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REVIEW ARTICLE

METHODOLOGICAL PROPOSAL FOR DETERMINING TOURISTIC COMPETITIVENESS IN THE PUEBLOS MÁGICOS UNDER A MULTICRITERIA APPROACH

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ABSTRACT

This article presents a methodological proposal for the assessment of touristic competitiveness applicable to the Pueblos Magicos, a program that emerges in 2001 with the objective of diversifying touristic offers in Mexico, as well as favoring the communities of the towns through touristic activity. The proposal is built from five dimensions also recognized as factors or components, taken from the importance they represent for the agents involved in the touristic field. In this sense, the paper proposes an alternative for the assessment of touristic competitiveness on the basis of multi-criterion methods for decision-making. Using this approach allows to evaluate and relatively compare the ''Pueblos Mágicos' in an effective way. Its usage is dealt with as a real multicriterion problem dealing with classifying dealing with the assessment and competitiveness of these destinations in Mexico.

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INTRODUCTION

The momentum and growth of tourism in Mexico has been a constant since 1960, from then some strategies have been implemented to achieve the development of the field sector in order to be highly competitive worldwide and keep up with the changes and benefits manifested by the touristic industry. Nevertheless, from the first National Tourism Plan in 1963 it has been emphasized in positioning tourism in the economic life of the country through the promotion of sustainable touristic offers sustained in the product-based model and sun-and-beach services on coastal destinations in the country. Decisions made about the planning and promotion of tourism in Mexico have favored the expansion of the traditional model that favors a high specialization and standardization of the touristic product, and have affected the loss of touristic competitiveness of the country lacking a diversified offer. In this context, the National Tourism Development Plan 2013-2018 recognizes the depletion of the sun and beach model, and identifies areas of opportunity to develop attractive and sustainable touristic products in the field of business tourism, ecotourism, adventure, health tourism, sports, luxury and cultural tourism. Among the proposals that have been raised in the tourism policy in Mexico, have emerged various approaches on diversifying programs and offers. In this sense, in 2001, during the administration of President Vicente Fox Quezada, the "'Pueblos Mágicos" (PPM) program was created as a strategy of the Federal Ministry of Tourism (SECTUR). The appointment of "Magic Town" provides a distinction to the town, since focused on the media and through projects which can managed the financial resources to improve touristic, preservation of historical and cultural heritage and adjacent natural areas, to fulfill its mission of enhancing social and economic development. Fifteen years after the program started, 111 towns who have received this award from the Ministry of Tourism, although some of those towns have managed to become competitive touristic destinations, increasing its infrastructure and tourism offer as well as the demands of visitors who generated an economic impact; this is not true for all Magic Towns, that even having this area of opportunity fail to consolidate the variables that allow them to consolidate as a touristic destination. In this context, this paper presents a methodology that brings together a number of qualitative and quantitative indicators to be considered by the agents involved in tourism activity in the 'Pueblos Mágicos, contributing in their relentless pursuit to establish itself as competitive destinations, to do so we implement the ELECTRE-III, that allows modeling the preferences of the decision maker, where those preferences can be expressed as a ratio of overrating valued method.

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The Tourism Competitiveness

The difficulty in conceptualizing and applicability of competitiveness lies in the fact that it is a multifaceted term that is used to evaluate -mainly economic- variables of a country, an industry or a region like that of a business corporation or a company by itself, thus giving rise to a variety of interpretations given to the concept (Acerenza, 2009). Given this complexity, several authors have tried to demonstrate the applicability of this theory in the service sector, particularly in touristic destinations; Dwyer and Kim (2003), Dieguez, Sinde, White (2011) Ritchie and Crouch (2000), Hassan (2000). The theme requires inquiry, due to the ongoing offer of touristic destinations and new trends of mobility and displacement. Referring to the conceptual understanding of Competitiveness applied to tourism, Hassan (2000), says it is the ability of a destination is to create and integrate products with added value capable of sustaining local resources and preserve its market position relatively superior to its competitors.

Models of Tourism Competitiveness

The research focused on the factors which determine the competitiveness of touristic destinations and the inclusion of sustainability as an indicator of performance, has led to the emergence of different theoretical and conceptual models that attempt to represent the complex system in which Tourismis present with all its network interactions involved; Crouch and Ritchie (1999); Dwyer and Kim (2003); Sanchez and Fajardo (2004); Dwyer, Mellor, Livaic, Edwards and Kim (2004); Duke (2005); Gomezelj (2006); Gandara, FumiChim-Miki, Domareski and Augusto Biz, (2013). For Greca and Moreira (1998), a model is an external representation, created by researchers, teachers, engineers, etc., that facilitates understanding or teaching systems or states of aspects in the world. Models of competitive touristic destinations have as a support the concepts of comparative and competitive advantages (Ritchie and Crouch 2000). The first reference make reference to factors equipped by the touristic destination, these are factors that occur naturally and those that have been created. To Sancho (1998), comparative advantages, therefore, are given by specific factors related to the destination that have enabled its origins and expansion. These factors are mainly natural resources (beaches, mountains, climate, etc.), the socioeconomic conditions that initially own the land (labor) and macroeconomic policies used to improve the sector (e.g. currency devaluation). Meanwhile, the Theory of Competitive Advantage states that a more competitive tourist destination is, the greater the ability of the managers to add value to a product or service also marketed by other competitors (Orta, 2005). It is related to the skill and ability of the destination to use their resources efficiently in the medium and long term (Ritchie and Crouch, 2000). Based on this theory, a touristic destination can have a wide variety of resources (comparative advantages) and not be as competitive as another that has few touristic resources, because of the way they have been developed. That is, a transition between static competitiveness dependent on the comparative advantages to dynamic competitiveness in which the most important is not the amount of resources in a touristic destination, but the ability exists to add value and obtain profitto those destinations (Barroso, and Flores, 2006).

Based on the mentionedabove Crouch and Ritchie (1999) studies conducted in developing models and general theories of competitiveness that are not specific to certain destinations or attributes, analyzing the nature and structure of destination competitiveness (Crouch and Ritchie, 1995, 1999; Ritchie and Crouch, 2000, 2003). Its aim was to develop a conceptual model based on the theories of comparative advantage (Smith, 1776 and Ricardo, 1817) and competitive advantage (Porter, 1998), adapted to the distinctive characteristics of the destination competitiveness. Figure 1 shows the model which recognizes that destination competitiveness is based on the allocation of resources it accounts (comparative advantage) and its ability to deploy resources (competitive advantage) is shown. This model also highlights the impact of global macro-environmental forces (e.g., the global economy, terrorism and cultural and demographic trends) and micro environmental circumstances affecting the functioning of the tourism system associated with the destination. The destination competitiveness factors are represented in the model grouped into five main groups. In developing the model, we include generic concepts resulting in a prototype that postulates the competitiveness of touristic destination, which is determined by five main components: determining limiters and amplifiers, planning policy and destination development, management of destination, attractors resources and basic factors, and support resources. The conceptual basis of the tourism competitiveness models may undergo adjustments according to the context of the study object, setting a series of indicators for evaluation to determine competitiveness. These indicators according to Sanchez and Fajardo (2004) can be classified as subjective indicators and objective indicators. Subjective indicators are those that relate to the perception of the visitor and they have, therefore, a marked qualitative, as would, in assessing the competitiveness of a cultural or natural resource, its "aesthetic", his "greatness" or "beauty", meanwhile, the objective indicators are those that are quantitatively measurable, such as, among others, the existence of historical and artistic resources declared by UNESCO as a World Heritage Site, the surface of destination dedicated to national parks or nature reserves, topography, climate, average temperatures and sunshine hours, among others (Sanchez and Fajardo 2004).

When considering the wide variety of indicators measuring touristic competitiveness, the complexity involved in the quantification of touristic destinations for its indisputable multidimensional character and the absence of consensus on the indicators to be used is unclear. In this situation, it is essential to have the knowledge of the characteristics of the destination and the particularities, motivations, preferences and needs of the touristic segments as well as to consider addressing tourism competitiveness as the sum of the competitiveness of the destinations, specific and potential segments in each geographical area of a nation.

Competitiveness in the 'Pueblos Mágicosprogram

In Mexico, has recognized a decline in terms of tourism competitiveness from public policy through the National Development Plan 2013 -2018. In this context, federal, state and municipal governments have agreed on the need to intervene jointly in order to ensure that national competitiveness is strengthened and reach an early and frank growth. In the same plan, the goal of building a "Mexico Prospero" arises. In this regard, the Ministry of Tourism, proposed the Tourism Sector Program (PROSECTUR), which aims to highlight the use of the country's touristic potential to generate economic benefits. Actions to realize such a claim are

based on five guiding objectives, 22 strategies and 112 lines of action from the Plan.

While The Magic Towns Program (PPM) is not considered in the public policy of PND and PROSECTUR for the period 2013 to 2018, its validity and importance as a tool for tourism development it has not decreased since its inception in 2001. One of the strategies proposed by the SECTUR, is to promote "expressive forms of establishing and developing intellectual, moral, emotional and physical values, therefore, tourism cannot be static, tourism and economic and social activity must respond to the movements, changes and requirements applying human being "(SECTUR, 2002), including approaches the PPM is enhanced. Valdez, Maldonado and Maldonado (2009) note that from 'Pueblos Mágicosprogram, it si pursuit to support traditional villages with cultural attractions of great singularity, and thus promote the conservation and improvement of its urban image and identity. In that sense, the SECTUR (2002) defines a "'Pueblo Mágicoas a town that has symbolic attributes, legends, stories, important events. In a nutshell, magic emanating in each of its socio-cultural manifestations, and they mean day-at-day a great opportunity for touristic development". Before the speech of competitiveness permeated tourism globally, from the federal level one pilot program was undertaken to identify the factors of competitiveness in various destinations, including 'Pueblos Mágicos. Regarding this issue, it is important to note that, although in some states of the country they created their proposals called Agendas for Competitiveness, highlighting the potential of 'Pueblos Mágicosas triggers of tourism, this strategy did not have a crosscutting for all the Federation, being exclusive of those destinations that had in its inventory with such attractions. In addition, it is clear that the Competitiveness Agendas were diagnostic mechanisms supported by an academic platform, which also set the local tourist inventory of each destination, identifying potential alternatives to diversify the touristic product without representing a commitment in budget for SECTUR. Consequently, the adoption or not of those proposed programs by the different houses of study, was discretionary of federal and state authorities.

Analysis of the competitiveness of 'Pueblos Mágicosusing multi-criteria analysis method

Regarding competitiveness studies of 'Pueblos Mágicos with methods Multi Criteria Analysis for Decision Analysis (MCDA for its acronym in English), Alvarez, Leon, Gastelum and Vega (2013) conducted an empirical analysis of the competitiveness of cities in Sinaloa, Mexico, with this method of ordering. Leyva, Gastelum and Urias (2013) developed the application of a multi-criteria approach to compare economic sectors: the case of the State of Sinaloa, Mexico. Peng and Tzeng (2012) explored strategies to improve the competitiveness of tourism implementing a help model to multicriteria decision (MCDM, Multicriteria Decision Making) by combining DEMATEL (Making Trial and Evaluation Laboratory) based upon ANP (Analytic Network Process Method). Mazanec, Wober and Zins (2007) developed an investigation in relation to the competitiveness of the touristic destination circumscribing compilations of competitiveness factors including Ritchie and Crouch (2003), Kim and Dwyer (2003) and Monitor Competitiveness made by the World Travel and Tourism Council (WTTC for its acronym in English). With these empirical studies, it was found that it is possible that the model by Crouch and Ritchie explains the levels of touristic activity that sustained tourism growth. In addition, they made recommendations on how to adjust the strategy for future research on the competitiveness of touristic destinations. Thus, taking into account the extent and variety of indicators used to measure competitiveness used in the literature, it is clear that the decisions that touristic planners face often include variables that are difficult to measure directly, and even if all variables can be measured accurately serious problems may arise for obtaining numerical measures of relative importance of the decision-making variables (Crouch, 2010).

Identification of alternatives

In a decision-making, you must choose among different alternatives, in this sense (Bertolini, Gallerani, Samoggia and Viaggi, 2005) consider that in a decision, the set of alternatives may be more or less defined. It is here where the basic characteristics of multi-criterion analysis, represents the fact of comparing alternatives based on a number of criteria, according to Roy (1985), alternatives must be:

- Mutually exclusive.
- Consistent over time and space.
- Comparable to any different from that expressed by the evaluation criteria feature.

Thus, analternative matrix is built | A | incorporating a decision label (Table 1), in this case, each alternative corresponds to a destination selected. Being | A | A = {*a1, a2, ..., aj, ..., am*} the finite set of alternatives, | A | = m (*Almeida, et al*., 2006).

Table 1. Alternatives and of touristic destinations and their labels

Label	Tourism destination
A1	DT 1
A2	DT 2
.	.
.	.
An	DT n

Source: created by myself.

In the analysis process, the recommendation may take the form of selecting a subset of alternatives in different categories or from global ordering. In these cases, it is necessary to identify those attributes that define each one and how can they be the same to be comparable.

Compound Indicators

The objective of an indicator is to measure a certain reality, such as the state of development of a country, economic sector or the quality of a university. Usually, a compound indicator is a combination of several individual indicators which capture particular aspects of a reality which will be evaluated. However, in trying to combine different indicators the inevitable question of how to add them arises. In this regard, the indicators usually are presented as a way of synthesizing information. Thus, the main aspect of this research is to combine individual indicators, ignoring the numerical value of the entities on each individual indicator and considering only the underlying order. The nature of the scale of an individual indicator is far away from being a trivial factor. Sometimes an individual indicator is a combination of several input variables and the result is often normalized. This process of

normalization of the original variables, proposed here, it is done for the purpose of rescale their values between zero and unity.

Process of variable's normalization

Before performing a process of aggregation of variables that have been selected for the construction of a compound indicator to perform the analysis, you must perform the normalization process, which aims to prevent the congregation of variables of different units of measure and the emergence of scale dependent phenomena (Cepal, 2009).

Therefore, the normalization of data is a previous step to any kind of aggregation of simple indicators. In this sense, the objectives of normalization techniques are:

- Adjust data for not having different units of measure.
- Adjust so data will not have different ranges of variation.
- Adjust if data follows an asymmetric distribution or in the presence of atypicaldata (Bas, 2014: 80)

To realize this process, the rescaling technique is detailed (called maximum and minimum) to normalize simple indicators to provide the best possible comparison among analysis units. This procedure tends to find that the normalized scale covers the range among 0 and 1 values to rescale (Barba-Romero, 2010). In this regard, the values of simple indicators corresponding each alternative as follows:

Being:

$$Vn(a_i) = \frac{x(a_i) \quad Min}{Max \quad Min} \tag{1}$$

indicating:

$Vn(a_i)$= normalized value.
$x(a_i)$= indicator i value.
Min= minimum indicator i value.
Max= maximum indicator i value.

Once the normalization calculations have been performed for the individual indicators, and using the weights provided by the decision maker - a procedure explained in the next section - the values will be transformed to an individual score using a weighted sum. Thus obtaining the compound indicators (criteria) that will determine the performance matrix.

Determination of weights

This procedure also aims to communicate to the analyst the information needed to assign a numerical value to the weights of each criterion when used in the ELECTRE III method. This information refers to the relationship among the weights of the most important and the least important criteria in the ranking.

a. Determination of weights through personal construction theory

The weights of the criteria in ELECTRE-III, unlike other methods, can be considered as "coefficients of importance" or "values of relative importance" and not "substitution rates" among criteria, thus avoiding compensatory problems. In this study, the decision maker was assisted to define the weights of each of the criteria according to the Personal Construction Theory (PCT), proposed by Roger, Bruen and Maystre, (2000). Where, wj is the coefficient of relative importance attached to the criterion gj, for j = 1,2, ..., n. The weights obtained from the consensus of the decision makers are shown in the example in Table 2.

Table 2. Criteria weights obtained through personal construction theory

	g_1	g_2	g_3	g_4	g_5	*RtG*	*RtG+1*	*Final Weight*
g_1	-	E	O	O	X	1	2	0.143
g_2	E	-	O	O	X	1	2	0.143
g_3	X	X	-	E	X	3	4	0.286
g_4	X	X	E	-	X	3	4	0.286
g_5	O	X	O	O	-	1	2	0.143
Total						9	14	1.000

Notes:
1. *RtG ←RtG +1 to take in consideration criteria* 5.
2. For each cell, *ij{X,E,O}*means criteriag_i is*{more, equal, fewer/less}*important than criteria.g_i.
3. The final weight of each criteria g_i is obtained when diving *RtG +1 between the* total.
Source: Own elaboration based on Roger, et al. (2000)

The issue of the relative weight of two criteria implicitly assumes that the statement "this criterion is more important than the other" has a meaning. It leads to the assumption that the weight of a criterion has an intrinsic character, that is to say, that it depends only on a point of view reflected by it and does not depend on the way in which it is modeled (Figueira and Roy, 2008).

B. Allocation of weights for individual indicators

A substantial element in the construction of compound indicators (criteria) is to support the decision maker in assigning the weighting of relative importance for each individual indicator. Although there are several methods to generate them, in this case it was considered to use the comparison matrix, a technique that is approached by Alireza, Majid and Rosnah (2010). That evaluation score is calculated for each alternative *Ai, i,* multiplying the given value *Xiij* to each alternative *i* to the attribute with the weights of relative importance *W i* directly assigned by the decision expert, followed by the sum of the products for all the criteria J. See the following formula:

$$A_i = \sum W_j X_{ij} \qquad i = 1, \dots, 5, \quad j = 1, \dots, 7 \tag{2}$$

The procedure consists of constructing a pairwise comparison matrix *(nxn)* of criteria, using a pairwise attribute scale. For each comparison, it is decided which of the two attributes is most important and is then assigned a score "how more important is" (Alireza *et al*., 2010). In this way, the weights of the attributes are calculated using comparison matrix. Meanwhile, the data will be suggested by the opinion expert to the instrument in each dimension considered to determine the competitiveness of touristic destinations, using values from the scale of 1 to 5 as suggested by Alireza, *et al*. (2010). As a result, we obtain the comparison matrix, which is shown in Table 3, which indicates the weights (relative importance) of the attribute in the columns compared to the attribute in the rows.

Table 3. Attribute´s comparison matrix

Attributes	% of people who senses their municipality to be unsafe	Monthly Average Income	Total Population	Territorial Percentage	Sum	Weigth
% of people who senses their municipality to be unsafe	1.00	4.00	4.00	4.00	13.0	0.44
Monthly Average Incomel	0.25	1.00	4.00	4.00	9.3	0.31
Total Population	0.25	0.25	1.00	4.00	5.5	0.19
Territorial Percentage	0.25	0.25	0.25	1.00	1.8	0.06
Total	1.75	5.50	9.25	13.00	29.50	1.0

Source: Own elaboration based on Alireza, *et al*. 2010.

Scale of Measurement and Criteria Characterization

For the analyst, the competitiveness of pueblos mágicos is a concept that encompasses the dimensions of the daily act of a destination, in this sense, there are many variables that influence their evolution which makes it difficult to choose these indicators, which summarize the reality of the destiny under study. In this way, competitiveness is derived from a set of dimensions, known as factors or components, where these are influenced by a series of variables, therefore, the result in the measurement of competitiveness, will be the ability to summarize the information of those variables, which will result in an important task. Therefore, as already mentioned in the literature review of touristic competitiveness, the development of the Crouch model (2010) included generic concepts that led to a model that postulates the competitiveness of the touristic destination, which is determined by five dimensions: in these terms $n = |A|$, being $F = \{g_1, g_2, \dots, g_j, \dots, g_n\}$ a finite set of criteria which are detailed in the following sections (Almeida, Figueira and Roy, 2006). Inthis way, the mathematical representation of the proposed model is developed to determine the competitiveness of Pueblos Mágicos, is constructed in the sense that integrates the following five criteria: 1) Basic resources and attractors, 2) Factors and resources of Support 3) Destination management or directions, 4) Destination planning and Development Policy 5) Limiting and amplifying factors (Crouch and Ritchie, 1999); Its importance lies in the preponderant role they represent for the touristic sector, both for economic, political, governmental and social actors. In this sense, the variables grouped in compound indicators are integrated and taking into consideration the previously proposed literature for its construction, the criteria obtained from the grouping process are developed. For each criterion *(C_j)* a series of indicators *(x_1, x_2, ... 〖, x〗 _n)* are proposed on a group of targets (a_i), from these, a set of criteria *(C_1, C_2, ... 〖, C〗 _n)*. Each (C_j) where (j = 1, ..., n) is a combination of *x_1, x_2, ... 〖, x〗 _n* originals by weight *(w_j)* for each criterion,

That is:

$$C_j(a_i) = \left(w_j \quad x_j(a_i)\right) + \left(w_2 \quad x_2(a_2)\right) + \\ + \left(w_n \quad x_n(a_n)\right) \tag{3}$$

Where

$\sum W_j X_i(a_i)$is the sum of all products of the combination of$x_1, x_2, \dots, x_n$for the weight (w_j) to criteria $(g_1, g_2, g_3, g_4, g_5)$, which capture the particular aspects of a reality, which is the same to be evaluated for the criteria of:resources and basic attractors;Resources and support factors;destination´s planning of development and policies; Destination´s management and direction and determining and limiting amplifiers.

Criterion 1: Resources and basic attractors $(\boldsymbol{g_1})$

Herein all the resources owned by the destination in goods and services are considered and are determining for the tourist, due to the fact they are object of human intervention and make touristic activity possible, satisfying the demanded needs:

For the Criterion (g_1) the signaled indicators, are expressed in the following formulation:

$$FRA(a_i) = \left(w_1 \quad Ts(a_i)\right) + \left(w_2 \quad TD(a_i)\right) \\ + \left(w_3 \quad Ar(a_i)\right) + \left(w_4 \quad Ee(a_i)\right) \\ + \left(w_5 \quad Ft(a_i)\right) \\ + \left(w_6 \quad Ct(a_i)\right) + \left(w_7 \quad Ms(a_i)\right) + \left(w_8 \quad Pa(a_i)\right) \tag{4}$$

Where:

FRA: Resources and Attractors Factor
Ts: number of symbolic touristic attractors
Td: number of differentiated touristic attractors
Ar: architecture
Ee: number of emblematic buildings
Ft: number of parties and traditions
Ct: Traditional Cuisine
Ms: number of Museums
Pa: Craft Production

Therefore:

$$FRA(a_i) = \sum W_j X_i(a_i) \tag{5}$$

Criterion 2: Support and Resources Factors $(\boldsymbol{g_2})$

We refer to infrastructural resources and are considered as the necessary factors to determine the structure of the touristic destination. For Criterion $(g_2)$the mentioned indicators, are expressed in the following formulation:

$$RA(a_i) = \left(w_1 \quad Ca(a_i)\right) + \left(w_2 \quad Av(a_i)\right) + \left(w_3 \quad Tp(a_i)\right) \\ + \left(w_4 \quad Am(a_i)\right) + \left(w_5 \quad Pt(a_i)\right) + \left(w_6 \quad Ob(a_i)\right) + \\ \left(w_7 \quad Sa(a_i)\right) + \left(w_8 \quad Sr(a_i)\right) + \left(w_9 \quad Ss(a_i)\right) + \\ \left(w_{10} \quad Dc(a_i)\right) + \left(w_{11} \quad Ba(a_i)\right) + \left(w_{12} \quad Bl(a_i)\right) \tag{6}$$

Where:

RA: Resources and Support Factors
Ca: kilometers of roads
Av: number of Travel agencies
Tp: number of Public Transportation

Am: Disabled & handicapped accessibility
Pst: number of Touristic Services
Ob: number of Banking offices
Sa: number of accommodation services
Sr: number of restaurants
Ss: number of Safety, comfort and care services
Dc: number of discos and nightclubs
Ba: number of bars& pubs
Bl: number of watering places

Therefore:

$$RA(a_i) = \sum W_j X_i(a_i) \quad (7)$$

Criterion 3: Destination planning and Development Policies (g_3)

Destination policy and the central components of the government are presented. For criterion(g_3) the referred indicators, are expressed in the following formulation:

$$\begin{aligned} PPD(a_i) = {} & (w_1 \quad Cp(a_i)) + (w_2 \quad Po(a_i)) + (w_3 \quad Co(a_i)) \\ & + (w_4 \quad En(a_i)) + (w_5 \quad Ex(a_i)) \\ & + (w_6 \quad Ctt(a_i)) + (w_7 \quad Cpm(a_i)) \\ & + (w_8 \quad Pt(a_i)) + (w_9 \quad Pi(a_i)) \\ & + (w_{10} \quad Mp(a_i)) + (w_{11} \quad Prt(a_i)) \\ & + (w_{12} \quad Oi(a_i)) + (w_{13} \quad Ld(a_i)) \\ & + (w_{14} \quad Poe(a_i)) + (w_{15} \quad Isc(a_i)) \\ & + (w_{16} \quad Isn(a_i)) + (w_{17} \quad Ac(a_i)) \end{aligned} \quad (8)$$

where:

PPD: policy, planning and destination development
Cp: Average rooms
Po: Hotel occupancy
Co: Average busy hotel occupancy
En: National Stay
Ex: Foreign Stay
Ctt: Touristic Load
Cpm: Touristic Committee "pueblo mágico".
Pt: Touristic promotion
Pi: Internet Websites
Mp: Pueblos Mágicos Landmark
Prt: Touristic products
Oi: Touristic information offices
Ld: Destination Cleanness
Poe: programs of entrepreneurial support
Isc: Inventory of Cultural Sites
Isn: Inventory of Natural Sites and historical monuments zones declaration
Ac: Actions of conservation of tangible and intangible heritage

Therefore:

$$PPD(a_i) = \sum W_j X_i(a_i) \quad (9)$$

Criterion 4: Destination´s management and direction (g_4)

They are part of the management of the destination, being this, one of the main components of the governments, the companies, as well as nongovernmental organisms, in charge of the promotion of tourism in its place of residence, it can be a municipality, state, national or international. For criterion (g_4)The above indicators, are expressed in the following formula:

$$\begin{aligned} PPD(a_i) = {} & (w_1 \quad Pdu(a_i)) + (w_2 \quad Pdt(a_i)) \\ & + (w_3 \quad Riu(a_i)) \\ & + (w_4 \quad Prc(a_i)) + (w_5 \quad Ppa(a_i)) + (w_6 \quad Pac(a_i)) + \\ & (w_7 \quad Ana(a_i)) + (w_8 \quad Ppa(a_i)) + (w_9 \quad Cai(a_i)) \\ & + (w_{10} \quad Mi(a_i)) + (w_{11} \quad Ge(a_i)) \\ & + (w_{12} \quad Sp(a_i)) \end{aligned} \quad (10)$$

where:
GD: Destination management
PduPlan of touristic urban development
Pdt: Municipal touristic developmental program
Riu: Urban Image Regulation
Prc: Reordering program of informal commerce.
Pac: Participation of local Civil Associations in the conservation of Historical Heritage.
Ana: Application of environmental regulations.
Ppa: Programs for the promotion of artistic and cultural activities.
Cai: Collaboration among agents involved in the touristic sector.
Mi: Tourism monitoring,
Ge: Generation of employment
Sp: Average salary

Therefore:

$$GD(a_i) = \sum W_j X_i(a_i) \quad (11)$$

Criterion 5: Limiting and amplifying factors(g_5)

This criterion classifies the determinants that are measured in terms of geography, territorial information and population. For this criterion$(g_5)$the indicators indicated above, are expressed in the following formula:

$$\begin{aligned} PPD(a_i) = {} & (w_1 \quad Pd(a_i)) + (w_2 \quad Sd(a_i)) \\ & + (w_3 \quad Cb(a_i)) + (w_4 \quad Pde(a_i)) \end{aligned} \quad (12)$$

where:
FD: determining factors
Pd: Proximity of destination,
Sd: Security of destination,
Cb: Cost benefit of destination
Pde: Prestige of destiny

Therefore:

$$FD(a_i) = \sum W_j X_i(a_i) \quad (13)$$

In this way, the structure of criteria is presented in a summarized way in Table 4. Where each of the criteria is defined and the purpose of the same is considered in the study. Finally, it is important to note that the competitiveness of Pueblos Mágicos can be a complex concept, since it combines different elements, some more tangible than others, which in some cases are not easy to measure. Gándara, Fumi, Domareski and Augusto (2013) emphasize that it is a relative concept and such measure can change according to the temporal space or destination that is taken as reference.

Table 4. Decision-making criteria for ordering the pueblos mágicos

Label	Criteria	Scope and reach ability of Criteria	Orienteering
C1	Resources and basic attractors	Resources within the destination and that are determinant for the tourist	Maximize
C2	Support and resources factors	They are the infrastructural resources and are considered as the factors that are used to determine the structure of the touristic destination	Maximize
C3	Destination planning and development policies	They are introduced as the policies of destination and are the central components of government	Maximize
C4	Destination´s management and direction	They are part of the management of the destination and are the main components of the companies	Maximize
C5	Limiting and amplifying factors	It classifies the determinants that are measured in terms of geographical, territorial and population information	Minimize

Source: Personal Elaboration

Table 5. Threshold values *q, pyv*

Criterion	*q*	*p*	*v*
Resources and basic attractors			
Support and resources factors			
Destination planning and development policies			
Destination´s management and direction			
Limiting and amplifying factors			

Source: Personal Elaboration

Table 6. Alternatives performance matrix

Label	Pueblos mágicos	Resources and basic attractors	Support and Resources factors	Destination planning and development policies	Destination´s management and direction	Limiting and amplifying factors
A1	DT 1	-	-	-	-	-
A2	DT 2	-	-	-	-	-
…	…	-	-	-	-	-
Am	DT m	-	-	-	-	-

Source: Personal Elaboration

Table 7. Credibility matrix

	A1	A2	A3	…	Am
A1	-				
A2		-			
A3			-		
…				-	
Am					-

Source: Personal Elaboration

Table 8. Orderings generated by the evaluative algorithm

	1	2	3	…	n
1					
2					
3					
…					
n					
λ					

Source: Personal Elaboration

Determination of indifference and preference parameters: thresholds

One of the supports given to the decision maker is the definition of preferences and uncertainties through the indifference (q), preference (p) and veto (v) thresholds. Traditional preference modeling assumes that by comparing two alternatives a, b, ∈A, the following two binary ratios are valid:

$aP_jb \Leftrightarrow g_j(a) > g_j(b)$: means that a is strictly preferred to b in g_j criteria.
$aI_jb \Leftrightarrow g_j(a) = g_j(b)$: means that a is indifferent to b in g_j criteria.

As shown, these relationships can lead to situations where given a minimum difference between two alternatives and one of them is considered preferred over the other, although in reality they should be considered indifferent (Almeida *et al*., 2006). For these studies it is proposed to consider the thresholds to which the corresponding values should be assigned, so it is considered to suggest specific values between q and p, and with respect to the threshold of veto v, since it is not an important factor for the decision criteria, It will not be assigned values to this threshold, trying to ensure that a non-important criterion could veto an important one. The values of the thresholds will be reflected in Table 5. With the use of thresholds, the ELECTRE method seeks to construct an outrank relationship *S*. *ASB* means that according to the overall

DM preference model, there are good reasons to consider that "*a* is at least as good as *b*" or "*a* isn't as worse as *b* ". Each pair of alternatives *A* and *B* is tested below in order to check whether the *ASB* statement is valid or not (Leyva, 2010).

Adding and calculation of evaluation parameters

Construction of the performance matrix

Pueblos Mágicos that will be evaluated with the criteria according to table 4, being all of them of quantitative nature. In this way, a performance matrix will be generated, which will be constructed in table 6 of *m* alternatives of magic villages by the five decision criteria.

Agreement and Discordance Principle

The test to accept the *ASB* statement is implemented using two principles:

A principle of agreement, which requires that most criteria, after considering its relative importance, is in favor of the affirmation - the principle of the majority - (Leyva, 2010). That is to say, the first step is to develop a measure of agreement, which appears in the concordance index *C (a, b),* for each pair of alternatives, so that a diffuse outranking relation is defined as follows**:**

$$c(a,b) = \frac{1}{W}\sum_{j=1}^{n} c_j(a,b)$$

where:

$$W = \sum_{j=1}^{n} w_j$$

$$C_j(a,b) = \begin{cases} 1 & sig_j(a) + q_j\left(g_j(a)\right) \geq g_j(b), \\ 0 & sig_j(a) + p_j\left(g_j(a)\right) \leq g_j(b), \end{cases}$$

$$Linearly\ increasing\ wit\ \ g_j(a)\ in\ t\ \ e\ intermediate\ region$$

On the other hand, the principle of discordance, which requires that, within the minority of criteria, which are not compatible with the statement, none of them strongly opposes the statement - respect for minority principles - (Leyva, 2010). To calculate the discordance, it is called the threshold of veto. The veto threshold *v_j* allows the possibility of *aSb* to be rejected in its entirety, by any criterion *j, g_j (b)>g_j (a) + v_j*. The discordance index for each criterion *d_j (a, b),* is calculated as:

$$d_j(a,b) = \begin{cases} 1 & sig_j(a) + p_j\left(g_j(a)\right) \leq g_j(b), \\ 0 & sig_j(a) + v_j\left(g_j(a)\right) \leq g_j(b), \end{cases}$$

$$Linearly\ decreasing\ tog_j(a)\ in\ t\ \ e\ intermediate\ region$$

Calculation of the Credibility Matrix (Final Ordering)

The final step in the construction phase of the model is the combination of the concordance and discordance matrix, these two measures are used to produce a measure of the degree of outranking, that is, a credibility index that evaluates the strength of the affirmation The '*a* is at least as good as *b*'. In this way, it is from the alternatives matrix (Table 3), with the values of the indifference (q) and preference (p) thresholds (Table 5) and the relative importance of the criteria (weights) obtained, the ELECTRE III - MOEA (Multi objective Evolutionary Algorithm) method is used to construct the preference adding model in the form of blurred relationship represented in the credibility matrix of the following Table 7.
The results of the credibility matrix are used, using the evolutionary algorithm presented in Leyva and Aguilera (2005), this result allows to exploit the relationship of blurring represented in table 8, in this way we obtain a ranking of alternatives of decreasing preferences, As well as the cut-off value obtained for each order *(λ).*

Finally, the concentration of the alternatives with respect to their position in the ordering is performed, this shows the number of times *T (i, j) (1≤i, j≤m)* (Leyva and Gastélum, 2013) being this, the alternatives found in a certain position in the final ordering associated with the run-outs of the evolutionary algorithm. Finally, a sequence is obtained in order of decreasing preference, which allows to generate the recommendations to the decision maker.

Conclusion

At present, the term competitiveness and its applicability in Pueblos Mágicos has led to the emergence of both descriptive and analytical studies, which seek to explain the particular characteristics of this phenomenon, considering not only studies of an economic and social nature, but also those involving the political nature because in these lie to a great extent the strategies that will allow to influence in favor of the variables of competitiveness of the Pueblos Mágicos. In this sense, determining the competitiveness of Pueblos Mágicosunder a multicriteria approach makes it possible the direct research from two approaches: on one hand, to promote the competitiveness of these destinations; on the other hand to motivate the use of the Electre III method under conditions of subjectivity in its measurement. In this way, the proposal that is made to determine the competitiveness of the Pueblos Mágicosunder a multicriterion approach, allows to generate empirical evidence of its applicability in this type of problems, when incorporating the use of evolutionary techniques, such as the one that has implemented the MOEA. In this case, using the ELECTRE-III method, which allows modeling preferences of the decision maker, where such preferences can be expressed as a valued over classification relationship. The contributions that are made in this study, of practical application, directed to the Pueblos Mágicos, are the following:

- The multicriteria evaluation of the Pueblos Mágicoswill make it possible to contribute to the economic development of the entities where they belong.
- The results of this practical exercise present the hierarchy in order of competitively decrease performance of the Pueblos Mágicos.
- The use of the multi-criterion technique is compared relatively favorable to the traditional procedures (until now more widely used) used to determine the competitiveness of the Pueblos Mágicos.
- This multicriteria method allows the relative comparison of the Pueblos Mágicos in study.

Finally, it is proposed the use of this methodology to carry out future studies in the 111 Pueblos Mágicos, starting from the five dimensions presented, with the objective of identifying strengths and weaknesses in each Pueblo Mágico with regard to each factor, allowing agents Involved in the touristic activity

to identify areas for improvement in the development and sustainable use of tourism.

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