Design of a Hybrid Method (ANP-SWOT) to Develop & Evaluation Strategic Alternatives for Development of Rural Cooperatives
(Case Study: Industrial Organizations of Iran)

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Abstract

Rural cooperatives as a small member-owned organizations are the potential to facilitate socio-economic development in rural areas. This study presents a novel hybrid method to develop strategies for development of rural cooperatives. It combines SWOT analysis, TOWS strategic alternatives matrix, and the analytic network process (ANP). SWOT was used to analyze the external and internal environment of rural cooperatives in Iran using the contributions of a team of experts. This team identified 19 SWOT sub-factors. A TOWS matrix was then constructed and the internal and external environmental sub-factors were combined to create good strategic alternatives. The expert team used the TOWS matrix to identify 11 strategic alternatives. ANP was applied to prioritize the strategic alternatives. According to the experts' team, the presented combined approach helps managers to choose the best alternative strategies considering both internal and environmental factors.

1. Introduction

A cooperative is a business or organization owned by and operated for the benefit of those using its services. Profits and earnings generated by the cooperatives are distributed among the members or their user-owners. Cooperatives are organizations with the potential to facilitate socio-economic development and to reduce poverty, especially in rural areas (FAO 2012, Getnet and Anullo 2012, United Nations 2013). They are relevant to the realization of sustainable development goals. Cooperatives help decrease poverty by providing employment, livelihoods, and services (Wanyama 2014). Rural cooperatives produce economic benefits as well as social development, inclusion, and empowerment (Choobchian, kalantari, Asadi et al. 2015, IFAD 2014, Sadighi and Darvishinia 2010). In many countries, agricultural cooperatives help overcome the limitations of family farms to help them compete with capital-intensive farming (Herbel, Rocchigiani and Ferrier 2015) by increasing efficiency through increased productivity per unit of input and increased quality per unit of output (Altman 2015). In china farmer cooperatives connect technical, social and economic dimensions of

farming practice. They provide corresponding services to link farmers to relevant actors, include extension agencies, research institutes and supermarkets (Yang, Klerkx and Leeuwis 2014).

Cooperatives represent a means of maintaining the independence of their members. They enable small-scale producers to scale up their operations, expand their bargaining power, and take better advantage of global market opportunities. These organizations empower farming families by providing access to inputs and services like credit, training, storage facilities, and technology to improve the profitability of smallholder farming. They help farmers process, transport, and market their produce (IFAD 2014, Suh 2015, Wanyama 2014). In addition, cooperatives are a source of stability and predictability to farming. In negotiations with the government over agricultural policy, they have acted on behalf of their members' interests (Chase 2013). IFAD (2014) reports that in Africa, cooperatives help young women and men gain access to opportunities that are often blocked by traditional age-related barriers.

The role of poverty reduction of cooperatives is well recognized. International organizations such as the FAO, UN, ILO, and International Cooperative Alliance have reported that cooperatives are the most suitable types of organization for addressing all dimensions of reducing poverty and exclusion. The way in which cooperatives reduce poverty varies. They can identify economic opportunities for their members (Lorendahl 2016), empower the disadvantaged to defend their interests, provide security to the poor by allowing them to convert individual risks into collective risks, and mediate member access to assets that they utilize to earn a living. In rural areas where private businesses hesitate to go and public authorities do not provide basic services, cooperatives play a major self-help role. They give a stronger voice to rural groups and provide opportunities for productive employment as well as offering health care, education, potable water, improved sanitation, roads, and market access (Franks and Mc Gloin 2017, Henry and Schimmel 2011).

Rural cooperatives are especially important in the developing world because more than half of humanity (3 billion of 5.5 billion people) live in rural areas and most depend directly or indirectly on agriculture for their livelihoods (World Bank 2017, 2014).

The role of agricultural cooperatives is instrumental in helping family farms overcome limitations and become competitive with capital-intensive farming (Herbel et al. 2015). As a whole, strong cooperatives and other producer organizations are able to overcome difficulties by offering their members services such as access to natural resources, information, communication, input and output markets, technologies and training. They facilitate participation in the decision-making process. Practices like group purchasing and marketing help farmers gain market power and get better prices on agricultural inputs and other necessities (FAO 2012). With cooperation, rural residents can have a voice in rural policy-making and to exchange ideas across borders. These organizations put people before profit and help them to achieve shared social, cultural, and economic aspirations. A cooperative is a social enterprise that promotes peace and democracy.

The Iranian rural community has a long history of informal cooperatives in community-based organizations. Boneh, Haraseh, and Wareh are examples these cultural and traditional organizations. Formal Iranian rural cooperatives emerged in 1935, when the government established the first rural cooperative in Davoodabad village in Garmsar, but the emergence of rural cooperatives accelerated after the 1979 revolution. The most recent report by the Central Organization of Rural Cooperatives of Iran on the network of rural cooperatives in Iran lists 2941 cooperatives with more than 4,500,000 members. Rural cooperatives and other farming organizations have a far-reaching effect. Since strategy formulation and management is a plan to obtain a sustainable competitive advantage for any firm (Spulber 2014), the present study developed a novel hybrid method to improve strategy-making for rural cooperatives. The strengths, weaknesses, opportunities, and threats (SWOT) approach and the threats, opportunities, weaknesses, strengths (TOWS) strategic alternatives matrix were employed in combination with the analytic network process (ANP) to achieve this task.

2. Methodology

2.1. SWOT analysis

SWOT analysis is a simple but useful framework for analyzing organizational strengths and weaknesses (internal environments) and opportunities and threats (external environments). It focuses on strengths, minimizes threats, and takes advantage of opportunities (Wheelen and Hunger 2012)

to attain a systematic approach and support for a decision. It involves systematic thinking and comprehensive diagnosis of factors relating to a new product, technology, management, or planning (Weihrich 2012). The results categorize factors into internal (strengths, weaknesses) and external (opportunities, threats) and enable decision makers to compare opportunities and threats with strengths and weaknesses.

If SWOT analysis is done correctly, it can be a good base for strategy formulation (Babaesmailli, Arbabshirani and Golmah 2012), but it cannot quantitatively measure the importance of each factor in decision-making or assess which factor influences most influences a strategic decision (Pesonen, Kurttila, Kangas et al. 2011, Shrestha, Alavalapati and Kalmbacher 2014). SWOT has no means of analytically determining the importance of factors or of assessing the fit between SWOT factors and alternative decisions (Babaesmailli et al. 2012).

In recent years, researchers have tried to improve this weakness by combining it with techniques such as AHP (Eslamipoor and Sepehriar 2014, Görener, Toker and Uluçay 2012, Lee and Walsh 2011, Shrestha et al. 2014) and ANP (Zarafshani, Sahraee and Helms 2015). Although SWOT approach in combination with AHP can provide a quantitative measure of importance of each factor on decision-making, it also assumes that all factors should be independent and determines the priority of alternatives based on this assumption, which is not always true. Interdependency can exist among SWOT factors and could change the final priority of alternatives (Yüksel and Dagdeviren 2017); therefore, it is important to consider dependency among the factors. The present study has used the ANP in place of AHP to determine the priority of strategies. ANP can be adopted to accommodate the concern of interdependence among selection factors or clusters (Yüksel and Dagdeviren 2017).

2.2. TOWS matrix

The TOWS matrix is an essential completion tool. It illustrates how external opportunities and threats facing an organization or a cooperative can be matched with its internal strengths and weaknesses to form four sets of possible strategic alternatives (SO, ST, WO and WT) (Wheelen and Hunger 2012). SO (maxi-maxi) strategies use strengths to maximize opportunities. ST (maxi-mini) strategies use strengths to minimize threats. WO (mini-maxi) strategies minimize weaknesses by taking advantage of opportunities. WT (mini-mini) strategies minimize weaknesses and avoid threats.
This is a good way to take advantage of brainstorming to create alternative strategies that might not otherwise be considered. It forces strategic managers to create various kinds of growth and retrenchment strategies (Weihrich 2012). SWOT can be applied to create a TOWS matrix to deploy strategies (Aslan, Çınar and Kumpikaitė 2012). The internal and external factors obtained through SWOT analysis can be replaced in a TOWS matrix (Figure 1). The TOWS matrix helps to systematically identify relationships between threats, opportunities, weaknesses and strengths, and offers a structure for generating strategies on the basis of these relationships (Weihrich 2012).

TOWS Matrix		External Factors	
		Opportunities (O) 1. 2. 3. 4.	Threats (T) 1. 2. 3. 4.
Internal Factors	Strengths (S) 1 2 3	SO: Maxi-maxi strategies that use strengths to maximize opportunities	ST: Maxi-mini strategies that use strengths to minimize threats
	Weaknesses (W) 1 2 3	WO: Mini-maxi strategies that minimize weaknesses by taking advantage of opportunities	WT: Mini-mini strategies that minimize weaknesses and avoid threats

2.3. The Analytic Network Process (ANP)

The ANP is a multiple-attribute decision-making method that is a generalization of the AHP which considers dependence between elements in the hierarchy. The AHP hierarchy formation is a linear (top-down) structure, where ANP is a non-linear structure that extends in all directions (Sevkli, Oztekin, Uysal et al. 2012). This enables ANP to model complex problems in the real world. This method considers mutual and interdependent relationships among criteria, sub-criteria and alternatives by assessing their relationships (Saaty 2014). It solves decision-making problems in which interrelations and correlations between decision-making levels (goal, criteria, sub-criteria and alternatives) are considered.

The world requires decisions that involve the interaction and dependence of higher-level elements in a hierarchy with lower-level elements. This means they cannot be structured hierarchically; thus, ANP is represented by a network rather than a hierarchy (Saaty and Vargas 2013). This network includes cycles connecting its components of elements or levels with loops that connect a component to it. Because SWOT factors are not usually independent, it is necessary to determine the inner dependence of SWOT factors by analyzing the effect of each factor on the others.

2.4. Proposed SWOT-TOWS-ANP model and its application

The present study introduces a hybrid method to improve strategy-making for rural cooperatives that combines the SWOT approach and TOWS matrix with ANP. Figure 2 compares a hierarchy and a network structure for SWOT-TOWS. The hierarchy (Figure 2.A) comprises a goal, levels of elements, and connections between the elements. These connections are oriented only toward elements in lower levels, but a network (Figure 2.B) has clusters of elements with elements in one cluster connected to elements in another cluster or in the same cluster. A hierarchy is a network with connections going only in one direction (Saaty 2016). Figure 2 includes outer and inner influences. The first compares the influence of elements in a cluster on elements in another cluster with respect to a control criterion, the latter compares the influence of elements in a group on each other.
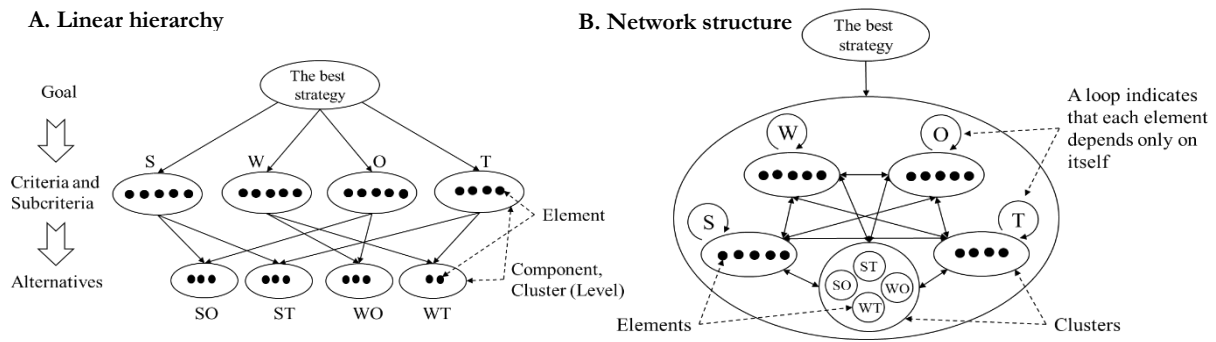
Figure 2. (A) Linear hierarchy and (B) network structure for SWOT-TOWS.

The present study implemented a network structure because the elements of SWOT are dependent. First, the SWOT factors and sub-factors were detected by identifying the internal and external factors of SWOT. An expert team comprising 10 individuals familiar with the central organization of rural cooperatives in Iran was employed. They were invited to meet and became familiar with the research methodology and its aim and were then asked to detect the SWOT factors and sub-factors. They detected 19 SWOT sub-factors (Table 1).

Next the TOWS matrix was constructed. The expert team was again employed for SWOT to fulfill the TOWS strategic alternatives matrix. They constructed the TOWS matrix and the SO, ST, WO and WT strategies. Figure 3 indicates the experts identified eleven main strategies for rural cooperatives development based on interactions between SWOT sub-factors.

Table 1. SWOT factors and sub-factors	
Internal Factors	
Strengths (S)	**Weaknesses (W)**
S1. Ability to optimize provision of production inputs for members.	W1. Managers of cooperatives do not have complete authority.
S2. Facilitate implementation of government policies.	W2. Farm ownership is not separate from farm management.
S3. Ability to apply professional management.	W3. Cooperatives have no specific statute.
S4. Ability to improve value and supply chains of products.	W4. Lack of management knowledge in cooperatives.
S5. Facilitate provision of technical and financial services.	W5. Poor performance and economic potential of cooperatives
External Factors	
Opportunities (O)	**Threats (T)**
O1. Legal support of cooperatives.	T1.Existence of parallel organizations.
O2. Existence of governmental facilities and supports.	T2. Imbalance of national funds for needs of cooperatives.
O3. Frequency of rural cooperatives and their members	T3. Lack of implementation of legal protection.
O4. Existence of national and international successful samples.	T4. Instability of government policies and programs.
O5. Existence of different levels of support structures from local to international (such as unions).	

TOWS Matrix			External Factors	
			Opportunities (O) O1, O2, O3, O4, and O5	Threats (T) T1, T2, T3, and T4
Internal Factors	Strengths (S)	S1 S2 S3 S4 S5	SO Maxi-Maxi Strategy SO1. Facilitate procurement of production inputs and develop supply and value chains of rural cooperatives inputs and products to benefit from opportunities such as legal supports and facilities. SO2. Implement public policy and provide technical and financial services using rural cooperatives to benefit from support structures and existing successful examples. SO3. Specialization of management of rural cooperatives to benefit from opportunities.	ST Maxi-Mini Strategy ST1. Increase competitiveness and reduce dependency of rural cooperative on financial, legal, and governmental support through provision of production inputs and optimization and improving supply and value chains. ST2. Involve rural cooperatives in policy planning and implementation and provide financial and technical services. ST3. Increase competitiveness and reduce dependency of rural cooperative on financial, legal, and governmental supports by developing and promoting professional management of rural cooperatives.
	Weaknesses (W)	W1 W2 W3 W4 W5	WO Mini-Maxi Strategy WO1. Enhance authority and knowledge of current management and educate professional managers for rural cooperatives to benefit more from available opportunities. WO2. Authorize specific statute for rural cooperatives for multiplicity and existence of successful examples and their support structures. WO3. Develop programs to improve performance and economy of rural cooperatives for maximum benefit of opportunities such as financial support and facilities.	WT Mini-Mini Strategy WT1. Improve competitiveness and reduce threats emanating from lack of credit and government support and political and programmatic instability through development of knowledge and rural cooperatives management. WT2. Policymaking and planning to improve performance and economy of rural cooperatives to enhance competitiveness and reduce threats of instability of policies, programs, lack of funding and government supports.

Figure 3. TOWS matrix for rural cooperatives development in Iran

The third step develops the network structure of the problem. The network structure of the problem (Figure 1.B) was defined to select the best strategies for rural cooperative development as the goal of network (G). SWOT factors identified as criteria (C), SWOT sub-factors as sub-criteria (SC), and the TOWS strategies as alternatives (A) were placed into the network structure (super matrix Wn):

		G	C	SC	A
W_n	G	0	0	0	0
	C	W_{21}	W_{22}	0	0
	SC	0	W_{32}	W_{33}	0
	A	0	0	W_{43}	1

When using ANP to model a problem, a network structure should represent the problem and pairwise comparisons are required to establish relations within the structure (Saaty and Vargas 2013).

Questionnaires were designed to allow pairwise comparison. Each expert completed the pairwise comparison matrix between the derived factors. The scale of values represented the intensity of opinion from 1 (equal) to 9 (extreme importance). It was used to detect the priority and interdependency of factors using the geometric mean of expert opinion. Next, the priority of each TOWS strategy was determined using ANP as follows (Babaesmailli et al. 2012, Shakoor Shahabi, Basiri, Rashidi Kahag et al. 2014, Yüksel and Dagdeviren 2017):

1.   Pairwise comparisons of SWOT factors assuming no dependency among factors are used to calculate the weight of the main SWOT factors (criteria) according to the goal (W21). The weight (priority) of each factor is calculated as (Table 2):

$$W_n = \frac{\left(\prod_{j=1}^n a_j\right)^{1/n}}{\sum_{i=1}^n \left(\prod_{j=1}^n a_{ij}\right)^{1/n}} \qquad \text{Eq. 1}$$

2.   Comparisons of SWOT factors based on the assumption of dependency between SWOT factors (W22) (Table 3). The weight (priority) of any factor is calculated using Eq. 1.

3.   Calculate the weights of relative importance of SWOT groups (W2) by multiplying W21 by W22.

W_{21}					W_{22}		W_2
	0	0.672	0.5	0.323	0.43		0.35
$W_2 = W_{21} \times W_{22} =$	0.57	0	0.25	0.089	0.11	$\times$ =	0.28
	0.333	0.265	0	0.588	0.43		0.26
	0.097	0.063	0.25	0	0.04		0.12

4.   Pairwise comparison of each SWOT sub-factor (W33) (Table 4) and measurement of the weight of a sub-factor (W3) by multiplying W33 by W2 (Table 5). The priorities of the sub-factors in each factor are calculated using Eq. 1.

5.   Calculate the relative importance of any alternative strategy (SOi, STi, WOi, WTi) for the corresponding sub-factors. These weights are derived from the relative pairwise comparison matrix (W43) using Eq. 1.

6.   Form the super matrix (Wn) using the matrices (W21, W22, W32, W33, and W43). Because the weight of any alternative strategy derives from the normalized supper matrix, normalize the super matrix to calculate the weight of any alternative strategy.

7.   Calculate the ultimate weight of any alternative strategy; this requires empowerment of the super matrix to a steady state. The result of super matrix is called the limit matrix (Saaty 2004, Saaty 2006, Saaty and Vargas 2013). The limit matrix was developed using Super Decision software (ver. 2.4). The limit matrix includes the priorities of each TOWS strategy (Table 6).

Table 2. Pairwise comparison of SWOT factors.				
W_{21}	S	W	O	T	Priorities
S	1	5	1	9	0.427
W	0.2	1	0.2	5	0.11
O	1	5	1	9	0.427
T	0.11	0.2	0.11	1	0.037
CR=0.035					

Table 3. Inner dependency matrix of SWOT factors vs. other factor				
Strength	**W**	**O**	**T**	**Priorities**
W	1	2	5	0.57
O	0.5	1	4	0.333
T	0.2	0.25	1	0.097
CR=0.024				
Weakness	**S**	**O**	**T**	**Priorities**
S	1	3	9	0.672
O	0.33	1	5	0.265
T	0.11	0.2	1	0.063
CR=0.028				
Opportunity	**S**	**W**	**T**	**Priorities**
S	1	2	2	0.5
W	0.5	1	1	0.25
T	0.5	1	1	0.25
CR=0.000				
Threat	**S**	**W**	**O**	**Priorities**
S	1	4	0.5	0.323
W	0.25	1	0.17	0.089
O	2	6	1	0.588
CR=0.009				
W_{22}	**S**	**W**	**O**	**T**
S	0	0.672	0.5	0.323
W	0.57	0	0.25	0.089
O	0.333	0.265	0	0.588
T	0.097	0.063	0.25	0

Table 4. Pairwise comparison of SWOT sub-factors (W_{33}).					
Strengths	**S1**	**S2**	**S3**	**S4**	**S5**	**Priorities**
S1	1	0.5	0.3	0.3	0.3	0.069
S2	2	1	0.3	0.3	0.5	0.111
S3	4	3	1	1	0.5	0.247
S4	4	3	1	1	2	0.326
S5	3	2	2	0.5	1	0.247
CR=0.052						
Weaknesses	**W1**	**W2**	**W3**	**W4**	**W5**	**Priorities**
W1	1	3	2	0.2	0.3	0.108
W2	0.33	1	0.5	0.1	0.2	0.046
W3	0.5	2	1	0.2	0.2	0.07
W4	5	7.04	6	1	2	0.463
W5	4	6.02	5	0.5	1	0.313
CR=0.027						
Opportunities	**O1**	**O2**	**O3**	**O4**	**O5**	**Priorities**
O1	1	1	3	5	2	0.323
O2	1	1	3	5	2	0.323
O3	0.33	0.33	1	3	0.5	0.114
O4	0.2	0.2	0.3	1	0.3	0.052
O5	0.5	0.5	2	4	1	0.188
CR=0.010						
Threats	**T1**	**T2**	**T3**	**T4**	**Priorities**	
T1	1	2	2	2	0.4	
T2	0.5	1	1	1	0.2	
T3	0.5	1	1	1	0.2	
T4	0.5	1	1	1	0.2	
CR=0.000						

Table.5. Final priority of each SWOT sub-factor				
Environment	Criteria and priority scores (W₂)	Sub-Criteria factor priority scores (W₃₃)		Sub-Criteria overall priority scores (W₃)	Sub-Rank
Internal	Strengths (S) 0.351	S1	0.07	0.024	4
		S2	0.11	0.039	3
		S3	0.25	0.087	2
		S4	0.33	0.114	1
		S5	0.25	0.087	2
	Weaknesses (W) 0.275	W1	0.11	0.03	3
		W2	0.05	0.013	5
		W3	0.07	0.019	4
		W4	0.46	0.127	1
		W5	0.31	0.086	2
External	Opportunities (O) 0.258	O1	0.32	0.083	1
		O2	0.32	0.083	1
		O3	0.11	0.029	3
		O4	0.05	0.013	4
		O5	0.19	0.048	2
	Threats (T) 0.116	T1	0.4	0.046	1
		T2	0.2	0.023	2
		T3	0.2	0.023	2
		T4	0.2	0.023	2

3. Discussion

3.1. Internal and external environment space of rural cooperatives

This study used the ANP-SWOT-TOWS hybrid method to choose better strategies the development of for rural Iranian cooperatives (RICs) assuming dependency. Table 5 and Figure 4 show that in the internal space, the strengths (0.351) of rural cooperatives were greater than the weaknesses (0.275). Strength S4 was the most important strength for the RICs and S1 was the least important (Figure 5). Weakness W4 (lack of management knowledge) was the most important weakness and W2 (ownership of farms not separate from farm management) was the least important. In the external space, the opportunities (0.258) were greater than the threats (0.116). Table 5 and Figure 5 shows that the greatest opportunity was O1 (legal supports of cooperatives) and the greatest threat was T1 (existence of parallel organizations). Figure 4 shows that the internal challenges of the RICs (weaknesses) are greater than its external challenges (threats) and the positive aspects of the RICs (strengths and opportunities) are greater than its negative aspects (weaknesses and threats).
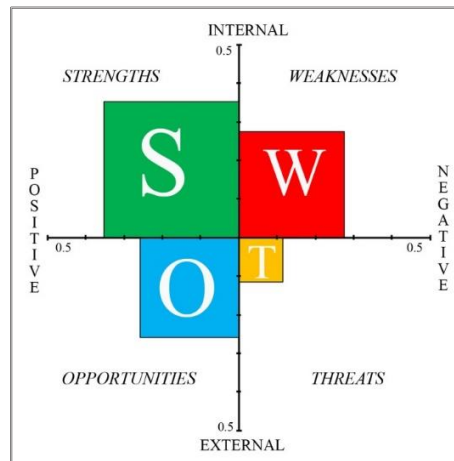
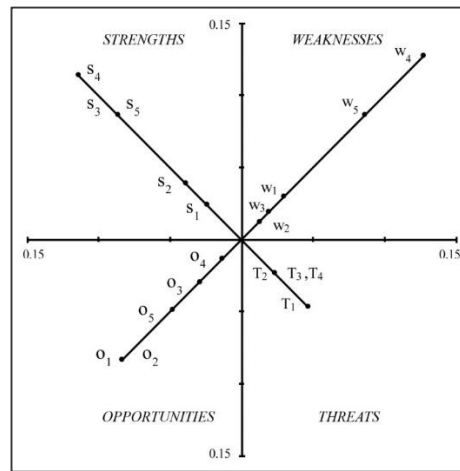**Figure 4. Internal and external environment space of RICs (SWOT factors).**

Figure 5. Graphical interpretation of pairwise comparisons of SWOT sub-factors.

3.2. Proposed TOWS strategies for IRC development

The inner and outer dependency of the SWOT factors and sub-factors indicates that SO strategies are the most powerful TOWS strategies for RIC development and WT strategies are the least powerful (Figure 6). The final priorities of the alternative strategies are shown in Figure 7 and Table 6. They indicate that SO2, SO1, and ST2 are, in order, the three best TOWS strategies and WO2 is the weakest TOWS strategy for RIC development.
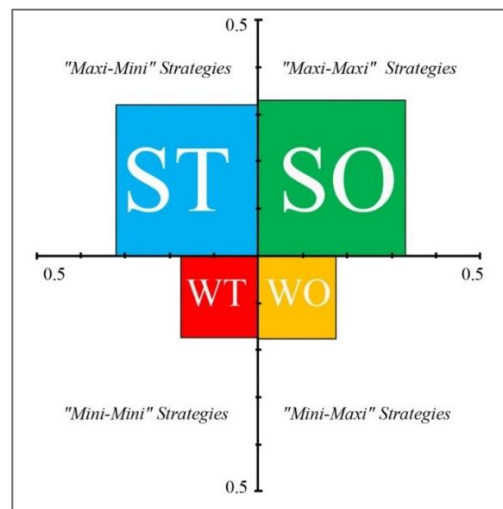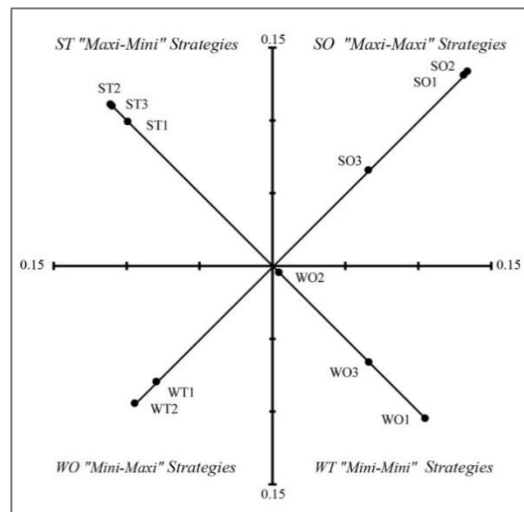

Figure 6. TOWS strategy spaces for RICs.

Figure.7. Graphical interpretation of TOWS strategies space of RIC.

Table 6. Priorities for each TOWS strategy				
Alternatives group	**Alternatives**	**Normal**	**Ideal**	**Ranking**
SO -0.331	SO1	0.131	0.98	2
	SO2	0.134	1	1
	SO3	0.066	0.492	10
ST -0.32	ST1	0.099	0.742	6
	ST2	0.111	0.83	3
	ST3	0.11	0.823	4
WO -0.175	WO1	0.105	0.783	5
	WO2	0.005	0.033	11
	WO3	0.066	0.494	9
WT -0.174	WT1	0.094	0.706	7
	WT2	0.08	0.594	8

As was observed above, this study presented a combined approach to help managers choose the best alternative strategies considering both internal and environmental factors. Because these factors and sub-factors that affect decision- and strategy-making are generally dependent, application of ANP in combination with SWOT analysis and TOWS strategic alternatives matrix comprised a useful and successful tool for strategy-making and choosing between strategic alternatives.

4. Conclusions

The present study offered a hybrid method as a strategy for rural cooperative development. The SWOT technique was first used to analyze the internal and external environment of rural cooperatives. SWOT identified the strategic factors and sub-factors through the use of expert opinion. Next, a TOWS strategic alternatives matrix constructed SO, ST, WO and WT strategies. A total of 11 strategies were defined. The SWOT factors and sub-factors had inner and outer dependency; thus, ANP was implemented to determine the dependencies among factors, sub-factors, and the final priority of alternative strategies. The results indicate that implementation of SO2, SO1 and ST2 strategies are of greater priority than the other strategies. These strategies can play a central role in development of rural cooperatives in Iran. It seems such enhanced version of SWOT analysis method is capable to provide enriched insights for strategic management. It can help managers to choose the best alternative strategies considering both internal and environmental factors. Because these factors and sub-factors that affect decision- and strategy-making are generally dependent, application of ANP in combination with SWOT analysis and TOWS matrix comprised a useful and successful tool for strategy-making and choosing between strategic alternatives.

Works Citation

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