" (Plenert, 2021); the importance of "Go and observe" - the Gemba walk; and the need to have good KBIs that will subsequently lead to results ideas (KPIs). Hence, 5 questions – one for each of the mentioned aspects, were formulated.

To operationalise the questions on organisational maturity, questions were formulated based on the description of the main requirements for each construct, proposed by authors in Table 10, and on further research for each topic based on the following authors:

i. *Strategic Alignment*: Adapted from Guerra-López (2018);

ii. *Stakeholder's management*: Adapted from Francisco de Oliveira & Rabechini (2019);

iii. *Culture*: Adapted from Schmiedel et al. (2014);

iv. *Internal processes*: Adapted from Chutivongse & Gerdsri (2020), Dijkman et al. (2016) and Domańska-Szaruga (2020);

v. *Use of technology*: Adapted from Suh et al. (2017).

The items regarding Environmental, Operational and Social performance were conceptualised based on the metrics proposed by Teixeira et al. (2022).

5.3. Data Collection and Characterisation of the Sample

This study will focus on part of the population - a sample. The population considered concerns all Portuguese organisations of small, medium, and large-sized, i.e., with more than 10 employees, as previously explained. The micro-enterprises were excluded from the study due a strategic choice as the number of micro enterprises in Portugal is extremely relevant – there are more than 1.3 million micro enterprises, representing 96% of Portuguese business (PORDATA, 2023). All sectors of activity were included in the investigation, as models are considered to be implemented in every sector.

To access to institutional emails of organisations under the characteristics abovementioned, the SABI database was used. This database contains comprehensive information on Portuguese and Spanish companies. This database enabled to extraction of a MS Excel file containing the institutional email of organisations under the criteria previously reported. The file extracted holds the institutional email of 37 730 organisations, whose number corresponds to the population of organisations in the study. Subsequently, an email requesting organisations to fulfil the survey (APPENDIX IV) was sent to each of them through an automatic flux created in MS Power Automate.

Sampling "is a procedure to select a sample from individual or from a large group of population for certain kind of research purpose" (Bhardwaj, 2019). Taking into consideration this population size, a sample of 381 or more answers is needed to have a confidence level of 95% (margin of error of ±5%). It was selected the Structural Equation Modelling (SEM) as the multivariate analysis

technique to test the hypotheses formulated. Hair et al. (2018) suggest a minimum sample size based on the model complexity and basic measurement model characteristics, in order to conduct a proper SEM. For models with more than a large number of constructs (more than seven), a sample of 500 answers must be at least achieved and this number must be higher when the data deviates from multivariate normality and missing data exceeds 10 percent, which is the case, as it will be further comprehensively explained (Hair et al., 2018).

The data collection was taken during a month and a half (6 weeks), from 15 June to 24 July 2023, in which it was possible to obtain 789 answers, a number above the minimum level required.

From the initial sample, a total of 731 responses were considered valid, as 58 were excluded due to what was considered respondent misconduct. Respondents who answered almost always the same in every question, i.e., responses with very low standard deviation were eliminated. However, the target population continues to adequately represent in the sample considered, making it possible to fulfil the objectives of this investigation.

It is also important to emphasise that the sample, despite being sufficient is still small when compared to the population considered. Some of the reasons for this issue are considered to be due to:

i. the time to collect the data was short and the data was undertaken during critical months for organisations – summer holidays.

ii. it was found that the database SABI was not recently updated as a considerable number of emails were returned asking to resent the survey fulfilment request to a more recent email – all these emails were resent one by one to the recent email requested.

iii. 2 062 emails were rejected due to the inexistence of domain or rejection by the server of the recipient's mail, hence, the population in the study consists of 35 667 organisations;

iv. the survey sent to organisations is too long, which may have led organisations to give up answering or to have given up while filling it in. The average time taken to complete the survey was approximately 28 minutes.

6. RESULTS OF THE SURVEY

This chapter aims to present an analysis of the results obtained from the survey by scrutinising the demographic profile of organisations, characterising the respondents in order to assess the legitimacy of answers received, and analysing the organisational maturity of organisations that constitute the sample in the study. Subsequently, in order to explore the items of each of the constructs of the model in analysis, univariate analyses were applied to assess every item in its individual form. Missing data and outliers are also checked before the assessment of the reliability and one-dimensionality of constructs. The concept of factor analysis has undergone a significant transformation in recent years, with the introduction of exploratory, confirmatory, and hybrid forms of factor analysis, which involve the extraction of exploratory factors and confirmatory rotation (Henson & Roberts, 2006). The analysis of the reliability and one-dimensionality of constructs theoretically proposed (an exploratory analysis) is followed by the Confirmatory Factor Analysis (CFA) in the subsequent chapter.

6.1. Demographic profile and characterisation of the organisations

Results presented in Figure 14 show evidence that the majority of organisations (43%) that participated in this survey belong to the North of Portugal (313), corresponding to a significant percentage of respondents. The other contributions to this investigation came from the Metropolitan Area of Lisbon (22%), representing a total of 172 organisations, whose percentage of responses is very similar to that total by the Centre of Portugal with 146 responses (20%). The remaining contributions came, respectively, from Alentejo with 42 responses (6%), Algarve with 22 (3%), Autonomous Region of the Azores with 20 (3%) and Autonomous Region of Madeira with 16 responses (2%).

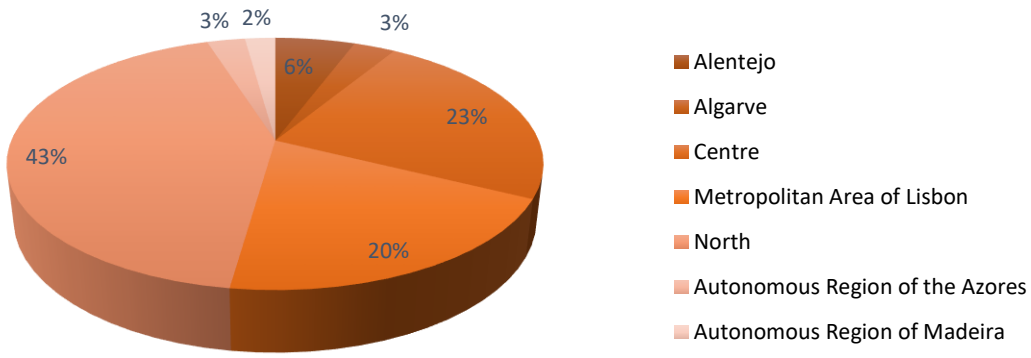


Figure 14 – Demographic profile of organisations

With regard to the sector of activity, as reported in Figure 15, the majority of respondents belong to the industry with 252 responses (34%), and the construction sector with 121 (17%). Many organisations were revealed to be part of sectors that were not listed in the survey, contributing to the huge percentage of the “Others” option in the chart with 171 responses (23%).

Hotel and catering organisations contributed with 53 responses, corresponding to 7% of the total number of responses, followed by the transport and health sector with 39 and 33 responses,

respectively (both 5%) and education and financial activities with 25 and 19, respectively (both 3%). Finally, 13 responses were accomplished by the energy sector (2%) and 5 responses by public administration (1%).

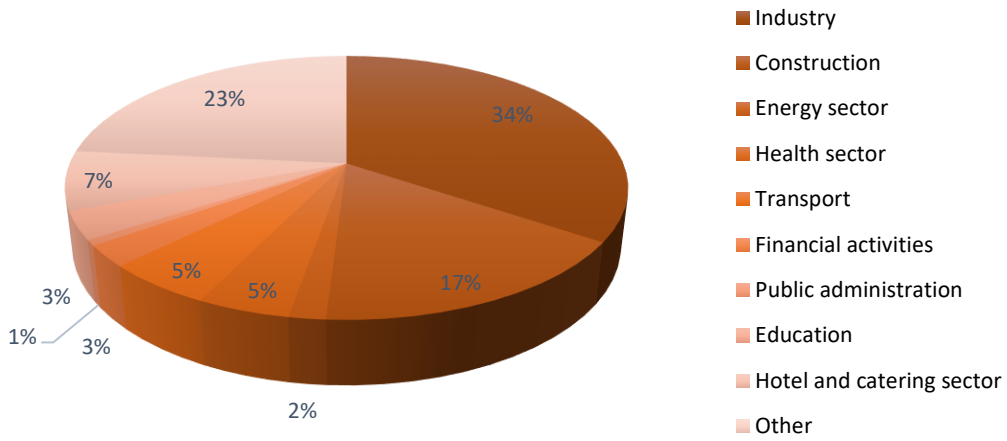


Figure 15 – Sector of activity of organisations

In the survey, when selecting the option "Other", respondents were also asked to specify the sector of their organisation, by writing it in full. After analysing and treating the responses given, it became clear that most of them belonged to the sectors displayed in Figure 16: Social services/Social economy with 20 responses (12%), IS/IT services with 17 (10%), Tourism and Consultancy with 5 (both 3%), Agriculture with 9 (5%), Automobile repair and sales with 16 (9%), Provision of services with 8 (5%), Environment/Forestry and waste management with 6 (4%), Trade services with 19 (11%) and 66 responses to more specific sectors (Others), corresponding to 39%.

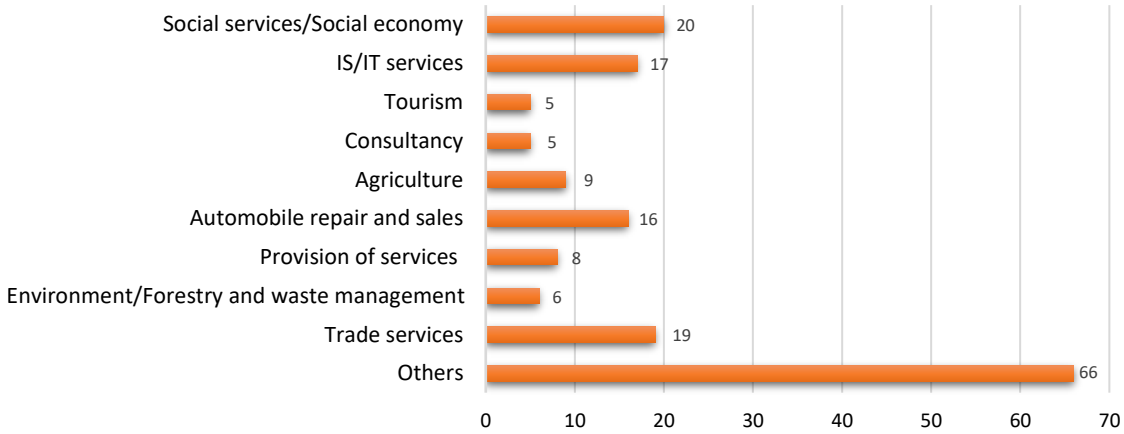


Figure 16 – Main sectors of activity of the organisations whose respondents selected the "Others" option

Organisations were also characterised in terms of their age. As can be observed in Figure 17, 446 organisations (61%) have existed for more than 20 years. 172 organisations in the study (24%) exist from 11 to 20 years and 86 respondents (12%) reported working for an organisation with 6 to 10 years of existence. Only a minority of organisations are considered recent – 25 organisations (3%) exist from 3 to 5 years and 2 organisations (corresponding to 0.3%, i.e., approximately 0%, as it is represented in the chart of Figure 17) were established from 1 to 2 years ago. Hence, the responses

of this sample reveal foremost importance, as the age of an organisation can be translated into expertise in the field and organisational maturity.

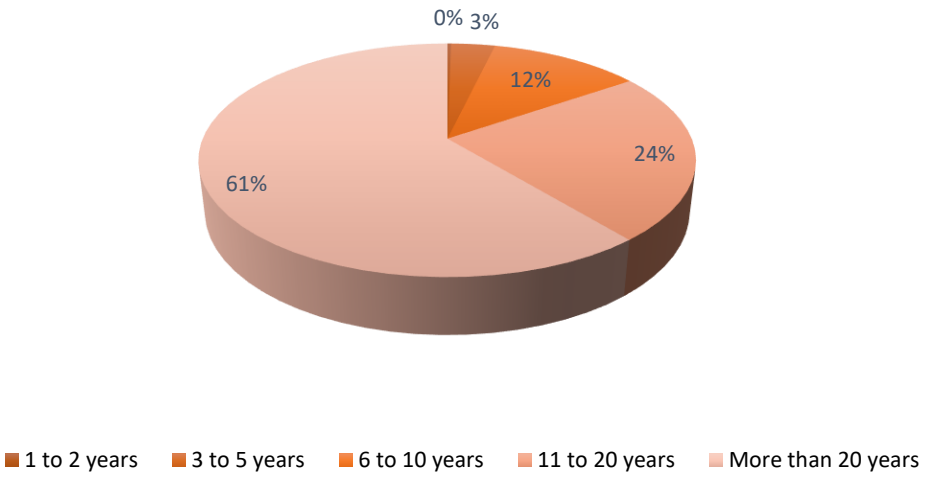


Figure 17 – Age of the organisations

By observing Figure 18, can be noticed that 673 organisations (92%) that participated in the survey were private, an extremely significant number. 52 of them (7%) are public and 6 organisations (1%) are characterised to be considered public-private organisations.

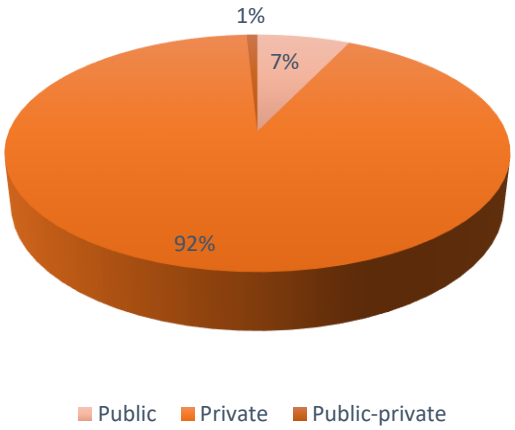


Figure 18 – Status of organisations

Figure 19 addresses the characterisation of organisations by the number of employees. Results show that 684 organisations (94%) are SMEs, of which 529 organisations (72%) have 11 to 50 employees – the majority, 93 (13%) have 51 to 100 employees and 62 (9%) have 101 to 249 employees, as it can be observed in the right side of the chart. Also, 47 organisations (6%) that participated in the survey are considered to be big organisations, as they employ more than 250 people.

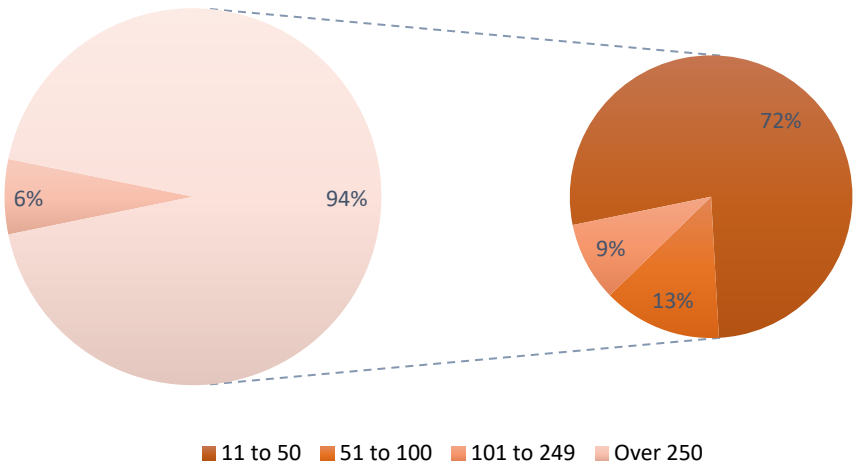


Figure 19 – Number of employees of organisations

To conclude the analysis of the demographic profile and the characterisation of organisations, it is important to emphasise that the majority of respondents did not implement either the Shingo or the EFQM model, having answered "Not Applicable" when specifically asked about the matter. Hence, this was the main reason to assess the validity of hypotheses through the “Propensity” of organisations to adopt a particular model. As can be observed in Figure 20, which presents a visual comparison of the number of organisations in the sample by time since the implementation of each model, 686 organisations (94%) reported not to have implemented the EFQM Model and 699 organisations (96%) to not have implemented the Shingo Model. However, 45 organisations report adopting the EFQM Model - 10 (1%) up to 1 year, 18 (3%) from 2 to 5 years, even, 7 (1%) from 5 to 7 years, even and 10 (1%) from more than 7 years. Also, 41 organisations to adopt the Shingo Model - 6 (1%) up to 1 year, 10 (1%) from 2 to 5 years, even, 8 (1%) from 5 to 7 years, even and 8 (1%) from more than 7 years.

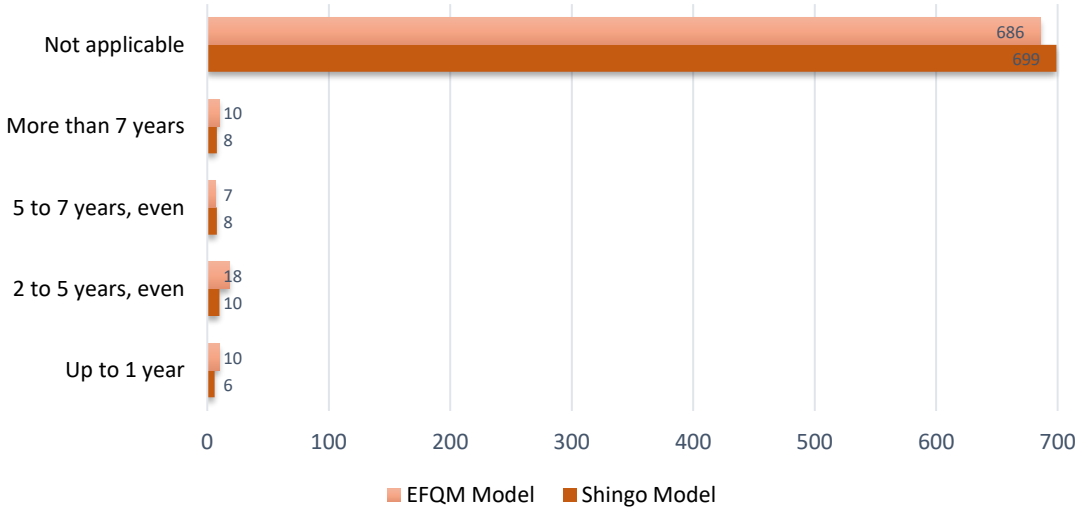


Figure 20 – Identification of organisations implementing the Shingo and the EFQM Models

6.2. Characterisation of the respondent

The respondent was characterised in terms of its academic qualification, based on the position held in the organisation and the amount of time working in the organisation to assess whether the responses received were legitimate.

With regard to the academic qualification of respondents, data shows as displayed in Figure 21 that the majority are Undergraduate or have a Bachelor's degree, with 390 responses, corresponding to 54%. 163 respondents (22%) have Secondary education, almost just as many as the number of respondents reporting to have a Master's degree – 152 respondents (21%). 9 respondents (1%) have a PhD degree and 17 (2%) answered to have an "Other" academic qualification.

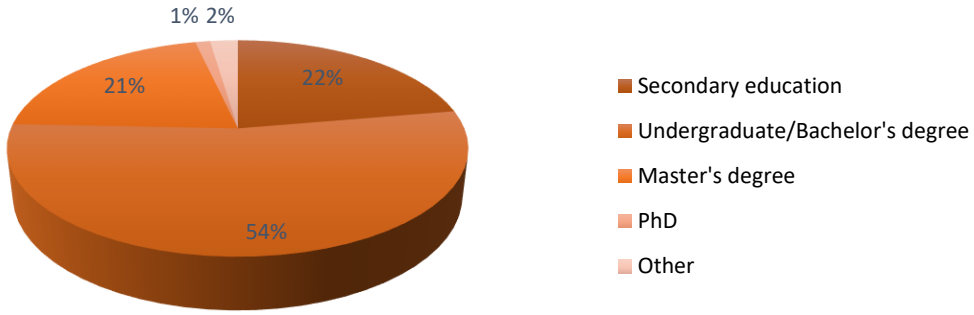


Figure 21 – Academic qualification of the respondent

Subsequently, Figure 22 presents information on the position held by the respondent in the organisations that comprise the sample in the study.

Validity to responses is also assured as the majority of respondents are CEOs of organisations, with 263 responses (36%). 104 respondents (14%) report to be CFO / Finance Manager, 87 (12%) to be CCO / Operations Manager, and 67 (9%) to be Quality and/or Organisational Excellence Manager.

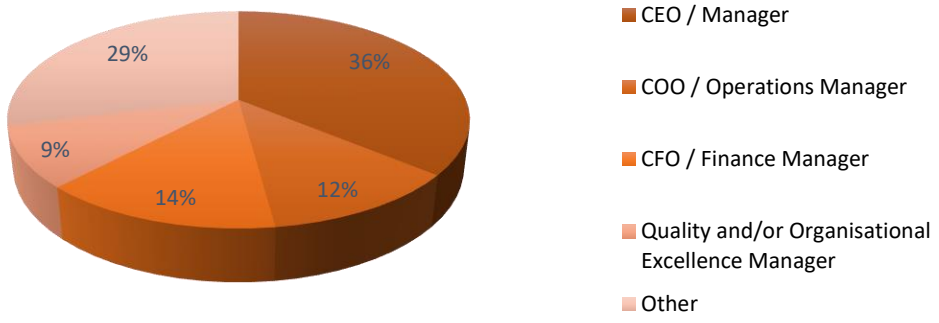


Figure 22 – Position held by the respondent in the organisation

Furthermore, it is important to notice that the category "Other" corresponds to a considerable number of 210 responses (29%). Respondents, when selecting this option, were further asked to identify their position on the organisation, by writing it in full. After analysing and treating the responses given, it became clear that most of them hold the positions displayed in Figure 23.

Results show that the majority of respondents report being the director, chief, or responsible for a particular department related to the subject of this dissertation with 98 responses (47%). 13 respondents (6%) are responsible or directors of Human Resources (HR), 48 (23%) are administrators and 51 (24%) belong to more specific sectors (Others), such as responsible engineers, collaborators, technicians, accountants, etc.

Figure 23 – Main positions held by respondents who selected the "Others" option

To conclude this analysis, it is also critical to analyse the amount of time that the respondent is working in the organisation as presented in Figure 24. Results indicate that more than half have been working for more than 10 years with 372 responses (51%), 138 (19%) report to have been working in the organisation for 6 to 10 years, 106 (14%) from 1 to 3 years, 85 (12%) from 4 to 5 years and only 30 respondents (4%) are on the organisation up to a year.

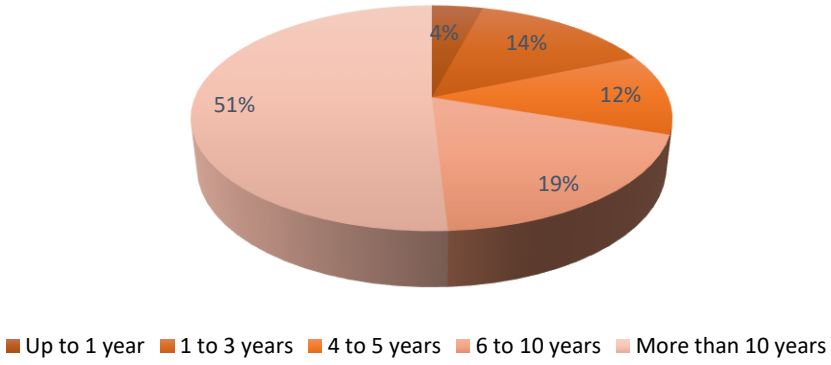


Figure 24 – Amount of time the respondent is working on the organisation

The analysis of the academic qualification, the position held in the organisation and the amount of time working in the organisation reported by respondents indicate that, in general, he/she has good knowledge/familiarisation with the organisation, suggesting the responses given in the survey on culture, maturity, actual practices and procedures, and future ambitions, assessed in the Propensity questions can be considered reliable to proceed with the subsequent analysis of data extracted from the survey.

6.3. Organisational maturity

From Figure 25 can be observed that 352 organisations (48%) do not adopt any benchmarks or standards. To properly analyse the chart, it is important to emphasise that results showed that 289 (40%) organisations only adopt a benchmark/standard and 90 (12%) adopt two or more. Also, it is of utmost importance to note that some organisations can be adopting other benchmarks/standards specified to the sector in which they operate that were no listed in the survey.

Results show that ISO 9001 of Quality Management Systems is the most adopted by 290 organisations (77% of organisations that adopt benchmarks/standards), followed by ISO 45001 – Occupational Health and Safety Management Systems by 183 organisations (48%) and ISO 14001 – Environmental Management Systems by 122 (32%).

SA 8000, ISO 50001, EMAS and GRI are the less adopted by the sample of Portuguese organisations in study. SA 8000 is adopted by 38 organisations (10%), ISO 50001 – Energy Management Systems by 28 (7%), EMAS – Eco-Management and Audit Scheme by 8 (2%), B CORP by 5 organisations (1%) and GRI – Global Reporting Initiative by 4 organisations, representing 1% of organisations that adopt benchmarks/standards.

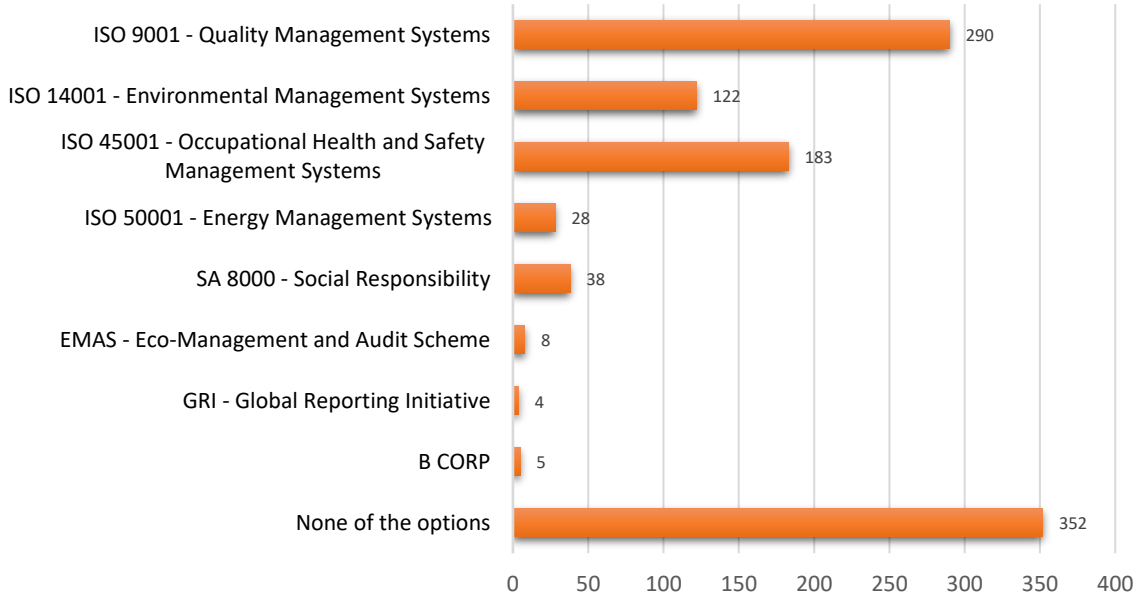


Figure 25 – Benchmarks and Standards adopted by organisations

Regarding the adoption of lean tools and/or practices, Figure 26 shows the ratio of organisations implementing and non-implementing lean tools/practices. Results suggest that the majority of them do not implement lean tools and lean practices on their daily basis, characterised by a total of 575 organisations (79%). 156 organisations (21%) report implementing lean tools/practices.

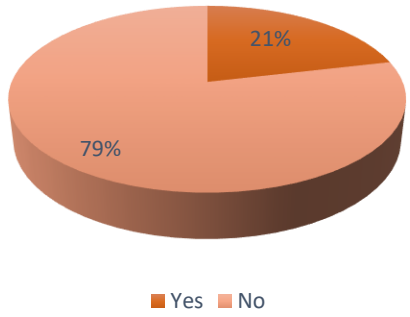


Figure 26 – Ratio of organisations implementing lean tools/practices

In the survey, in the case a respondent indicated that the organisation does not implement lean tools and practices, he/she is invited to answer a question assessing the Propensity to implement those tools in short, medium, or long term, despite having answered that in the present moment those tools or practices are not already implemented, or if, in fact, those organisations have no intention in implementing them.

Results displayed in Figure 27 indicate the 317 organisations (55%) not only do they not adopt lean tools, but they do not have the intention to. Only 32 organisations (6%) are walking towards the lean direction in the short term (within a year). 140 organisations (24%) report to plan implementing lean tools or practices in the medium term (within 1 to 3 years) and 86 (15%) to implement in the long term (more than 3 years from now).

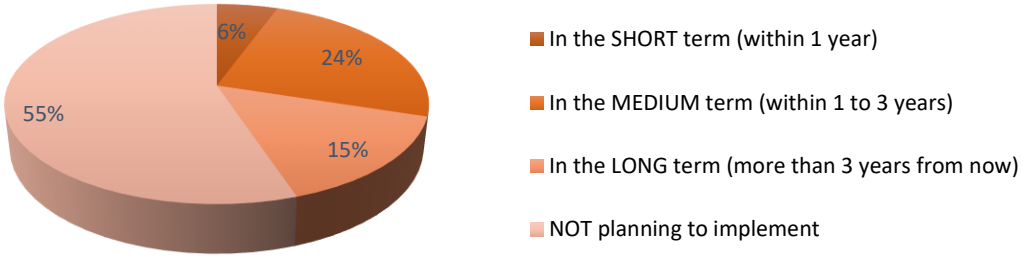


Figure 27 – Propensity to implement lean tools/practices

The 156 organisations (21%) that responded positively to the question concerning the adoption of lean tools and practices were directed towards a question, asking respondents to select what the tools are they actually implement in practice.

64 organisations (41%) only implement a tool/practice, being the 5S the most commonly used, whereas the other 92 organisations (59%) adopt two or more tools/practices. Figure 28 presents quantitative information the tools/practices implemented by the sample of organisations considered.

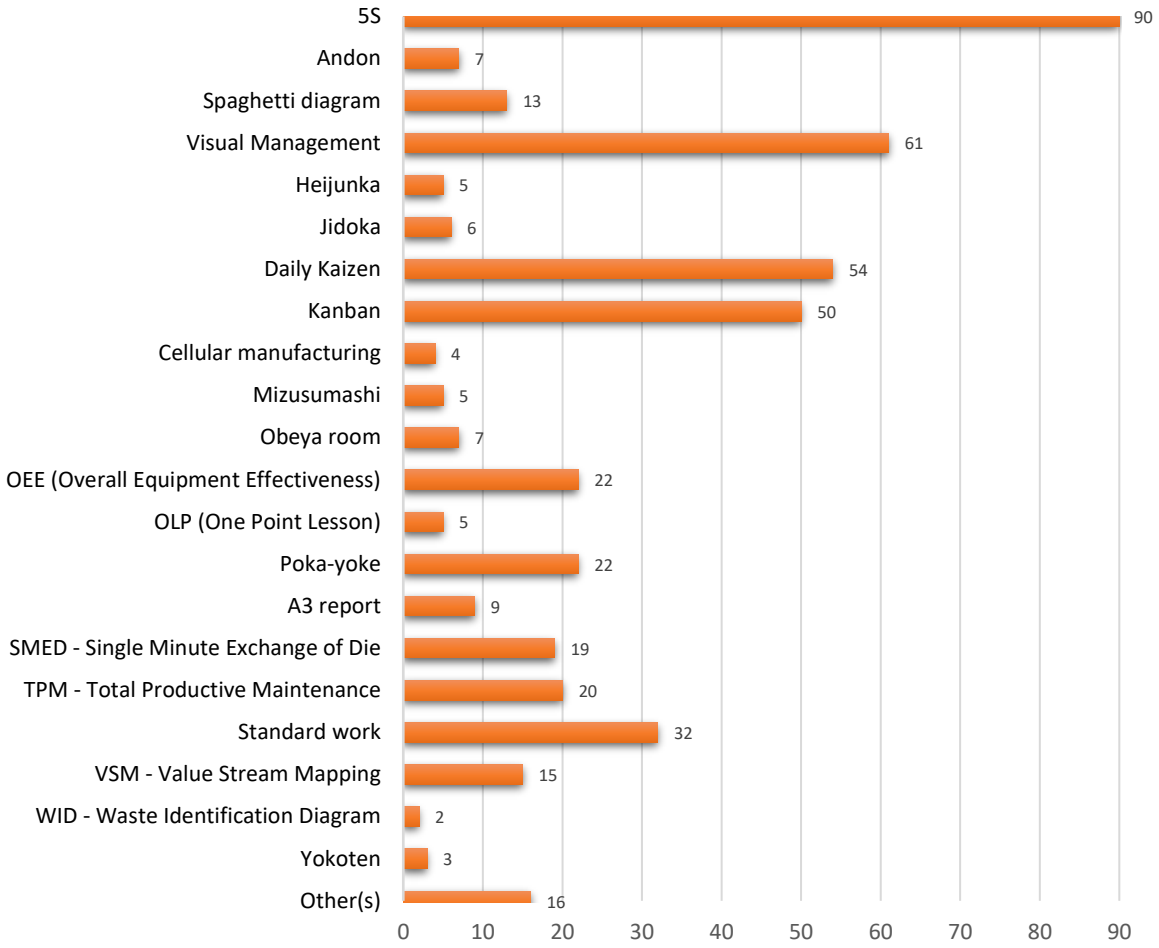


Figure 28 – Lean tools and practices adopted by organisations

From Figure 28 can be observed that 5S, Visual management, Daily Kaizen, Kanban, and Standard Work are the most preferrable ones. 5S is implemented in 90 organisations (58% of organisations that responded positively to the question concerning the adoption of lean tools and practices), Visual Management by 61 (39%), Daily Kaizen by 54 (34%), Kanban by 50 (32%) and Standard Work by 32 organisations (21%). OEE (Overall Equipment Effectiveness) is used in 22 organisations (14%), just as Poka-Yoke by 22 (14%). TPM (Total Productive Maintenance) and SMED (Single Minute Exchange of Die) by 20 (13%) and 19 (12%) organisations, respectively. VSM (Value Stream Mapping) is reported to be used in 15 organisations, which correspond to 10%, followed by the Spaghetti diagram used by 13 (8%) and by A3 report used by 9 organisations (6%). The less used tools and practices comprise Andon and Obeya room used in 7 organisations (both 4%), Jidoka in 6 organisations (4%), Heijunka, Mizusumashi and OLP (One Point Lesson) by 5 organisations, corresponding to 3% each, Cellular manufacturing by 4 organisations (3%), Yokoten by 3 (2%) and WID (Waste Identification Diagram) by only 2 organisations, corresponding to 1%. 16 respondents, which corresponds to the 10% of organisations that responded positively to the question concerning the adoption of lean tools and practices, reporting to be using different tools/practices apart from the listed in the survey.

6.4. Descriptive analysis of the variables

This chapter presents a statistical analysis of the variables of each variable. The following table (Table 11) displays for each variable the number of valid and omitted cases, the mean, the standard deviation, and the minimum and maximum value, from 1 to 5, obtained. Please refer to the APPENDIX I to visualise the univariate analysis of each variable.

Table 11 – Statistical analysis of the variables

Variable	N Valid	N Omitted	Mean	Standard Deviation	Minimum	Maximum
CC1	731	0	3.65	1.087	1	5
CC2	731	0	3.64	1.025	1	5
CC3	731	0	3.84	.954	1	5
CC4	731	0	4.07	1.005	1	5
AC1	731	0	3.25	1.030	1	5
AC2	731	0	3.73	.991	1	5
AC3	731	0	3.38	1.100	1	5
AC4	731	0	3.81	1.003	1	5
HC1	731	0	2.95	1.067	1	5
HC2	731	0	3.73	.996	1	5
HC3	731	0	3.38	1.033	1	5
HC4	731	0	3.98	.880	1	5
MC1	731	0	3.33	1.047	1	5
MC2	731	0	3.73	.992	1	5
MC3	731	0	3.62	.968	1	5
MC4	731	0	3.79	.954	1	5
SA1	731	0	3.64	1.055	1	5
SA2	731	0	3.49	1.033	1	5
SA3	731	0	3.57	1.010	1	5
SM1	731	0	3.31	1.144	1	5
SM2	731	0	3.22	1.115	1	5
SM3	731	0	3.13	1.100	1	5
C1	731	0	3.80	1.016	1	5
C2	731	0	3.74	1.028	1	5
C3	731	0	3.65	1.009	1	5
IP1	731	0	3.34	1.112	1	5
IP2	731	0	3.08	1.276	1	5
IP3	731	0	3.25	1.112	1	5
T1	731	0	3.54	1.099	1	5
T2	731	0	3.54	1.078	1	5
T3	731	0	3.67	1.048	1	5
T4	731	0	3.61	1.030	1	5
PE1	731	0	4.51	1.186	1	5
PE2	731	0	4.37	1.308	1	5
PE3	731	0	3.15	1.768	1	5
PE4	731	0	3.43	1.734	1	5
PE5	731	0	4.47	1.278	1	5

Variable	N Valid	N Omitted	Mean	Standard Deviation	Minimum	Maximum
PE6	731	0	4.50	1.242	1	5
PE7	731	0	4.62	1.093	1	5
PS1	731	0	4.58	1.102	1	5
PS2	731	0	4.05	1.567	1	5
PS3	731	0	4.56	1.151	1	5
PS4	731	0	4.48	1.260	1	5
PS5	731	0	4.13	1.529	1	5
EOSP1	551	180	3.68	1.192	1	5
EOSP2	640	91	3.81	1.151	1	5
EOSP3	636	95	3.62	1.144	1	5
EOSP4	634	97	3.77	1.115	1	5
EOSP5	699	32	3.41	1.197	1	5
EOSP6	685	46	3.64	1.091	1	5
EOSP7	700	31	3.70	1.092	1	5
EOSP8	686	45	4.20	.957	1	5
EOSP9	702	29	4.01	1.014	1	5
EOSP10	685	46	3.99	1.041	1	5

Note: N-Total number of observations; CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; PS-Propensity to implement Shingo Model; PE-Propensity to implement EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EOSP-Environmental, Operational and Social Performance.

As it can be observed from Table 11 there were no omitted observations for items from CC1 to T4 as all the questions until that point were mandatory. However, as every question regarding the Environmental, Operational and Social Performance was not applicable to every organisation that fulfilled the survey, those questions were not mandatory and there are considerable omitted cases. The variable with most omitted cases is EOSP1 with only 551 observations from the 731 considered in the sample, regarding the emission of atmospheric and/or liquid pollutants. The variable with less omissions was EOSP9 (29), concerning the working conditions of employees and suppliers, on the social aspect. Minimum and maximum values from the Likert scale, i.e., 1 and 5 were selected in every question, thus the dispersion of values was also significant, as it can be observed by the values of standard deviation of each variable in Table 11 above. The mean of the majority of variables is above 3.5, indicating homogeneity in answers and that respondents report to "Neither agree nor disagree", "Agree" or " Strongly agree" more than "Strongly disagree" or "Disagree" with the statements proposed in the survey.

Variable HC1 (first question regarding the Hierarchy culture), in which respondents answered on their organisation being or not a very controlled and structured place, where formal procedures generally govern what people do, has the lowest mean (2.95), even though the standard deviation is 1.067. The variable with the highest mean (4.62) is PE7 (the last question regarding the Propensity to implement the EFQM Model) assessing on whether or not Portuguese organisations analyse, evaluate, and use the opportunities brought by innovation and new technologies. Observing the univariate analysis in APPENDIX I, it is possible to observe than 88.6% of organisations "Strongly Agree" with this practice. Both the EFQM and the Shingo Model key and differentiating practices, translated into questions in the survey from PE to PS, respectively report to be in accordance with organisations needs and strategies, due to the high mean values observed. The third and fourth

questions on the Propensity to implement the EFQM model show the lowest mean values within the Propensity construct with 3.15 and 3.43, respectively. Variable PE3 concerns the importance of benchmarking results with other organisations to grow and improve, and PE4 concerns the monitoring and assessment of the contribution of organisations in society. Key important aspects concerning the EFQM Model. The low mean value for these variables is due to dispersion of results, as the majority of respondents answered 1 or 5, indicating whereas some organisations are positively oriented towards the latest indications of the EFQM model, many still do not show Propensity regarding these specific points.

Before continuing with the analysis, it is crucial to carefully observe the values of the mean obtained for each type of culture. Assessing the type of culture is crucial in the model conceptualised as they are precedent constructs. Figure 29 presents a Radar Chart in order to compare the mean values obtained for each of the constructs with the variables theoretically proposed to be part of that construct.

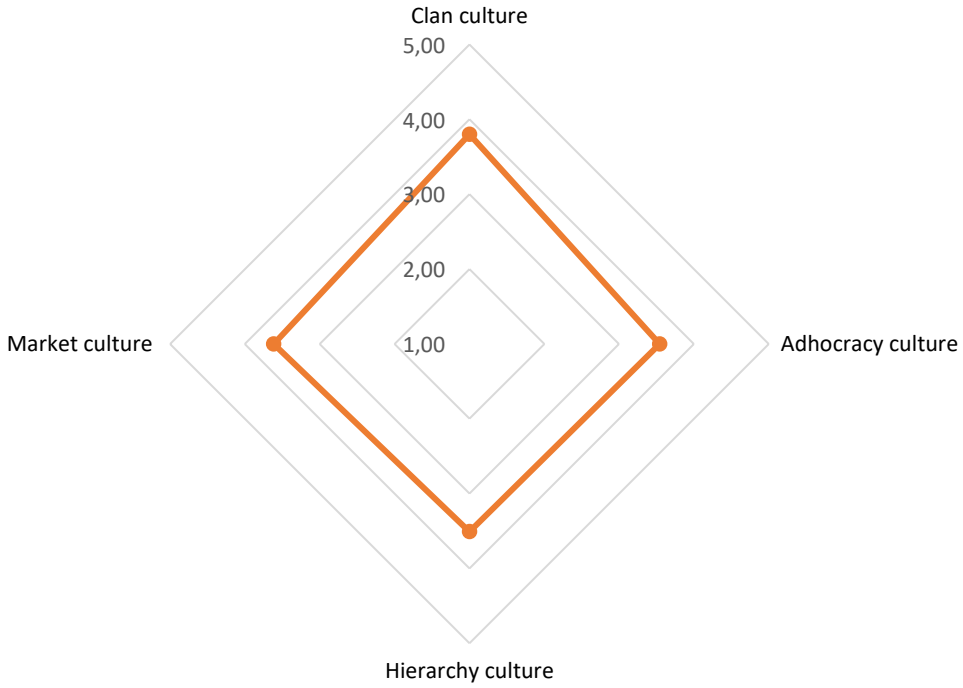


Figure 29 – Radar chart – characterisation of the organisational culture of the sample in study

As it can be verified, responses are practically homogenous within the 16 questions proposed, except for item CC4 and HC1. Thus, respondents report that Portuguese organisations value the human resources and high cohesion, and morale is of significant importance, having less tendency for the organisation to be a very controlled and structured place, where formal procedures generally govern what people do.

The unexpected similarity between responses indicating that Portuguese organisations to have a Propensity for a specific type of culture, but rather a homogeneity with the Portuguese territory, even though the culture indicates to slightly be of clan type, as it is observed by the Radar Chart presented in Figure 29 above.

6.5. Examination of Data

When conducting a survey, there is a high likelihood that missing data, nonnormal data, and data with outliers is presented (Yuan et al., 2002). Consequently, in this subchapter, missing data, outliers, and data normality will be assessed as they constitute assumptions that must be met to conduct a proper structural equations analysis (Hair et al., 2018; Marôco, 2010).

6.5.1. Missing Data

The items of the last construct in the survey aimed to assess the environmental, social, and operational performance of organisations. As this survey was sent to many sectors of activities, from questions EOSP1 to EOSP12 there was an additional option "Not applicable", as some of the items might not have been applicable to every organisation, as it follows in the example: "*Your organisation, last year reduced and/or avoided the emission of air pollutants and/or liquid pollutants*". This problem did not happen in any other constructs as all of those items were compulsory. Bosma & Van Witteloostuijn (2021) report that the majority of the studies deals with missing data by listwise deletion, however, it is estimated that in these cases the loss of information is about a third of the information collected. To circumvent this issue research was considered to find an adequate imputation method.

The missing values, in this specific case, correspond, according to Hair et al. (2018) to censored data, i.e., a type of data that was not completed because respondents were not able to supply the required information. The same authors argue that when the percentage of missing data is less than 10% for an individual observation that data can be generally ignored. Even though, in this investigation there are six variables in which the percentage of missing values is less than 10%, four of them show percentages higher than 10%, as it can be observed in Table 11. Thus, the missing data in all variables was imputed by linear regression. This method can be used when there are moderate to high levels of missing data and the relationships are sufficient to predict not impacting the overall results, as new values are calculated based on the existing observations, however it is important to mention that like all of the methods this one also has some disadvantages as it reinforces the relationships already existing, reduces generalizability, understates variance and replacement values can be out of range (Hair et al., 2018). To eliminate the last disadvantage an additional constraint of providing values only between 1 and 5 was added.

The following table (Table 12) shows the statistics of each variable, before and after missing values imputation.

Table 12 – Descriptive statistics before and after the missing values imputation

	Variable	EOSP1	EOSP2	EOSP3	EOSP4	EOSP5	EOSP6	EOSP7	EOSP8	EOSP9	EOSP10
Before missing values imputation	N Valid	551	640	636	634	699	685	700	686	702	685
	N Omitted	180	91	95	97	32	46	31	45	29	46
	Mean	**3.68**	**3.81**	**3.62**	**3.77**	**3.41**	**3.64**	**3.70**	**4.20**	**4.01**	**3.99**
	Standard Deviation	**1.192**	**1.151**	**1.144**	**1.115**	**1.197**	**1.091**	**1.092**	**.957**	**1.014**	**1.041**
	Minimum	1	1	1	1	1	1	1	1	1	1
	Maximum	5	5	5	5	5	5	5	5	5	5

	Variable	EOSP1	EOSP2	EOSP3	EOSP4	EOSP5	EOSP6	EOSP7	EOSP8	EOSP9	EOSP10
After missing values imputation	N Valid	731	731	731	731	731	731	731	731	731	731
	N Omitted	0	0	0	0	0	0	0	0	0	0
	Mean	**3.71**	**3.8**	**3.62**	**3.76**	**3.42**	**3.65**	**3.70**	**4.18**	**4.01**	**3.99**
	Standard Deviation	**1.122**	**1.118**	**1.109**	**1.084**	**1.187**	**1.08**	**1.084**	**.945**	**1.002**	**1.025**
	Minimum	1	1	1	1	1	1	1	1	1	1
	Maximum	5	5	5	5	5	5	5	5	5	5

Note: N-Total number of observations; EOSP-Environmental, Operational and Social Performance.

As it can be observed in Table 12, the mean of each variable did not change significantly and the standard deviation only decreased slightly, thus it can be concluded that the values after the imputation represent the original population and that further analysis can proceed.

6.5.2. Outliers

One of the assumptions that also needs to be checked is the existence of outliers, as they can compromise the statistical study (Kwak & Kim, 2017) and result in inaccurate confirmation or denial of hypotheses (Aguinis et al., 2013). Outliers consist of observations that are far away from the tendency of all the other observations in the sample (Ghosh & Vogt, 2012). Consequently, outliers or poor leverage observations have a significant impact on all fit indices following normal-distribution-based maximum likelihood (Yuan & Xiaoling Zhong, 2013) and can make a sample become nonnormal, even though the opposite is not unequivocally true (Yuan et al., 2002). The same author reports that there are two ways of dealing with outliers – they can be identified and then after a subjective decision eliminated or kept; or a more robust approach can be used. To identify outliers a common method is to assess the Mahalanobis Distance (Leys et al., 2018). Using the AMOS extension of the SPSS Statistics software it was possible to diagnose multivariate outliers, as both p1 and p2 values were very reduced (Marôco, 2010).

In this study it was decided to only eliminate the observation which produced the highest Mahalanobis d-squared distance. Hence, from this point on, the sample under study comprises 730 organisations. The observation was eliminated as its value was substantially different and distant from the others and as reported by Marôco (2010), eliminating a series of multivariate outliers will cause different new outliers, that previously were not reported to appear. Moreover, it can affect substantially the sample as a huge amount of data is being wasted. Also, this study encompasses responses of organisations from vastly different sizes and sectors, thus dissimilitude between responses under the same variables is somehow understandable. The elimination of this observation did not have an impact on the main statistics considered.

6.5.3. Normality Assessment

The multivariate normality (MVN) assumption is the foundation for the correlational statistics used in Factor Analysis and for various techniques, such as the $\chi 2$ goodness of fit used in Maximum Likelihood (ML) analysis. To test this assumption, it is important to verify in first instance the univariate normality (UVN). Violations of UVN increase the probability of MVN being violated. However, it is possible for MVN to be violated even when no individual variables are non-normal (Gie Yong & Pearce, 2013).

Shapiro-Wilk test is the most powerful test typically used to assess normality (Mohd Razali & Bee Wah, 2011; Rani Das, 2016). Shapiro-Wilk test showed a significant departure of all variables from normality, as significance level is always <.005, rejecting the null hypotheses that a variable is normally distributed in some population. The Kolmogorov-Smirnov test – another test used to assess normality, was also conducted, even though when the sample is higher preference should be given to Shapiro-Wilk test (Marôco, 2018). The Kolmogorov-Smirnov test also indicates that the data is not normally distributed, as p <.005. Please refer to APPENDIX II to further analysis of the normality tests conducted. Due to the high incidence of non-normality and their implications for statistical inferences, it is essential to report statistics on skewness or kurtosis in order to comprehend the violation of normal data (Cain et al., 2017). Also, adjustment tests are very sensitive to small deviations from normality when dealing with large samples and may lead to the error of concluding that the variable does not show a normal distribution, when the opposite is true, so skewness (*sk*) and kurtosis (*ku*) should always be checked (Marôco, 2010).

The adjustment method used in structural equation modelling is maximum likelihood (ML), and as (Marôco, 2010) states, this method is sufficiently robust to the violation of the normality assumption if the kurtosis and skewness of the manifest variables are not too significant. The same author reports that ML method is appropriate when *sk*<|3| and *ku*<|7|. All the manifest variables in the model verify these assumptions. Please refer to APPENDIX III to visualise the table regarding the skewness and kurtosis values. With regard to multivariate kurtosis, Marôco (2010) states that values greater than 10 indicate a serious violation of the normality assumption, which may lead to the ML method being unsuitable for estimating the model. This model presents a multivariate kurtosis of 985.446. Non-normality tends to influence the chi-square test, CFI and RMSEA (Marôco, 2010), however there are many indices that have been proposed over the years to assess the quality of the model, alternatively to reporting chi-square (McDonald & Ho, 2002).

6.6. Reliability and one-dimensionality of constructs

The adequate use of Factor Analysis requires the researcher to make a considered judgement regarding a series of analytical decisions (Henson & Roberts, 2006), even though it is important to understand that the degrees of freedom of the researcher may lead to false positive results, by having an impact on the statistical tests (Simmons et al., 2011).

There are a number of statistical and methodological decisions and verifications that need to be made when assessing the reliability and one-dimensionality of constructs. It is common to assess the KMO (Kaiser-Meier-Olkin) test and the Bartlett test of sphericity to understand if there are abundantly strong relationships in the data to perform the analysis (Howard, 2016).

The KMO test for sampling should be greater than .5 and tests adequacy at whether the relationships between the variables in a correlation matrix can be explained by a smaller number of factors, whether the Bartlett test of sphericity confirms the null hypotheses that there are no correlations between any of the variables. In the case of both of these tests are successful, there is an assurance of the suitability of data for factor analysis (Ferguson & Cox, 1993). Hence, in what concerns the KMO test, values under .5 are unacceptable, between .5 and .6 are considered miserable, from .6 to .7, middling, from .7 to .8, meritorious and values above .9 are considered marvellous (Howard, 2016). Bartlett's test of sphericity assesses the extent to which the covariance matrix is similar to an identity matrix, where significance levels of p <0.05 indicate that the matrix

is favourable, rejecting the null hypotheses that the data in the matrix is similar to an identity matrix (Damásio, 2012).

Cronbach's alpha is one of the most commonly used reliability statistics. It measures the internal consistency or average correlation of items within a survey to measure its internal reliability (Jebb et al., 2021). Tavakol & Dennick (2011) report that the Cronbach's alpha must range between .7 and .95, as low values indicate poor correlation between items and too high correlations may indicate that some items are redundant.

The table below (Table 13) shows the results of the KMO test, Bartlett test of sphericity, and Cronbach's alpha applied to constructs in study, conducted on SPSS Statistics.

Table 13 – Results of the KMO test, Bartlett test of sphericity, and Cronbach's alpha

Construct	KMO	Bartlett test of sphericity	Cronbach's alpha
Clan Culture	.772	<.001	.779
Adhocracy Culture	.767	<.001	.809
Hierarchic Culture	.697	<.001	.713
Market Culture	.783	<.001	.789
Strategic Alignment	.737	.000	.907
Stakeholders Management	.753	.000	.934
Culture	.731	<.001	.871
Internal Processes	.734	<.001	.865
Use of Technology	.829	.000	.920
Propensity to implement the EFQM Model	.848	.000	.806
Propensity to implement the Shingo Model	.731	<.001	.672
Environmental, Operational and Social Performance	.906	.000	.935

By observing Table 13, it can be confirmed that there is reliability, and that factor analysis can be applied, since the results obtained are favourable. With regard to the KMO test, all the variables have values above .7, except for Hierarchical Culture, even though this value is very tangential to .7, thus it can be considered that there is correlation between the variables. In the Bartlett's Test of Sphericity, the significance was less than .05 for all the results obtained, meaning that there is correlation between the variables. The Cronbach's Alpha for all the variables was higher than .7, except for the Propensity to implement the Shingo Model, but this value is categorically close to .7, revealing a good internal consistency of the items and ensuring the reliability of the measurement instruments.

The factors of each construct were extracted after applying a factor analysis to each set of manifest variables that constitute a construct. The principal component analysis (PCA) was used to extract the factors, i.e., the number of components as a function eigenvalue > 1 (Hayton et al., 2004), using varimax rotation, making it easier to interpret the factors, since the variables analysed often have high factor loadings in more than one factor (Marôco, 2018).

The number of factors to maintain is essential to determine. Hayton et al. (2004) affirms that this choice can be considered more important than the choice of factor analytic method or type of

rotation, as it balances parsimony by differentiating the underlying correlations into varied factors and because choosing too many or little factors affect the results substantially. According to Marôco (2018) a minimum number of factors must be maintained in order to explain at least 50 per cent of the total variance of the original variables, although this is always a subjective value.

The corrected item-total correlation indicates the degree to which the individual item relates to the total score if the item is deleted. Correlations must range between and .4, thus the item should be considered for deletion if correlations are below .15 and if they are above .3 are considered 'good' (Wagner et al., 2005).

As it can be analysed from Table 14, the corrected item-total correlation column shows that items HC1 and PS2 report values under .4. In this analysis, it was always extracted just one factor, except for Environmental, Operational and Social Performance. Here, the first factor concerns the four items related to environmental issues and the second factor the subsequent items related to the operational and social performance. The total explained variance is above 50% to all variables, except on the Propensity to implement each of the models, even though the percentage is near the desired 50%. Given the satisfactory results of PCA, it was decided not to eliminate any item at this point and proceed to the confirmatory factor analysis.

Table 14 – Principal Component Analysis

Construct	Item	Corrected Item-Total Correlation	Number of extracted factors	Factor loading 1	Factor loading 2	Eigen-values	Total explained variance (%)	Cumulative explained variance (%)
Clan Culture	CC1	.418	1	.615		2.452	61.308	61.308
	CC2	.616		.812				
	CC3	.671		.844				
	CC4	.655		.838				
Adhocracy Culture	AC1	.619	1	.793		2.552	63.798	63.798
	AC2	.516		.708				
	AC3	.672		.834				
	AC4	.704		.852				
Hierarchy Culture	HC1	.379	1	.597		2.182	54.543	54.543
	HC2	.555		.789				
	HC3	.577		.792				
	HC4	.508		.758				
Market Culture	MC1	.549	1	.745		2.463	61.574	61.574
	MC2	.534		.732				
	MC3	.671		.838				
	MC4	.641		.818				
Strategic Alignment	SA1	.810	1	.917		2.529	84.305	84.305
	SA2	.858		.940				
	SA3	.775		.897				
Stakeholders' Management	SM1	.850	1	.933		2.650	88.343	88.343
	SM2	.896		.956				
	SM3	.845		.931				

Construct	Item	Corrected Item-Total Correlation	Number of extracted factors	Factor loading 1	Factor loading 2	Eigen-values	Total explained variance (%)	Cumulative explained variance (%)
Culture	C1	.770	1	.901		2.385	79.489	79.489
	C2	.778		.906				
	C3	.710		.867				
Internal Processes	IP1	.715	1	.871		2.370	78.999	78.999
	IP2	.760		.897				
	IP3	.766		.899				
Use of Technology	T1	.786	1	.878		3.233	80.830	80.830
	T2	.810		.894				
	T3	.835		.911				
	T4	.836		.912				
Propensity to implement the EFQM Model	PE1	.581	1	.727		3.458	49.396	49.396
	PE2	.615		.750				
	PE3	.413		.517				
	PE4	.500		.610				
	PE5	.626		.769				
	PE6	.603		.764				
	PE7	.588		.743				
Propensity to implement the Shingo Model	PS1	.429	1	.647		2.255	45.110	45.110
	PS2	.284		.467				
	PS3	.480		.729				
	PS4	.516		.759				
	PS5	.479		.715				
Environmental, Operational and Social Performance	EOSP1	.733	2	.863		3.892	38.921	38.921
	EOSP2	.788		.871				
	EOSP3	.752		.830				
	EOSP4	.825		.825				
	EOSP5	.667			.533	3.575	35.749	74.670
	EOSP6	.790			.640			
	EOSP7	.762			.638			
	EOSP8	.700			.741			
	EOSP9	.711			.887			
	EOSP10	.682			.872			

7. STRUCTURAL EQUATION MODELLING

It was selected the Structural Equation Modelling (SEM) as the multivariate analysis technique to test the hypotheses formulated. Structural modelling was developed and disseminated due to need of researchers to "understand the structure and interactions of latent phenomena" (Tarka, 2018) and allows to examine the direct and indirect impacts on pre-conceived causal relationships (Fan et al., 2016). Typically, there are two parts that comprise SEM: the measurement model (i.e., confirmatory factor analysis (CFA)) and the structural model. The measurement model defines the relationship between the constructs and the observed variables, while the structural model defines specific relationships between the constructs (Schreiber, 2008).

This chapter presents the results and the options taken during the assessment of the measurement model and the structural model, using the AMOS extension of the SPSS software, culminating in the evaluation of the research hypotheses.

7.1. Measurement Model

At this point it is important to distinguish that there are two types of factor analysis: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is conducted when it is necessary to select the underlying latent constructs, whereas the CFA is conducted when the manifest variables for each construct are already specified according to prior knowledge (Fan et al., 2016), which corresponds to the present case. According to Hair et al. (2018) there are some steps that must be taken into consideration when testing measurement theory validation with CFA: i) Defining individual constructs; ii) Developing the overall Measurement Model; iii) Designing a Study to Produce empirical Results and iv) Assessing Measurement Model Validity.

The number of constructs presented in the model was established *a priori* under theoretical assumptions previously reported in this dissertation and derived from the evaluation of the psychometric properties, where constructs' reliability (through the analysis of Cronbach's alpha and corrected item-total correlation) and validity (through the analysis of variance explained) were tested, in order to assess their unidimensionality and validity.

To proceed with the confirmatory factor analysis, to verify if the variables properly reflect the constructs before assessing the structural model (Jackson et al., 2009), the model was constructed and specified.

In order for the estimation to occur some options were taken – the constructs were standardized by setting its variance at 1 and by setting the residual variances of variables at 1, as suggested by Marôco (2010) and Hair et al. (2018). In this measurement model it is also ensured that there are at least 3 manifest variables for each construct, the minimum required by Hair et al. (2018). Also, it is important to highlight that this model is overidentified, which means that there are more unique covariance and variance terms than parameters to be estimated.

The following figure (Figure 30) shows the original measurement model created in AMOS Software. The measurement model is constituted by 13 constructs and 54 manifest variables.

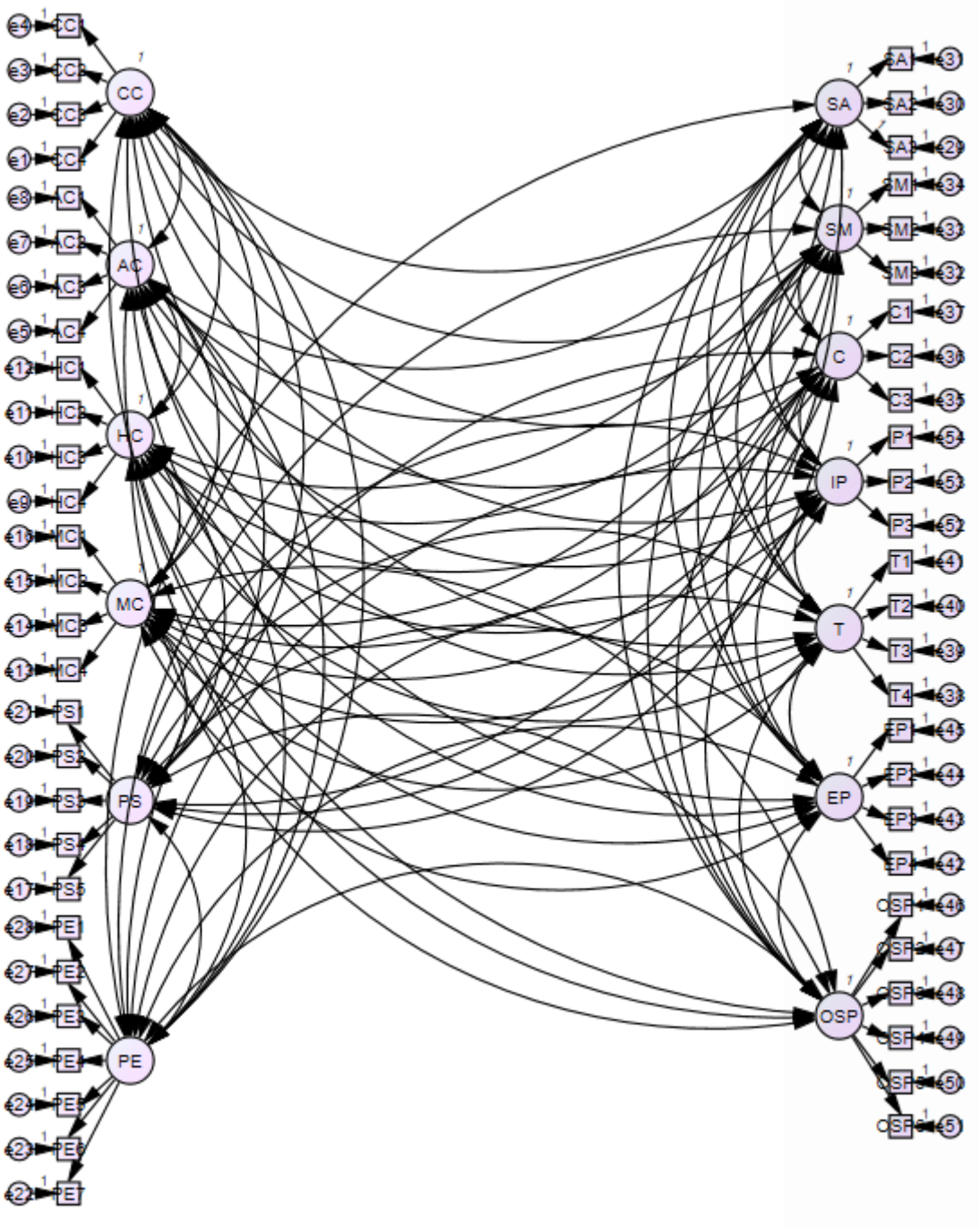


Figure 30 – Original measurement model

To assess the global measurement model validity some statistics and indices must be carefully checked. A fit index is a global assessment of the fitness of the data collected to the model proposed. There are no specific rules on what fit indices should be reported to assess the adjustment quality of the model, also the cutoff values for some of the indices have changed over the time (Jackson et al., 2009). Some authors affirm that usually only CFI, TLI and RMSEA are reported (Jackson et al., 2009; Schreiber, 2008; Xia & Yang, 2019). In this investigation, it was decided to report the indices and statistics reported by Marôco (2010), i.e., χ^2/df, CFI, GFI, TLI, PGFI, PCFI and RMSEA. The reference values for each of the fit indices according to the author are detailed in Table 15.

Table 15 – Indices and statistics on the quality of adjustment and their reference values

Index grouping	Indices/Statistics	Abbreviation	Reference Values
Absolute fit indices	Chi-square	χ^2	The lower, the better
	Chi-square per degrees of freedom	χ^2 / df	> 5 – poor adjustment]2; 5] – sufferable adjustment]1; 2] – good adjustment ~1 – very good adjustment
Comparative fit indices	Comparative fit Index	CFI	< 0.8 – poor adjustment [0.8; 0.9[– sufferable adjustment [0.9; 0.95[– good adjustment ≥ 0.95 – very good adjustment
	Goodness of Fit Index	GFI	
	Tucker-Lewis Index	TLI	
Parsimonious fit indices	Parsimony-adjusted GFI	PGFI	< 0.6 – poor adjustment [0.6; 0.8[– good adjustment ≥ 0.8 – very good adjustment
	Parsimony-adjusted CFI	PCFI	
Population discrepancy indices	Root Mean Square Error of Approximation	RMSEA	> 0.10 – unacceptable adjustment]0.05; 0.10] – good adjustment ≤ 0.05 – very good adjustment

Note: adapted from Marôco (2010)

The χ^2 test tests the hypothesis that there is a discrepancy covariance matrix estimated by the model and the original covariance matrix, in which the χ^2 test is ideal if p > .05 (Fan et al., 2016). However, some criticism lays on this statistic. Chi-square statistic presents some problems due to its sensitivity to violations of normality (Jackson et al., 2009) and when the sample size is large, as little discrepancies between the expected and verified correlations produce a significant χ^2 in these cases (Brown, 2015; Chen, 2007; Cole, 1987).

CFI indicates the amount of variation that has been considered in the covariance matrix, thus the higher the value, the better the model fit, being also important to highlight that this statistic is less sensitive to sample size than the χ^2 test (Chen, 2007; Fan et al., 2016). On the other hand, GFI and NFI (Normed fit index) are highly affected by the sample size (Fan et al., 2016). GFI consists of the measure of the relative number of variances and covariances accounted in conjunction by the model (Marsh et al., 1988). TLI statistics aims to partly exceed the disadvantages of NFI, being independent of sample size (Fan et al., 2016), even though, some authors claim TLI is also affected by sample size, but mainly due to outliers when the sample is small (Marsh et al., 1988).

The parsimony indices PCFI and PGFI are obtained by correcting the relative indices with a penalisation factor due to the complexity of the model (Marôco, 2010). The indices combine information about goodness of fit with information about parsimony into a single index which aims to compensate the artifactually increase in fit resulting in including more parameters (Marôco, 2010; Mulaik et al., 1989). Consequently, these indices are important as they provide more information compared to those which only consider the goodness of fit, being an additional help to decide whether the model can be accept or rejected.

RMSEA is measure of discrepancy between the observed covariance matrix and model-implied covariance matrix per degree of freedom (Chen, 2007), where 0 indicates the perfect fit and higher values indicate the lack of fit, helping to detect model misspecification, as it is less sensitive to sample size than the χ^2 test (Fan et al., 2016).

Table 16 presents the global quality of adjustment of the original measurement model based on the indices/statistics previously mentioned and under the precedent indicated reference values.

Table 16 – Global quality of adjustment of the original measurement model

Indices/Statistics	Measurement model values	Quality of the model
χ^2; p-value	6005.112; .000	
χ^2 /df	4.619	Sufferable
CFI	.861	Sufferable
GFI	.704	Bad
TLI	.847	Sufferable
PGFI	.617	Good
PCFI	.782	Good
RMSEA	.070	Good

The χ^2 statistic shows a value of 6005.112 and a p-value of .000, which suggests the rejection of the hypothesis that the model fits the population perfectly. A significant χ^2 suggests that a significant amount of actual covariance between measures is still unexplained by the model. However, as previously mentioned this statistic suffers from a number of issues, including its sensitivity to non-normality and to large sample size. Thus, the global quality of adjustment of the measurement model must be assessed concerning the other statistics, whose values of CFI = .861, GFI = .704, and TLI = .847 show a sufferable adjustment of the model, which invokes the later need to re-specify the original measurement model.

To assess the local measurement model adjustment, the reliability of the constructs and manifest variables was checked. In construct validity it is analysed whether or not the items properly reflect its the latent construct, in order words the items that constitute a construct must converge/share a high proportion of variance in common – convergent validity. As a consequence, all factor loadings should be statistically significant - standardized loading estimates should be at least .5 (preferably higher than .7), whose its square (R^2) represents the variation in an item explained by the construct (Hair et al., 2018). According to Marôco (2010) when R^2 is above or equal to .25, it is an indicator of appropriate individual reliability.

The Average Variance Extracted (AVE) is calculated as the mean variance extracted for the items that constitute a construct. AVE must be calculated for each construct and values under .5 indicates that on average there is more error in the items than variance in common with their latent factor (Farrell & Rudd, 2009; Hair et al., 2018).

In order to assess convergent validity it is also important to verify the Construct Reliability (CR), which can be calculated by the squared sum of factor loadings and the sum of the error variance terms for each of the constructs, whose values above or equal to .7 suggest internal consistency, meaning that all items truly represent the same construct (Hair et al., 2018). Also, as previously reported Cronbach's alpha is also a measure of internal consistency, as it measures the proportion of variability that is shared among factors, ranging from 0 to 1 (Hajjar, 2018).

The Table 17 presents the values of Standardized Regression Weights (SRW), R^2, Construct Reliability (CR), and Average Variance Extracted (AVE) in order to assess convergent validity.

Table 17 – Reliability of manifest variables and constructs - original measurement model

Variables			SRW	R^2	CR	AVE	Cronbach's alpha
CC1	<---	CC	.438	.192	.804	.517	.779
CC2	<---	CC	.787	.619			
CC3	<---	CC	.756	.572			
CC4	<---	CC	.829	.687			
AC1	<---	AC	.400	.160	.705	.409	.809
AC2	<---	AC	.995	.990			
AC3	<---	AC	.426	.181			
AC4	<---	AC	.553	.306			
HC1	<---	HC	.323	.104	.692	.400	.713
HC2	<---	HC	.996	.992			
HC3	<---	HC	.458	.210			
HC4	<---	HC	.543	.295			
MC1	<---	MC	.382	.146	.705	.409	.789
MC2	<---	MC	.997	.994			
MC3	<---	MC	.516	.266			
MC4	<---	MC	.480	.230			
PS1	<---	PS	.522	.272	.694	.325	.672
PS2	<---	PS	.305	.093			
PS3	<---	PS	.595	.354			
PS4	<---	PS	.698	.487			
PS5	<---	PS	.648	.420			
PE1	<---	PE	.680	.462	.826	.412	.806
PE2	<---	PE	.670	.449			
PE3	<---	PE	.411	.169			
PE4	<---	PE	.500	.250			
PE5	<---	PE	.705	.497			
PE6	<---	PE	.731	.534			
PE7	<---	PE	.725	.526			
SA1	<---	SA	.886	.785	.927	.809	.907
SA2	<---	SA	.931	.867			
SA3	<---	SA	.881	.776			
SM1	<---	SM	.910	.828	.942	.843	.934
SM2	<---	SM	.948	.899			
SM3	<---	SM	.897	.805			
C1	<---	C	.895	.801	.886	.722	.871
C2	<---	C	.871	.759			
C3	<---	C	.778	.605			
IP1	<---	IP	.815	.664	.881	.712	.865
IP2	<---	IP	.844	.712			
IP3	<---	IP	.872	.760			
T1	<---	T	.849	.721	.929	.767	.920
T2	<---	T	.855	.731			
T3	<---	T	.889	.790			
T4	<---	T	.908	.824			

Variables			SRW	R^2	CR	AVE	Cronbach's alpha
EP1	<---	EP	.875	.766	.935	.781	.931
EP2	<---	EP	.915	.837			
EP3	<---	EP	.845	.714			
EP4	<---	EP	.899	.808			
OSP1	<---	OSP	.720	.518	.912	.633	.903
OSP2	<---	OSP	.846	.716			
OSP3	<---	OSP	.832	.692			
OSP4	<---	OSP	.761	.579			
OSP5	<---	OSP	.822	.676			
OSP6	<---	OSP	.786	.618			

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement Shingo Model; PE-Propensity to implement EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

As it can be observed in Table 17, five manifest variables have standardized regression weights of less than .5, being the most critical HC1, MC1 and PS2, i.e., the first question concerning the hierarchical and the market organisational culture, respectively, and the second question concerning to the Shingo model. In the previous analysis in Subchapter 6.6., items HC1 and PS2 already showed a low item-total correlation, and their exclusion would allow a higher % of variance to be explained, namely above the required 50% for the Propensity to implement Shingo Model. Cronbach's alpha shows values above .7 in all constructs or remarkably close to .7 (PS), suggesting good internal consistency.

The variables CC1, AC1, AC3, HC1, HC3, MC1, PS2 and PE3 show values of R^2 below 0.25. Consequently, the value for AVE is less than .5 for constructs on Adhocracy, Hierarchy and Market cultures and on the Propensity to implement the Shingo and EFQM Models. Construct Reliability (CR) is equal or above .7 to all of the constructs, indicating reliability of each construct.

In CFA it is also important to assess the discriminant validity, which aims to verify whether a construct accounts for more variability in observed variables related to it than a measurement error or similar external, unmeasured effects or constructs within the model (Farrell & Rudd, 2009), that is, results of discriminant validity must confirm that constructs are not highly intercorrelated. Discriminant validity can be assessed in AMOS software using heterotrait-monotrait ratio (HTMT) of correlations or Fornell & Larcker Criterion. In the conceptualisation of this dissertation both methods are used as some criticism lays on Fornell & Larcker Criterion, thus researchers have been concluding that HTMT is more sensitive and specific when detecting discriminant validity problems, when compared to the previous method (Hamid et al., 2017).

Table 18 and Table 19 show the final results of discriminant validity. The darker grey rectangles in the first table, which present the discriminant validity assessment of the original measurement model, according to the Fornell & Larcker Criterion, represent the square root of AVE, which must be greater than the correlation value between than construct with other constructs (Hamid et al., 2017). The lighter grey rectangles in Table 18 point out the values above the value of the square root of AVE, within the construct.

Table 18 – Discriminant Validity – original measurement model - Fornell & Larcker Criterion

	CC	AC	HC	MC	PS	PE	SA	SM	C	IP	T	EP	OSP
CC	**0.719**												
AC	0.694	**0.638**											
HC	0.686	1.002	**0.632**										
MC	0.688	1.008	1.006	**0.640**									
PS	0.092	0.041	0.035	0.034	**0.570**								
PE	0.071	0.013	0.004	0.006	0.824	**0.643**							
SA	0.780	0.647	0.649	0.649	0.087	0.055	**0.899**						
SM	0.612	0.512	0.510	0.511	0.073	0.031	0.791	**0.919**					
C	0.900	0.600	0.594	0.595	0.125	0.095	0.855	0.726	**0.850**				
IP	0.558	0.489	0.489	0.488	0.062	0.041	0.814	0.777	0.685	**0.844**			
T	0.674	0.563	0.564	0.563	0.048	0.029	0.809	0.676	0.787	0.796	**0.876**		
EP	0.461	0.319	0.318	0.319	0.070	0.082	0.490	0.398	0.493	0.444	0.465	**0.868**	
OSP	0.664	0.518	0.515	0.517	0.070	0.027	0.682	0.562	0.686	0.585	0.643	0.819	**0.776**

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement Shingo Model; PE-Propensity to implement EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

As can be observed in Table 18 some constructs show intercorrelation between other variables, as correlations for some constructs present a higher value than the square root of AVE. There is a correlation between Clan culture and the construct Culture, which assesses the organisational maturity. It is certain that the questions proposed on items C1 to C3 would fit in clan culture type, however, the purpose of the analysed constructs is categorically distinct. Constructs concerning the other types of culture show a perfect correlation, which indicates they represent the same. This contradictory and false conclusion is due to the fact of data containing homogenous answers within the questions regarding those 3 types of cultures, as previously explained (please refer to Figure 29 for a better understanding). According to this method, there is a multicollinearity between Adhocracy culture and Hierarchy and Market culture, and between these two last cultures, whose main reason for these issues remains the same as previously reported. Strategic Alignment also shows a slight correlation with AC, HC, and MC. There is also collinearity between the Propensity to implement both of the models (PE and PS).

Table 19 presents the results of discriminant validity, according to HTMT criterion. In HTMT criterion, values must be lower than .85 to confirm discriminant validity (Bernarto et al., 2020). The lighter grey rectangles point out the values above .85, indicating potential problems with discriminant validity.

Table 19 – Discriminant Validity – original measurement model - HTMT

	CC	AC	HC	MC	PS	PE	SA	SM	C	IP	T	EP	OSP
CC													
AC	0.721												
HC	0.715	1.062											
MC	0.713	1.062	1.067										
PS	0.093	0.043	0.036	0.035									
PE	0.072	0.014	0.004	0.006	0.833								
SA	0.787	0.666	0.671	0.667	0.087	0.055							
SM	0.617	0.528	0.527	0.577	0.074	0.031	0.791						
C	0.909	0.619	0.614	0.612	0.127	0.096	0.856	0.726					
IP	0.563	0.504	0.506	0.544	0.062	0.041	0.815	0.777	0.686				
T	0.680	0.580	0.584	0.579	0.048	0.029	0.299	0.677	0.389	0.797			
EP	0.455	0.323	0.322	0.322	0.070	0.080	0.191	0.398	0.244	0.447	0.460		
OSP	0.650	0.517	0.517	0.579	0.065	0.320	0.668	0.553	0.666	0.573	0.624	0.782	

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement Shingo Model; PE-Propensity to implement EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

As it can be observed, results from the two applied criteria are different. According to what can be seen in HTMT matrix, the correlation is noticed between AC with HC and MC, and between MC and HC. Also, it is verified between C and CC and between C and SA. In this case, PE and PS correlation is not verified.

Theoretically, multicollinearity refers to redundant information and, as authors claim, researchers must proceed with their elimination (Hair et al., 2018). However, it is important to assess the danger of altering the constructs and consequently the model and the purpose of the investigation, thus "conceptual considerations" must always prevail (Diamantopoulos et al., 2008).

In order to adjust the quality of the measurement model, it was decided to exclude some manifest variables, taking into account the results obtained from the previous analyses. Therefore, the first question concerning the identification of each type of culture was removed from the model. On the other hand, it was decided to remove the first question of each construct relating to the types of culture, since the four questions of each construct were designed with a very similar and homogeneous structure, ensuring this way that the variables remaining in the survey continue to ensure an identical and cohesive structure to the survey. The four variables removed have a very low factor weight, and the analysis indicates that after their exclusion the model will be better explained. It should be noted that the constructs relating to the identification of culture types have had some issues, which may, for example, have been due to a lack of understanding on the part of the respondent to the survey or to some ambiguity left at the time of translation, since this set of questions is widely used in the literature as a way of identifying the prevailing culture in a given organisation. Thus, items CC1, AC1, HC1 and MC1 were extracted. For the same reasons as above, it was also decided to exclude item PS2, i.e., the second question on identifying the Propensity for the Shingo model.

Analysing the values for the modification indices, it was found that there were manifest variables that showed a lower capacity to explain the context of the model. Modelling modifications based

on modification indices are often referred to as post hoc modifications, whose modifications should only be made when they are theoretically and practically feasible (Jackson et al., 2009). Hence, once having carefully assessing the theoretical feasibility of the modifications, the model was re-specified by correlating the errors of items as showed in Figure 31.

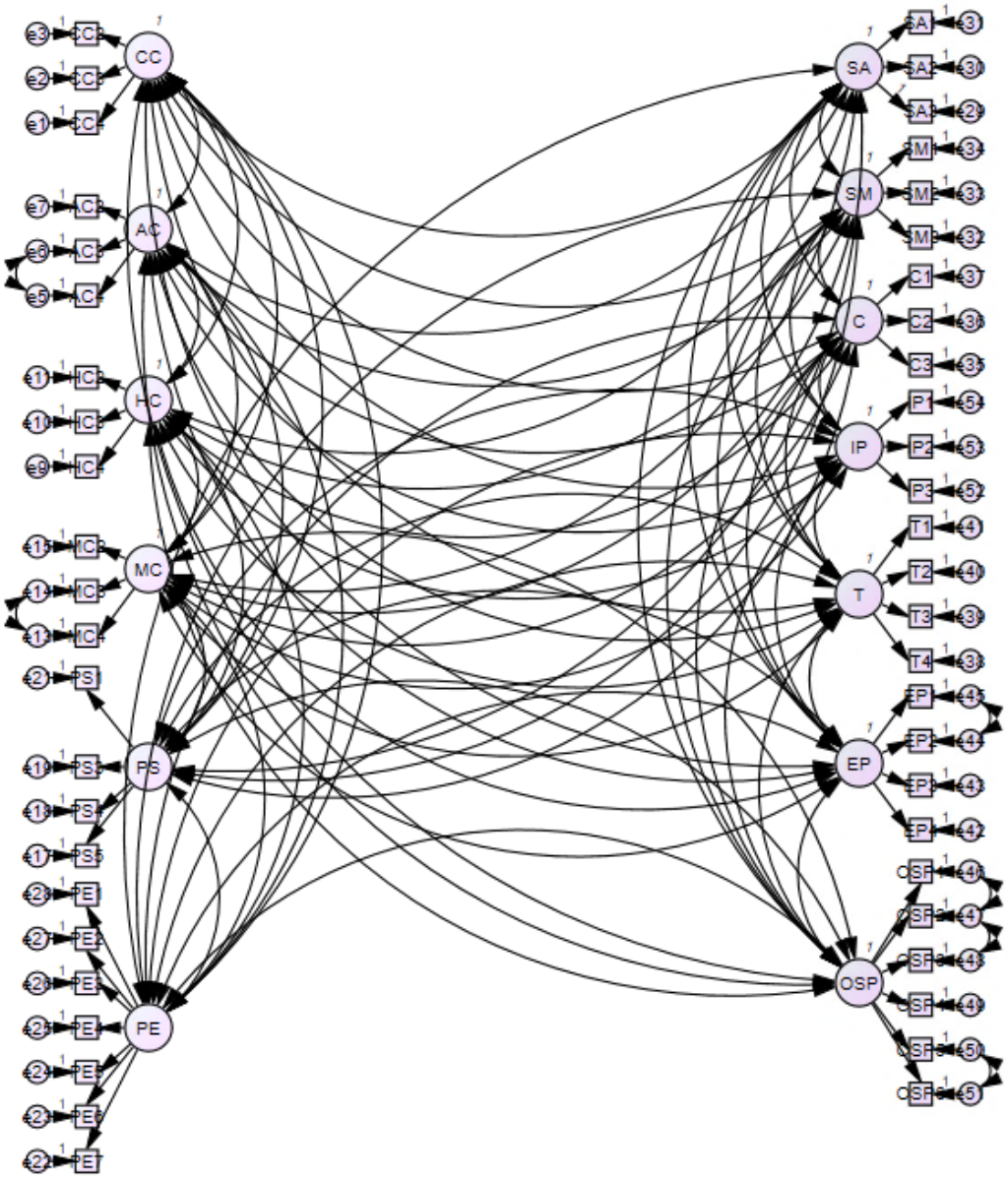


Figure 31 – Re-specified measurement model

The following table (Table 20) presents the global quality of adjustment of the re-specified measurement model.

Table 20 – Global quality of adjustment of the re-specified measurement model

Indices/Statistics	Measurement model values	Quality of the model
χ^2; **p-value**	3824.047; .000	
χ^2 */df*	3.664	Sufferable
CFI	.914	Good
GFI	.811	Sufferable
TLI	.903	Good
PGFI	.691	Good
PCFI	.812	Very Good
RMSEA	.060	Good

The χ^2 statistic shows a value of 3824.047 and a p-value of .000, which still suggests the rejection of the hypothesis that the model fits the population perfectly. However, as previously mentioned this statistic suffers from several issues, including its sensitivity to non-normality and to large sample size, which indicates that the global quality of adjustment of the measurement model must be assessed according to the values obtained from the other statistics. CFI value in the previous measurement model was sufferable, and in this re-specified model is good (.914), GFI value indicates a better adjustment, even though remains sufferable, TLI, PGFI, and RMSEA report a good adjustment of the model, and PCFI statistic indicates a very good adjustment of the model.

In what concerns the global adjustment, analysing the fit indices and statistics values (χ^2 */df* = 3.664; CFI = .914; GFI = .811; TLI = .903; PGFI = .691; PCFI = .812; RMSEA = .060) it can be concluded that the measurement model presents a good global adjustment.

In order to statistically confirm whether the re-specified model is better than the original model, the χ^2 difference test was applied. Since the test statistic of each of the nested models follows a χ^2 distribution, the difference in χ^2 values between the two models is also χ^2 distributed and the difference in degrees of freedom between the two models equals the number of degrees of freedom for the difference (Schermelleh-Engel et al., 2003):

$$\chi^2_{diff}(df_{diff}) = \chi^2_A(df_A) - \chi^2_B(df_B)$$

A represents the model that was restricted from B, i.e., has fewer parameters but more degrees of freedom. According to Marôco (2010), the hypotheses to be tested are the following:

$$H_0 : \chi^2_A = \chi^2_B$$

$$H_1 : \chi^2_A \neq \chi^2_B$$

H_0 represents the hypothesis in which the simplified model and the original model have the same quality of adjustment and in H_1 the quality of adjustment is different in the two models. Hence,

$\chi^2_{diff} = \chi^2_A - \chi^2_B = 6005.112 - 3824.047 = 2181.065$

$df_{diff} = df_A - df_B = 1300 - 1044 = 256$

As it can be verified in Figure 32, to $\alpha = 0.05$, $\chi^2_{0.95;(256)} = 234$.

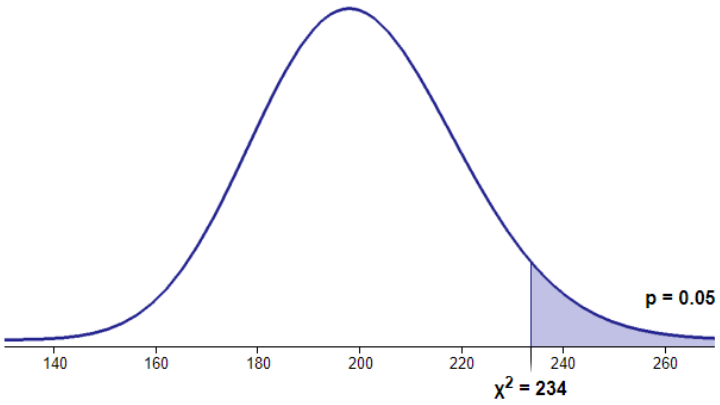


Figure 32 – Chi-square (χ^2) distribution - $\chi^2_{0.95;(256)}$

As $\chi^2_{diff} = 2181.065 > \chi^2_{0.95;(256)} = 234$ hypothesis H_0 is rejected, allowing to conclude that the simplified model fits the correlational structure observed between the items in the study sample better than the original model (Marôco, 2010).

In what concerns the re-specified measurement model, it was also assessed convergent and divergent reliability. Results of the Standardized Regression Weights (SRW), R^2, Construct Reliability (CR) and Average Variance Extracted (AVE) are shown in the following table (Table 21).

Table 21 – Reliability of manifest variables and constructs – re-specified measurement model

Variables			SRW	R^2	CR	AVE	Cronbach's alpha
CC2	<---	CC	.787	.619			
CC3	<---	CC	.746	.557	.829	.619	.814
CC4	<---	CC	.825	.681			
AC2	<---	AC	.991	.982			
AC3	<---	AC	.426	.181	.716	.489	.764
AC4	<---	AC	.550	.303			
HC2	<---	HC	.996	.992			
HC3	<---	HC	.458	.210	.726	.499	.728
HC4	<---	HC	.543	.295			
MC2	<---	MC	.995	.990			
MC3	<---	MC	.514	.264	.723	.495	.763
MC4	<---	MC	.480	.230			
PS1	<---	PS	.509	.259			
PS3	**<---**	PS	.596	.355	.710	.383	.698
PS4	<---	PS	.706	.498			
PS5	<---	PS	.646	.417			

Variables			SRW	R^2	CR	AVE	Cronbach's alpha
PE1	<---	PE	.682	.465			
PE2	<---	PE	.672	.452			
PE3	<---	PE	.407	.166			
PE4	<---	PE	.499	.249	.826	.412	.806
PE5	<---	PE	.705	.497			
PE6	<---	PE	.730	.533			
PE7	<---	PE	.725	.526			
SA1	<---	SA	.886	.785			
SA2	<---	SA	.930	.865	.927	.809	.907
SA3	<---	SA	.881	.776			
SM1	<---	SM	.910	.828			
SM2	<---	SM	.948	.899	.942	.843	.934
SM3	<---	SM	.897	.805			
C1	<---	C	.895	.801			
C2	<---	C	.871	.759	.886	.721	.871
C3	<---	C	.778	.605			
IP1	<---	IP	.816	.666			
IP2	<---	IP	.843	.711	.881	.712	.865
IP3	<---	IP	.872	.760			
T1	<---	T	.849	.721			
T2	<---	T	.855	.731			
T3	<---	T	.889	.790	.929	.767	.920
T4	<---	T	.909	.826			
EP1	<---	EP	.806	.650			
EP2	<---	EP	.857	.734			
EP3	<---	EP	.868	.753	.924	.754	.931
EP4	<---	EP	.938	.880			
OSP1	<---	OSP	.685	.469			
OSP2	<---	OSP	.819	.671			
OSP3	<---	OSP	.808	.653			
OSP4	<---	OSP	.774	.599	.901	.602	.903
OSP5	<---	OSP	.805	.648			
OSP6	<---	OSP	.758	.575			

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement Shingo Model; PE-Propensity to implement EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

All variables in the modified model present Construct Reliability and Cronbach's alpha above .7 (except PS, but still practically above), as recommended in the literature. AVE values in the constructs where manifest variables were extracted are now near the recommended value of .5, even though no significant difference between this and the original model was verified in what concerns convergent validity. However, despite some fragilities the adjusted model presents satisfactory values of reliability.

The re-specified measurement model was also assessed in what concerns the discriminant validity according to the Fornell & Larcker Criterion (Table 22) and according to the heterotrait-monotrait ratio (HTMT) (Table 23).

Table 22 – Discriminant Validity – re-specified measurement model - Fornell & Larcker Criterion

	CC	AC	HC	MC	PS	PE	SA	SM	C	IP	T	EP	OSP
CC	**0.787**												
AC	0.703	**0.699**											
HC	0.695	1.003	**0.706**										
MC	0.697	1.010	1.006	**0.703**									
PS	0.088	0.040	0.033	0.033	**0.618**								
PE	0.074	0.013	0.004	0.006	0.826	**0.642**							
SA	0.798	0.649	0.649	0.649	0.079	0.055	**0.899**						
SM	0.622	0.514	0.509	0.511	0.065	0.031	0.791	**0.918**					
C	0.911	0.602	0.594	0.595	0.118	0.095	0.856	0.726	**0.849**				
IP	0.580	0.490	0.488	0.488	0.055	0.041	0.814	0.777	0.685	**0.844**			
T	0.466	0.320	0.318	0.319	0.071	0.082	0.490	0.398	0.493	0.796	**0.876**		
EP	0.673	0.519	0.514	0.517	0.064	0.028	0.682	0.562	0.686	0.444	0.465	**0.868**	
OSP	0.580	0.490	0.488	0.488	0.055	0.041	0.814	0.777	0.685	0.586	0.643	0.819	**0.776**

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement the Shingo Model; PE-Propensity to implement the EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

Table 23 – Discriminant Validity – re-specified measurement model - HTMT

	CC	AC	HC	MC	PS	PE	SA	SM	C	IP	T	EP	OSP
CC													
AC	0.631												
HC	0.718	0.931											
MC	0.634	0.826	0.947										
PS	0.088	0.036	0.035	0.030									
PE	0.074	0.012	0.004	0.005	0.830								
SA	0.799	0.583	0.670	0.591	0.079	0.055							
SM	0.622	0.461	0.526	0.466	0.065	0.031	0.791						
C	0.912	0.541	0.614	0.543	0.119	0.096	0.856	0.726					
IP	0.580	0.440	0.505	0.445	0.054	0.041	0.815	0.777	0.686				
T	0.694	0.507	0.582	0.513	0.043	0.029	0.317	0.677	0.416	0.797			
EP	0.458	0.282	0.323	0.285	0.070	0.081	0.204	0.391	0.261	0.436	0.457		
OSP	0.655	0.454	0.517	0.458	0.062	0.332	0.664	0.547	0.668	0.570	0.626	0.783	

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; MC-Market Culture; PS-Propensity to implement the Shingo Model; PE-Propensity to implement the EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EP-Environmental Performance; OSP-Operational and Social Performance.

Constructs concerning the culture, keep showing high correlation between them, as previously justified, however, there is an improvement in the results obtained, especially according to the HTMT method. Given the theoretical justifications previously reported when analysing the discriminant validity of the original model, regarding the reasons not to just simply eliminate what show collinearity, this re-adjusted version comprises a generally good adjustment to proceed with the examination of the structural model.

7.2. Structural Model

As previously mentioned, the structural equation modelling is divided into two parts: the confirmatory factor analysis and the structural model. At this point, it is important to verify the structural model fitness and then analyse if the structural relationships are coherent with theoretical assumptions (Hair et al., 2018).

Figure 33 shows the structure model, i.e., the endogenous and exogenous variables and the hypotheses formulated between them. As it can be observed, between exogenous constructs CC, AC, HC, and MC there are covariance arrows, as it is frequently assumed that exogenous constructs are related unless contrary information (Hair et al., 2018).

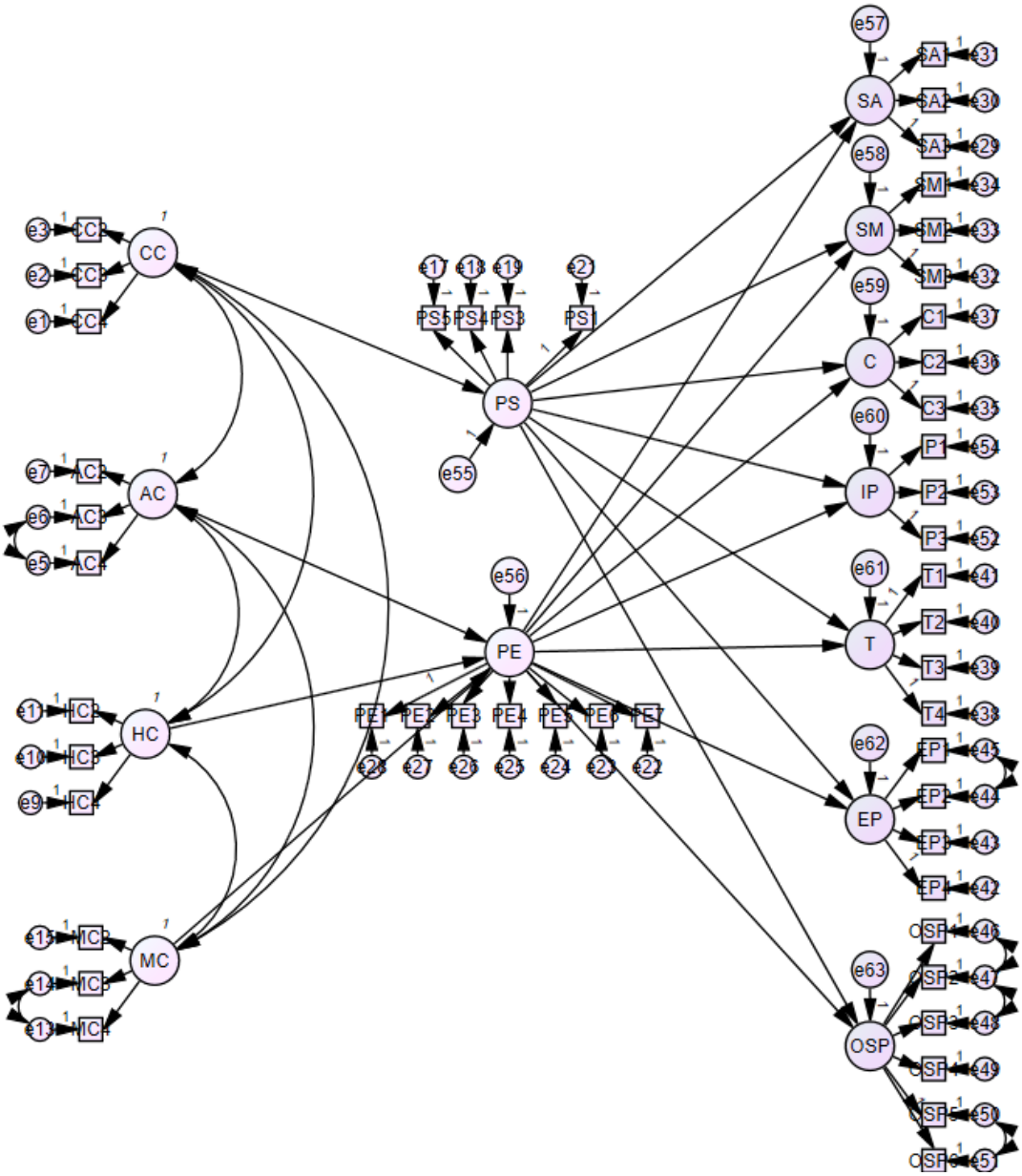


Figure 33 – Structural model

Table 24 presents the values obtained for the indices/statistics that assess the global quality of, in this case, the structural model.

Table 24 – Global quality of adjustment of the structural model

Indices/Statistics	Structural model values
χ^2; p-value	3824.047; .000
χ^2 /df	4.892
CFI	.868
GFI	.745
TLI	.858
PGFI	.668
PCFI	.811
RMSEA	.073

The χ^2 statistic presents a value of 3824.047 and a p-value of .000, which suggests the rejection of the hypotheses that the model fits the population perfectly. CFI and TLI values are sufferable, GFI value is bad, but PCFI, PGFI, and RMSEA report good adjustment of the model. Thus, in what concerns the global adjustment, analysing the fit indices and statistics values (χ^2 /df = 4.892; CFI = .868; GFI = .745; TLI = .858; PGFI = .668; PCFI = .811; RMSEA = .073) it can be concluded that the measurement model presents reasonable global adjustment.

The following table (Table 25) presents the Estimates, Standard Errors (S.E.), Critical Ratio (C.R.), Standardised Regression Weights (SRW), and p-value obtained for each of the hypothesis.

Table 25 – Regression weights

Hypotheses	Estimate (b)	S.E.	C.R. (t)	SRW	p-value
H1	.166	.036	4.591	.842	***
H2	-.638	.621	-1.027	-.822	.304
H3	-.065	.218	-.298	-.804	.765
H4	.702	.773	.908	.905	.364
H5	4.048	.876	4.620	.780	***
H6	-.085	.034	-2.532	-.077	.011
H7	3.853	.839	4.592	.780	***
H8	-.103	.042	-2.434	-.082	.015
H9	3.462	.755	4.585	.903	***
H10	-.021	.031	-.673	-.022	.501
H11	3.462	.755	4.585	.808	***
H12	-.099	.043	-2.275	-.080	.023
H13	3.936	.852	4.618	.838	***
H14	-.109	.039	-2.791	-.091	.005
H15	2.728	.611	4.461	.533	***
H16	.008	.050	.153	.006	.878
H17	2.980	.656	4.540	.726	***
H18	-.078	.038	-2.023	-.075	.043

Note: *** p < 0.001

According to Hair et al. (2018), SRW values must be above .5 and ideally above .7 in order for the hypothesis to be supported. Values below .5 must not be considered, even though, they are statistically significant, according to p-values results. Any of the hypotheses report to have SRW values above 1 or below -1, otherwise it could indicate problems in the model (Hair et al., 2018). Despite only observing the SRW and the p-value, Table 25 also presents the Critical Ratio values obtained for each hypothesis, which consist of the Estimate divided by the Standard Error. For the hypothesis to supported, this value must be equal to or higher than 1.96 (Byrne, 2010). Hence, Table 26 presents a summary on the support or non-support of each hypothesis according to the criteria presented.

Table 26 – Results of the hypotheses testing

	Hypotheses	Status
H1	**Clan culture → Propensity to implement the Shingo Model**	**Supported**
H2	Adhocracy culture → Propensity to implement the EFQM Model	Not supported
H3	Hierarchy culture → Propensity to implement the EFQM Model	Not supported
H4	Market culture → Propensity to implement the EFQM Model	Not supported
H5	**Propensity to implement the Shingo Model → Strategic Alignment**	**Supported**
H6	Propensity to implement the EFQM Model → Strategic Alignment	Not supported
H7	**Propensity to implement the Shingo Model → Stakeholders' Management**	**Supported**
H8	Propensity to implement the EFQM Model → Stakeholders' Management	Not supported
H9	**Propensity to implement the Shingo Model → Culture**	**Supported**
H10	Propensity to implement the EFQM Model → Culture	Not supported
H11	**Propensity to implement the Shingo Model → Internal Processes**	**Supported**
H12	Propensity to implement the EFQM Model → Internal Processes	Not supported
H13	**Propensity to implement the Shingo Model → Use of Technology**	**Supported**
H14	Propensity to implement the EFQM Model → Use of Technology	Not supported
H15	**Propensity to implement the Shingo Model → Environmental Performance**	**Supported**
H16	Propensity to implement the EFQM Model → Environmental Performance	Not supported
H17	**Propensity to implement the Shingo Model → Operational and Social Performance**	**Supported**
H18	Propensity to implement the EFQM Model → Operational and Social Performance	Not supported

8. DISCUSSION OF RESULTS

This chapter will discuss the results obtained through hypotheses testing and their interrelation with what was previously proposed in the hypotheses conceptualisation.

Results from the hypotheses testing reveal that Portuguese organisations have a tendency to adopt the Shingo Model. The research in this investigation was conducted through the application of a survey and the Propensity to implement a certain model was based on the examination of the differences of models in order for the researcher to be able to assess the Propensity by facing respondents with a set of questions concerning specific practices of each of the models separately. However, the EFQM and Shingo Models share a high percentage of common ideas, as emphasised in Chapter 3, despite being conceived under different constructs. Hence, the survey only contained key questions to assess each of the models in the study.

The results of the structural model allow for the confirmation or rejection of the hypotheses formulated based on grounded theory. The results indicate that all the hypotheses relating to the Shingo model are positive and significant (H1, H5, H7, H9, H11, H13, H15, and H17). On the other hand, the hypotheses relating to the EFQM model are mostly negative (H2, H3, H6, H8, H10, H12, H14, and H18), contradicting the theory exposed earlier in this dissertation, and they are also mostly non-significant. It should be noted that, although half of the EFQM hypotheses (H6, H8, H12, H14, and H18) are significant because their p-value is below 0.05, none of these hypotheses are corroborated because they have low SRW. With regard to the first hypothesis relating to the Shingo model (H1), it can be seen that it has a very low estimate value when compared to the other hypotheses supported regarding the Shingo model. However, the low Standard Error (S.E.) value indicates an accurate estimation since the precision with which the parameter was estimated is reflected in this value (Byrne, 2010) The Critical Ratio (C.R.), as previously reported, results from the division of the Estimate by the Standard Error (S.E.), and unstandardised estimates must have a C.R. equal to or greater than 1.96 to be statistically significant, in order to support the hypothesis in question, according to Byrne (2010). Since this second assumption was verified (C.R. = 4.591), and in conjunction with the value obtained for SRW (.842), as well as due to having $p<.001$, the support for this hypothesis was confirmed.

Developing the right culture is paramount to achieving sustainable results within the organisation and to attain competitive advantage (Suciu, 2017). Hence, organisational culture is a crucial aspect when it comes to excellence models. In the theoretical model previously conceived four types of organisational culture were analysed according to the items proposed by Cameron and Quinn (2006) based on its dominant characteristics, organisational leadership, strategic emphases, and management glue. As reported in Subchapter 6.4, the responses to the majority of items were practically homogenous, namely in what concerns the Adhocracy, Hierarchy, and Market cultures. Portuguese organisations reveal practically no distinction between these cultures, even though results show that the Clan culture is the most implemented in the sample in study, even though the difference is not too pronounced. Organisational culture consists of precedent constructs, used to predict other constructs, in this case the Propensity to implement the Shingo Model and the Propensity to implement the EFQM Model. The outcomes of these two last constructs are influenced by the results in the constructs regarding the organisational culture. From the four hypotheses relating to organisational culture, only the first hypothesis (H1: “Clan culture is

positively related to the implementation of the Shingo model") was supported (b = .166, t = 4.591, p<.001).

The support for hypothesis 1 confirms the theory that the clan culture type is indeed directly related to the intrinsic, representative, and distinctive concepts underpinning the Shingo model. According to Hofstede's cultural dimensions theory, Portugal is characterised as being a collectivist country, where commitment to group is long-term maintained, being considered part of an extended family and relationships between employers and employees are viewed morally, much like a familial connection (Hofstede Insights, 2023), being in accordance with the results obtained in the survey and the clan culture characteristics. Furthermore, Macedo et al. (2022) concluded that, in Portugal, authoritarian leadership is not the most adopted style of leadership and Costa & Bogdány (2013) also report that clan culture is the prevailing culture in Portugal.

The hypothesis regarding the EFQM Model were not sufficiently robust to be accepted. None of the hypothesis on culture were supported in having a positive influence on the Propensity to the implementation of the EFQM model, thus H2: Adhocracy culture is positively related to the implementation of the EFQM model (b = -.638, t = -1.027, p = .304), H3: Market culture is positively related to the implementation of the EFQM model (b = -.065, t = -.298, p = .765.) and H4: Hierarchy culture is positively related to the implementation of the EFQM model were rejected (b = -.702, t = .908, p = .364), contradicting the research conducted by Giménez Espín et al. (2022). One of the reasons to the non-support of hypothesis regarding the EFQM model may lay in the precedent constructs – Adhocracy, Hierarchy and Market culture. The homogeneity of responses may have occurred due to issues concerning the interpretation of items which aimed to assess the culture and may also lay on the fact of the proximity but not perfect Portuguese translation, as some English terms, such as "a smooth-running organisation" translated to Portuguese, can eventually suggest some doubts, even though the survey was previously tested before being sent to organisations.

In what concerns the Propensity to implement whether the Shingo or the EFQM models, as previously referred, only the hypotheses regarding the Shingo Model were verified, as none of the EFQM hypotheses was supported using this specific structural model in the population in study. Hence, respondents report to have the main purpose of improving the efficiency and effectiveness of internal processes, report to usually go to the workplace and keep a collaborative posture in which the leaders listen to difficulties and opinions of employees, allow for mutual learning, and permanently keep improving the process of improvement. Also, respondents affirmed that they usually analyse if the proper culture is spreading within the organisation and that they recognise and verify that their organisation consists of multiple systems that interconnect with each other's and which are dynamic – particular questions that comprised the construct regarding the Propensity to implement the Shingo model and that are in line with the results obtained for Portuguese organisations.

It was also assessed the positive influence of the Propensity to implement the Shingo/EFQM Models on organisational maturity, regarding the Strategic Alignment, Stakeholders' Management, Culture, Internal Processes and on the Use of Technologies. Hence, the hypotheses H5: The Propensity to implement the Shingo Model has a positive impact on Strategic Alignment (b = 4.048, t = 4.620, p = <0.001), H7: The Propensity to implement the Shingo Model has a positive impact on Stakeholders' Management (b = 3.853, t = 4.592, p < .001), H9: The Propensity to implement the Shingo Model has a positive impact on Culture (b = 3.462, t = 4.585, p < .001) were supported as advocated by

Plenert (2021), Edgeman (2018) and Edgeman & Barker (2019); H11: The Propensity to implement the Shingo Model has a positive impact on Internal Processes (b = 3.462, t = 4.585, p < .001) was supported as theoretically expected since this model was primarily conceived to attain operational excellence (Dinis-Carvalho & Macedo, 2021). Kelly & Hines (2019) experienced the optimisation of internal processes when implementing the Shingo Model; H13: The Propensity to implement the Shingo Model has a positive impact on the Use of Technologies (b = 3.936, t = 4.618, p < .001) was supported and, even though, there are no practical studies on the influence of information technology on Shingo Model, authors have been studying and reporting the positive synergy between the implementation of lean practices and use of technology (Anerao & Deshmukh, 2016; Moyano-Fuentes et al., 2012; Schumacher et al., 2020), thus the use of technology foster the efficiency rate of processes and can be an ally when implementing the Shingo Model, consequently, the support of this hypothesis indicates that Portuguese organisations that share the Propensity to implementing this excellence model are positively related with the use of technologies.

Moreover, in what concerns the Environmental, Operational and Social Performance, both H15: The Propensity to implement the Shingo Model has a positive impact on Environmental Performance (b = 2.728, t = 4.761, p < .001) and H17: The Propensity to implement the Shingo Model has a positive impact on Operational and Social performance (b = 2.980, t = 4.540, p < .001) were also supported as theoretically expected since lean principles underpinning the Shingo Model help to be successful in achieving a favourable environmental performance, for example by eliminating waste (Baker, 2016). Hence, the operational and environmental performance go hand in hand, as positive results in one aspect are paramount to attain positive results in the other. When it comes to the social issues, the concern with the employees is crucial to the Shingo Model, once in order to have satisfied, motivated, and empowered employees to produce the best possible results, their working conditions and importance with occupational health and safety when performing their business activities is also a main focus, as corroborated by the support of this hypothesis. Moreover, the lean tools help to promote each of the sustainability pillars (economic, social, and environmental) towards excellence in conformity with the Shingo model (Sá et al., 2022).

As previously reported, none of the hypotheses regarding the EFQM model was supported given the non-support of any of the precedent hypothesis regarding the EFQM model. Hence, the Propensity to implement this excellence model, under the influence of its latest version, did not show a positive impact in the constructs concerning the organisational maturity and in environmental, social, and operational performance, displayed the right side of the model. Consequently, the hypotheses H6: The Propensity to implement the EFQM Model has a positive impact on Strategic Alignment (b = -.085, t = -2.532, p = .011) was not supported against the theory (Fonseca, 2022; Vukomanovic & Radujkovic, 2013) and the guidelines of this model; H8: The Propensity to implement the EFQM Model has a positive impact on Stakeholders' Management (b = -.103, t = -2.434, p = .015) was not supported even though stakeholders' management is a key concept when adopting this excellence model (Menezes et al., 2021; Nenadál, 2020), H10: The Propensity to implement the EFQM Model has a positive impact on Culture (b = -.021, t = -.673, p = .501) was also not supported, nonetheless the latest version of the EFQM model advocates that organisations must have a less hierarchical and collaborative culture (EFQM, 2019) and, even though studies highlight the synergy between employee satisfaction and the implementation of EFQM Model (Matthies-Baraibar et al., 2014; Tutuncu & Kucukusta, 2010). Also, it was proved that

the EFQM model can be a tool to help improving human resource management, i.e., results towards employees (Garbarova, 2017).

Continuing with the results obtained from hypotheses testing regarding the EFQM model, H12: The Propensity to implement the EFQM Model has a positive impact on Internal Processes (b = -.099, t = -2.275, p = .023) was rejected contradicting theoretical and practical studies which report that the implementation of this model increase the efficiency of internal processes (Gómez-López et al., 2019; Heras-Saizarbitoria et al., 2011); H14: The Propensity to implement the EFQM Model has a positive impact on the Use of Technologies (b = -.109, t = -2.791, p = .005), even though the latest model version highly encompasses the use of technology and promotes digital transformation. There is a link between Industry 4.0 and the model criteria and guidance points, though specific references to Industry 4.0. pillars are not perfectly clear, due to the non-prescriptive nature of the model (Fonseca et al., 2021), whereas some authors report that effectively there is a strong relationship between the EFQM model and Industry 4.0. (Murthy et al., 2021b). Hence, theoretical evidence was not supported regarding the use of technology; H16: The Propensity to implement the EFQM Model has a positive impact on Environmental Performance (b = .008, t = .153, p = .878) and H18: The Propensity to implement the EFQM Model has a positive impact on Operational and Social performance (b = -.0738, t = -2.023, p = .043) were also rejected, although there is evidence that the EFQM 2020 model version encompasses and promotes the three pillars of sustainability, as deeply discussed in the third chapter of this dissertation and emphasised in some studies (Fonseca, 2022; Martín-Gaitero & Escrig-Tena, 2018; Martusewicz et al., 2022; Politis & Grigoroudis, 2022; Val et al., 2020).

The results do not show that Portuguese organisations are not ready to implement the EFQM model, on the contrary, Portuguese organisations have already started their journey towards excellence (Araújo & Sampaio, 2014). In fact, there are more organisations recognised by the EFQM (EFQM, 2023b), in Portugal, than there are recognitions on the Shingo Model (Shingo Institute, 2022) and recognised Portuguese organisations by the EFQM report to have a positive and robust relationship with management maturity (Pimentel & Ramos Pires, 2017). At the moment of this dissertation, any Portuguese organisation has been recognised by the Shingo Institute, even though Spain, France, Italy, and Germany are already comprise recognition on this model (Shingo Institute, 2022). Reasons for the adoption of the EFQM model in detention of the Shingo Model lay in the fact that Portugal as already a long tradition in the implementation of this model (Suárez et al., 2017) and may also lay in geographical issues. EFQM, as it stands, is a “European Framework” and consequently a natural Propensity for this model can overlap the Shingo Model. For example, EFQM newest model version highly promotes sustainability, incorporating the United Nations’ 17 Sustainable Development Goals (SDGs) and the United Nations Global Compact (2000) – ten principles for sustainable and socially responsible business (EFQM, 2019) – practices highly in accordance with what self-conscious organisations aim to achieve, given the political and geographic context where it operates (Europe). And this was precisely the purpose of this investigation, to assess whether or not despite the physical distance of the area of influence of the Shingo Model (mainly in United States/American continent), this model can perfectly suit the Portuguese organisations and help them to attain sustained superior performance, even more given the comprehensive nature of its latest version, in which Operational Excellence evolved to Enterprise Excellence (Plenert, 2021). Nowadays, Shingo’s primary objective is not only to achieve specific operational outcomes, but rather to strengthen organisational structures and

organisational culture in order to achieve and enhance those outcomes in the future (Khatib et al., 2022).

When assessing the Propensity to implement whether the Shingo or the EFQM models, all the questions included the typical "yes"/"no" answer, in which a typification of the "no" was immediately proposed in case of this response. It was important to verify if even when people do not apply a specific principle, which in some way is highly correlated with achieving high maturity - the "no" given in the survey comes from the resistance to change or because that practice/tool was not still implemented due to many other factors, such as economic concerns. Hence, in this discussion of results, it is also important to emphasise the medium maturity level accomplished by organisations in Portugal, in general, translated by results obtained from answers given on the constructs regarding the Strategic Alignment, Stakeholders' Management, Culture, Internal Processes and Use of Technology. Even though, the last two constructs report to have the high mean values, the dispersion of results is bigger, thus Portuguese organisations must improve risk management and must gather proper KPIs in order to periodically assess processes to promote continuous improvement. Also, many Portuguese organisations reveal not to use technology to improve processes and to increase productivity, evidence of low level of maturity in Portuguese organisations in terms of use of technology and a crucial aspect when implementing these excellence models, specially the EFQM, as its latest version (2020) enthusiastically promotes.

As previously said, the questions on the assessment on the EFQM model and the Shingo model were selected to be key differentiated items. The new version of the EFQM model can be too innovative and "out of the box" for the Portuguese context, as this model version explores concepts like innovation, creativity, the abundant use of technology, the importance of engaging the key stakeholders, the emphasis on improving performance within the "ecosystem" in which it operates, questions used to precisely differentiate this model from the Shingo model in the survey applied to the organisations. One the other hand, some studies highlight the correlation between the EFQM model and ISO's. Fonseca (2015) emphasises that ISO 9001 incorporates many principles of the EFQM model, and consequently can perfectly be considered a step towards the journey of excellence, thus it is also an indirect positive indicator towards the tendency for this excellence model. The results from this analysis indicate that almost 40% of organisations of the considered sample have adopted ISO 9001, but 48% report not to have adopted any of them. In what concerns the adoption of benchmarks/standards inquired in this survey it is also important to remark two important aspects: i) the first one concerns the likelihood of the survey not attending to a specific benchmark or standard adopted by the organisation, thus respondents answered their organisation does not adopt any of them, when in fact they do; ii) the second aspect is related with the less adopted ones - SA 8000, EMAS and GRI, which report on social and environmental responsibility, an important pillar for the excellence models, but specially in accordance with the latest guidelines of the EFQM model.

The question regarding the standard work was excluded from the model in order to achieve a better quality of adjustment for the model. However, nonetheless the model is better explained without the question than with it, Standard Work is an important principle according to the Shingo Model. This information can also be accessed from the initial questions of the survey, even though this question does not inquire on the Propensity to implement the models, it is important to verify that it is fifth lean practice implemented in Portugal. Moreover, 21% of the sample in analysis report to use lean practices/tools. This indicator is important and considerably not low, as organisations from

many discrepant sectors participated in the survey. As lean tools and practices are extremely important in the context of Shingo Model (Hines et al., 2020; Sá et al., 2022), this evidences also corroborate the hypotheses verified in this dissertation that effectively Shingo Model principles fits well the current ambitions and needs of Portuguese organisations

To conclude this chapter, it is paramount to highlight that the structural equation modelling allowed to be validating exclusively the hypotheses related to the Propensity to Implement the Shingo Model and this discussion of results allowed to understand possible causes that lead to these results.

9. CONCLUSION

This chapter presents the final conclusions conducted from the elaboration of this dissertation, as well as the main contributions, limitations, and future research avenues.

This dissertation resulted in the development of the following article: *A New Conceptual Model for Excellence in Business Towards Sustainable Development.*

9.1. Final Conclusions

The purpose of this dissertation was to broaden the knowledge on the latest versions of the EFQM and the Shingo models towards corporate sustainability and to conclude which of the model criteria fits better within the Portuguese organisations. Over the years, organisations have tried to improve their processes, to obtain better results, whether nowadays, they seem to be increasingly more aware of the urge to incorporate social and environmental practices, if they aim to attain long-term sustainable results. This literature review allowed to conclude that sustainability comprehensively is emphasised in both models.

Top managers have seen many advantages in the implementation of EFQM and the Shingo model. The 17 reasons identified in the literature review are mentioned in the conceptual model proposed in Chapter 3. However, some managers, especially the ones running SMEs still face some barriers to their implementation, generally due to the complexity of the models and the lack of workforce and financial resources. It is important to highlight that both of the models have a comprehensive nature being widely used, despite the size of the organisation, and type of activity, also they were designed under the assumption of continuous improvement, to permanently seek to make the best efforts towards achieving the best results. Furthermore, this dissertation stresses the importance of employee empowerment and satisfaction, as only committed and satisfied employees will help to achieve the desired sustainable results, along with the best organisational culture, environmental policies, and stakeholders' engagement in this process, by proposing a conceptual model for excellence in business towards sustainable development where knowledge on these subjects in unified.

Also, this dissertation aimed to assess if Portuguese organisations report the Propensity to implement whether the Shingo or the EFQM models. By analysing the criteria and assumptions on which both of the models are built, a conceptual model was created. It was selected the structural equation modelling (SEM) as the multivariate analysis technique to test the hypotheses formulated. The data was collected from 731 valid responses from a survey sent to Portuguese organisations from a wide range of sectors of activity. Results from the hypotheses testing allow to conclude that Portuguese organisations have a Propensity to implement the Shingo Model. Hence, it was possible to conclude that there is a positive relationship between the Clan culture and the Propensity to implement the Shingo Model, as well as, that there is a positive relationship between the Propensity to implement the Shingo Model and the constructs regarding the organisational maturity: Strategic Alignment, Stakeholders' Management, Culture, Internal Processes and Use of Technology, i.e., organisations that positively report to have preference for the Shingo Model reveal maturity on key aspects that comprise the model, represented by the constructs abovementioned. Also, it was found that there is a positive relationship between the Propensity to implement the Shingo Model

and the Environmental, Operational and Social performance of organisations. Thus, the Shingo Model was found to be the excellence model that fulfils the current needs and ambitions of Portuguese organisations. It is also important to refer that, none of the hypotheses concerning the EFQM model was supported, neither the hypotheses regarding the positive impact of the Adhocracy, Hierarchy and Market cultures on the Propensity to implement the EFQM Model, nor the subsequent hypotheses regarding the positive impact of the Propensity to implement the EFQM Model on any construct regarding the organisational culture and on the positive relationship between the Propensity to implement the EFQM Model and the Environmental, Operational and Social performance of organisations.

Undoubtedly, writing this dissertation has provided greater added value in terms of the knowledge acquired, as it has enabled me to learn about the potential of excellence models and structural equation modelling.

9.2. Contributions

This dissertation helps to understand how the EFQM Model and the Shingo Model inspire organisations to promote the best sustainable practices and how they perceive them, having allowed answering the research question initially stated: *How do business excellence models inspire the sustainability of organisations?*, as well as to understand what excellence model best fits the Portuguese current needs and ambitions, helping to answer the second research question: *Which of the excellence models do Portuguese organisations reveal better propensity to implement?*

Literature suggests that both of the models promote Sustainability, under its three pillars and that the Shingo Model is the one that best identifies the Portuguese reality. Moreover, this dissertation provides summarised knowledge on the newest EFQM Model version and on the Shingo Model, along with information regarding the relationship between these models and corporate sustainability. A new conceptual model for excellence in business towards sustainable development is proposed. This model helps organisations to understand the key aspects that must be taken into consideration to achieve sustainable development and their relationships, based on the principles of the EFQM and the Shingo Models. Also, the conceptual model proposed highlights the outcomes of the implementation of the models, divided by the pillars of sustainability and emphasises the need of implementing the policies under the designed constructs of the conceptual model with effective leadership, prioritising continuous improvement, and adequately engaging stakeholders in order to attain sustainable results. In this dissertation, it was also assessed the convergent points, i.e., the similarities between the two models and the main key differences, so that the Propensity to implement a specific model could be verified. Furthermore, through SEM it was possible to understand that despite the EFQM model being the most recognised and well-known model by Portuguese organisations, the Shingo Model criteria fit the prevalent culture and the needs and aspirations of organisations, being the one which most adapts to Portuguese reality.

Also, the data extracted from the survey applied to organisations from utterly different sector and from different regions allow to assess the organisational culture in prevalence in Portugal, as well as the organisational maturity of Portuguese organisations in the present moment. Moreover, as mentioned in the first chapter, the number of papers available regarding these models, especially

the Shingo Model is yet very limited, thus, this dissertation aims to contribute to fulfil the shortcomings associated with them.

9.3. Limitations

Even though the main objectives of this dissertation were accomplished, there are always limitations inherent to the investigation. In the literature review, the process of choosing articles to be as transparent as possible, the PRISMA methodology was implemented. The main limitation is provided by the underlying subjectivity of this dissertation author when choosing the publications by their title and abstract in the records screening phase. Also, there are limitations regarding the only database used – Web of Science, the inaccessibility to some articles, and all the exclusion criteria, namely regarding to the period considered in each search and the single language of the papers considered (English). Furthermore, the difficulty in obtaining publications on the Shingo Model and the relationship between the Shingo Model and Corporate Sustainability, as already mentioned, as well as the existence of a limited number of studies on the latest version of the EFQM Model and therefore on the relationship between this model version and Corporate Sustainability, represented adversities in the literature review.

As far as the practical component of this research is concerned, the survey failed to be sent during critical months for organisations (summer time), during a short period of time (6 weeks) and for being too long, as it aimed to assess many aspects at once, culminating in an average fulfilment time of 28 minutes, an extremely high time for a survey, which may have led organisations to give up answering or to have given up while filling it. Moreover, the main limitation reflected consequently in the final results was the failure to separate the sample by sector of activity, since the sample obtained contains results from numerous different sectors, whose needs and ambitions are different, and this may have affected the final results, which were worked on as a whole, i.e., the results were aggregated and not analysed by sector of activity.

9.4. Future research avenues

Future research should fill gaps regarding the lack of practical studies on the new version of the EFQM Model and the Shingo model with corporate sustainability. Readers are also encouraged to study the practical implications of the proposed conceptual model, in the critical analysis of the literature review, in order to provide stronger evidence of it, as well as, to enhance the model.

Moreover, a more in-depth study of the impact of the model and the results obtained in organisations can be accomplished, the conceptual model created to assess the Propensity of organisations to implement a specific excellence model must be tested when moderated by other variables to analyse the results more specifically, i.e., for instance, by sector and by size of organisations. Future research could also focus on the applicability of the model designed only in organisations that have effectively implemented the EFQM and Shingo models exclusively, in order to be able to extract results regarding the type of culture that is most related to a specific type of excellence model, as well as to have a practical study that clearly verifies if both the Shingo model and the EFQM model incorporate the concepts associated with the organisational maturity constructs, as well as to test in practice the relationship between the excellence models and the pillars of sustainability.

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APPENDIX I – UNIVARIATE ANALYSIS

CLAN CULTURE

		Frequency	Percent	Valid Percent	Cumulative Percent
CC1	1	34	4.7	4.7	4.7
	2	70	9.6	9.6	14.2
	3	189	25.9	25.9	40.1
	4	262	35.8	35.8	75.9
	5	176	24.1	24.1	100.0
	Total	731	100.0	100.0	
CC2	1	32	4.4	4.4	4.4
	2	60	8.2	8.2	12.6
	3	190	26.0	26.0	38.6
	4	306	41.9	41.9	80.4
	5	143	19.6	19.6	100.0
	Total	731	100.0	100.0	
CC3	1	19	2.6	2.6	2.6
	2	43	5.9	5.9	8.5
	3	157	21.5	21.5	30.0
	4	329	45.0	45.0	75.0
	5	183	25.0	25.0	100.0
	Total	731	100.0	100.0	
CC4	1	26	3.6	3.6	3.6
	2	22	3.0	3.0	6.6
	3	124	17.0	17.0	23.5
	4	264	36.1	36.1	59.6
	5	295	40.4	40.4	100.0
	Total	731	100.0	100.0	

ADHOCRACY CULTURE

		Frequency	Percent	Valid Percent	Cumulative Percent
AC1	1	42	5.7	5.7	5.7
	2	120	16.4	16.4	22.2
	3	257	35.2	35.2	57.3
	4	239	32.7	32.7	90.0
	5	73	10.0	10.0	100.0
	Total	731	100.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
AC2	1	21	2.9	2.9	2.9
	2	61	8.3	8.3	11.2
	3	177	24.2	24.2	35.4
	4	310	42.4	42.4	77.8
	5	162	22.2	22.2	100.0
	Total	731	100.0	100.0	
AC3	1	48	6.6	6.6	6.6
	2	105	14.4	14.4	20.9
	3	203	27.8	27.8	48.7
	4	269	36.8	36.8	85.5
	5	106	14.5	14.5	100.0
	Total	731	100.0	100.0	
AC4	1	22	3.0	3.0	3.0
	2	54	7.4	7.4	10.4
	3	157	21.5	21.5	31.9
	4	308	42.1	42.1	74.0
	5	190	26.0	26.0	100.0
	Total	731	100.0	100.0	

HIERARCHY CULTURE

		Frequency	Percent	Valid Percent	Cumulative Percent
HC1	1	74	10.1	10.1	10.1
	2	165	22.6	22.6	32.7
	3	258	35.3	35.3	68.0
	4	188	25.7	25.7	93.7
	5	46	6.3	6.3	100.0
	Total	731	100.0	100.0	
HC2	1	21	2.9	2.9	2.9
	2	62	8.5	8.5	11.4
	3	177	24.2	24.2	35.6
	4	306	41.9	41.9	77.4
	5	165	22.6	22.6	100.0
	Total	731	100.0	100.0	
HC3	1	39	5.3	5.3	5.3
	2	97	13.3	13.3	18.6
	3	231	31.6	31.6	50.2
	4	275	37.6	37.6	87.8
	5	89	12.2	12.2	100.0
	Total	731	100.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
HC4	1	11	1.5	1.5	1.5
	2	27	3.7	3.7	5.2
	3	143	19.6	19.6	24.8
	4	334	45.7	45.7	70.5
	5	216	29.5	29.5	100.0
	Total	731	100.0	100.0	

MARKET CULTURE

		Frequency	Percent	Valid Percent	Cumulative Percent
MC1	1	40	5.5	5.5	5.5
	2	109	14.9	14.9	20.4
	3	246	33.7	33.7	54.0
	4	245	33.5	33.5	87.6
	5	91	12.4	12.4	100.0
	Total	731	100.0	100.0	
MC2	1	21	2.9	2.9	2.9
	2	60	8.2	8.2	11.1
	3	181	24.8	24.8	35.8
	4	306	41.9	41.9	77.7
	5	163	22.3	22.3	100.0
	Total	731	100.0	100.0	
MC3	1	28	3.8	3.8	3.8
	2	48	6.6	6.6	10.4
	3	222	30.4	30.4	40.8
	4	309	42.3	42.3	83.0
	5	124	17.0	17.0	100.0
	Total	731	100.0	100.0	
MC4	1	14	1.9	1.9	1.9
	2	58	7.9	7.9	9.8
	3	167	22.8	22.8	32.7
	4	320	43.8	43.8	76.5
	5	172	23.5	23.5	100.0
	Total	731	100.0	100.0	

STRATEGIC ALIGNMENT

		Frequency	Percent	Valid Percent	Cumulative Percent
SA1	1	31	4.2	4.2	4.2
	2	73	10.0	10.0	14.2
	3	181	24.8	24.8	39.0
	4	290	39.7	39.7	78.7
	5	156	21.3	21.3	100.0
	Total	731	100.0	100.0	
SA2	1	34	4.7	4.7	4.7
	2	91	12.4	12.4	17.1
	3	197	26.9	26.9	44.0
	4	304	41.6	41.6	85.6
	5	105	14.4	14.4	100.0
	Total	731	100.0	100.0	
SA3	1	32	4.4	4.4	4.4
	2	63	8.6	8.6	13.0
	3	217	29.7	29.7	42.7
	4	295	40.4	40.4	83.0
	5	124	17.0	17.0	100.0
	Total	731	100.0	100.0	

STAKEHOLDERS' MANAGEMENT

		Frequency	Percent	Valid Percent	Cumulative Percent
SM1	1	65	8.9	8.9	8.9
	2	101	13.8	13.8	22.7
	3	215	29.4	29.4	52.1
	4	246	33.7	33.7	85.8
	5	104	14.2	14.2	100.0
	Total	731	100.0	100.0	
SM2	1	70	9.6	9.6	9.6
	2	102	14.0	14.0	23.5
	3	239	32.7	32.7	56.2
	4	240	32.8	32.8	89.1
	5	80	10.9	10.9	100.0
	Total	731	100.0	100.0	
SM3	1	75	10.3	10.3	10.3
	2	113	15.5	15.5	25.7
	3	250	34.2	34.2	59.9
	4	230	31.5	31.5	91.4
	5	63	8.6	8.6	100.0
	Total	731	100.0	100.0	

CULTURE

		Frequency	Percent	Valid Percent	Cumulative Percent
C1	1	28	3.8	3.8	3.8
	2	53	7.3	7.3	11.1
	3	136	18.6	18.6	29.7
	4	332	45.4	45.4	75.1
	5	182	24.9	24.9	100.0
	Total	731	100.0	100.0	
C2	1	30	4.1	4.1	4.1
	2	55	7.5	7.5	11.6
	3	162	22.2	22.2	33.8
	4	314	43.0	43.0	76.7
	5	170	23.3	23.3	100.0
	Total	731	100.0	100.0	
C3	1	30	4.1	4.1	4.1
	2	62	8.5	8.5	12.6
	3	177	24.2	24.2	36.8
	4	325	44.5	44.5	81.3
	5	137	18.7	18.7	100.0
	Total	731	100.0	100.0	

INTERNAL PROCESSES

		Frequency	Percent	Valid Percent	Cumulative Percent
IP1	1	53	7.3	7.3	7.3
	2	102	14.0	14.0	21.2
	3	224	30.6	30.6	51.8
	4	244	33.4	33.4	85.2
	5	108	14.8	14.8	100.0
	Total	731	100.0	100.0	
IP2	1	104	14.2	14.2	14.2
	2	134	18.3	18.3	32.6
	3	216	29.5	29.5	62.1
	4	155	21.2	21.2	83.3
	5	122	16.7	16.7	100.0
	Total	731	100.0	100.0	
IP3	1	55	7.5	7.5	7.5
	2	130	17.8	17.8	25.3
	3	212	29.0	29.0	54.3
	4	246	33.7	33.7	88.0
	5	88	12.0	12.0	100.0
	Total	731	100.0	100.0	

USE OF TECHNOLOGY

		Frequency	Percent	Valid Percent	Cumulative Percent
T1	1	35	4.8	4.8	4.8
	2	100	13.7	13.7	18.5
	3	177	24.2	24.2	42.7
	4	274	37.5	37.5	80.2
	5	145	19.8	19.8	100.0
	Total	731	100.0	100.0	
T2	1	33	4.5	4.5	4.5
	2	91	12.4	12.4	17.0
	3	200	27.4	27.4	44.3
	4	264	36.1	36.1	80.4
	5	143	19.6	19.6	100.0
	Total	731	100.0	100.0	
T3	1	27	3.7	3.7	3.7
	2	81	11.1	11.1	14.8
	3	182	24.9	24.9	39.7
	4	303	41.5	41.5	81.1
	5	138	18.9	18.9	100.0
	Total	731	100.0	100.0	
T4	1	27	3.7	3.7	3.7
	2	81	11.1	11.1	14.8
	3	182	24.9	24.9	39.7
	4	303	41.5	41.5	81.1
	5	138	18.9	18.9	100.0
	Total	731	100.0	100.0	

PROPENSITY TO IMPLEMENT THE EFQM MODEL

		Frequency	Percent	Valid Percent	Cumulative Percent
PE1	1	54	7.4	7.4	7.4
	2	21	2.9	2.9	10.3
	3	35	4.8	4.8	15.0
	4	9	1.2	1.2	16.3
	5	612	83.7	83.7	100.0
	Total	731	100.0	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
PE2	1	69	9.4	9.4	9.4
	2	26	3.6	3.6	13.0
	3	47	6.4	6.4	19.4
	4	13	1.8	1.8	21.2
	5	576	78.8	78.8	100.0
	Total	731	100.0	100.0	
PE3	1	238	32.6	32.6	32.6
	2	67	9.2	9.2	41.7
	3	90	12.3	12.3	54.0
	4	22	3.0	3.0	57.0
	5	314	43.0	43.0	100.0
	Total	731	100.0	100.0	
PE4	1	188	25.7	25.7	25.7
	2	71	9.7	9.7	35.4
	3	83	11.4	11.4	46.8
	4	16	2.2	2.2	49.0
	5	373	51.0	51.0	100.0
	Total	731	100.0	100.0	
PE5	1	70	9.6	9.6	9.6
	2	23	3.1	3.1	12.7
	3	16	2.2	2.2	14.9
	4	5	.7	.7	15.6
	5	617	84.4	84.4	100.0
	Total	731	100.0	100.0	
PE6	1	63	8.6	8.6	8.6
	2	25	3.4	3.4	12.0
	3	19	2.6	2.6	14.6
	4	2	.3	.3	14.9
	5	622	85.1	85.1	100.0
	Total	731	100.0	100.0	
PE7	1	45	6.2	6.2	6.2
	2	22	3.0	3.0	9.2
	3	14	1.9	1.9	11.1
	4	2	.3	.3	11.4
	5	648	88.6	88.6	100.0
	Total	731	100.0	100.0	

PROPENSITY TO IMPLEMENT THE SHINGO MODEL

		Frequency	Percent	Valid Percent	Cumulative Percent
PS1	1	45	6.2	6.2	6.2
	2	19	2.6	2.6	8.8
	3	27	3.7	3.7	12.4
	4	16	2.2	2.2	14.6
	5	624	85.4	85.4	100.0
	Total	731	100.0	100.0	
PS2	1	123	16.8	16.8	16.8
	2	33	4.5	4.5	21.3
	3	43	5.9	5.9	27.2
	4	20	2.7	2.7	30.0
	5	512	70.0	70.0	100.0
	Total	731	100.0	100.0	
PS3	1	55	7.5	7.5	7.5
	2	14	1.9	1.9	9.4
	3	22	3.0	3.0	12.4
	4	13	1.8	1.8	14.2
	5	627	85.8	85.8	100.0
	Total	731	100.0	100.0	
PS4	1	66	9.0	9.0	9.0
	2	26	3.6	3.6	12.6
	3	14	1.9	1.9	14.5
	4	12	1.6	1.6	16.1
	5	613	83.9	83.9	100.0
	Total	731	100.0	100.0	
PS5	1	112	15.3	15.3	15.3
	2	35	4.8	4.8	20.1
	3	36	4.9	4.9	25.0
	4	13	1.8	1.8	26.8
	5	535	73.2	73.2	100.0
	Total	731	100.0	100.0	

ENVIRONMENTAL. OPERATIONAL AND SOCIAL PERFORMANCE

		Frequency	Percent	Valid Percent	Cumulative Percent
EOSP1	1	38	5.2	6.9	6.9
	2	50	6.8	9.1	16.0
	3	129	17.6	23.4	39.4
	4	167	22.8	30.3	69.7
	5	167	22.8	30.3	100.0
	Total	551	75.4	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
EOSP2	1	34	4.7	5.3	5.3
	2	52	7.1	8.1	13.4
	3	135	18.5	21.1	34.5
	4	199	27.2	31.1	65.6
	5	220	30.1	34.4	100.0
	Total	640	87.6	100.0	
EOSP3	1	34	4.7	5.3	5.3
	2	69	9.4	10.8	16.2
	3	173	23.7	27.2	43.4
	4	191	26.1	30.0	73.4
	5	169	23.1	26.6	100.0
	Total	636	87.0	100.0	
EOSP4	1	31	4.2	4.9	4.9
	2	45	6.2	7.1	12.0
	3	162	22.2	25.6	37.5
	4	197	26.9	31.1	68.6
	5	199	27.2	31.4	100.0
	Total	634	86.7	100.0	
EOSP5	1	57	7.8	8.2	8.2
	2	98	13.4	14.0	22.2
	3	189	25.9	27.0	49.2
	4	209	28.6	29.9	79.1
	5	146	20.0	20.9	100.0
	Total	699	95.6	100.0	
EOSP6	1	34	4.7	5.0	5.0
	2	62	8.5	9.1	14.0
	3	186	25.4	27.2	41.2
	4	239	32.7	34.9	76.1
	5	164	22.4	23.9	100.0
	Total	685	93.7	100.0	
EOSP7	1	36	4.9	5.1	5.1
	2	55	7.5	7.9	13.0
	3	173	23.7	24.7	37.7
	4	256	35.0	36.6	74.3
	5	180	24.6	25.7	100.0
	Total	700	95.8	100.0	

		Frequency	Percent	Valid Percent	Cumulative Percent
EOSP 8	1	16	2.2	2.3	2.3
	2	19	2.6	2.8	5.1
	3	107	14.6	15.6	20.7
	4	217	29.7	31.6	52.3
	5	327	44.7	47.7	100.0
	Total	686	93.8	100.0	
EOSP9	1	21	2.9	3.0	3.0
	2	34	4.7	4.8	7.8
	3	128	17.5	18.2	26.1
	4	251	34.3	35.8	61.8
	5	268	36.7	38.2	100.0
	Total	702	96.0	100.0	
EOSP10	1	24	3.3	3.5	3.5
	2	34	4.7	5.0	8.5
	3	128	17.5	18.7	27.2
	4	238	32.6	34.7	61.9
	5	261	35.7	38.1	100.0
	Total	685	93.7	100.0	

APPENDIX II – ASSESSMENT OF NORMALITY (KOLMOGOROV-SMIRNOV AND SHAPIRO-WILK TESTS)

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
CC1	.225	730	<.001	.882	730	<.001
CC2	.251	730	<.001	.876	730	<.001
CC3	.267	730	<.001	.855	730	<.001
CC4	.238	730	<.001	.804	730	<.001
AC1	.195	730	<.001	.907	730	<.001
AC2	.254	730	<.001	.873	730	<.001
AC3	.226	730	<.001	.899	730	<.001
AC4	.257	730	<.001	.862	730	<.001
HC1	.190	730	<.001	.913	730	<.001
HC2	.252	730	<.001	.874	730	<.001
HC3	.223	730	<.001	.897	730	<.001
HC4	.261	730	<.001	.839	730	<.001
MC1	.199	730	<.001	.906	730	<.001
MC2	.251	730	<.001	.874	730	<.001
MC3	.245	730	<.001	.874	730	<.001
MC4	.259	730	<.001	.868	730	<.001
SA1	.245	730	<.001	.881	730	<.001
SA2	.251	730	<.001	.887	730	<.001
SA3	.238	730	<.001	.884	730	<.001
SM1	.207	730	<.001	.902	730	<.001
SM2	.197	730	<.001	.902	730	<.001
SM3	.197	730	<.001	.904	730	<.001
C1	.280	730	<.001	.848	730	<.001
C2	.263	730	<.001	.863	730	<.001
C3	.266	730	<.001	.870	730	<.001
IP1	.203	730	<.001	.904	730	<.001
IP2	.150	730	<.001	.909	730	<.001
IP3	.207	730	<.001	.908	730	<.001
T1	.236	730	<.001	.891	730	<.001
T2	.222	730	<.001	.895	730	<.001
T3	.243	730	<.001	.878	730	<.001
T4	.251	730	<.001	.883	730	<.001
PE1	.498	730	.000	.452	730	<.001
PE2	.474	730	.000	.521	730	<.001
PE3	.283	730	<.001	.760	730	<.001
PE4	.328	730	<.001	.740	730	<.001
PE5	.505	730	.000	.441	730	<.001
PE6	.508	730	.000	.434	730	<.001
PE7	.522	730	.000	.374	730	<.001
PS1	.502	730	.000	.422	730	<.001
PS2	.429	730	.000	.608	730	<.001
PS3	.505	730	.000	.414	730	<.001

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
PS4	.500	730	.000	.446	730	<.001
PS5	.448	730	.000	.580	730	<.001
EOSP1	.180	730	<.001	.892	730	<.001
EOSP2	.195	730	<.001	.870	730	<.001
EOSP3	.175	730	<.001	.902	730	<.001
EOSP4	.187	730	<.001	.882	730	<.001
EOSP5	.193	730	<.001	.904	730	<.001
EOSP6	.206	730	<.001	.890	730	<.001
EOSP7	.228	730	<.001	.878	730	<.001
EOSP8	.254	730	<.001	.792	730	<.001
EOSP9	.224	730	<.001	.831	730	<.001
EOSP10	.224	730	<.001	.836	730	<.001

Note: a. Lilliefors Significance Correlation; df – degrees of freedom; Sig. – Significance; CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; PS-Propensity to implement the Shingo Model; PE-Propensity to implement the EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EOSP-Environmental, Operational and Social Performance.

APPENDIX III – ASSESSMENT OF NORMALITY (KURTOSIS AND SKEWNESS)

Variable	min	max	skewness	c.r.	kurtosis	c.r.
CC1	1.000	5.000	-.596	-6.577	-.226	-1.245
CC2	1.000	5.000	-.675	-7.452	.130	.719
CC3	1.000	5.000	-.804	-8.873	.543	2.995
CC4	1.000	5.000	-1.154	-12.743	1.146	6.323
AC1	1.000	5.000	-.275	-3.036	-.404	-2.229
AC2	1.000	5.000	-.656	-7.244	.097	.533
AC3	1.000	5.000	-.441	-4.864	-.467	-2.578
AC4	1.000	5.000	-.766	-8.454	.250	1.377
HC1	1.000	5.000	-.100	-1.099	-.624	-3.446
HC2	1.000	5.000	-.649	-7.162	.059	.327
HC3	1.000	5.000	-.436	-4.813	-.270	-1.491
HC4	1.000	5.000	-.819	-9.037	.768	4.236
MC1	1.000	5.000	-.314	-3.467	-.404	-2.232
MC2	1.000	5.000	-.644	-7.104	.082	.452
MC3	1.000	5.000	-.630	-6.954	.338	1.868
MC4	1.000	5.000	-.651	-7.183	.107	.588
PS1	1.000	5.000	-2.516	-27.772	4.843	26.726
PS2	1.000	5.000	-1.199	-13.238	-.350	-1.929
PS3	1.000	5.000	-2.478	-27.350	4.516	24.924
PS4	1.000	5.000	-2.146	-23.690	2.853	15.745
PS5	1.000	5.000	-1.325	-14.631	-.041	-.227
PE1	1.000	5.000	-2.234	-24.655	3.415	18.849
PE2	1.000	5.000	-1.816	-20.043	1.677	9.254
PE3	1.000	5.000	-.109	-1.208	-1.752	-9.669
PE4	1.000	5.000	-.387	-4.269	-1.615	-8.915
PE5	1.000	5.000	-2.127	-23.474	2.737	15.104
PE6	1.000	5.000	-2.196	-24.235	3.069	16.938
PE7	1.000	5.000	-2.690	-29.694	5.560	30.683
SA1	1.000	5.000	-.620	-6.842	-.122	-.671
SA2	1.000	5.000	-.544	-6.004	-.196	-1.080
SA3	1.000	5.000	-.583	-6.440	.065	.358
SM1	1.000	5.000	-.401	-4.427	-.559	-3.084
SM2	1.000	5.000	-.374	-4.125	-.505	-2.788
SM3	1.000	5.000	-.327	-3.611	-.538	-2.971
C1	1.000	5.000	-.893	-9.852	.500	2.758
C2	1.000	5.000	-.783	-8.644	.275	1.516
C3	1.000	5.000	-.720	-7.946	.219	1.210
IP1	1.000	5.000	-.381	-4.200	-.496	-2.735
IP2	1.000	5.000	-.075	-.826	-.983	-5.428
IP3	1.000	5.000	-.305	-3.362	-.641	-3.537
T1	1.000	5.000	-.502	-5.541	-.458	-2.525
T2	1.000	5.000	-.469	-5.173	-.396	-2.186

Variable	min	max	skewness	c.r.	kurtosis	c.r.
T3	1.000	5.000	-.648	-7.153	-.045	-.247
T4	1.000	5.000	-.583	-6.437	-.148	-.814
EOSP1	1.000	5.000	-.739	-8.158	-.142	-.783
EOSP2	1.000	5.000	-.768	-8.480	-.111	-.615
EOSP3	1.000	5.000	-.514	-5.669	-.432	-2.385
EOSP4	1.000	5.000	-.693	-7.651	-.100	-.553
EOSP5	1.000	5.000	-.401	-4.422	-.690	-3.808
EOSP6	1.000	5.000	-.611	-6.742	-.179	-.986
EOSP7	1.000	5.000	-.699	-7.714	-.041	-.229
EOSP8	1.000	5.000	-1.207	-13.319	1.281	7.072
EOSP9	1.000	5.000	-.995	-10.987	.659	3.637
EOSP10	1.000	5.000	-.996	-10.995	.598	3.303
Multivariate					985.446	171.299

Note: CC-Clan Culture; AC-Adhocracy Culture; HC-Hierarchy Culture; PS-Propensity to implement the Shingo Model; PE-Propensity to implement the EFQM Model; SA-Strategic Alignment; SM-Stakeholders' Management; C-Culture; IP-Internal Processes; T-Use of Technology; EOSP-Environmental, Operational and Social Performance.

APPENDIX IV – SURVEY

ADOPTION OF EXCELLENCE MODELS IN PORTUGUESE ORGANISATIONS

This survey is part of a **dissertation** for a **Master's degree** in **Mechanical Engineering,** in Industrial Management, at ISEP (Instituto Superior de Engenharia do Porto).

All the data collected in the survey **is confidential** and for **scientific purposes only**.

You are asked to answer the questions with the utmost sincerity, and there are no right or wrong answers.

The survey will take approximately 15 minutes to complete.

If you have any questions while completing the survey, please contact me (tlm 91******* and/or email 1180734@isep.ipp.pt).

Thank you for your availability and co-operation!

* Mandatory question

1. Declaration of Knowledge *

☑ I hereby declare that I have taken note of the processing of the data of the organisation I represent, contained in this survey, for the strict purpose of collection and integration into a database for subsequent statistical processing, and only for the period of time necessary, in the context of the completion of the Master's Dissertation by Ana Oliveira, who can be contacted at 1180734@isep.ipp.pt. The answers will be confidential and the analysis resulting from the data processing will be global, and it will not be possible to identify any answer individually.

DATA RELATING TO THE RESPONDENT

2. Respondent's position in the organisation *

Please identify your position in the organisation.

- ☐ CEO
- ☐ COO
- ☐ CFO
- ☐ Manager of Quality and/or Organisational Excellence
- ☐ Other

If "Other" in the previous question:
Please indicate your position in the organisation. _____

3. How long have you worked for the organisation? *

- ☐ Up to 1 year
- ☐ 1 to 3 years
- ☐ 4 to 5 years
- ☐ 6 to 10 years
- ☐ More than 10 years

4. What are your academic qualifications? *

- ☐ Secondary education
- ☐ Undergraduate/Bachelor's degree
- ☐ Master's degree
- ☐ Ph.D.
- ☐ Other

DATA RELATING TO THE ORGANISATION

5. Your organisation's main sector of activity *

- ☐ Industry
- ☐ Construction
- ☐ Energy sector
- ☐ Health sector
- ☐ Transport
- ☐ Financial activities
- ☐ Public administration
- ☐ Education
- ☐ Other

If "Other" in the previous question:
Please indicate your organisation's main sector of activity.
_____

6. Age of your organisation *

- ☐ 1 to 2 years
- ☐ 3 to 5 years
- ☐ 6 to 10 years
- ☐ 11 to 20 years
- ☐ More than 20 years

7. Number of employees in your organisation *

- ☐ 11 a 50
- ☐ 51 a 100
- ☐ 101 a 249
- ☐ Over 250

8. Geographical location of your organisation *

- ☐ Alentejo
- ☐ Algarve
- ☐ Centre
- ☐ Lisbon Metropolitan Area
- ☐ North
- ☐ Autonomous Region of the Azores
- ☐ Autonomous Region of Madeira

9. Your organisation belongs to the sector... *

- ☐ ... public
- ☐ ... private

10. Indicate which of the following references/standards your organisation adopts. *

- ☐ ISO 9001 - Quality Management Systems
- ☐ ISO 14001 - Environmental Management Systems
- ☐ ISO 45001 – Occupational Health and Safety Management Systems
- ☐ ISO 50001 - Energy Management Systems
- ☐ SA 8000 - Social Responsibility
- ☐ EMAS - Eco-Management and Audit Scheme
- ☐ GRI - Global Reporting Initiative
- ☐ B CORP
- ☐ None of the above

11. Has your organisation implemented any lean tools and/or practices?

- ☐ Yes
- ☐ No

If "yes" on question 11:

12. Of the *lean* practices and tools listed below, please indicate which are used in your organisation. *

- ☐ 5S
- ☐ Andon
- ☐ Spaghetti diagram
- ☐ Visual Management
- ☐ Heijunka
- ☐ Jidoka
- ☐ Daily kaizen
- ☐ Kanban
- ☐ Cellular manufacturing
- ☐ Poka-yoke
- ☐ A3 Report
- ☐ SMED - Single Minute Exchange of Die
- ☐ TPM - Total Productive Maintenance
- ☐ Value Stream Mapping
- ☐ Standard work
- ☐ None of the above
- ☐ Other

13. Does your organisation have implemented other lean practices and/or tools besides those previously mentioned? If yes, which ones?

_____

If "No" in the previous question:

12. However, does your organisation have any perspective to implement any lean practices and/or tools in the future?

- ☐ Plan to implement some of them in the SHORT term (within 1 year)
- ☐ Plan to implement some of them in the MEDIUM term (within 1 and 3 years)
- ☐ Plan to implement some of them in the LONG term (within more than 3 years)
- ☐ Does not plan to implement any lean practices and/or tools.

TYPE OF ORGANISATIONAL CULTURE

Please mark from 1 to 5 depending on whether your organisation "does not identify" or "identifies a lot" with each statement.
Please tick from 1 to 5 depending on whether your organisation "does not identify" or "identifies a lot" with each statement.

13. Your organisation ... *

	1	2	3	4	5
...it's a very personal place. It's like an extended family.	☐	☐	☐	☐	☐
...it's a very dynamic and entrepreneurial place. People are willing to take risks.	☐	☐	☐	☐	☐
...is a very controlled and structured place. Formal procedures generally govern what people do.	☐	☐	☐	☐	☐
...is very results-orientated. There's a great deal of concern about completing tasks. People are very competitive.	☐	☐	☐	☐	☐

14. In your organisation, leaders are generally seen as ... *

	1	2	3	4	5
...mentors, an example of guidance, facilitation or stimulation.	☐	☐	☐	☐	☐
...entrepreneurs, innovators or risk-takers.	☐	☐	☐	☐	☐
...coordinators, organisers, administrators.	☐	☐	☐	☐	☐
...producers, technicians - someone mainly concerned with the technical aspects.	☐	☐	☐	☐	☐

15. Your organisation holds together ... *

	1	2	3	4	5
...loyalty and mutual trust. The employees' commitment to the organisation is high.	☐	☐	☐	☐	☐
...for its commitment to innovation and development. There is an emphasis on always being at the forefront.	☐	☐	☐	☐	☐
...by formal rules and policies. It is considered very important to maintain an organisation that functions in a fluid way.	☐	☐	☐	☐	☐
...because of the emphasis placed on the fulfilment of tasks and objectives.	☐	☐	☐	☐	☐

16. Your organisation values ... *

	1	2	3	4	5
...human resources. Cohesion and high morale are important.	☐	☐	☐	☐	☐
growth and the acquisition of resources. It's important to be prepared for new ...changes and challenges.	☐	☐	☐	☐	☐
...permanence and stability. It's important for efficiency and fluidity in daily operations.	☐	☐	☐	☐	☐
...success and competitiveness. It's important to set measurable goals.	☐	☐	☐	☐	☐

ORGANISATIONAL MATURITY

Please mark from 1 to 5 depending on whether your organisation "does not identify" or "identifies a lot" with each statement.

17. In your organisation ... *

	1	2	3	4	5
... there is a well-defined strategy, translated into specific objectives and priorities.	☐	☐	☐	☐	☐
... actions are always promoted in line with the organisation's strategy.	☐	☐	☐	☐	☐
... managers and employees understand the strategy in order to improve the organisation's performance.	☐	☐	☐	☐	☐
... communication with *stakeholders* is maintained and their levels of satisfaction are periodically measured.	☐	☐	☐	☐	☐
... mutual expectations are established between *stakeholders* and the organisation.	☐	☐	☐	☐	☐
... *stakeholders* are mapped according to their urgency and legitimacy.	☐	☐	☐	☐	☐
...an environment of co-operation, involvement, safety and learning is promoted between employees and managers/leaders.	☐	☐	☐	☐	☐
...the development of creative/innovative solutions to improve organisational performance is encouraged.	☐	☐	☐	☐	☐
...employees have autonomy and are empowered to make improvements and solve problems in a structured way.	☐	☐	☐	☐	☐
... processes are mapped, documented, and regularly evaluated in order to optimise them.	☐	☐	☐	☐	☐
...there are a series of metrics (KPIs) to evaluate performance and control processes.	☐	☐	☐	☐	☐
...good risk management is achieved by identifying, monitoring, evaluating and minimising the impacts of threats that arise.	☐	☐	☐	☐	☐
...information technology is used to improve processes/increase productivity.	☐	☐	☐	☐	☐
...processes are automated wherever possible.	☐	☐	☐	☐	☐

... the expense of technology and its importance in today's context are understood. ☐ ☐ ☐ ☐ ☐

...uses reliable data/information to promote continuous improvement in all processes and sectors of the organisation ☐ ☐ ☐ ☐ ☐

NEEDS / STRATEGY OF THE ORGANISATION

18. Does your organisation **cope effectively** in environments of **change/uncertainty/risk/threat by understanding** and **anticipating these situations** and using **credible information/data**, thereby ensuring that it is **better prepared for the future?***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to deal efficiently in environments of change/uncertainty/risk/threat, understanding and anticipating these situations, as well as using credible information/data, thus ensuring that it is better prepared for the future?*

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

19. Does your organisation **frequently analyse the "ecosystem" in which it operates,** getting involved and seeking to maximise opportunities to learn and grow with others within your ecosystem? *

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to frequently analyse the "ecosystem" in which it operates, getting involved and seeking to maximise opportunities to learn and grow with others within its ecosystem? *

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

20. Does your organisation **use specific metrics to compare** its results with those of other organisations? *****

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to compare its results with those of other organisations using specific metrics? *****

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

21. Does your organisation **monitor and evaluate its contribution to society? ***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to monitor and evaluate its contribution to society? *****

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

22. Does your organisation **analyse the challenges/opportunities that arise in its environment and act on them? ***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to analyse the challenges/opportunities that arise in its environment and act on them? *****

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

23. Is your organisation looking to **transform** its practices**, favouring the use of technology as a means of achieving a sustainable future? ***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan** to **implement actions** to try to transform its practices, favouring the use of technology as a means of achieving a sustainable future? ***

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

24. Does your organisation **analyse, evaluate and use the opportunities brought about by innovation and new technologies? ***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to analyse, evaluate and use the opportunities brought about by innovation and new technologies? ***

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

25. Is your organisation**'s main objective to improve the efficiency and effectiveness of its internal processes, i.e. is your focus mainly on the operational level? ***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan** to **implement actions aimed** primarily at improving the efficiency and effectiveness of its internal processes, i.e. improving mainly at an operational level? *

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

26. Your organisation **favours standardised work (i.e. processes are mostly consistent/standardised)?***

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation plan **to implement actions** to favour standardised work (i.e. mostly consistent/standardised processes)? *

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

27. In your organisation, **do leaders make a habit of going to workplaces to observe and study processes**, where difficulties are observed, approaches that work well and/or need improvement are questioned, knowledge is gained and opportunities for improvement are explored? *

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** so that leaders start going to workplaces frequently to observe and study processes, where difficulties will be observed, approaches that work well and/or need improvement questioned, knowledge gained and opportunities for improvement explored? *

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

28. Does your organisation **analyse and assess whether the behaviour of its employees is becoming more and more in line with the organisational culture**? *****

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to analyse and evaluate whether employee behaviour is increasingly close to the organisational culture that is widespread in your organisation? *****

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

29. **Is** your organisation **subdivided/organised into different systems and do you recognise that these systems are dynamic**, i.e. **they** communicate and interrelate with each other and **are therefore constantly evaluated and improved in order to produce certain objectives**? *****

- ☐ Yes
- ☐ No

If "No" in the previous question:

However, does your organisation **plan to implement actions** to identify the various systems that exist within it, organise them, constantly evaluate them and improve them in order to produce certain objectives? *****

- ☐ YES, in the short term (within 1 year)
- ☐ YES, in the medium term (within 1 to 3 years)
- ☐ YES, in the long term (more than 3 years from now)
- ☐ The organisation does NOT plan to implement actions in this direction.

ENVIRONMENTAL, OPERATIONAL AND SOCIAL PERFORMANCE

Please tick from 1 to 5 depending on whether your organisation "does not identify" or "identifies a lot" with each statement. If the statement is not relevant to your organisation, please tick "Not applicable".

30. Your organisation in the last year ... *

	1	2	3	4	5	N.A
... reduced and/or avoided the emission of atmospheric pollutants and/or liquid pollutants.	☐	☐	☐	☐	☐	☐
... minimised adverse environmental impacts resulting from its activity.	☐	☐	☐	☐	☐	☐
... reduced the amount of solid waste produced.	☐	☐	☐	☐	☐	☐
... had an increase in its environmental performance.	☐	☐	☐	☐	☐	☐
... managed to reduce its operating costs.	☐	☐	☐	☐	☐	☐
... managed to improve efficiency in the management of resources (e.g. raw materials, equipment, ...)	☐	☐	☐	☐	☐	☐
... had an overall increase in its operating performance.	☐	☐	☐	☐	☐	☐
... complied with the applicable safety procedures.	☐	☐	☐	☐	☐	☐
... improved working conditions for employees and suppliers.	☐	☐	☐	☐	☐	☐
... has seen an increase in its occupational health and safety performance in its business activities.	☐	☐	☐	☐	☐	☐

MODELS OF EXCELLENCE

31. Has your organisation implemented any of the following models? If so, for how long? *

If your organisation **has not implemented** any of the models, please select the "**Not Applicable**" column.

	Up to 1 year	Between 3 and 5 years inclusive	Between 5 and 7 years old	More than 7 years	Not applicable
Shingo model	☐	☐	☐	☐	☐
EFQM model	☐	☐	☐	☐	☐