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Evaluación de la Validez de Contenido de un Instrumento de Medición de los Factores de la Innovación de la Cadena de Suministro en la Industria Láctea

Evaluating the Content Validity of a Supply Chain Innovation Factors Measurement Instrument in the Dairy Industry

Avaliação da validade de conteúdo de um instrumento para medir os fatores de inovação na cadeia de abastecimento na indústria de lacticínios

Gabriela Margarita Reyna García
Instituto Tecnológico de Monterrey, Campus Monterrey, México
greynag@tec.mx
https://orcid.org/0000-0001-7175-5361

Rafael García Martínez
Tecnológico Nacional de México, IT Hermosillo, México
gamrmx@yahoo.com
https://orcid.org/0000-0001-7175-5361

Eduardo Rafael Poblano-Ojinaga*
Tecnológico Nacional de México, IT la Laguna, México
pooe_65@hotmail.com
https://orcid.org/0000-0003-3482-7252

Vianey Torres-Arguelles
Universidad Autónoma de Ciudad Juárez
vianey.torres@uacj.mx
https://orcid.org/0000-0003-0978-3796

*Autor corresponsal

Resumen

El desarrollo de capacidades tecnológicas es una condición necesaria para aumentar la competitividad. Para ello, se implementan proyectos de mejora e innovación en las cadenas de suministro, dichas estrategias son indispensables en los mercados actuales altamente competitivos. Por lo tanto, es fundamental que estos proyectos tengan éxito. Sin embargo, la literatura y la práctica industrial ofrecen una amplia variedad de proyectos alternativos, lo que dificulta determinar el más adecuado. El objetivo de este trabajo es diseñar y evaluar la validez de contenido de un instrumento para medir la contribución de los factores del proyecto e identificar así los factores críticos. Los factores son identificados mediante una revisión bibliográfica, siendo ellos, el dinamismo del entorno, la orientación al conocimiento, la orientación a la calidad, la gestión de procesos y la colaboración. Estos factores se utilizan para construir el instrumento de medición, cuya validez de contenido se evalúa mediante el juicio de diez expertos. Estos juicios se analizan mediante el Índice de Validez de Contenido de Lynn (I-ICV, S-CVI/ave). Los resultados muestran que el instrumento de medición tiene una validez de contenido con un nivel de significancia del 5%. El instrumento de medición es una herramienta útil para obtener la información necesaria para construir modelos que expliquen la relación entre los factores de éxito de los proyectos de innovación tecnológica en las cadenas de suministro y se puedan formular estrategias y desplegar proyectos.

Palabras clave: validez de contenido del instrumento de medición, juicio de expertos, factor crítico de éxito, innovación en la cadena de suministro.

Abstract

Developing technological capabilities is a necessary condition for increasing competitiveness. To this purpose, improvement and innovation projects are implemented in supply chains, which are strategic in today's highly competitive markets. Therefore, it is essential that these projects succeed. However, the literature and the industrial practices offer a wide variety of alternative projects, making it difficult to determine the most suitable one. The objective of this work is to design and evaluate the content validity of an instrument to measure the contribution of project factors and thus identify the critical factors. The factors are identified through a literature review: the dynamism of the environment, knowledge orientation, quality orientation, process management, and collaboration. These factors are used to construct the measurement instrument, whose content validity is evaluated by the judgment of ten experts. These judgments are analyzed using Lynn's Content Validity Index (I-ICV, S-CVI/ave). The results show that the measurement instrument has content validity with a significance level of 5%. The measurement instrument is a useful tool for obtaining the information needed to build models that explain the relationship between the success factors of technological innovation projects in supply chains and formulate strategies.

Keywords: content validity of the measurement instrument, expert judgment, critical success factor, supply chain innovation.

Resumo

O desenvolvimento de capacidades tecnológicas é uma condição necessária para o aumento da competitividade. Para tal, são implementados projetos de melhoria e inovação em cadeias de abastecimento, que são estratégicas nos mercados altamente competitivos da atualidade. Por isso, é essencial que estes projetos sejam bem-sucedidos. Contudo, a literatura e a prática industrial oferecem uma ampla variedade de projetos alternativos, dificultando a determinação do mais adequado. O objetivo deste trabalho é desenvolver e avaliar a validade de conteúdo de um instrumento para medir a contribuição dos fatores de projeto e, assim, identificar os fatores críticos. Os fatores identificados através de uma revisão da literatura são o dinamismo do ambiente, a orientação para o conhecimento, a orientação para a qualidade, a gestão de processos e a colaboração. Estes fatores são utilizados para construir o instrumento de medição, cuja validade de conteúdo é avaliada pela opinião de dez especialistas. Estas opiniões são analisadas através do Índice de Validade de Conteúdo (I-ICV, S-CVI/ave) de Lynn. Os resultados mostram que o instrumento de medição tem uma validade de conteúdo com um nível de significância de 5%. O instrumento de medição é uma ferramenta útil para a obtenção da informação necessária para a construção de modelos que expliquem a relação entre os fatores de sucesso dos projetos de inovação tecnológica nas cadeias de abastecimento.

Palavras-chave: validade de conteúdo do instrumento de medição, opinião de especialistas, fator crítico de sucesso, inovação na cadeia de abastecimento.

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Introduction

The Supply Chain (SC) comprises the processes and flows of materials and information beginning with the purchase of materials, including production operations, all through to the physical distribution and sale of the product. This is a complex issue, shaped by a variety of factors, both external and internal. Among the external factors, competitive competition and the dynamic nature of the environment stand out; while internally, the complexity stems from the management of the supply chain, which is a very broad issue because of the diversity of factors involved, as well as the fact that the critical success factors (CSFs) for supply chain innovation are not fully identified.

Besides, the literature is still in full development and that there is no consensus in the determination of the Critical Success Factors (CSF's), nor their relative impact on the success of the Supply Chain Innovation Process (SCIP). As well as the activities aimed at the improvement and innovation of technological capabilities, the reduction of costs and the management of finances to develop the competitive advantage required to satisfy the demands of customers and compete successfully in the markets (Mentzer et al., (2001) ; Yao et al., (2020), factors that together, make up a complex problem.

According to Porter (1998) the company's competitiveness depends on its capacity to innovate and improve, thus establishing a close relationship between innovation capacity and competitiveness. Innovation is a necessary condition for developing competitiveness (Navas & Nieto, 2003). Hidalgo et al. (2002) state that the most competitive companies must be more innovative if they want to maintain that advantage, while Lugones et al. (2007) add that innovative companies not only increase the competitiveness of the economy but also generate technological improvements for economic agents. Therefore, innovation and technological development in the supply chain are essential as elements that contribute to increasing the competitiveness of companies.

Mexico's dairy industry is economically important, contributing 16% to the GDP and generating 600,000 direct jobs and over one million indirect jobs. Additionally, 95% of the milk consumed in the country is processed, and 50% of dairy exports are infant formula. However, production is insufficient, as 30% of the milk is imported according to Canilec (2022), making it necessary to increase its competitiveness.

To increase the sustainable competitiveness of dairy companies, it is necessary to implement projects that create and develop relevant technological capabilities in the supply chain and in their products. Specifically, innovations and technological development are required in products, processes, and marketing within companies in this sector. However, the results of innovation and technological development projects often fall short of expectations. This situation is partly due to the lack of a model that establishes the causal relationship between innovation factors and the project's success—that is, the effects each factor has on the Supply Chain Innovation Process (SCP). This lack can compromise the efficient and effective management of innovation and supply chain projects, as Drucker (2004) points out.

The objective of this research is to design and evaluate the content validity of a measurement instrument of the factors influencing the supply chain innovation processes. This work considers the management of these projects as an Innovation Process (IP) and requires identifying the critical success factors (CSF's) and quantifying the effect of each one on achieving Sustainable Innovation (SI), with the aim of developing a model that establishes the causal relationships between the CSFs and success in the IP.

Factors of innovation in supply chains

There are internal and external factors determining the Innovation Processes Success Factors, (PICS). The former include Knowledge Orientation (KO), Quality Orientation (QO), and Process Management; the external factors include Environmental Dynamism (ED) and Collaboration (C), (Kafetzopoulos et al., 2020).

Knowledge management (KM) comprises the processes for capturing, creating, and developing knowledge, which establish business standards aimed at increasing organizational efficiency and effectiveness through the development of human skills and capabilities (Kafetzopoulos, 2020). Currently, most applications of this factor focus on Industry 4.0 principles, such as the Internet of Things (IoT), *Big Data*, *Machine Learning, and Deep Learning* . These technologies represent a significant opportunity within the supply chain, as they enable the automation of processes and operations. Furthermore, Industry 4.0 facilitates integration and connectivity throughout the supply chain, from raw material suppliers to the end consumer, facilitating supply chain control and the analysis of factors and opportunities for innovation (Fatorachian & Kazemi, 2020) .

In the application of Industry 4.0 in supply chain analysis, Stylos et al. (2020); Priore et al. (2019) and Shamout (2019), respectively, determined that 3D printing, *machine learning* and *big data* are suitable technologies to improve performance and increase the innovation capacity of the supply chain.

Customer perception (CPH) is the customer's perception of the quality of a product or service (Hamsioglu, 2011). Since this factor can increase competitive advantage, it is deeply rooted in the customer relationship and maintains a close relationship with environmental dynamics, because quality in the supply chain (SC) and customer perception is close associated to the environment in which the SC operates. Priore et al. (2019) applied the environmental dynamics factor to innovate within the SC using *machine learning* . They proposed a dynamic framework for selecting replenishment policies in a rapidly changing SC environment; they found that the developed algorithm showed an average accuracy of 88% in selecting the correct policy. On the other hand, Belhadi et al. (2021) empirically determined that the relationship between artificial intelligence (AI) and resilience is useful for increasing CS performance, and that the use of artificial intelligence and its data processing capabilities has a significant effect on CS performance. Process Management is essential to the very nature of any business or company, as it encompasses the set of related activities that result in a product or service that generates value. An effective and efficient organization identifies its core processes, for the delivery of its products/services and impact, considering the expectations of customers and other stakeholders, in line with its mission and strategy.

Collaboration in the supply chain is vital, it includes the participation of different actors in innovation activities promoting increased relationships with other organizations (customers, suppliers, research institutes) to strengthen or exploit new opportunities, according to Kafetzopoulos (2020). By creating new networks and gaining access to external knowledge and technologies, companies can facilitate the decision to commercialize innovations and/or improve their ability to offer and benefit from internal innovations and improvements (Materia et al., 2017) .

Factor Items

This section presents the results of the literature review conducted to identify the supply chain factors and their respective items, which are analyzed, selected and adapted to build the measurement instrument. Among the factors influencing supply chain performance are the dynamics of collaboration among its elements, technology, and innovation (Esser et al., 1996; Malaver and Vargas, 2006). The dynamism of technological change, information , *nearshoring*, forward and backward integration, the opening of borders, and other areas impact the development of a systematic approach to supply chain integration (Flynn et al., 2010). The use of technologies such as handheld electronic devices, voice recognition, barcodes, radio frequency identification, and mobile printing also contribute to increased efficiency.

The setting of objectives and the corresponding strategies to achieve them, involves managing innovation processes, which requires identifying the critical success factors (those that significantly influence innovation in the supply chain). The information generated by this identification is a useful tool for decision-makers in these types of companies, as it allows them to allocate resources optimally in managing these critical success factors.

Logistics and innovative supply chain management are priority trends that enable companies to achieve sustainable competitive advantages. To develop a Supply Chain Innovation Process (SCP), companies must identify their innovation opportunities and, based on them, formulate a strategy to achieve success in the SCP management. The increase in international trade and the complexity of logistics operations have meant that competitiveness among organizations is no longer measured solely by brands or points of sale, but by well-managed supply chains (Cooper et al., 1997), thus preserving competitive advantage (Baryannis et al., 2019). Therefore, it is important to make sound decisions that generate success in supply chain management, which requires identifying the critical success factors (CSF's) that determine supply chain competitiveness (Bughin et al., 2010).

Table 1 presents other factors of the competitiveness of the supply chain (Aranvidh and Ganesan, 2011) .

Table 1Chain Competitiveness Factors

References	Factors
Bower and Hout, 1988	Purchase order cycle time
Schonberger, 1990	Order processing time and delivery time
Rushton and Oxley, 1991	Order cycle and delivery process, product development cycle time.
Graham et al., 1994	Supplier support in resolving technical problems, supplier's ability to respond to quality issues
Stewart, 1995	Inventory cost
Thomas and Griffin, 1996	Supplier cost-saving initiatives
Mason J. and Towill, 1997	Supplier order placement methods
Levy, 1997	Cost of transporting information
Spekman et al., 1998	Level of buyer-supplier partnership
Gunasekaran et al., 2001	Total supply chain cycle time, supplier lead time, supplier defects, supplier rejection rate, accuracy of forecasting techniques, operating costs, delivery reliability, responsiveness to emergencies. Delivery schedule adherence, delivery service quality. Delivery documentation and frequency, quality of delivered products, achievement of defect-free deliveries, flexibility of service systems, perceived customer value, total cash flow time, customer query resolution time.
Tan, 2001	Effectiveness of the master production schedule.
Fuentes et al., 2004	Customer consultation time

Source: own elaboration

Statistical analysis for the validation of IM content

For the statistical analysis of the database obtained through the application of a measurement instrument to be reliable, it is necessary to verify the content validity of the instrument, regardless of whether other validity measures are achieved, as suggested by Almanaresh et al. (2019). Guillot et al. (2022) state that the method of the use of expert judgment to assess the validity of the IM content is the one that maximizes the plausibility of the measurement instruments. This method consists of integrating a group of people, experts on the subject, who decide if the items are sufficient, clear, coherent and relevant.

The procedure for validating the content of the measurement instrument consists of four stages. The first stage, known as "definition", consists of carrying out a literature review that serves as a basis for selecting the constructs and their corresponding items. In the second stage, by their judgments, the group of experts evaluate the sufficiency, clarity, coherence, and relevance of the items and the constructs of the measurement instrument using a Likert scale to score the items.

In the third stage, the statistical analysis informs if the agreement between the scores assigned by the judges is not attributable to chance. A fourth stage is carried out in case in stage 3 the measurement instrument is declared to have no content validity, and consists of restructuring and/or eliminating the items and/or constructs to restart in stage two, this process is repeated until content validity is satisfactory.

The evaluation of the content validity of the IM, tells if the proposed items correspond to a particular content domain to measure, using the knowledge and experience of the experts participating as judges. Applying the Content Validity Index (CVI, Lynn, 1986), Content Validity Ratio (CVR, Lawshe, 1975), Kendall's concordance test, (Polit et al., 2007) and the modified Kappa index, to test the hypotheses.

To test the hypothesis that inter-judge agreements are attributable to chance, Almanasreh et al. (2019) and Wilson et al. (2012) recommend using the CVR index due to its simplicity for comparison with other alternative criteria, the existence of tabular values for this indicator, and its ease of quantification. However, when the number of expert judges is eight, this critical value breaks the monotony observed in the rest of these values and to solve this problem, Wilson et al. (2012) propose the use of the indicator given in eq.1

$$CVR_{\propto} = \frac{z_{\propto}}{\sqrt{N}} \quad (1)$$

where N represents the number of expert judges who perform the evaluation, and $z_{\propto}$ corresponds to the quartile value of the standard normal distribution.

The use of the Content Validity Index (CVI) is an alternative to the CVR method due to its ease of calculation and understanding, thus, offering greater advantages due to its potential for discrimination (Romero et al., 2023). Furthermore, the CVI allows establishing the degree of agreement between judges at two levels: at the individual level for each item (I-CVI) and at the scale level, which records the agreement between judges on the measurement instrument as a whole (S-CVI) and is given by the indices S-CVI/ave and S-CVI/UA. The individual content validity for each item of the measurement instrument is determined by obtaining the rating that each expert gives to each item based on its relevance, clarity, pertinence and coherence with the corresponding construct. The ratings are compared to a critical value for the acceptance of each I-CVI, and those items that do not exceed the critical values are reviewed or excluded. Then, the content validity of the IM as a whole is determined using the average scale content validity index (S-CVI/ave) as the arithmetic mean of the I-CVI values of all items, where a "high" S-CVI/bird value indicates agreement between judges not attributable to experimental error.

For the content validity calculation process, a 4-point Likert scale is used, where 1 indicates no correspondence, 2 indicates poor correspondence, 3 indicates correspondence, and 4 indicates complete correspondence. To quantify the CVI indicators of the measurement instrument, responses from judges or experts equal to one or two are coded with the number zero, while responses with values of three or four are coded with the number one, calculating the values of the indicators with the response coding. Table 2 presents the indicators.

Table 2. CVI Indicators

Indicator	Name	Definition	Formula
I-CVI	Content validity index per item	Proportion of judges who declare the item essential	$I - CVI = \frac{k}{N}$ k =# of essential items N =# of judges
S-CVI/ave	Content validity index for the scale, based on the average method	Arithmetic mean of the **I-CVI** of the items ; or as the proportion of items evaluated as essential by each judge (j_i).	$\mathbf{S - CVI/ave} = \frac{\sum_{i=1}^{n}(\mathbf{I - CVI}_i)}{n}$ $(\mathrm{I - CVI}_i)$ =I-CVI of the item$i$ n =# items either $\mathbf{S - CVI/ave} = \frac{\sum_{i=1}^{n} j_i}{N}$

Source Yusoff, (2029).

To evaluate the I-CVI, which examines each item individually, it is necessary to establish the proportion of experts who judged the item as fundamental. That is, those who assigned a rating of three or four, meaning a coding with the number one, according to Polit et al. (2007). An item is declared excellent if its I-CVI indicator value is equal to 1, if the number of experts is between 3 and 5; and equal to 0.78 for between 6 and 10 experts. The average scale content validity index (S-CVI/ave) value is determined as the arithmetic mean of all previously evaluated I-CVI values. Likewise, the S-CVI/ave is acceptable if it reaches a value bigger than or equal to 0.90. The value of the cumulative scalar/universal content validity index (S-CVI/UA) is calculated as the proportion of items rated as essential and its critical acceptance value is equal to 0.80 (Shi, et al, 2012).

Regarding the T indices, Gwet's AC1, Cohen's Kappa, Weighted Kappa, Fleiss Kappa (Multiple Rater Kappa), among others for the evaluation of the content validity of the measurement instrument. Almanasreh, et al. (2019) comment that these indices should be interpreted with caution if used for the purpose of evaluating content validity, because their development and design aim to assess the general agreement between evaluators, but not to quantify the content validity of a measurement instrument.

Validation of the measuring instrument

Ten experts integrate the group for the assessment of the judgement's agreement, evaluating each item and the measurement instrument itself. The Content Validity Index (CVI) by Lynn (1986), which Almanasreh et al. (2019) describe as the most widely used index for quantifying the content validity of a measurement instrument, was used. This index measures two characteristics: the Item Content Validity Index (I-CVI), which determines the level of agreement among the judges for each item, and the Scale Content Validity Index (S-CVI), which measures the agreement among the judges regarding the entire measurement instrument. Using the indicators given in Table 2 for the evaluation of the content validity of the IM, and the criteria established by Shi et al. (2012), to reject the null hypothesis, with a significance level of 5%, stating that the agreement between the judges, the accuracy of the items and the measurement instrument is attributable to chance.

Table A1 presents the measurement instrument in the format for evaluation of four characteristics. Sufficiency, which corresponds to evaluating whether the set of items considered in each construct fully represents the construct. Clarity, determining whether each item written in such a way that a knowledgeable person can understand it. Coherence, asking whether each item is associated with the construct. Relevance, to determine whether the elimination of each item affects the measurement of the construct. Once the experts have issued their judgment, their statistical analyses indicate if the items need adjustments and making modifications in an iterative evaluation process until reaching satisfactory values.

Results

Table 3 shows the results of the content evaluation of the measurement instrument, corresponding to the results issued by the experts or judges in the first round. The quality scores for each item and construct are higher than the established parameter values for the variables sufficiency, clarity, coherence, and relevance. Therefore, the IM is suitable for quantifying and obtaining measurements of the critical success factors, given that the agreement among the experts in rating each item and construct as fundamental is not attributable to chance.

Some authors propose Kendall's test of agreement and modified Kappa indices to assess inter-rater agreement in the ratings assigned to the MI. However, these approaches do not allow for the evaluation of agreement for each item individually. This makes it impossible to determine the role of chance in the concurrence of each of these evaluations. The use is acceptable despite their inability to discriminate the effects of randomness in the assessment of inter-expert agreement. In other words, from a statistical point of view, the results obtained when evaluating content validity with these methods are questionable.

Table 3. Ratings of the characteristics of sufficiency, clarity, coherence and relevance of the measurement instrument

	Sufficiency Qualification		Clarity Qualification		Coherence Qualification		Relevance Qualification	
$Item$	$I-CVI$	$\frac{I-CVI}{ave}$	$I-CVI$	$\frac{I-CVI}{ave}$	$I-CVI$	$\frac{I-CVI}{ave}$	$I-CVI$	$\frac{I-CVI}{ave}$
1	1	0.99	0.833	0.96	0.833	0.93	1	0.96
2			1		1		1	
3			1		1		1	
4			1		1		1	
5			1		1		0.833	
6			1		1		1	
7			1		1		1	
8	0.833		1		1		1	
9			1		1		1	
10			1		0.833		1	
11			1		1		1	
12	1		1		1		1	
13			1		1		1	
14			1		1		0.833	
15			1		1		1	
16	1		1		1		1	
17			1		1		1	
18			1		1		1	
19			1		1		0.833	
20	1		1		1		1	

Source: own elaboration

Discussion of Results

The statistical results obtained allow us to verify the content validity of the MI proposed in this research. This implies that the items assigned to each construct adequately and completely represent it. Therefore, the MI presents excellent content validity in the four characteristics evaluated, given that the numerical values observed for the I-CVI indicators meet the criterion of at least 0.78, considered excellent, and for the I-CVI/ave, it is considered acceptable, reaching a value greater than 0.90 (Polit et al., 2007). Met in both cases, the criteria established by Shi et al. (2012).

This implies that these items are sufficient to represent their respective construct, are clear in their wording, coherent in their relationship to the concepts that define each construct, and relevant to each construct. It is important to note that the results of the MI are obtained in the first round of evaluation, making another round unnecessary for this instrument, as suggested by (Polit et al., 2007).

The measurement instrument (Table A1, Appendix) demonstrates content validity, assessed using four characteristics recommended by Escobar and Cuervo (2008), making it a suitable tool for measuring the influence of the factors on the success of innovation in the dairy industry supply chain. This result allows future studies to analyze the causal relationships between the exogenous variables corresponding to these critical success factors and the endogenous variable (PICS) of the dairy industry. This is useful for modeling the causal relationships between exogenous and endogenous variables using a structural model.

Conclusions and Recommendations

Based on the results, the proposed Measurement Instrument is suitable for collecting the data necessary to build models that estimate the causal relationships between the factors and the process innovation success, the endogenous variable in the dairy industry.

Overall, even with the main limitation that the sample size is restricted to the Laguna region, several aspects indicate that the study is considered valid. These include, in the CVI, as an alternative to the CVR method:

- The item content validity index (I-CVI), which allows establishing the degree of agreement between judges at two levels: at the individual level for each item.
- The average content validity index of the scale (I-CVI/ave), where a high value of S-CVI/ave indicates agreement between judges not attributable to experimental error.

Given that these two available alternatives (CVR and CVI) for evaluating the content validity of the Measurement Instrument are valid, it is pertinent a simulation study to compare the effectiveness of these indicators when evaluating agreement, and select the most appropriate one for the study.

Future lines of research

This work is part of the first stage of the research project Measuring Innovation Factors, in this case, in the supply chain in the dairy industry, therefore, the next step is to take a sample of the target population and perform a statistical analysis using factor analysis and structural equation modeling.

The possibility remains open to obtain a larger sample of a greater number of Mexican companies, which is essential to validate and generalize the results obtained, as a possible line of future research.

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Contribution Role	Author(s)
Conceptualization	Gabriela Margarita Reyna García<principal>, Rafael García Martínez<same>
Methodology	Gabriela Margarita Reyna García (principal), Rafael García Martínez (supporting)
Software	Rafael García Martínez <principal>, Eduardo Rafael Poblano-Ojinaga <same>
Validation	Gabriela Margarita Reyna García <principal>, Rafael García Martínez <equal>, Eduardo Rafael Poblano-Ojinaga <supporting>
Formal Analysis	Gabriela Margarita Reyna García, Rafael García Martínez, Eduardo Rafael Poblano-Ojinaga, Vianey Torres-Arguelles
Investigation	Gabriela Margarita Reyna García <principal>, Vianey Torres-Arguelles <supporting>
Resources	Gabriela Margarita Reyna García <principal>, Vianey Torres-Arguelles <supporting>
Data curation	Rafael García Martínez <principal>, Eduardo Rafael Poblano-Ojinaga <supporter>,
Writing - Preparing the original draft	Gabriela Margarita Reyna García <principal>, Rafael García Martínez <supporting>
Writing - Reviewing and Editing	Eduardo Rafael Poblano-Ojinaga (principal), Vianey Torres-Arguelles (supporting)
Display	Gabriela Margarita Reyna García <main>
Supervision	Rafael García Martínez <principal>, Vianey Torres-Arguelles <supporting>
Project Management	Gabriela Margarita Reyna García <principal>, Rafael García Martínez <equal>
Acquisition of funds	Gabriela Margarita Reyna García <principal>, Vianey Torres-Arguelles <supporting>

Annex A

Table 4. Measurement instrument in questionnaire format for expert judgment

Ítems por dimensión o constructo a evaluar	Característica a evaluar			
VARIABLE: COLABORACION *Qué tan de acuerdo estoy con la afirmación de que la empresa*	SUFICIENCIA	CLARIDAD	COHERENCIA	RELEVANCIA
Dimensión: Colaboración con proveedores y clientes				
La empresa desarrolla relaciones fuertes con sus proveedores				
La empresa desarrolla relaciones fuertes con sus clientes				
Dimensión: Colaboración interna de la empresa				
Existe una relación fuerte entre los diferentes departamentos de la empresa				
Dimensión: Colaboración con empresas externas o competencia				
La empresa colabora cercanamente con otras empresas o competidores que pueden ayudarla				
VARIABLE: ORIENTACION AL CONOCIMIENTO *Qué tan de acuerdo estoy con la afirmación de que la empresa …*	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Dimensión: Orientación al conocimiento nivel medio				
El conocimiento de los empleados es una inversión, no un gasto				
El conocimiento es visto como un producto clave necesario para garantizar la supervivencia de la organización				
Dimensión: Orientación al conocimiento nivel medio				
La alta dirección está de acuerdo en que la capacidad de aprendizaje de los empleados es la clave de nuestra competitividad.				
La alta dirección hace hincapié en la búsqueda de conocimientos que se adapten al nuevo entorno.				
Ítems por dimensión o constructo a evaluar	Característica a evaluar			
VARIABLE: ORIENTACION HACIA LA CALIDAD *Qué tan de acuerdo estoy con la afirmación de que la empresa …*	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Dimensión: Orientación hacia la calidad interna				
La alta dirección con frecuencia articula las metas y la visión de la empresa a los empleados.				
La calidad es responsabilidad de todos en la organización				
Los gerentes inician y participan activamente en actividades de mejora de la calidad.				
Todos los empleados trabajan en equipo para la mejora continua				
Alta inversión monetaria y tiempo a la educación para la calidad				

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Ítems por dimensión o constructo a evaluar	Característica a evaluar			
VARIABLE: ADAPTABILIDAD *Qué tan de acuerdo estoy con la afirmación de que la empresa …*	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Dimensión: Adaptación a necesidades externas				
La demanda de los productos no es estable en el tiempo, pero se ajusta fácilmente				
Cuando las necesidades y deseos de los clientes cambian, ¿La empresa implementa cambios automáticos?				
La empresa se adapta fácilmente a las innovaciones de la competencia				
Dimensión: Adaptación a necesidades internas				
La empresa se adapta fácilmente a las innovaciones de la competencia				
La empresa realiza cambios en los procesos internos cuando hay cambios en el mercado				
VARIABLE: GESTION DEL PROCESO LOGISTICO DE ENTRADA Y SALIDA *Qué tan de acuerdo estoy con la afirmación de que la empresa …*	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Dimensión: Gestión del proceso interno				
La inspección, revisión o verificación del proceso está automatizada				
Nuestros procesos de trabajo están automatizados				
Las técnicas de calidad se utilizan para reducir la variación en los procesos.				
VARIABLE: COLABORACION ***Qué tan de acuerdo estoy con la afirmación de que la empresa***	SUFICIENCIA	CLARIDAD	COHERENCIA	RELEVANCIA
Dimensión: Colaboración con proveedores y clientes				
La empresa desarrolla relaciones fuertes con sus proveedores				
La empresa desarrolla relaciones fuertes con sus clientes				
Dimensión: Colaboración interna de la empresa				
Existe una relación fuerte entre los diferentes departamentos de la empresa				
Dimensión: Colaboración con empresas externas o competencia				
La empresa colabora cercanamente con otras empresas o competidores que pueden ayudarla				

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Ítems por dimensión o constructo a evaluar	Característica a evaluar			
VARIABLE: ORIENTACION AL CONOCIMIENTO	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Qué tan de acuerdo estoy con la afirmación de que la empresa …				
Dimensión: Orientación al conocimiento nivel medio				
El conocimiento de los empleados es una inversión, no un gasto				
El conocimiento es visto como un producto clave necesario para garantizar la supervivencia de la organización				
Dimensión: Orientación al conocimiento nivel medio				
La alta dirección está de acuerdo en que la capacidad de aprendizaje de los empleados es la clave de nuestra competitividad.				
La alta dirección hace hincapié en la búsqueda de conocimientos que se adapten al nuevo entorno.				
VARIABLE: ORIENTACION HACIA LA CALIDAD	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Qué tan de acuerdo estoy con la afirmación de que la empresa …				
Dimensión: Orientación hacia la calidad interna				
La alta dirección con frecuencia articula las metas y la visión de la empresa a los empleados.				
La calidad es responsabilidad de todos en la organización				
Los gerentes inician y participan activamente en actividades de mejora de la calidad.				
Todos los empleados trabajan en equipo para la mejora continua				
Alta inversión monetaria y tiempo a la educación para la calidad				
VARIABLE: ADAPTABILIDAD	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Qué tan de acuerdo estoy con la afirmación de que la empresa …				
Dimensión: Adaptación a necesidades externas				
La demanda de los productos no es estable en el tiempo, pero se ajusta facilmente				
Cuando las necesidades y deseos de los clientes cambian, ¿La empresa implementa cambios automáticos?				
La empresa se adapta fácilmente a las innovaciones de la competencia				
Dimensión: Adaptación a necesidades internas				
La empresa se adapta fácilmente a las innovaciones de la competencia				
La empresa realiza cambios en los procesos internos cuando hay cambios en el mercado				
VARIABLE: GESTION DEL PROCESO LOGISTICO DE ENTRADA Y SALIDA	SUFICIENCIA	CLARIDAD	COHERENCIA	RELAVANCIA
Qué tan de acuerdo estoy con la afirmación de que la empresa …				
Dimensión: Gestión del proceso interno				
La inspección, revisión o verificación del proceso está automatizada				
Nuestros procesos de trabajo están automatizados				
Las técnicas de calidad se utilizan para reducir la variación en los procesos.				