

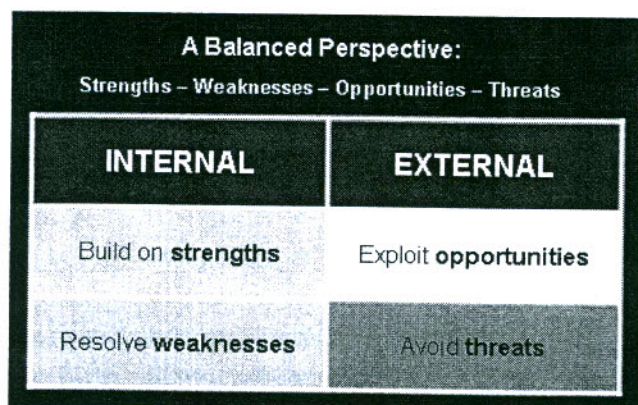
SWOT-AHP : A multi-attribute decision making model in fisheries management

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SWOT, an acronym for Strength, Weakness, Opportunity and Threat, is the most popular method for development strategies that enables the qualitative evaluation of criteria under which strategic decisions are made. Though SWOT analysis is a commonly accepted tool followed by the managers for strategic decision making, but sometimes these are difficult to quantify as they are intangible and subjective. In order to overcome this problem, there is need to combine SWOT with AHP ranking analysis (Osuna and Aranda, 2007; Wickramasinghe and Takano, 2009; Jeon and Kim, 2011). AHP is a multi-criteria based measurement tool that influence the decision making process by structuring the problems, identifying and measuring the importance of decision-making factors. OHP converts the intangible elements of the SWOT to numerical values and systematic evaluation of weights of selected attributes in pairs through a series of comparisons within the group and between the groups (Saaty, 2008). Hence the integration of SWOT with AHP is a hybrid method that facilitates the quantitative expression of SWOT attributes through AHP procedure with which the qualitative evaluation of SWOT analysis can improve its usability. AHP makes pair-wise comparison between the SWOT factors within the group and among the four SWOT groups and prioritize them through evaluation of different factors in SWOT and equate their intensities with the help of SWOT and AHP methods together.

SWOT Analysis

SWOT is a tool for qualitative analysis of internal strengths and weaknesses and external opportunities and threats in order to attain a systematic approach and support for a decision for strategy formulation and development (Markovska, Taseska and Jordanov, 2009). SWOT analysis explores the possibilities for new solutions to problems by seizing/exploiting the opportunities, avoiding threats, building on strengths and resolving weaknesses.



In SWOT analysis, the internal and external factors are referred to as strategic factors that grouped into four parts called SWOT groups: strengths, weaknesses, opportunities, and threats. SWOT involves systematic thinking and comprehensive diagnosis of the factors relating to a new product, technology, management, or planning. SWOT matrix is a commonly used tool for analyzing external and internal environments concurrently in order to support for a decision situation (Kurtilla et al., 2000; Kangas et al., 2003; Yüksel and Dağdeviren, 2007). Therefore in strategic decisions

making through SWOT analysis, it requires to implement a strategy resulting in a proper balance between the internal and external factors (Kangas et al., 2003).

SWOT Matrix for strategic planning

	STRENGTHS	WEAKNESSES
	1. 2. 3. 4.	1. 2. 3. 4.
OPPORTUNITIES 1. 2. 3. 4.	(OS) Strategies use strengths to take advantage of opportunities 1. 2.	(OW) Strategies overcome weaknesses taking advantage of opportunities 1. 2.
THREATS 1. 2. 3. 4.	(TS) Strategies use strengths to avoid threats 1. 2.	(TW) Strategies minimize weaknesses to avoid threats 1. 2.

SWOT : Generating Strategies- get them USED

When the desired objectives have been deemed to be attainable, the SWOTs are used as inputs for the creative generation of possible strategies, by answering the following four questions :

- ❖ How can we **Use** each Strength?
- ❖ How can we **Stop** each Weakness?
- ❖ How can we **Exploit** each Opportunity?
- ❖ How can we **Defend** against each Threat?

SWOT in Decision Making (with forced field analysis)

Where -

- ❖ **Strengths** need to be maintained, built upon or leveraged.
- ❖ **Weaknesses** need to be remedied, changed or stopped.
- ❖ **Opportunities** need to be prioritized, captured, built on and optimized.
- ❖ **Threats** need to be countered or minimized and managed.

Shortcomings of SWOT analysis

- ❖ SWOT analysis lacks the possibility of comprehensively appraising the strategic decision-making situation.
- ❖ SWOT merely pinpoints the number of factors in strength, weakness, opportunity or threat groups does not pinpoint the most significant group.
- ❖ SWOT includes no means of quantitative analysis for determining the importance of factors for decision making.
- ❖ SWOT analysis is only a superficial and imprecise and incomplete qualitative evaluation of internal and external factors.

Overcoming the challenges :

- ❖ SWOT-AHP facilitates the holistic understanding of concept, objectives, consideration of multiple stakeholder values, behaviors, and improves abilities to predict and plan for future based on multi-criteria decision making and conflict resolution model.
- ❖ SWOT-AHP provides a framework for selecting a preferred alternative from among a set of potential solutions to a problem, therefore leads to more sustainable planning and management decisions.

SWOT- Analytic Hierarchy Process (AHP)

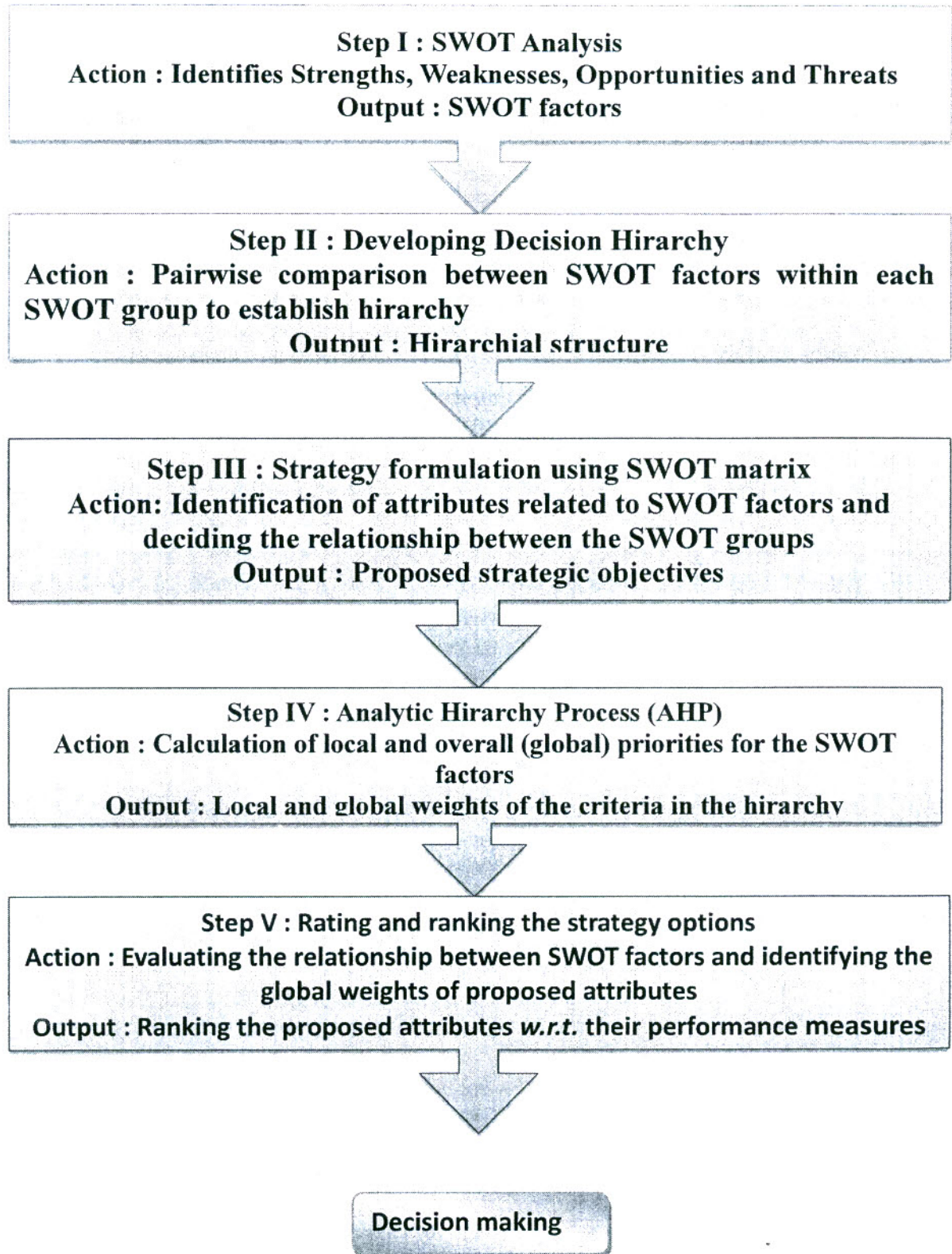
SWOT-AHP (Analytic Hierarchy Process) technique is a hybrid method that integrates both qualitative and quantitative information for determining the priorities of the SWOT factors and makes them commensurable and usable for strategic decision making with regard to their relative importance.

The Analytic Hierarchy Process (AHP) was proposed by Dr. Thomas Saaty (2008) as a method to solve decision problems using a hierarchical structure of criteria and alternatives. It is a multicriteria decision making (MCDM) technique that can help express the general decision operation by decomposing a complicated problem into a multilevel hierarchical structure of objective, criteria and alternatives (Sharma et al., 2008). AHP is considered as an effective decision making method as it performs pairwise comparisons to derive relative importance of the variable in each level of the hierarchy and / or appraises the alternatives in the lowest level of the hierarchy in order to make the best decision among alternatives (Tuzmen and Sipahi, 2011). AHP is used to determine relative priorities on absolute scales from both discrete and continuous paired comparisons in multilevel hierarchic structures (Saaty and Vargas, 1996). The prioritization mechanism is accomplished by assigning a number from a comparison scale developed by Saaty (1980, 1996) to represent the relative importance of the criteria. Pairwise comparisons matrices of these factors provide the means for calculation (Sharma et al., 2008). There are various articles that expose problems with this scale but for the sake of this review we will use the 1-9 scale shown above.

Table 1: Pairwise Comparison Scale (Saaty, 1996; Yüksel and Dağdeviren, 2007)

Scale	Intensity of importance	Explanation
1	Equal importance	Two criterion contribute equally to the objective
3	Moderate importance	Experience and judgement slightly favour one over another
5	Strong importance	Experience and judgment strongly favour one over another
7	Very strong importance	An criterion is favoured very strongly over another
9	Extreme importance	Importance of one over another affirmed on the highest possible order
2, 4, 6, 8		Used to represent compromise between the priorities listed above

Steps in SWOT-AHP technique



Steps of SWOT-AHP Analysis

- ❖ In case of standard AHP, it is recommended that the number of factors within a SWOT group should not exceed 10 due to requirement of pairwise comparison between SWOT factors. Here we follow *delphi* technique.
- ❖ *Pairwise comparisons between SWOT factors are carried out within every SWOT group*, where the relative local priorities of the factors are computed using the eigen- value method. These priorities reflect the decision maker's perception.
- ❖ *Pairwise comparisons are made between the four SWOT groups where the factor with the highest relative local priority is chosen from each group to represent the group*. These four factors are then compared and their relative priorities are calculated. The overall (global) priorities of the independent factors within the group is calculated by multiplying the factors' of local priorities with the corresponding scaling factor of the SWOT group. The global priorities of all the factors sum up to one.

The advantages of this hierarchical decomposition are clear. By structuring the problem through AHP technique, it is possible to better understand the decision to be achieved, the criteria to be used and the alternatives to be evaluated. This step is crucial and this is where, in more complex problems, it is possible to request the participation of experts to ensure that all criteria and possible alternatives have been considered. Also note that in complex problems it may be necessary to include additional levels in the hierarchy such as sub-criteria. The SWOT-AHP method of decision analysis improves the information basis of strategic planning processes by analyzing the situation more precisely and in more depth. Research based SWOT-AHP analysis is relatively objective and it provides an effective framework for adoption-decision of farmers towards innovative technologies. Quantitative SWOT analysis can be used as an effective tool in decision making processes where multiple decision makers or judges are involved.