

Structural Equations: Analysis Of The Malcolm Baldrige Model (MBNQA) And Productivity In The Textile Sector Of Tungurahua

Silvia Melinda Oyaque Mora¹

¹Universidad Andina Simón Bolívar, Sede Bolivia, silvia.oyaque@uasb.edu.bo,
ORCID: <https://orcid.org/0000-0002-7278-5201>

Abstract

The research analyzed the relationship between the dimensions of the Malcolm Baldrige National Quality Award (MBNQA) model and productivity in the textile sector of Tungurahua. A quantitative, non-experimental, and correlational approach was applied. A questionnaire was used, with questions structured around the seven criteria of the model and the elements of productivity. It was validated through an exploratory factor analysis KMO = 0.833; Bartlett $p < 0.05$ and with an acceptable Cronbach's alpha reliability = 0.848. Structural equations (SEM) were applied as a technique to identify latent relationships between the factors analyzed. The results obtained reflected a strong association between process management and productivity, while dimensions such as leadership and performance evaluation showed significant weaknesses. Around 50% of the companies surveyed reported that they do not apply formal quality tools or techniques for evaluating and monitoring business performance. The findings, while aligned with the application of the model and its contribution to improving organizational productivity, also reflect the need for leadership commitment, the adoption of efficient process management, and continuous evaluation and improvement.

Keywords: Malcolm Baldrige model, productivity, textile sector, processes, quality management.

RESUMEN

La investigación analizó la relación entre las dimensiones del modelo Malcolm Baldrige National Quality Award (MBNQA) y la productividad en el sector textil de Tungurahua; se aplicó un enfoque cuantitativo, un diseño no experimental y correlacional. Se tomó en consideración un cuestionario cuyas preguntas están estructuradas en torno a los siete criterios del modelo y los elementos de la productividad; se validó a través de un análisis factorial exploratorio KMO = 0,833; Bartlett $p < 0,05$ y con una fiabilidad aceptable de alfa de Cronbach = 0,848; se aplicaron, como técnica, las ecuaciones estructurales (SEM), herramienta para identificar las relaciones latentes entre los factores analizados. Los resultados obtenidos reflejaron una fuerte asociación entre la gestión por procesos y la productividad, mientras que dimensiones como liderazgo y evaluación de resultados, mostraron debilidades significativas. Alrededor del 50% de las empresas encuestadas reportaron que no aplican herramientas formales de calidad, ni técnicas de evaluación, y seguimiento de desempeño empresarial. Los hallazgos, si bien están alineados a la aplicación del modelo y su contribución a la mejora de la productividad organizacional, también reflejan la necesidad del compromiso del liderazgo, la adopción de la gestión por procesos eficiente, así como evaluación y mejora continuas.

Palabras clave: Modelo Malcolm Baldrige, productividad, sector textil, procesos, gestión de calidad.

INTRODUCTION

In the contemporary business world, a dichotomy exists between companies that have adopted a variety of programs and activities aimed at enhancing the quality of their products or services to maintain competitiveness in increasingly demanding markets and those that exhibit resistance to change, adopting new and modern production methodologies (Santamaria-Freire & Pico-Barrionuevo, 2015). The pursuit of quality and productivity characterizes the former, while the latter demonstrate a reluctance to embrace modern methodologies.

The textile sector in Ecuador is currently a pillar of the country's economy, as its contribution is significant. In 2022, the sector accounted for 5.5% of GDP (gross domestic product), and it has generated a total of 172,000 jobs, the majority of which are held by women. The post-pandemic

period does not yet reflect an economic recovery in the sector. It is noteworthy that in 2020, sales in the sector amounted to approximately 1.498 billion, and by 2023, they had decreased to 1.443 billion. According to the Association of Textile Industrialists of Ecuador (2024), the country's imports totaled 97 million. Factors such as those enumerated in this paragraph provide a foundation for assessing the importance of the sector. Nevertheless, the contemporary context is undergoing accelerated transformation, prompting the textile sector and its constituent enterprises to confront mounting pressure to enhance the quality of their products, optimize their production operations, and enhance their profitability. In the aftermath of the financial crisis precipitated by the pandemic, companies in the sector have been compelled to devise mechanisms to fortify their competitive position and adapt to prevailing market demands. Consequently, two paradigms have emerged as catalysts for enhancing production operations and the performance of key processes. The first is quality and the second is productivity (H. Hernández et al., 2018; Luna Vicharra & Armanda Pacheco, 2022; Molina & Sánchez-Riofrio, 2016; Ormaza & Guerrero-Baena, 2021). The concept of quality is often employed as a metric of excellence or customer satisfaction, signifying the efficacy of products or services in meeting customer needs (Aguado Lingan et al., 2022; Aguilar Bustamante et al., 2007; Cubillos & Roza, 2009; De Carvalho et al., As demonstrated in the works of Maya-Mendoza (2014), Pérez-Achaval (2015), Roncalli (2011), Saavedra (2017), and Sanabria et al. (2014), productivity has evolved into a significant phenomenon in recent decades. The term "productivity" is used to describe a company's ability to achieve its business objectives at a reduced cost and in a shorter timeframe than initially anticipated. This capability enables the company to attain a competitive advantage over its competitors (Agustín et al.). According to the works of Aza (2016), Becerra-Peña & Lemos Mejía (2021), Cardona (2008), Carvajal Larenas et al. (2018), Colmenares (2009), Cortés (2017), Domínguez (2020), Felsinger & Runza (2014), Franco-Paredes et al. (2016), and Hofman et al., As indicated in the works of Medina (2010), Morelos Gómez & Núñez Bottini (2017), Piva et al. (2023), Portela Maquieira et al. (2022), Ramírez et al. (2022), Raya & Núñez (2015), Rincón et al. (2022), Sánchez et al. (2020), Unger (1993), and Valero Camino (2024), the subject has been thoroughly researched. Consequently, the investigation of mechanisms that facilitate the attainment of productivity levels and the implementation of quality models within companies in the sector constitutes a fundamental area of research.

The preceding paragraphs serve as the foundation for this investigation, as the research is conducted within the following parameters: The textile sector's low productivity levels (Association of Textile Industrialists of Ecuador, 2024) are a precursor to the problem to be addressed in this research, and establishing its causes is the central focus. The objective of this document is to determine the relationship between the criteria of the Malcolm Baldrige quality model and the productivity of the sector studied. In the contemporary business landscape, enterprises are driven to enhance their performance in pivotal domains such as operations, quality, business outcomes, and innovation (Parast & Safari, 2022; Pastor, 2013). These criteria are predicated on the principles and framework of the Malcolm Baldrige Model (MBM).

LITERATURE REVIEW

Modelo del Premio Nacional a la Calidad Malcolm Baldrige (MBNQA)

In 1987, the United States Congress enacted National Law 100-107, which was based on the criteria of the Malcolm Baldrige Award. The National Quality Improvement Act (NQIA) was designed to enhance the competitiveness of US companies. In the initial phase of the study, three categories were delineated: Manufacturing, Services, and Small Businesses, which served as the registration platform for companies seeking to win the award. In 1997, it was renamed the Baldrige Performance Excellence Program, and today it is known as the Malcolm Baldrige National Quality Award (Gryna et al., 2007; Parast & Safari, 2022). The Malcolm Baldrige model establishes a performance framework that is used to determine whether organizations direct their processes toward satisfying customer needs. This model is employed to evaluate companies because, since 1987, its premise has been to recognize companies for achieving levels of excellence and quality in their processes. A fundamental tenet of this award is to incentivize companies to pursue the implementation and adoption of quality by their internal customers, thereby ensuring the attainment of quality in their

processes and, consequently, fostering an environment conducive to the enhancement of customer satisfaction. It is evident that, over time, the quality criteria of the Malcolm Baldrige Model have been recognized as quality standards. These standards have been adopted by companies to implement quality management (Aydın & Kahraman, 2019; Haktanir, 2020).

The Malcolm Baldrige model posits that business leaders must be guided by strategic direction and the satisfaction of their customers' needs, and that the management applied by executives must be results-oriented. The model also stipulates that strategies must be designed to include criteria and evaluations that seek to improve performance and quality (Camisón et al., 2006).

The criteria of the Malcolm Baldrige model have been demonstrated to be applicable to the pursuit of quality improvement in companies, the promotion of productivity levels, and a focus on results, as this leads to sustainability in quality and performance (Miranda & Reyes-Chua, 2021).

The criteria of the Malcolm Baldrige model are elements that enable the evaluation of companies, and whose results are the basis for feedback. When applied, the criteria enable companies to improve their competitiveness in three areas (Soledispa, 2017):

Performance, capabilities, and results;

Company communication and information;

Planning and promoting continuous improvement.

The improvement of these areas leads to a threefold objective:

Seeking sustainability through a process of improvement focused on consumers and stakeholders, improving efficiency and capabilities by directing the learning of companies and personnel.

The criteria of the model are divided into seven categories (Haktanir, 2020, p. 1098), which are interrelated, and each of these has a weight that contributes to the overall framework of the model. Malcolm Baldrige, as a tool, is based on three elements:

It is based on the business environment, the existence of working relationships, and strategic goals. The processes are divided into six criteria: leadership, strategic planning, customer and market focus, human resource focus, process management, and business and organizational results (Mariño, 2017, p. 71).

Measurement involves activities aimed at improving the performance and competitiveness of companies.

Below are the criteria of the Malcolm Baldrige model

Criterion 1: Leadership. This criterion evaluates how leaders direct, motivate, and manage the organization, that is, how managers communicate with their subordinates. Taking the theoretical conceptualization of this criterion to a higher level, it can be discerned that it seeks to evaluate how managers motivate their employees to uphold the vision, mission, corporate values, and management of public relations or responsibilities with external groups. (Cadena, 2018, p. 95)

Subcriteria: Leadership

Subcriteria: Governance and social responsibility

Criterion 2: Strategic planning. - Examines how companies apply planning under strategic criteria, determines the adaptability of plans according to the needs of companies and the achievements made; this criterion seeks sustainability, taking into account the company and its environment (Armijos & Angulo, 2018, p. 78; Cadena, 2018, p. 95; Camisón et al., 2006, p. 706; Gaitán, 2007, p. 56; Miranda & Reyes-Chua, 2021, p. 536; Rodríguez B., 2009, p. 12; Soledispa, 2017, p. 13).

It is classified as follows:

Subcriterion: Strategy

Subcriterion: Application of strategy

Criterion 3: Focused on the customer and the market. - This criterion is aimed at evaluating the activities of companies and is geared toward satisfying consumer and market requirements. It evaluates how companies direct their efforts toward customer loyalty and satisfaction and how they orient themselves to meet market requirements (Cadena, 2018, p. 96).

Subcriterion: Customer and market

Subcriterion: Customer relations and satisfaction

Criterion 4: Measurement, analysis, and knowledge management: This criterion determines how the company manages information, data, and their use in support of key process management and

the results management system. This criterion determines the use of resources in knowledge analysis and management within companies and their contribution to the core processes of organizations (Cadena, 2018, p. 95; Miranda & Reyes-Chua, 2021).

It is divided into:

Subcriterion: Measuring, analyzing, and reviewing performance

Subcriterion: Information and knowledge management

Criterion 5: Focus on human resources: This criterion focuses on human resources and evaluates work systems, internal customer learning, and customer motivation. It seeks to align employee efforts with the company's objectives, strategies, and plans. The criterion's premise is the growth, development, and professionalization of human talent (Miranda & Reyes-Chua, 2021).

The criterion is divided into:

Subcriterion: Work system

Subcriterion: Employee motivation and learning

Subcriterion: Employee satisfaction

Criterion 6: Process management: Evaluation of process design and how processes are oriented toward customers, suppliers, and partners, and how processes add value to each of these groups. In other words, it evaluates the efficiency and effectiveness of processes, design, and the relationship with external customers; it focuses on the development of processes, whether operational or financial, and aims at continuous improvement (Miranda & Reyes-Chua, 2021, p. 13).

It is classified into:

Subcriterion: Value-oriented processes

Subcriterion: Processes to support and facilitate operational planning

Criterion 7: Focus on results: Examines the results obtained by companies and, most importantly, the contribution to improvement in product, service, and customer satisfaction (Gaitán, 2007, p. 56).

It is divided into:

Subcriterion:

Results for:

Product or service

Customers

Human talent

Management

Leadership and social responsibility

The model is a contribution to enhancing the quality and productivity levels of companies that adopt it, to developing a competitive advantage; the model offers a set of very specific guidelines for companies seeking quality and improved productivity levels. The criteria have been developed based on principles such as:

Visionary leadership: This is the management style of senior management, the way in which it directs, designs, and communicates to staff the strategies and strategic direction of the company. It is a management style that empowers employees to adopt the mission, vision, and organizational values of the company and motivates them to implement change.

External and internal cooperation: This is the participation of stakeholders in the company's activities.

Learning: The development of skills and abilities.

Process focus: The company's efforts should focus on processes and then on results.

Continuous improvement: Processes must be adapted not only to the requirements of stakeholders, but also to feedback from evaluation processes.

Employee and customer satisfaction: Satisfying customer requirements and meeting employee needs in terms of their development and professionalization are two pillars that must be interrelated for the company to achieve its strategic objectives (Rodríguez B., 2009, p. 209).

Productivity

In the contemporary business landscape, productivity is regarded as a multifaceted concept within the domain of business strategy. The pursuit of this productivity is imperative for companies seeking to expand, maintain their viability over time, and enhance their competitive edge. Productivity can be defined as a set of actions that are deliberately and strategically implemented to achieve specific business objectives while cultivating an optimal working environment. Productivity is a critical factor in determining economic performance and the attainment of profits in each of the key processes of companies (Serna-Mosquera & Agualimpia-Ortiz, 2016).

Productivity is widely regarded as a primary strategic objective for companies, entailing the formulation and implementation of mechanisms aimed at enhancing competitiveness and attaining objectives (Medina, 2010).

The criteria articulated by Serna-Mosquera and Agualimpia-Ortiz (2016) merit consideration, as they underscore the significance of productivity as a metric for evaluating the utilization of resources in the production of goods and services. This productivity, as they emphasize, is a reflection of the efficiency with which human resources, capital, and knowledge are employed to achieve strategic objectives.

METHODOLOGY

The methodology applied in this research is an adaptation of the methods used by authors such as Cancino et al. (2016); Carbó-Carreté et al. (2016) and Farfán-Pimentel et al. (2023), who agree with the methodology proposed by García Veiga (2011) and Covas (2020).

The type of research was quantitative and applied, which is a non-systematic way of finding the causes and solutions to a problem (Cabezas et al., 2018); with a correlational research level to determine the bilateral correlation between the research variables; and with a non-experimental design, as there was no manipulation of the variables (Bernal, 2010; R. Hernández et al., 2014).

The research was cross-sectional, as it was carried out over a period of time, taking into account the analysis of the problem. The research has a quantitative approach, and the data were collected, measured, and evaluated (Bernal, 2010; R. Hernández et al., 2014).

Before designing the Structural Equation Model (SEM), which is a statistical analysis technique used in research to analyze relationships between variables (Ortiz & Fernández-Pera, 2018), the database is analyzed, which is the basis of the research and, therefore, the basis for processing the application. The database must be described, the normality of the data must be analyzed, as well as the reliability of the instrument used to obtain said database. For this purpose, an instrument divided into two components is developed: 1.- General and informative data on the company; and the second component, 2. The Malcolm Baldrige model criteria.

The questionnaire is applied to a significant sample of companies in the textile sector that were the subject of this research. To verify the content, its validity has been determined through an in-depth study of the literature on the subject and the compilation of expert criteria. The validity of the construct is determined through a factor analysis (R. Hernández et al., 2014) of principal components. This analysis takes into account Bartlett's sphericity test, where the significance must be less than or equal to 0.05, to determine the existence of correlation between the variables under investigation. In addition, the Kaiser-Meyer-Olkin (KMO) measure is considered, which determines values greater than 0.5, indicating the existence of strong relationships between the variables. Regarding the reliability of the instrument, Cronbach's alpha coefficient was used, which indicates that it must be greater than 0.7 to be accepted (Curran et al., 1996; R. Hernández et al., 2014).

Once the database has been checked and its normality, validity, and reliability analyzed, the SEM is constructed (Fernando et al., 2018; Insuasti & Silva, 2022; Ruiz et al., 2013).

RESULTS

The reliability analysis of the instrument was 0.8 with an analysis of 12 elements, which shows excellent reliability according to Cronbach's alpha parameters.

Table

Reliability statistics

1

Survey	Cronbach's alpha	Cronbach's alpha based on typified items	N of elements
MBNQA	,848	,849	12

As a starting point for the diagnosis, an analysis of the indicators of the Malcolm Baldrige National Quality Award (MBNQA) model is carried out..

Table 2 Model dimensions and indicators (MBNQA).

DIMENSION	INDICATORS	CODE
Modelo del Premio Nacional a la Calidad Malcolm Baldrige (MBNQA)	Leadership	MMB1
		MMB2
	Strategic planning	MMB3
	Customer and market focus	MMB4
	Human resources focus	MMB5
	Process management	MMB6
	Business and organizational results	MMB7
Productivity	Business productivity	PC1
	Processes	PC2

Table 3 Descriptions of the Malcolm Baldrige National Quality Award (MBNQA) Model

Question		Features enterprise-grade models	
		Yes	No
		% of N in table	% of N in table
1. [The commitment of managers to implementing and promoting the company's mission, vision, values, and culture of quality is clearly evident.]	Always	0,90%	1,90%
	Almost always	0,90%	1,90%
	Sometimes	3,80%	6,60%
	Almost never	5,70%	11,30%
	Never	14,20%	52,80%
2. [Managers are involved in the development and improvement of the management system by identifying activities that must be carried out by those involved within the organization]	Always	0,90%	2,80%
	Almost always	0,90%	3,80%
	Sometimes	1,90%	4,70%
	Almost Never	6,60%	14,20%
	Never	15,10%	49,10%
3. [Those responsible for executing and complying with strategic planning are the ones who should develop it.]	Always	0,90%	1,90%
	Almost Always	1,90%	3,80%

	Sometimes	1,90%	2,80%
	Almost Never	5,70%	16,00%
	Never	15,10%	50,00%
4. [The company's strategies are designed to strengthen customer commitment and expand the company's market share.]	Always	0,90%	1,90%
	Almost Always	1,90%	2,80%
	Sometimes	2,80%	7,50%
	Almost Never	5,70%	11,30%
	Never	14,20%	50,90%
5. [The company's internal customers participate in business decisions.]	Always	0,90%	1,90%
	Almost Always	4,70%	0,90%
	Sometimes	0,00%	0,00%
	Almost Never	5,70%	20,80%
	Never	14,20%	50,90%
6. [Process management within the company is an indicator that allows bottlenecks and areas for improvement to be identified]	Always	0,90%	1,90%
	Almost Always	3,80%	0,90%
	Sometimes	0,00%	1,90%
	Almost Never	13,20%	43,40%
	Never	7,50%	26,40%
7. [Mechanisms are designed to evaluate the organization's key results, and these are linked to the company's improvement plan]	Always	0,90%	2,80%
	Almost Always	0,90%	1,90%
	Sometimes	5,70%	12,30%
	Almost Never	4,70%	9,40%
	Never	13,20%	48,10%
	Always	0,90%	2,80%
	Almost Always	1,90%	2,80%
8. Quality policies are implemented to enhance the added value of the company.	Sometimes	0,90%	4,70%
	Almost Never	7,50%	19,80%
	Never	14,20%	44,30%
	Always	1,90%	3,80%
	Almost Always	1,90%	7,50%
9. Evaluation techniques are applied to production and management processes.	On Occasions	3,80%	4,70%
	Almost Never	5,70%	12,30%
	Never	12,30%	46,20%

Between 49% and 52.8% of companies selected the option “never,” implying that senior management is not committed to implementing and disseminating the mission, vision, and values,

and that they are not involved in improving and developing the management system. Fifty percent of respondents selected the option “never,” which implies that those responsible for executing and complying with strategic planning do not develop it; that 50.9% of the company's strategies are not customer- or market-oriented; and that 50.9% of internal customers do not participate in business decisions. 26.40% point to process management as an indicator; 48.10% point to the design of mechanisms to evaluate the organization's key results; 44.30% of the companies surveyed implement quality policies to enhance the added value of the companies; 46.20% of the companies apply evaluation techniques to production and management processes.

Exploratory factor analysis

The confirmatory factor model is applied, with one parameter being that the research variable must have at least three indicators. This analysis is used as a starting point to determine whether the variables are correlated and to discover which variable can be omitted from the present investigation.

Under the arithmetic mean criterion, the value known as variance is selected for each component. It must be verified that:

$$\lambda_h > \bar{\lambda} = \frac{\sum_{i=1}^p \lambda_i}{\sum_{j=1}^p \lambda_j = p}$$

If the original variables are typed, since the mean inertia is equal to 1, the factors whose inertia is greater than 1 will be retained.

The structure of the scale, i.e., the construct validity, was applied to factor analysis using the principal component method.

Table 4 MV Factor Analysis, Bartlett's Test.

KMO and Bartlett's test		
Kaiser-Meyer-Olkin sample adequacy measure.		0,833
Bartlett sphericity test.	Approximate chi-square	831,875
	Gl	66
	Sig.	0

The Bartlett test has a value of 0.833, which means that the factorial method is feasible. The sphericity test shows normality, which reaffirms the usefulness of the statistical technique for establishing the relationship between the Malcolm Baldrige model and productivity.

Table 5 Analysis of variances and determination of factors and variables.

Total variance explained

Component	Initial self-values			Sums of the squared saturations of the extraction		
	Total	% of variance	cumulative %	Total	% of variance	cumulative %
1	5,964	49,698	49,698	5,964	49,698	49,698
2	1,465	12,211	61,908	1,465	12,211	61,908
3	1,218	10,151	72,059	1,218	10,151	72,059
4	,784	6,531	78,590			
5	,592	4,929	83,519			
6	,527	4,390	87,910			
7	,402	3,350	91,260			
8	,335	2,793	94,053			
9	,286	2,380	96,433			
10	,200	1,663	98,096			
11	,140	1,167	99,263			

12,088,737 100,000

Extraction method: Principal component analysis.

Table Factor identification matrix.

Component matrix^a

	Component		
	1	2	3
1. Answer as objectively as possible: [The commitment of managers to implementing and promoting the company's mission, vision, values, and culture of quality is clearly evident].	,611	,498	-,467
2. Answer as objectively as possible: [Managers are involved in the development and improvement of the management system by identifying the activities that those involved within the organization should carry out].	,676	-,066	-,433
3. Answer as objectively as possible: [Those responsible for implementing and ensuring compliance with strategic planning are the ones who should develop it].	,763	-,003	-,503
4. Answer as objectively as possible: [The company's strategies are designed to strengthen customer commitment and expand the company's market share].	,593	,571	,209
5. Answer as objectively as possible: [Internal customers within the company participate in business decisions]	,663	,542	,213

6. Answer as objectively as possible: [Process management within a company is an indicator that allows bottlenecks and areas for improvement to be identified].	,580	,330	,555
7. Answer as objectively as possible: [Mechanisms are designed to evaluate the organization's key results, and these are linked to the company's improvement plan].	,766	-,077	-,086
8. Quality policies are implemented to enhance the added value of the company.	,675	-,287	,066
9. Evaluation techniques are applied to production and management processes.	,865	-,298	-,006

Extraction method: Principal component analysis.

The table above analyzes the number of items belonging to each of the components: Leadership, Process, and Results. Those that are not within the threshold of 0.5 should be considered.

Generated factors

The weight in Table 6 allows for the design of the table of generated factors. It should be noted that the components were determined according to the author's criteria, who established the components based on theoretical similarity: Leadership, Process, and Results.

Table 6 Identification matrix of factors generated with a weight of less than 0.5

MODELS	Component/variable Latent	Indicators
MODEL 1 (MMB)	LEADERSHIP	MMB1, MMB2, MMB
	PROCESSES	MMB3, MMB4, MMB5
	RESULTS	MMB6, MMB7, MMB8
	PRODUCTION	PC1, PC2, PC

Note: Under this analysis, model validation is determined, which involves using the model to evaluate the model and productivity.

Model adjustment

The application of structural factors can be discerned through model fit. In order to measure the correlation fit between variables, it is necessary to avoid discrepancies between the proposed and observed correlations, i.e., a poor model fit.

The metrics employed to ascertain the goodness of fit are delineated in the ensuing tables, which establish the upper and lower limits (Hossain et al., 2021).

Figure 1 Model adjustment measures

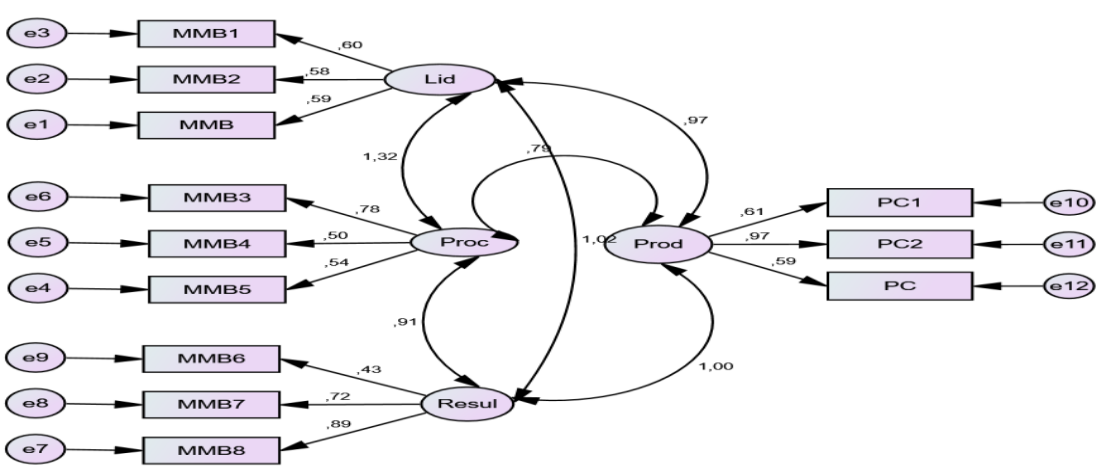
Measure	Threshold
Chi-square/df (cmin/df)	< 3 good; < 5 sometimes permissible
p-value for the model	> .05
CFI	> .95 great; > .90 traditional; > .80 sometimes permissible
GFI	> .95
AGFI	> .80
SRMR	< .09
RMSEA	< .05 good; .05 - .10 moderate; > .10 bad
PCLOSE	> .05

The path diagram was used to adjust the model in order to visualize the correlations and the respective adjustment.

Figure

2

Path diagrams are presented under standardized estimates. Malcolm Baldrige Model
MODEL 1



The trajectory diagram. The correlation between items and factors can be observed; the following table shows the factors from lowest to highest, taking into account, for the lowest (< 0.5) and highest (> 0.5).

Table

7

Malcolm Baldrige Model–Factor Analysis

MODELS	COMPONENT	LOW	HIGH
MODELO 1 (MMB)	LEADERSHIP		MMB1, MMB2, MMB
	PROCESSES		MMB3, MMB4, MMB5
	RESULTS	MMB6	MMB7, MMB8
	PRODUCTION		PC1, PC2, PC

In terms of the model, the weakness lies in the performance indicators, with a high correlation between processes and productivity. This implies the absence of mechanisms to evaluate the organization's key results and link them to the company's improvement plan.

DISCUSSION

The objective of the present study is to ascertain the relationship between the elements of the Malcolm Baldrige model and productivity levels in the Tungurahua textile sector. To this end, structural equations (SEM) were utilized, a tool that identified three key dimensions: leadership, process, and results, which demonstrated a substantial weight of 72.06%. However, the most salient findings indicated that leadership and its implementation are deficient. Moreover, the findings demonstrated a robust correlation between process management and productivity. Finally, the findings indicated an inadequate relationship between the evaluation of results and organizational improvement plans. The initial finding indicates a modest correlation between leadership and productivity. However, when considering the findings of Rodríguez B. (2009), who asserts that leadership constitutes a central axis of the model, the results obtained indicate that, in more than 50% of the surveyed companies, managers communicate the organizational mission, vision, and values, while their implementation is relegated to a secondary role. One potential explanation for this phenomenon is resistance to change, which is prevalent in conventional organizational structures. This assertion can be explained by the fact that, although the Baldrige model is theoretically robust, for it to be successful, it needs to be fully embraced by managers. Consequently, for this or any other model to achieve success, it is imperative to enhance management capabilities. In contrast, the processes exhibited a substantial correlation with productivity. Indicators such as strategic planning, customer focus, and human talent management demonstrated factor loadings greater than 0.6, which is consistent with the findings of Camisón et al. (2006) and Miranda & Reyes-Chua (2021). These researchers argue that for companies to possess a structure with operational efficiency and adaptability to the environment, efficient process management is imperative. The findings indicate that companies that implement effective process management strategies enhance their productivity and, consequently, their economic performance. In this sense, it is reaffirmed that process management is a lever for raising productivity levels.

When the results are analyzed, the data reveal a structural weakness; nearly 50% of the companies surveyed lack evaluation tools for achieving the objective, and they do not adopt the integration of results into improvement plans. This finding contradicts the prevailing expectations, particularly in light of the Baldrige model's assertion of a results-based approach as a fundamental principle (Hossain et al., 2021). One potential explanation for this phenomenon is the absence of structured information systems within companies, a deficiency that can hinder efforts to ensure the consistent quality of their products and services. In the context of productivity indicators, a robust correlation was identified with process-related dimensions. This finding suggests that business productivity is not an isolated entity but rather a consequence of effective planning, execution, and monitoring of processes. This assertion aligns with the conclusions of Serna-Mosquera & Agualimpia-Ortiz (2016), who posit that the effective utilization of human, technological, and financial resources is imperative for the attainment of strategic objectives. Therefore, this study presents empirical evidence that supports the view that business productivity is subject to a systematic approach.

A notable strength of this study is the implementation of the SEM model in a relatively unexplored context, namely the textile sector in Tungurahua. In addition, the implementation of robust statistical tests, including MKO and Cronbach's alpha, substantiates the reliability and validity of the instruments utilized. However, it must be acknowledged that the present study is not without its limitations. The primary concern pertains to the potential for bias in the respondents' responses, as they may be subjective due to their self-perception of internal processes. However, content validation tools were employed by experts to mitigate this risk. This scenario may serve as a foundation for future studies that could employ longitudinal methodologies or data triangulation to enhance the findings.

CONCLUSION

The findings indicate a positive association between the Malcolm Baldrige model and productivity, particularly in terms of processes. The adoption of a structured approach to operations, customers, and human talent has been demonstrated to be correlated with enhanced organizational efficiency.

Conversely, critical domains such as strategic leadership and results evaluation must be addressed to enhance business performance.

The findings demonstrate the applicability of the model in productive sectors, such as textiles. The model provides a framework for future research that could delve deeper into the adoption of variables, such as innovation, sustainability, or financial focus.

REFERENCES

1. Aguado Ligan, A. M., García Bravo, B., Malpartida Gutiérrez, J. N., & Garivay Torres De Salinas, F. D. M. (2022). Gestión de calidad en pequeñas y medianas empresas de Pasco, Perú. *Revista Venezolana de Gerencia*, 27(Edición Especial 7), 709–726. <https://doi.org/10.52080/rvgluz.27.7.46>
2. Aguilar Bustamante, M. C., López López, W., Barreto, I., Rey, Z. B., Rodríguez, C., & Vargas, E. C. (2007). Análisis bibliométrico de los trabajos de grado del área organizacional de la Facultad de Psicología de la Universidad Santo Tomás. *Diversitas*, 3(2), 317–334. <https://doi.org/10.15332/s1794-9998.2007.0002.11>
3. Agustín, I. C. L., Francisco, O. A., & Griselda, D. A. (2022). Characterization of the productivity of a Mexican technology development company through fuzzy control. *Revista de Metodos Cuantitativos Para La Economia y La Empresa*, 34(34), 281–304. <https://doi.org/10.46661/revmetodoscuanteconempresa.5374>
4. Armijos, M. E., & Angulo, E. R. (2018). Principios de calidad en las pequeñas y medianas empresas ecuatorianas. *Espacio*, 39 (Nº48), 22. <http://www.revistaespacios.com/a18v39n48/a18v39n48p22.pdf>
5. Asociación de Industriales Textiles del Ecuador. (2024). Boletín estadístico Febrero 2024 Dirección técnica. <https://www.aite.com.ec/boletines.html>
6. Aydın, S., & Kahraman, C. (2019). Evaluation of firms applying to Malcolm Baldrige National Quality Award: a modified fuzzy AHP method. *Complex and Intelligent Systems*, 5(1), 53–63. <https://doi.org/10.1007/s40747-018-0069-9>
7. Aza, C. (2016). Análisis de productividad y medición de la PTF por rama de actividad de la economía española (1995-2007): relación con las TIC y otros determinantes [Universidad Autónoma de Madrid]. In Universidad Autonoma de Madrid. https://repositorio.uam.es/bitstream/handle/10486/677771/aza_custodio_claudia.pdf?sequence=1&isAllowed=y
8. Becerra-Peña, D. L., & Lemos Mejía, M. X. (2021). La productividad del sector manufacturero: caso Colombia 2005-2016. *Revista Mexicana de Economía y Finanzas*, 16(4), 1–27. <https://doi.org/10.21919/remef.v16i4.527>
9. Bernal, C. (2010). Metodología de la investigación (Vol. 3, Issue 1). Pearson Educación. <http://journal.um-surabaya.ac.id/index.php/JKM/article/view/2203>
10. Cabezas, E., Andrade, D., & Torres, J. (2018). Introducción a la metodología de la Investigación Científica. In ESPE (Ed.), ESPE. (Vol. 1, Issue 1). [https://repositorio.espe.edu.ec/bitstream/21000/15424/1/Introduccion a la Metodologia de la investigacion cientifica.pdf](https://repositorio.espe.edu.ec/bitstream/21000/15424/1/Introduccion%20a%20la%20Metodologia%20de%20la%20investigacion%20cientifica.pdf)
11. Cadena, O. (2018). Gestión de la Calidad y Productividad. In Universidad de las Fuerzas Armadas ESPE (Vol. 1, Issue 1). Universidad de las Fuerzas Armadas ESPE. [https://repositorio.espe.edu.ec/bitstream/21000/15416/1/GESTION DE LA CALIDAD Y PRODUCTIVIDAD.pdf](https://repositorio.espe.edu.ec/bitstream/21000/15416/1/GESTION%20DE%20LA%20CALIDAD%20Y%20PRODUCTIVIDAD.pdf)
12. Camisón, C., Cruz, S., & Gonzáles, T. (2006). Gestión de la calidad: Conceptos, enfoques, modelos y sistemas. In Pearson Educación (Alberto Ca, Vol. 1). <http://dspace.ups.edu.ec/bitstream/123456789/5081/1/UPS-CYT00109.pdf>
13. Cancino, N., González, C., Gallardo, I., & Estrada, C. (2016). Evaluation of a conceptual quality of life model built from data. *Acta Colombiana de Psicología*, 19(1), 297–309. <https://doi.org/10.14718/ACP.2016.19.1.13>
14. Carbó-Carreté, M., Guàrdia-Olmos, J., Giné, C., & Schalock, R. L. (2016). A Structural Equation Model of the relationship between physical activity and quality of life. *International Journal of Clinical and Health Psychology*, 16(2), 147–156. <https://doi.org/10.1016/j.ijchp.2015.11.001>
15. Cardona, F. (2008). Propuesta metodológica para la medición de la productividad a través de indicadores de gestión y evaluación práctica en XM compañía de expertos en mercados S.A. E.S.P. filial del grupo ISA (Vol. 1, Issue 5). Antioquia.
16. Carvajal Larenas, R. P., Saltos Cruz, J. G., & Camacho Tipán, H. J. (2018). Factores determinantes de la productividad: Un análisis multivariante de la industria ecuatoriana. *Ciencia Digital*, 2(4), 236–256. <https://doi.org/10.33262/cienciadigital.v2i4.228>
17. Colmenares, O. (2009). MEDICION DE LA PRODUCTIVIDAD EMPRESARIAL Oscar A. Colmenares.
18. Cortés, E. L. A. U. (2017). Tesis Doctoral Eficiencia Y Productividad Del Sistema.
19. Covas, D., Hernández, G. D., Cabello, J. J., & Crespo, L. (2020). Modelo de ecuaciones estructurales con variables influyentes en la calidad de vida urbana. Caso de estudio: ciudad de Cienfuegos, Cuba. *Ingeniare. Revista Chilena de Ingeniería*, 28(3), 499–513. <https://doi.org/10.4067/s0718-33052020000300499>
20. Cubillos, M. C., & Roza, D. (2009). El concepto de calidad: Historia, evolución e importancia para la competitividad. *Revista Universidad de La Salle*, 0(48), 80–99. <https://ciencia.lasalle.edu.co/cgi/viewcontent.cgi?article=1170&context=ruls>
21. Curran, P. J., West, S. G., & Finch, J. F. (1996). The Robustness of Test Statistics to Nonnormality and Specification Error in Confirmatory Factor Analysis. *Psychological Methods*, 1(1), 16–29. <https://doi.org/10.1037/1082-989X.1.1.16>
22. De Carvalho, J. R. M., Chim-Miki, A. F., Da Silva, C. C., & De Araujo Carvalho, E. K. M. (2019). Análisis Multicriterio de la Competitividad Empresarial bajo triple perspectiva: Financiera, Gobernanza Corporativa y Sostenibilidad Multicriteria Analysis of Business Competitiveness by triple perspective: Financial, corporate governance and sustainabili. *Journal Globalization, Competitiveness and Governability*, 13(2), 116–131.

<https://doi.org/10.3232/GCG.2019.V13.N2.06>

23. Domínguez, G. (2020). Herramienta de mejora continua para la optimización de los procesos en el almacén de avíos de la empresa arte textil latino sac. *Revista De Ciencias Empresariales*, 8–33. <https://innovacienciasbusiness.org/index.php/ISB/article/view/21>
24. Farfán-Pimentel, J. F., Godoy-Cedeño, C. E., Delgado-Arenas, R., & Abad-Escalante, K. M. (2023). Las ecuaciones estructurales y sus aplicaciones técnicas: Un análisis teórico. *Ciencia Latina Revista Científica Multidisciplinar*, 7(3), 273–287. https://doi.org/10.37811/cl_rcm.v7i3.6182
25. Felsinger, E., & Runza, P. (2014). Productividad: un estudio de caso en una universidad del CEMA - Maestría en Dirección de Empresas. In *TEC Empresarial* (Vol. 8, Issue 2). https://ucema.edu.ar/posgrado-download/tesinas2002/Felsinger_MADE.pdf
26. Fernando, D. F., Inma, R. A., & Antoni, M. A. (2018). Models of structural equations in social science research: User experience in Facebook. *Revista de Ciencias Sociales*, 24(1), 22–40.
27. Franco-Paredes, K., Díaz-Reséndiz, F. de J., Pineda-Lozano, J. E., & Hidalgo-Rasmussen, C. A. (2016). Bibliometric analysis of scientific production of Mexican Journal of Eating Disorders, 2010-2014. *Revista Mexicana de Trastornos Alimentarios*, 7(1), 9–16. <https://doi.org/10.1016/j.rmta.2016.03.001>
28. Gaitán, L. K. (2007). Diseño de un Modelo de Gestión de la calidad Basado en los Modelos de Excelencia y el Enfoque de Gestión por Procesos. In *Vasa*. <http://manglar.uninorte.edu.co/bitstream/handle/10584/86/32884145.pdf?sequence=1>
29. García Veiga, M. Á. (2011). Análisis Causal Con Ecuaciones Estructurales De La Satisfacción Ciudadana Con Los Servicios Municipales. *Eio.Usc.Es*, 1–125. http://eio.usc.es/pub/mte/descargas/proyectosfinmaster/proyecto_610.pdf
30. Gryna, F. M., Chua, R. C., & Defeo, J. A. (2007). Método Juran. Análisis y planteamiento de la calidad.
31. Haktanir, E. (2020). Interval valued Pythagorean fuzzy aggregation operators based Malcolm Baldrige National Quality Award assessment. *Journal of Intelligent and Fuzzy Systems*, 39(5), 6431–6441. <https://doi.org/10.3233/JIFS-189108>
32. Hernández, H., Barrios Parejo, I., & Martínez, D. (2018). Gestión de la calidad: elemento clave para el desarrollo de las organizaciones. *Criterio Libre*, 16(28), 169–185. <https://doi.org/10.18041/1900-0642/criteriolibre.2018v16n28.2130>
33. Hernández, R., Fernández, C., & Baptista, M. del P. (2014). Metodología de la Investigación. In *McGRAW-HILL* (McGRAW-HILL).
34. Hofman, A., Matilde, M., Aravena, C., & Fernández de Guevara, J. (2017). Crecimiento económico y productividad en Latinoamérica Economic Growth and Productivity in Latin America: LA-KLEMS. *El Trimestre Económico*, 84(334), 259–306. <https://www.scielo.org.mx/pdf/ete/v84n334/2448-718X-ete-84-334-00259.pdf>
35. Hossain, M. S., Mostafa, M. G., & Hossain, M. A. (2021). Modeling tourists' satisfaction in the nature-based tourist destination using structural equation modeling technique. *Geojournal of Tourism and Geosites*, 37(3), 814–822. <https://doi.org/10.30892/GTG.37311-713>
36. Insuasti, P. R. M., & Silva, E. (2022). A joint analysis of service quality: A case study of SERVQUAL and INTSERVQUAL models in Ecuadorian lodges. *Investigaciones Turísticas*, 23, 239–265. <https://doi.org/10.14198/INTURI2022.23.11>
37. Luna Vicharra, I. M., & Armanda Pacheco, J. M. (2022). Impacto de los indicadores de productividad en la gestión empresarial. *Revista de Filosofía*, 39(101), 567–581.
38. Mariño, M. del C. (2017). Impacto de Sistemas de Gestión de Calidad en Centros Educativos de Galicia.
39. Maya-Mendoza, J. (2014). Método para lograr la calidad en las organizaciones. *Punto de Vista*, 5(8). <https://doi.org/10.15765/pdv.v5i8.485>
40. Medina, J. E. (2010). Modelo integral de productividad, aspectos importantes para su implementación. *Revista Escuela de Administración de Negocios*, 69, 110–119. <https://doi.org/10.21158/01208160.n69.2010.519>
41. Miranda, R. D., & Reyes-Chua, E. (2021). Best practices in quality assurance in selected higher education institutions (Heis) in the philippines in the light of the malcolm baldrige framework. *WSEAS Transactions on Environment and Development*, 17, 533–545. <https://doi.org/10.37394/232015.2021.17.51>
42. Molina, D., & Sánchez-Riofrío, A. (2016). Factores de competitividad orientados a la pequeña y mediana empresa (PYME) en Latinoamérica: Revisión de la literatura. *Revista San Gregorio*, 15, 5–24. <https://doi.org/10.18356/53a19772-es>
43. Morelos Gómez, J., & Núñez Bottini, M. Á. (2017). Productividad de las empresas de la zona extractiva minera-energética y su incidencia en el desempeño financiero en Colombia. *Estudios Gerenciales*, 330–340. <https://doi.org/10.1016/j.estger.2017.11.002>
44. Ormaza, M. G., & Guerrero-Baena, M. D. (2021). Gestión de calidad y crecimiento empresarial: Análisis bibliométrico. *Revista Venezolana de Gerencia*, 26(93), 318–333. <https://doi.org/10.52080/rvg93.22>
45. Ortiz, M. S., & Fernández-Pera, M. (2018). Modelo de Ecuaciones Estructurales: Una guía para ciencias médicas y ciencias de la salud. *Terapia Psicológica*, 36(1), 51–57. <https://doi.org/10.4067/s0718-48082017000300047>
46. Parast, M. M., & Safari, A. (2022). Do quality and business excellence models improve quality and operational results in educational organizations? A repeated cross-sectional analysis. *Operations Management Research*, 0123456789. <https://doi.org/10.1007/s12063-022-00332-1>
47. Pastor, A. (2013). Comparación De Los Modelos De Evaluación De La Excelencia Empresarial. *Tourism & Management Studies*, 4, 1058–1072. <http://www.redalyc.org/articulo.oa?id=388743877002>
48. Pérez-Achaval, M. C. (2015). Un Modelo de Gestión de la Calidad para Proyectos de Inteligencia Territorial (MGCPIT): aplicación al caso de Buenavista de Apasco, Macuspana, Tabasco, México (Issue 1088592285). *Huelva*.

49. Piva, M., Tani, M., Vivarelli, M., Van den Bosch, J., Vanormelingen, S., Bisztray, M., de Nicola, F., Muraközy, B., Camino-Mogro, S., Carrillo-Maldonado, P., Deshaware, Y. B., Zoaka, J. D., Güngör, H., Zaman, A. U., Khan, N. A., Sun, G., Lin, X., Chen, J., Xu, N., ... Rossello, G. (2023). High-growth firms' contribution to aggregate productivity growth. *Small Business Economics*, 60(2), 771–811. <https://doi.org/10.1057/s41599-023-01561-w>
50. Portela Maquieira, S., Tari, J. J., & Molina-Azorin, J. F. (2022). Asociaciones entre el liderazgo transformador y las prácticas de gestión de la calidad en hoteles españoles. *Investigaciones Turísticas*, 24(24), 106. <https://doi.org/10.14198/inturi2022.24.6>
51. Ramírez, G. G., Magaña, D. E., & Ojeda, R. N. (2022). Productividad, aspectos que benefician a la organización. Revisión sistemática de la producción científica. *Trascender, Contabilidad Y Gestión*, 8(20), 189–208. <https://doi.org/10.36791/tcg.v8i20.166>
52. Raya, M. A., & Núñez, R. (2015). La productividad, un pilar importante en la ventaja competitiva de las organizaciones: una perspectiva para la gestión de los factores que influyen en la productividad empresarial. *Portal de La Ciencia*, 77–88. <https://doi.org/10.5377/pc.v7i0.2134>
53. Rincón, I. C., Chaparro, J. E., & Garazón, M. (2022). Productividad empresarial y ética sindical: una mirada a Colombia. *HUMAN REVIEW. International Humanities Review / Revista Internacional de Humanidades*, 11(Monográfico), 1–14. <https://doi.org/10.37467/revhuman.v11.4145>
54. Rodríguez B., C. del C. (2009). Principios y teorías a ser aplicadas a los modelos de gestión de calidad de las universidades. *Contaduría Universidad de Antioquia*, 53, 197–224. <https://doi.org/10.17533/udea.rc.2210>
55. Roncalli, M. (2011). La calidad total en organizaciones y entornos complejos. https://repositorio.uam.es/bitstream/handle/10486/9300/48695_silva_maranhao_roncalli.pdf?sequence=1
56. Ruiz, M., Pardo, A., & San Martín, R. (2013). Modelos de ecuaciones estructurales. *Cirugía Plástica Ibero-Latinoamericana*, 39(SUPPL. 1), 34–45. <https://doi.org/10.2307/jj.4908187.3>
57. Saavedra, M. L. (2017). La competitividad de la Mipyme en el nivel micro: El caso de Querétaro, México. (The MSME competitiveness at the micro level: The case of Querétaro, México). *Revista En-Contexto*, 7, 176–203. <https://190.217.57.229/index.php/encontexto/article/view/453>
58. Sanabria, P., Romero, V., & Flores, C. (2014). El concepto de calidad en las organizaciones: una aproximación desde la complejidad. *Universidad & Empresa*, 16(27), 165–213. [file:///C:/Users/E5411-P3GV/Desktop/capitulo2 \(1\).pdf](file:///C:/Users/E5411-P3GV/Desktop/capitulo2%20(1).pdf)
59. Sánchez, M. G., Hernández, J. M., Molina, H. D., & García, M. de L. (2020). Colaboradores satisfechos - productividad empresarial. *Boletín Científico de La Escuela Superior Atotonilco de Tula*, 7(14), 4–9. <https://doi.org/10.29057/esat.v7i14.6034>
60. Santamaría-Freire, E. J., & Pico-Barrionuevo, F. P. (2015). La calidad de vida del propietario de la empresa familiar, caso empresas de Ambato, Tungurahua, Ecuador. *Sotavento M.B.A.*, 25, 66. <https://doi.org/10.18601/01233734.n25.08>
61. Serna-Mosquera, Y. B., & Agualimpia-Ortiz, L. J. (2016). Caracterización de la productividad de las ebanisterías de Quibdó, Chocó-Colombia. *Entramado*, 12(2), 206–219. <https://doi.org/10.18041/entramado.2016v12n2.24210>
62. Soledispa, F. (2017). La Calidad Y Competitividad En Las Empresas De La Ciudad De Manta-Ecuador. *Revista Científica Multidisciplinaria*, 3, 9–18. <http://45.238.216.13/ojs/index.php/mikarimin/article/view/832>
63. Unger, K. (1993). Productividad, desarrollo tecnológico y competitividad exportadora en la industria mexicana. *Economía Mexicana (Nueva Época)*, II(1), 183–237.
64. Valero Camino, M. I. (2024). Productivity and economic growth of manufacturing SMEs in an Ecuadorian locality. *Sapienza*, 5(2), 1–9. <https://doi.org/10.51798/sijis.v5i2.749>