



Analytic Network Process Based Strategic Planning for Iran's Trade Promotion Organization

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Strategic planning in each organization identifies its orientation and coming priorities as all decisions to be adopted respect to the ensuing outcomes. Strategic decisions considering crucial and irreversible results should not be based on experience and judgments. This paper uses analytic network process (ANP) method for prioritization in strategic planning. ANP is mostly analogous to analytic hierarchical process (AHP) with the only difference that the latter takes into account no interdependence between criteria and hierarchal levels, but the former does. The interpretations of the experts of the Iran's Trade Promotion Organization's (TPO), internal and external factors have determined Strength and Weakness points, opportunities and threats (SWOT) as well as their internal communications. After all, the appropriate strategies are defined and prioritized. In this paper, as a result, prioritization of strategies using AHP and ANP methods yield different results and to judge appropriately, the necessity of surveying relationships among criteria is indicated.

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1. INTRODUCTION

Long-term planning is completed based on the mission of each organization considering Strength and Weakness points, opportunities and threats encountered with. Strategic planning is a type of long-term planning considering the organization as a whole. Within the framework of strategic planning, managers wonder what they should do to attain the long-term objectives of the organization. The long-term period is often three up to five years. Experience has proved that the most successful managers are those who can encourage innovative strategic idea in their organizations [1, 2].

Strategic planning in an organization defines orientation and upcoming priorities and each decision is made based on its future consequences. Such a planning can also create logic and defensible bases for decision-making. Internal and external affairs are brought under control and maximum insight is applied.

No organization can implement all of the proper strategies and; so, categorization of strategies based on their priorities is a must for any organization. However, managers often confront the challenge of defining a precise time framework for strategic planning. Generally, they have to adhere to the principle of commitment requiring them to allocate a budget to planning, foretell the results and guarantee the return of capital. As long as a logic return of the capital is not observed, strategic planning would not be justifiable [3]. At present, strikingly fast changes provide us with a world of experiences and we can no longer count on customary methods for management. Since, the decisions are strategic and lead to crucial and irreversible results; we can no longer trust experience or judgments [4]. In this paper, we investigate Iran's Trade Promotion Organization as our case study. Iran's Trade Promotion Organization is a governmental organization and is one of the deputy ministers of ministry of industry, mine and business. The duties of this organization are policy making and supporting the business by means of supporting the exporters,

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syndicates, guilds and related chains. Respect to the acquaintance to this organization and positive view of the head of this organization over strategic planning, this case study was performed related to it. Firstly, with the presence of the main chief of organization numerous sessions were hold. On the basis of those sessions, ten individuals involving the deputies, managers, elicits of organization were formed the strategic committee. In different stages of performing, the project of these elicit introduced their opinions. There exist some problems in these sessions. For example, particular issues are regarded as strength points for various individuals. However, same issues are observed as weak points for other individuals as well. Some elicits did not send their opinions in predefined due to dates times. Otherwise, some individuals that their opinions were impressive did not attend the sessions. Nonetheless, the problems were solved by collective opinion and organization strategy was compiled and prioritized by AHP and ANP methods appropriately. At last, the difference between these two methods was elucidated.

In this research, firstly analytic network process offers a new model for prioritization. Secondly, the results are compared with strategic planning based on analytic hierarchal process (AHP). Iran's Trade Promotion Organization, the official body charged with non-oil exports, enjoys a strategic position within the government and it has been assigned a key task. Therefore, any planning in this organization has to be strategic.

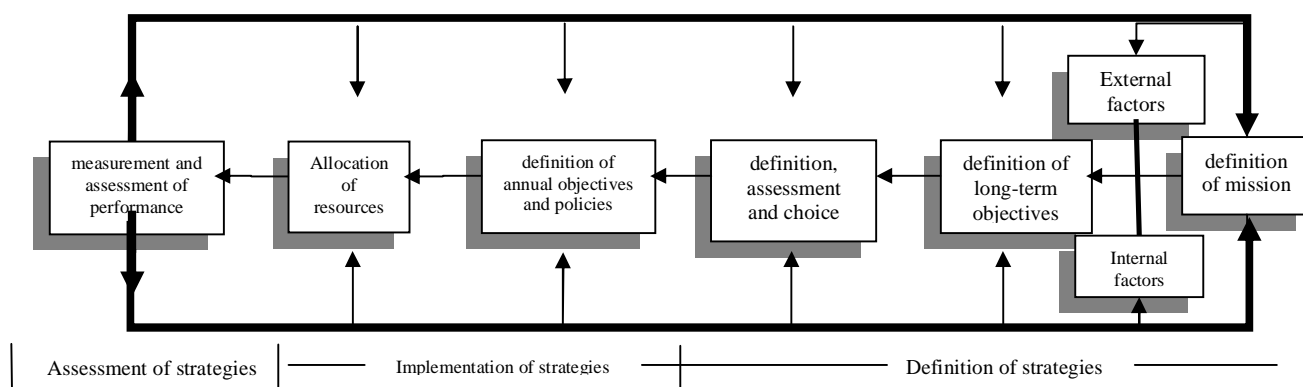
2. STRATEGIC PLANNING

Simply, strategic planning can improve the performance. Members of an organization grow perplexed amid routine task and daily challenges. Additionally, they are likely to forget the main objectives of the organization. A strategic planning can

give a better understanding of the objectives and stimulate a futurist attitude within the organization. Internal cooperation within an organization can be highly effective and efficient when all members are aware of the common goals which they pursue. A successful strategic planning ends up in action, results a common view based on values, leads managers and staff to cooperate among them. In this relates, managers are responsible and responsive in the society. In addition, it is sensitive to external events, based on high-quality data and being the key part of effective management [5].

In strategic planning, to find out the strength and weakness points within an organization, the history of the organization, its present status and its former performance have to be taken into consideration. Opportunities and threats are recognized based on realistic information. Key staff and senior managers have to contribute to the planning process bearing in mind a comprehensive and perfect strategic planning.

1. 2. Defining Strategy Definition of strategy consists of specifying mission, identifying external threats and opportunities, knowing about strengths and weaknesses and defining long-term objectives. The important issues aroused in definition of strategy are related to the allocation of resources, making decisions about diversification of activities, winning footholds into international markets, deciding about possible merger and finding ways not to be outstripped by rivals [6]. The framework illustrated in Figure 1 is a comprehensive, regular and acceptable model of strategic management process. This model never guarantees the success of the company, but it offers a clear and practical method in consideration of defining strategies. This model shows the relation between the main components of the process of strategic management, which is not defined in a closed space.



"How Companies Define Their Mission".[6]:

Figure 1. Strategic management model

Different levels of the organization are often engaged in exchanges and many organizations convene every six months to reconsider their views of mission, SWOT, strategies, long-term objectives and policies. In such gatherings, some participants back down from their previous views and such conventions are basically aimed at encouraging creativity and active contribution. Strong communications and taking feedback from the outcome of activities are essential for each strategic management process.

3. ANALYTIC HIERARCHICAL PROCESS (AHP)

As the world has become so complicated, we have to focus on the problems whose resolution requires resources beyond what we have at our disposal. To deal with political, economical and social issues in which there exists no clear structure, we have to set our priorities. Managers may get frustrated with conflicting data provided to them. Managers may have to know what issues need reconsideration. At times, we simply make mistakes in our analysis and assessment of different issues. Thus, we have to make sure that what we think and what we feel would take us to the same conclusion.

What we need is not a more complicated way of thinking. However, it is viewing our affairs within an organized but complex framework. AHP presents such a framework. This method enables us to simplify and accelerate our decision-making processes bearing in mind of adopting more effective decisions about complicated affairs.

The necessity to attribute a value to every variable helps decision-makers adopt cohesive models of thinking and achieve the same conclusion. Moreover, agreement in decision-making helps coordination and stability of judgments, let alone the boost given to AHP as a decision-making tool [7, 8]. AHP is a decision-making approach developed by Saaty [9].

To assign weight in AHP method, there exist numerous approaches. One of the approaches is pairwise comparison. Additionally, one of the important issues related to this approach is finding incompatibility rate (IR). However, to assign weight in AHP method pairwise comparison approach is more common and appropriate. Of course, it is used for at most up to six to seven criteria. For these number of criteria surveyed in this paper, this method is not appropriate and incompatibility rate is very high. In the present paper, to obtain elicited estimation, use has been made of vector method. In this method, elicited estimation is obtained as a number of falls between 1 to 9. Next, number is divided by the total sum of the numbers and normal weight of that criterion is obtained with respect to the other elicited estimations. In vector method, the incompatibility is equal to zero.

Although AHP offers numerous of advantages for assessment of strategies, it cannot measure possible relationships among factors. In this process, the factors are supposed to be independent from each other although it is not logical assumption. The relationships among factors could be achieved in the internal and external analysis of factors [10]. For instance, an internal factor like the organization's assets can help us take advantage of an external opportunity like investment. If we miss this opportunity, our rivals will outdo us [11]. Many decision-making issues could not be simulated in a hierarchical form because of interaction among their criteria. A factor from a higher level could be in interaction with a factor from a lower level. Saaty proposed AHP for problems with independent criteria and ANP for problems with interdependent criteria [12].

4. ANALYTIC NETWORK PROCESS (ANP)

Preliminary studies make it clear that AHP is the best technique for multi-criterion problems. It can serve as a proper solution to social and economic problems. The main assumption in AHP is that the criteria from higher levels are independent from those in lower levels (Figure 2). Saaty introduced ANP as a complement to AHP [10].

Figure 2 illustrates the structural differences between AHP and ANP. The elements in each cluster could be in relation with one or all elements from another cluster. Internal relationships between two clusters are known as external relationship while the internal interactions between elements of each cluster are referred to as internal relationship.

ANP is an extended version of AHP and it is used in various studies for assessment of performance [13]. However, there exist numerous works using ANP techniques to judge optimally. For further study please refer to [14-16].

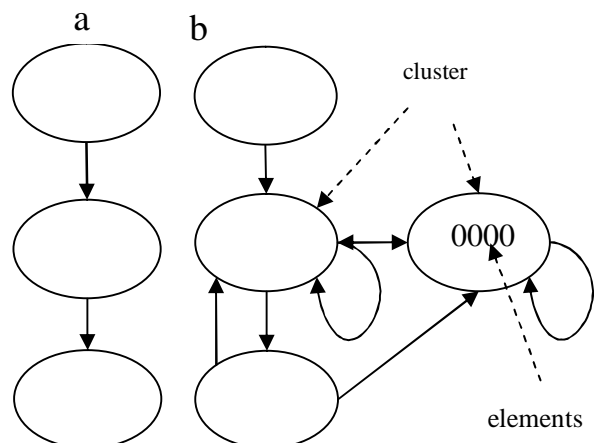


Figure 2. Structural difference between AHP (a) and ANP (b)

TABLE 1. Super matrix

		C1			...	Ck			...	Cn					
		e11	e12	...	e1 m1	...	ek1	ek2	...	ek mk	...	en1	en2	...	en mn
C1	e11	w11	.	.	.			w1k	.	.	.			.	w1n
	e12	.	.	.	.			.	.	.	.			.	.

Ck	e1 m1	.	.	.	.			.	.	.	.			.	.

	ek1	wk1	.	.	.			wkk	.	.	.			.	wkn
Cn	ek2	.	.	.	.			.	.	.	.			.	.

	ek mk	.	.	.	.			.	.	.	.			.	.
...	
Cn	en1	wn1	.	.	.			wnk	.	.	.			.	wnn
	en2	.	.	.	.			.	.	.	.			.	.

	en														
	mn														

ANP consists of four main stages [17]:

1. Defining the problem's structure: The problem needs to be completely transparent and analyzable to logical systems.
2. Pair wise comparisons and priority vector: Like AHP, paired comparisons are carried out in each cluster and among clusters.
3. Super matrix: The internal priority vectors need to be inserted in an appropriate column in the matrix in a bid to compute the priorities. This super matrix is a combination of matrices showing relationships between two clusters in a system. Each cluster is $c_k, K=1,2,\dots,n$ while each cluster K contains m_k elements and is symbolized as $e_{k1}, e_{k2}, \dots, e_{kmk}$. The relationships computed in the previous stage are replaced in their proper spots to produce a super matrix. Table 1 shows the standard form for a super matrix.
4. Best choice: Once the super matrix is calculated in Step 3 it means that the weight of all relationships has been calculated and the entire network has been covered. Then, the best choices are selected.

5. RESEARCH METHODOLOGY

In this research, it was first assumed that the clusters are not interdependent and then the strategies were defined through AHP and surveying experts taking into account discovering strengths and weaknesses, opportunities and threats. Since this research is fraught with elements, pairwise comparison cannot grant weight to them and the task was done by a group of experts from the organization. The elements have received scores of one

up to nine based on their significance. The weight for each element is calculated by dividing the element score by the total of scores. Afterwards, cluster interdependence is illustrated like in Figure 3 by ANP. Based on the relationships among elements, a more general relationship is defined as in Figure 4. By earning feedback from elicits as shown in Figure 4, inner relationships among criteria were obtained. In other words, it was specified that each criterion has what inner relationships with other criteria. (The main topic related to AHP method). After specifying these relationships and preparation conversion matrix by acting on obtained weight, correct prioritizations are chosen by means of AHP method. Relevant factors are then granted weight. For example, the domestic factors "human resources/knowledge/specialty" are relevant to other factors like organizational culture, technology, management and beneficiaries, tradesmen, agencies, statesmen, etc. The views of experts helped create Table 2. All factors were computed same as human resource/knowledge/expertise and can be shown like Table 2.

Primary matrix has not been normalized and it needs to be normal. The normal one is investigated in Table 3 and identified as W_n . It is necessary to know that some factors are related to a single factor and no table is sketched for them. Now, with the weight of internal relationships calculated, a matrix has to be achieved. We assume a matrix whose rows and columns are internal and external factors. We insert the weights in the proper places. Meaning, in each spot the proportion of the factors appeared in each row to the relevant column is introduced. First, we should consider an identity matrix and insert the calculated weights from Tables 2 up to 5 in the right spots in the matrix [10].

TABLE 2. Weight of factors relevant to human resource/knowledge/expertise

The criterion factor	Weight of factors relevant			
	Organizational Culture	IT	Management	Beneficiaries/Businessmen/Enterprises/Statesmen, etc
Human resource/ knowledge/expertise	0.304	0.174	0.217	0.304

TABLE 3. Normal matrix

	If1	If2	If3	If4	If5	If6	If7	If8	Ef1	Ef2	Ef3	Ef4	Ef5	Ef6	Ef7
If1	0.500	0.500	0.000	0.000	0.000	0.167	0.000	0.083	0.000	0.000	0.000	0.000	0.140	0.000	0.000
If2	0.152	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
If3	0.000	0.000	0.500	0.167	0.500	0.000	0.000	0.146	0.500	0.125	0.054	0.150	0.000	0.000	0.000
If4	0.000	0.000	0.083	0.500	0.000	0.000	0.000	0.063	0.000	0.000	0.000	0.000	0.100	0.000	0.000
If5	0.000	0.000	0.050	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
If6	0.087	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.075	0.000	0.000	0.000	0.105	0.000
If7	0.000	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.080	0.000	0.000
If8	0.109	0.000	0.117	0.133	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.100	0.105	0.208
Ef1	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000
Ef2	0.000	0.000	0.100	0.000	0.000	0.208	0.000	0.000	0.000	0.500	0.089	0.000	0.000	0.132	0.000
Ef3	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.175	0.500	0.350	0.080	0.158	0.292
Ef4	0.000	0.000	0.050	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.125	0.500	0.000	0.000	0.000
Ef5	0.152	0.000	0.000	0.200	0.000	0.000	0.500	0.063	0.000	0.000	0.071	0.000	0.500	0.000	0.000
Ef6	0.000	0.000	0.000	0.000	0.000	0.125	0.000	0.083	0.000	0.125	0.071	0.000	0.000	0.500	0.000
Ef7	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.063	0.000	0.000	0.089	0.000	0.000	0.000	0.500

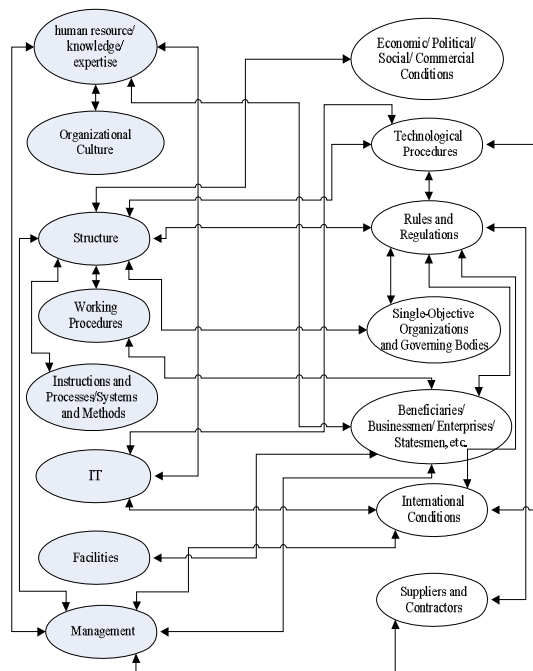


Figure 3. Relationship between internal and external factors in Iran's Trade Promotion Organization

Once computed, this matrix is multiplied by the matrix of internal and external factors' weights to give the real weight of factors and the real absolute weight of criteria. These weights can help to prioritize the strategies similarly to AHP method. Strength and Weakness points as well as opportunities and threats are referred to as criteria. Therefore, c1-c12 represent the Strength points, c13-c32 the Weakness points, c33-c46 the opportunities and c47-c62 the threats. The last level of the decision tree indicates that all strategies have to be measured by SWOT to be permitted a weight. For instance, to calculate c1, we have to examine all twelve strategies and attribute weights to them. This weight is known as W_{ST_i, C_j} indicating the i th strategy for the j th criterion.

The absolute weight of the criteria is identified as W_{C_j} .

The weight of each strategy is calculated by the addition of the multiplication of the absolute weight of the criteria by their weight. In other words, we have the following results for i varying between 1 and 12:

$$W_{ST_i} = \sum_{j=1}^{62} W_{ST_i, C_j} \times W_{C_j}$$

TABLE 4. Weight of strategies based on c1 (the first strength)

Strategies evaluation criterion	St1	St2	St3	St4	St5	St6	St7	St8	St9	St10	St11	St12
(C1) S1	0.068	0.136	0.068	0.091	0.068	0.045	0.091	0.068	0.045	0.045	0.068	0.205

TABLE 5. Prioritization of strategies based on AHP and ANP

Strategies	ANP Weight	AHP Weight	Ranking ANP	Ranking AHP
st1	0.088	0.089	4	3
st2	0.064	0.065	12	11
st3	0.134	0.138	2	1
st4	0.093	.092	3	4
st5	0.122	0.124	1	2
st6	0.085	0.081	5	5
st7	0.064	0.067	11	10
st8	0.069	0.068	10	9
st9	0.073	0.075	6	6
st10	0.069	0.062	8	12
st11	0.0698	0.0695	7	7
st12	0.0688	0.0695	9	8

Now, only $W_{st_i c_j}$ remains missing. We have to attribute weights up to the 12 strategies to calculate c1. All strategies are weighted based on all obtained SWOT same as Table 4

6. RESULTS

To define strategies for the organizations, experts are requested to offer theirs bearing in mind the mission of the organization and in the light of the Strength and Weakness points as well as opportunities and threats. The result is as follows:

- ST1. Raising the level of scientific and practical skills of staff
- ST2: Boosting the participative spirit of the organization and the staff
- ST3: Bolstering the country's capacities for more efficient foreign trade
- ST4: Development of target export markets
- ST5: Accelerating improvement of working spaces
- ST6: Winning satisfaction of domestic and foreign beneficiaries
- ST7: Implementation of knowledge management system
- ST8: IT promotion

- ST9: Integration of data flow and procedures
- ST10: Reengineering of structures and working procedures
- ST11: Strategic thinking promotion
- ST12: Focus on creativity and innovation (see Table 5)

In this stage, the strategies defined in the previous steps are compared through W_{ST_i} formula and within the framework of both AHP and ANP methods.

7. CONCLUSION

Analytic Network Process (ANP), along with having all analytic hierarchical process (AHP) AHP capabilities comes through the serious incapability of AHP method meaning overlooking mutually relationships among criteria. It procures suitable structure to analyze different problems. In this paper, it is indicated that overlooking these mutually relationships makes it difficult to reach the main goal. Because, the most important part in decision making, respect to the shortage of resources and facilities, is the correct prioritization of strategies and if it is required, performing the higher prioritization as well. Obtained results were reinvestigated considering elisits's oponions and proved that proritization based on the ANP yields better solutions and results.

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برنامه‌ریزی استراتژیک در سازمان، جهت‌گیری و الویت‌های آینده را مشخص می‌نماید و تصمیمات امروز، با توجه به پیامدهای آینده آن اتخاذ می‌شوند. هنگامی که تصمیمات جنبه استراتژیک دارند و به نتایج بسیار عمده و غیر قابل برگشت می‌انجامند، نمی‌توان از تصمیم‌گیری‌های مبتنی بر قضاوت‌های شهودی و تجربه استفاده کرد. در این مقاله از روش فرایند تحلیل شبکه‌ای (ANP) برای اولویت بندی در برنامه‌ریزی استراتژیک استفاده شده است. روش ANP مانند فرایند تحلیل سلسله برنامه‌ریزی استراتژیک در سازمان، جهت‌گیری و الویت‌های آینده را مشخص می‌نماید و تصمیمات امروز، با توجه به پیامدهای آینده آن اتخاذ می‌شوند. هنگامی که تصمیمات جنبه استراتژیک دارند و به نتایج بسیار عمده و غیر قابل برگشت می‌انجامند، نمی‌توان از تصمیم‌گیری‌های مبتنی بر قضاوت‌های شهودی و تجربه استفاده کرد. در این مقاله از روش فرایند تحلیل شبکه‌ای (ANP) برای اولویت بندی در برنامه‌ریزی استراتژیک استفاده شده است. روش ANP مانند فرایند تحلیل سلسله مراتبی (AHP) می‌باشد با این تفاوت که در AHP معیارهای مورد بررسی و سطوح سلسله مراتب مستقل از هم فرض می‌شوند ولی در ANP بین سطوح مختلف و معیارها، ممکن است وابستگی وجود داشته باشد. با نظر خواهی از خبرگان سازمان، عوامل داخلی و خارجی، نقاط قوت، ضعف، فرصت‌ها و تهدیدهای سازمان (SWOT) و ارتباطات درونی آنها بدست آمده و وزن‌دهی می‌گردد. با توجه به آنها استراتژی‌های مناسب تعیین شده و اولویت بندی می‌گردند. برای روشن تر شدن و مشخص شدن کارایی، این روش به عنوان نمونه در سازمان توسعه تجارت ایران (TPO) با روش AHP مقایسه شده است. مراتب (AHP) می‌باشد با این تفاوت که در AHP معیارهای مورد بررسی و سطوح سلسله مراتب مستقل از هم فرض می‌شوند ولی در ANP بین سطوح مختلف و معیارها، ممکن است وابستگی وجود داشته باشد. با نظر خواهی از خبرگان سازمان، عوامل داخلی و خارجی، نقاط قوت، ضعف، فرصت‌ها و تهدیدهای سازمان (SWOT) و ارتباطات درونی آنها بدست آمده و وزن‌دهی می‌گردد. با توجه به آنها استراتژی‌های مناسب تعیین شده و اولویت بندی می‌گردند. برای روشن تر شدن و مشخص شدن کارایی، این روش به عنوان نمونه در سازمان توسعه تجارت ایران (TPO) با روش AHP مقایسه شده است.

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