An Empirical Analysis of Competitiveness on Cities of Sinaloa, Mexico with an Outranking Method

Pavel A. Alvarez Carrillo[1] , Martín León Santiesteban[1] , Diego A. Gastelum Chavira[1] , Luis A. Vega Osuna[1]

[1]Universidad de Occidente, Culiacan, Mexico
pavel.alvarez@udo.mx, martin.leon@udo.mx, luisalfredo86@yahoo.com.mx, diego.gastelum@udo.mx

Abstract

This work aims to develop an Empirical Analysis of Destination Competitiveness of three main cities of Sinaloa, Mexico with a well-known Crouch-Ritchie model. This problem is approached as a multicriteria ranking problem with an outranking method and a multicriteria group decision support system to generate a ranking of main cities on Sinaloa. The Crouch-Ritchie model is used to generate information to evaluate Destination Competitiveness and the outranking method generates a preferential model and obtains destination competitiveness based ranking of cities.

Keywords: Destination Competitiveness, Tourism Destination, Outranking Method, Multiobjective Optimization.

1. Introduction

In nowadays world economy, and specifically tourism, major changes occur, which require competitiveness analysis tools for private and public sectors. In this matter, our objective is to analyze the competitiveness of three tourist destinations with a well-known model for destination competitiveness, using an outranking method to generate a ranking of alternatives in decreasing preference order. The outranking method for this empirical analysis is the ELECTRE III and is used as a tool to construct the preferential model with the information obtained by the Crouch-Ritchie model for destination competitiveness. The outranking method is not an alternative model for destination competitiveness evaluation, instead; it is a tool to extend the Crouch-Ritchie model with an objective evaluation of the destinations being compared.

Few studies have attempted to identify strategies for improving Tourism Destination Competitiveness, preventing decision makers from obtaining valuable cues for making accurate decisions to improve Competitiveness (Peng and Tzeng, 2012). In this work, we use the Crouch-Ritchie model as a framework to analyse the destination competitiveness of three main cities in Sinaloa. The destination competitiveness is compared among the cities using the model to obtain 5 main criteria. The procedure of this analysis indicates how to use the attributes to make a comparison among tourism destinations.

1.1. Sinaloa in the Touristic Context

When we speak about tourism in Sinaloa, undoubtedly we need to talk about the port of Mazatlan, which is considered as the productive core of the southern part of the state, since it has defined the tourism as one of its economic vocations; activity which the city has emphasized its specialization since the decreasing productivity of fishing and commercial traffic led to the port in recent years.

However, we should not leave behind cities like Culiacan and Los Mochis, which are considered commercial and business destinations. In this sense, Sinaloa has a wide range of attractions, which allow it to be considered as a State with an important touristic potential. Some examples are the colonial buildings, the dams, pristine beaches, lagoons for hunting development and traditional cultural expressions.

Therefore, Tourism is considered as the second pillar of the Sinaloa economy after agricultural activities, this because in 2011 it accounted for 12 percent of Gross State Product and is the second source of foreign exchange, with a large multiplier effect investment, income and employment (PED, 2011: 227).

In this sense, the touristic inflow of Sinaloa in 2011 was 2 million 739 thousand tourists, 2.1 percent less than in 2010, of which 311 were 2 million domestic visitors and 428,000 foreigners. (INEGI, 2012).

The hotel infrastructure of Sinaloa, in 2011, was made up of 19,742 rooms in 431 shops, 74.7 percent distributed in Hotels and 10 percent in Motels. The rest consists of guesthouses, cottages, suites, lodges, RV parks, among others. This fact allows the State to occupy the eighteenth place nationally, according to INEGI (2012).

In addition, by category, 7.7 percent are five star hotels, 13.2 percent four stars, 18.8 percent three stars, 9.5 percent two stars and 10.2 percent one star hotels, the remaining 40.6 percent are not yet classified.

There are some projects aimed to pro-mote Sinaloa, which will come to deto-nate the tourism industry and it is as-sumed that with them it could be said that the state will compete with the best desti-nations in Mexico and / or possibly with some countries. These projects are the Espiritu Beach in Escuinapa, the OceArp Las Labradas Park in San Ignacio, the Eco Park Las Marismas, the Sus-

tainable Model Beach (Togo), The Cortes Island Project (New Altata) in Navolato, Ohuira Bay in Ahome, Mill Park in Los Mochis, Ahome, the Durango-Mazatlan highway, the Baluarte Bicentennial Bridge, as well as real estate development and high-level services in Mazatlan. Furthermore, we have to consider the 29 projects that have been promoted in recent years, which carry considerable progress in Sinaloa tour-ism´s development (GES, 2012).

This paper is divided into 4 main sections. In the Section 2, we describe some destination competitiveness models and some studies of competitiveness developed with Multicriteria Decision Analysis (MCDA). The method of the analysis of destination competitiveness based on Crouch-Ritchie model is described in the Section 3. In the Section 4, an analysis of the destination competitiveness with an outranking method is presented and a sensitive analysis is developed to strengthen our results. Finally, conclusions are presented in the Section 5.

2. Related work

There are a lot studies developed in destination competitiveness. However, some few are developed with MCDA methods. In this section we explain tourism competitiveness models and relevant works developed with MCDA methods.

2.1. Analysis of Tourism Competitiveness Models

Regarding the models that analyze the factors that can determine whether a destination is more competitive in relation to another, there are some approaches focused on destination competitiveness. In this section, we describe the approaches proposed by Porter (1998) and Crouch (2010). Also, we will highlight the definition of competitiveness by Dwyer and Kim (2003).

Porter's Approach (1998) is not focused on the study of enterprises. Rather, it studies countries or destinations, because its main idea distinguishes that the success of a company depends not only on the strategy and positioning, but also on the environment. It also considers destinations as "clusters" due to the success of a particular sector, where the environment is dynamic, challenging and encourages businesses to improve their advantage.

According to Porter, economic competitiveness is based on the determinants of competitive advantage, which considers four main attributes and two secondary. The first one, the condition of the factors, incorporates the basic components of tourism product, which determine the attractiveness of a destination and are proposed in three categorizations: 1) natural and cultural resources, 2) capital and infrastructure and 3) human resources. The second one, the demand conditions are determined by: 1) the size of the potential market, 2) the characteristics of the market, 3) positioning in growth markets and 4) for sophisticated tourists: recognize new trends.

Third one, bidders-related industries 'direct offer': 1) access to the destination, 2) food, entertainment, 3) souvenir industry, 4) quality services, 5) suppliers, 6) education and training centers and 7) health centers.

And finally, Structure, Organization and Strategy: the key element of this determinant is the availability of a strategic tourism plan. In this sense, there are also different ways to run a company or a destination. Here the strategy is to find the best one.

On the other hand, Crouch (2010) states that, "the tourism product is an experience that is delivered by a destination to the visitors". This means that the additional complexity of the product itself consists of a greater number of attributes, which ensures that each visitor takes home a unique experience.

At the same time, there are many different objectives that lie behind the policy of private and public tourism. While some goals address the economic return and profit, other objectives concern the environmental and social context. In this way the management of the destination competitiveness lies not only in one business but in all the participants that impact visitors in their experience, just like tourism enterprise should be, like the support enterprises that include the organizations.

Crouch (2010) notes that the management of the destination competitiveness has become a subject of interest because of the theories, models and processes that can guide the approach to this challenge, as they offer the possibility of place with clarity and rigor a complex management task.

On the other hand, it impresses that the impact of an attribute of the competitiveness in the relative performance of a destination is a function as long as the importance of the attribute is variable in the destination.

This Crouch-Ritchie model (2010) is accentuated mainly on two factors that recognize the complexity of the destination, which is based on resource endowments of a destination (comparative advantage), as well as its ability to deploy resources (competitive advantage) and get the impact of macroeconomic and microeconomic environment.

The term destination competitiveness according to Dwyer and Kim (2003) can be defined as "the relative ability of a destination to meet the needs of visitors in the various aspects of the tourism experience".

2.2. Studies of Competitiveness with MCDA methods

Peng and Tzeng (2012) explored strategies for improving tourism competitiveness implementing a MCDM model and combining DEMATEL - based ANP. Mazanec, Wober and Zins (2007) developed a research regarding with the tourism destination competitiveness including the gargantuan compilations of competitiveness factors than include Ritchie and Crouch (2003), Dwyer and Kim (2003) and Competitiveness Monitor initiated by the World Travel and Tourism Council. With an empirical study, they found that is possible with the Competitiveness monitor model explain the levels of tourism activity

better than sustained tourism growth. Furthermore, they made recommendations on how to adjust the future strategy of research on destination competitiveness.

3. Method

In this work, we are interested in analyzing the main cities of Sinaloa, Mexico with a destination competitiveness approach. Thus, we used the Crouch-Ritchie model to analyze three cities as a tourism destination. For rank the destinations we use the well-known ELECTRE III methodology as an outranking method for this multicriteria ranking problem.

The outranking methods (e.g., ELECTRE methods) presents a natural heuristic approach based on the concordance and discordance principles where the majority rules are combined with respect to significant minorities. This outranking method has the ability to deal with uncertain and fuzzy information.

Figueira, Greco and Roy (2009) assert two main important advantages of using outranking methods. The firs advantage is that they are able to take purely ordinal scales into account (Martel and Roy, 2006), without needing to convert the original scales into abstract ones with an arbitrary imposed range, thus maintaining the original concrete verbal meaning.

A second advantage is that indifference and preference thresholds can be taken into account when modeling the imperfect knowledge of data, which is not feasible in the methods: AHP, MACBETH MAUT, SMART and TOPSIS.

In empirical analysis of destination competitiveness of three cities of Sinaloa, Mexico, we use information obtained from the Statistical and Geographic National Institute in Mexico (INEGI -acronym in Spanish).

In total, the Crouch-Ritchie model identifies 36 destination competitiveness attributes. However, the information founded in INEGI (2012) let us use 45 attributes regarded to the five main factors of the model, which were used as criteria in the outranking method.

The factor Core Resources and Attractors is show in the Table 1. This factor regards natural resource as well as attractions of structure. Table 2 presents the information regarding Destination Management. Table 2 shows indicators about the organization of the governmental agencies of tourism. The factor of Destination Policy, Planning and Development regards the management and development of tourism by the governmental agencies. This factor must monitor and evaluate the capacities of the hotels (see Table 3). The factor Qualifying and Amplifying Determinants is measured in terms of geographical, territorial and population information (see Table 4). The factor Supporting factors and resources regards the roads and transportation capabilities, travel agencies and hotels capabilities (see Table 5).

Table 1: Factor of Core Resources and Attractors.

Core Resources and Attractors	Ahome	Culiacan	Mazatlan
Nature			
Watercourse	8	20	14
Dams	2	3	1
Thermal spring	1	1	1
Temperature	25.9	25.6	24.7
*Especial events	30	30	30
Entertainment			
Hunting and fishing	1	1	1
Colonial buildings	1	1	1
Archaeological sites	1	1	1
Super-structure			
Shopping center	1	1	1
Conglomerate hotels	1	1	1
Association of hotels	1	1	1
Market ties	175,051	430,614	1,239,091
Foreign tourism	16,263	7,566	270,997
Domestic tourism	158,788	423,048	968,114

* The value obtained is for the all state in general.

Table 2: Factor of Destination Management.

Destination Management	Ahome	Culiacan	Mazatlan
Organization			
Secretary for Tourism	1	1	1
Municipal Direction for tour-	1	1	1

ism			
Council for economic development	1	1	1
Car rental	5	6	13

Table 3: Factor of Destination Policy, Planning and Development.

Destination Policy, Planning and Development	Ahome	Culiacan	Mazatlan
Time to election of delegates	3	3	3
Development of new projects	5	5	10
Monitoring and evaluation for hotels			
Average rooms	1,276	2,147	9,143
Available rooms	39,556	66,557	283,430
Rooms in use	14,732	28,424	125,589
Occupancy rate %	37.24	42.71	44.31

Table 4: Factor of Qualifying and Amplifying Determinants.

Qualifying and Amplifying Determinants	Ahome	Culiacan	Mazatlan
*Latitude	32° 43' - 14° 32' N		
Longitude	109° 0' O	107° 23' O	106° 25' O
Altitude (msnm)	10	60	10
Feeling of insecurity %	0.72	0.72	0.72
Average of monthly salary	6,453	9,278	5,775
Total population	416,299	858,638	438,434
Territorial percentage	6.9	10.9	4.4

* Latitude is the same for every destination

Table 5: Factor of Supporting and Resources.

Supporting factors and resources	Ahome	Culiacan	Mazatlan
International airports	1	1	1
Passengers in commercial flies	221,800	1,077,308	701,085
Direct aerial destinations	8	16	25
Roads (Km.)	2,939	2,573	636
Travel agency	22	49	65
Car rental	5	6	3
Marine tourism	0	0	2
Hotels	31	61	145
Rooms	1,490	3,036	9,331
Restaurants	50	175	137
Restaurant bar	44	32	140
Coffee shop	6	15	6
Bars	8	14	11
Museums	13	5	43

4. Analysis of the Destination Competitiveness with an Outranking Method

The described problem was treated with a Multi-criteria group decision support system named SADGAGE (Alvarez and Leyva, 2012) (acronym in Spanish). The SADGAGE system was designed based on a multicriteria methodology for the ranking problem that uses the ELECTRE III method (Roy, 1990) for modeling the group preferences with a method developed by Leyva and Fernandez (2003) and a multiobjective evolutionary algorithm (Leyva and Aguilera, 2005). The system is available on the page http://mcdss.udo.mx/xgdss (see Fig. 1 and Fig. 2).

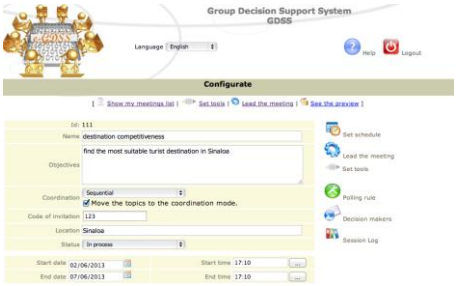

Fig. 1: Configuration of a multicriteria ranking project on SADGAGE.

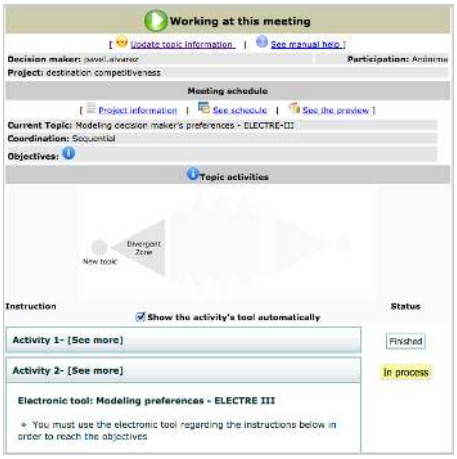

Fig. 2: Development of the decision process on SADGAGE.

Based on Crouch and Ritchie (2011) we rank three local cities of Sinaloa. In this section we solved a multi-criteria ranking problem which aims to find the most competitiveness destination on Sinaloa, Mexico.

There are three most important cities in Sinaloa; Los Mochis (Ahome), Culiacan and Mazatlan. Los Mochis is one of the biggest agriculture zones of the country. It has one of the most fertile valleys on the world. Culiacan is the capital and the most important city of the Sinaloa state. Mazatlan is one of the most important beach touristic destinations in Mexico.

We have three cities to evaluate their competitiveness with Crouch and Ritchie (2011) model (see Table 6).

Table 6: Alternatives or destinations to evaluate.

Code	Destination
A1	Ahome
A2	Culiacan
A3	Mazatlan

Crouch and Ritchie (2011) conceptual model of destination competitiveness presents a vast list of attributes to evaluate competitiveness destinations. In total there are 36 factors to be considered. They represent five main factors. To adapt Crouch and Ritchie (2011) model and evaluate the three most important destinations in Sinaloa we modified some attributes deleting and adding them. The model considers the Qualifying and Amplifying Determinants; Destination Policy, Planning and Development; Destination Management; Core Resources and Attractors; and Supporting Factors and Resources.

However, due to the lack of data, we use a different factor named sustainable management of the environment. Then the criteria to evaluate destination competitiveness are showed in Table 7. Table 8 shows the values of each alternative (destination) with respect to each criterion, this is the performance matrix.

Table 7: Criteria to evaluate destinations.

Code	Criterion
C1	Core Resources and Attractors
C2	Destination Management
C3	Destination Policy, Planning and Development
C4	Qualifying and Amplifying Determinants
C5	Supporting factors and resources

Table 8: Performance of the alternatives.

	C1	C2	C3	C4	C5
A1	29	30	18	28	20
A2	36	32	22	48	34
A3	35	38	59	24	46

According to ELECTRE III methodology (e.g. Roy 1990) the following choices of weights, indifference and strict preference thresholds associated to each criterion were made (see Table 9). In this problem the DMs are not considered using the veto threshold.

Table 9: Pseudo-criteria parameters: weights, indifference and preference thresholds.

	C1	C2	C3	C4	C5
w	0.3	0.1	0.2	0.1	0.3
q	3	3	5	4	5
p	6	5	10	10	10

w is the weight of the criterion
q is the indifference threshold of the criterion
p is the preference threshold of the criterion

According to the additional information pointed out before, for the decision maker we applied ELECTRE III to construct a valued outranking relation. Afterwards, we used the evolutionary algorithm presented in Leyva and Aguilera (2005) to exploit the outranking relation and derive a final ranking of the alternatives in decreasing order of preferences.

The modeling individual preference step results in a valued preference relation. The preferences outcome is called Credibility Matrix and they are presented in Table 10.

Table 10: Credibility Matrix.

	A1	A2	A3
A1	1	0.3	0.1
A2	1	1	0.4
A3	1.0	0.9	1

Once it is obtained the decision maker's preference model (credibility matrix), the next step is its exploitation in order to obtain a ranking of alternatives. To do that, we used a heuristic method based on multiobjective evolutionary algorithms (MOEA), which was presented in Leyva and Aguilera (2005).

As we said before, we used SADGAGE software, which has implemented the MOEA to derive a ranking of alternatives; the parameters defined for it are shown as follow:

- Number of generations: 10,000
- Population size: 30
- Crossover probability: 0.95
- Mutation probability: 0.05.

The restricted Pareto front, $PF_{known}^{restricted}$, found and the associated final set of solutions returned by the MOEA, $P_{known}^{restricted}$, are presented in Table 11.

Table 11: Restricted Pareto front found and the associated individuals of the solutions space.

Ranking	$\tilde{p}_1$	$\tilde{p}_2$	$\tilde{p}_3$	$\tilde{p}_4$	$\tilde{p}_5$	$\tilde{p}_6$
1	A_3	A_3	A_3	A_3	A_3	A_3
2	A_2	A_2	A_2	A_2	A_2	A_2
3	A_1	A_1	A_1	A_1	A_1	A_1
u	0	0	0	0	0	0
f	0	0	0	0	0	0
λ	0.899	0.899	0.899	0.899	0.899	0.899
Fitness	27.5	27.5	27.5	27.5	27.5	27.5

Notes:

$\tilde{p}_i$ is an individual (solution) associated to the members of the final restricted Pareto front.

- A_1 - Ahome, A_2 - Culiacán, A_3 - Mazatlán
- u, f, and are the objective functions of the MOEA

The MOEA was executed 50 times with the parameters described above. The outputs of the algorithm are shown in Table 12, which presents the number of times that an alternative was found at a certain place in the ranking. As each position in the order has assigned a weight w_i, we calculate the weighted sum $\sum_{i=1}^{m} w_i T(i,j), j=1..,m,$ with which we obtained the final recommendation to the decision maker. As noted, the alternatives at all times retained their position in the ranking with a credibility level of .8999, which being close to 1.0 gives greater certainty of the outcome.

Table 12. The number of times that an alternative was found at a certain place in the ranking.

Weight w_i	**Rank**	A_1	A_2	A_3
3	1	0	0	50
2	2	0	50	0
1	3	50	0	0
$\sum_{i=1}^{m} w_i T(i,j)$		50	100	150
Minimum λ:				

Finally, Table 12 suggests the final ranking shown in Table 13

Table 13: Ranking of the alternatives.

Position	Code	Destination
1	A3	Mazatlan
2	A2	Culiacan
3	A1	Ahome

4.1. Sensitivity Analysis

After obtaining a recommendation to the decision maker, and even if this is accepted, the decision process is not necessarily is finalized. Additionally, the analyst can propose to undertake a sensitivity analysis. A sensitivity analysis is to measure the robustness of an optimal solution based on changes in the values of the decision maker's preferences. This analysis allows us to interpret the results from the modification of the values of the weights and/or thresholds of indifference, preference. For this, the decision maker provides a range of values consistent even considering their preferences. A proposal about how to perform this kind of analysis on the weights of the criteria and the performance values of the alternatives is presented by Triantaphyllou and Sánchez (1997). Examples where the implementation of a sensitivity analysis can be found in Briggs et al., (1990); Goicoechea et al., (1982), Rios Insua and French, (1991), Leyva (2005) and Leyva and Gastelum, (2013).

A sensitivity analysis can be addressed by changing values on the following parameters:

Change in the values of the relative importance (w) in just one criterion,

Change in the values of the relative importance (w) in several criteria,

Change in the values of indifference (I) and/or preference (P) thresholds in just one criterion, and

Change in the values of indifference (I) and/or preference (P) thresholds in several criteria.

The outcomes of the sensitivity analysis for this empirical study are shown in Table 14.

Table 14. Influence of changes in specific parameters and changing values in the selected parameters on the final result.

Range of changes †	**Assumed changes**††	**Final results**§		
		A_3 A_2 A_1	A_2 A_3 A_1	Minimum λ
1. Change in the values of the relative importance (w) for two or more criteria simultaneously	C1: $w1$=0.2 C2: $w2$=0.2	5	0	0.8999
	C1: 1=0.25 C3: 3=0.25	5	0	0.8999
	C3: $w3$=2.5 C5: $w5$=2.5	5	0	0.8999
	C2: 2=0.15 C3: 3=0.15	5	0	0.8999
	C3: 3=0.15 C4: 4=0.15	5	0	0.8499
	C2: $w2$=0.2 C5: $w5$=0.2	5	0	0.8999
	C4: $w4$=0.2 C5: $w5$=0.2	5	0	0.7999
	C1: $w1$=0.1 C2: $w2$=0.3	5	0	0.8999
	C4: $w4$=0.3 C5: $w5$=0.1	5	0	0.6999
	C1:$w1$=0.25 C2: $w2$=0.2 C5:$w5$=0.25	5	0	0.8999
	C1:$w1$=0.25 C4: $w4$=0.2 C5:$w5$=0.25	5	0	0.7999
	C2:$w2$=0.15 C3: $w3$=0.1 C4:$w4$=0.15	5	0	0.8499
	C1: $w1$=0.2 C2: $w2$=0.2 C3: $w3$=0.2 C4: $w4$=0.2 C5: $w5$=0.2	5	0	0.7999
2. Change in the values of the q and p thresholds for a single criterion	C1: q=3.5, p=5.5	5	0	0.8999
	C2: q=3.5, p=4.5	5	0	0.8999
	C3: q=6.5, p=8.5	5	0	0.8999
	C4: q=6, p=8	5	0	0.8999
	C5: q=7, p=8	5	0	0.8999
3. Changes in the values of q and p for multiple criteria simultaneously.	C1: q=4, p=5 C4: q=6, p=8	5	0	0.8999
	C2: q=3.5, p=4.5 C4: q=6, p=8	5	0	0.8999
	C1: q=4, p=5 C3: q=7, p=8 C5: q=7, p=8	5	0	0.8999

Notes:

† Range of changes of specific parameters related to the decision maker's preferences.

†† Assumed changes in parameter values.

§ Final results after the changes in parameters have been introduced.

For each single of the 21 experiments where were changed weights or thresholds, on one or more criteria, were performed five executions of the MOEA, i.e., the MOEA was executed 105 times, and as can be seen in Table 14, the rankings obtained were 100% consistent with the final recommendation shown in Table 13.

The process of decision finalizes with the sensitivity analysis. The process is long and ultimately is the decision maker who makes an assessment of whether the presented recommendation is according to their preferences or not; but with this methodology various real-world problems can be addressed obtaining good outcomes.

5. Conclusion

This work presents an empirical analysis of a well-know Crouch-Ritchie model to determine the destination competitiveness of three cities of Sinaloa, Mexico. The ranking of the cities was developed with an outranking method comparing the attributes that reflect the destination competitiveness.

The results of the ranking hold constants because Mazatlan city presents higher attributes and values of tourism compared with the rest of cities in terms of competitiveness. However, this empirical analysis can be considered as a first prototype of procedure to use the Crouch-Ritchie model in the multicriteria ranking problem for evaluation of competitiveness in tourism destination.

For future works, this procedure could be used to evaluate the competitiveness of others tourism destinations and identify which factors can be more attractive for tourism.

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