Investment Strategies of Finnish Forest Industry in North America: A case study using A’WOT (AHP in SWOT analysis)

by
Mauno Pesonen1 Jyrki Ahola2, Mikko Kurttila3, Miika Kajanus4 and Jyrki Kangas5

Abstract
The present study examines a hybrid method for improving the usability of SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis. A commonly used decision analysis method, the Analytic Hierarchy Process (AHP), and its eigenvalue calculation framework are integrated with SWOT analysis. AHP’s connection to SWOT, called here hybrid method A’WOT, yields analytically determined priorities for the factors included in SWOT analysis and makes them commensurable. The aim in applying the hybrid method is to improve the quantitative information basis of strategic planning processes. The hybrid method was tested in connection with Finnish forest industry company on decision making to invest North America. In the case study, the results were presented in an illustrative way by utilizing the quantitative information achieved by the hybrid method. The results indicated that forest industry investment was reasonable in North America. In addition, the needed pairwise comparisons were found useful, because they force the decision maker to think over the weights of the factors and to analyze the situation more precisely and in more depth.

Keywords: AHP, decision analysis, external and internal environment, forest industry, investment, strategic planning, SWOT

INTRODUCTION
Forest industry, like other businesses, is influenced by changes within internal and external operational environments. Common strategic planning approaches are fundamentally based on adjusting to changes in the external environment and there exists a wide range of planning methods that are well suited for analyzing the interactions of both environments simultaneously. The enterprise’s strategy process is seen as a way to consider, decide on and implement strategies (Ahola 1995). The strategy process does not form a sequential, hierarchical system but a group of activities, which will be implemented when the need arises. The strategy process consists of the management’s working process to produce such strategies, which fulfills owner’s and other major stakeholders’ objectives for the enterprise.

Life cycle of forest industry products is very long. Also, the business of forest industry is long cyclic. Despite of that, business trend of forest industry might be changed rapidly. From that point of view, forest industry is not the easiest business area. This branch of industry is very sensitive to business trends and demand of forest industry products might be changed quickly.

Forest industry is also a very capital-intensive branch of industry, because the production units grow bigger and bigger. Starting pulp and paper machines create new production capacity, of which planning and building time period has been many years. Therefore, decision making of investment on right time is very important. The starting point of investment can be explained with evolutionary process theory (Ahola 1995). The theory explains changes of organizations and society: it does not predict changes, but explains them.

Globalization and increasing size of forest industry companies has made decision making of investment more difficult. Despite of this phenomena, business areas have been divided into smaller groups according to business, localization, and other criteria. The goal has been to get more flexibility to production, to accelerate decision making, to seek synergies, and to control competition better: success in competition demands concentration on key knowledge and products. The production of forest industry is moving nearer customers. The vision of Finnish forest industry can be concluded: 1) good profitability and balance, 2) customer orientation, 3) structural change, 4) concentration of business, and 5) globalization.

Growth of production has occurred by joint equity ventures, joint contractual ventures, and organic growth (e.g. Caves - Mehra, 1986). Joint contractual ventures are easy way to get in new markets;
otherwise the goal of joint equity ventures is to win new markets minimizing risks.

SWOT (the acronym standing for Strengths, Weaknesses, Opportunities and Threats) analysis is a commonly used tool for analyzing internal and external environments in order to attain a systematic approach and support for a decision situation (e.g. Kotler, 1988; Wheelen and Hunger, 1995). The internal and external factors most important to the enterprise’s future are referred to as strategic factors and they are summarized within the SWOT analysis. The final goal of strategic planning process, of which SWOT is an early stage, is to develop and adopt a strategy resulting in a good fit between internal and external factors. SWOT can also be used when strategy alternative emerges suddenly and the decision context relevant to it has to be analyzed. If used correctly, SWOT can provide a good basis for successful strategy formulation. Nevertheless, it could be used more efficiently (McDonald, 1993). When using SWOT, the analysis lacks the possibility of comprehensively appraising the strategic decision-making situation; merely pinpointing the number of factors in strength, weakness, opportunity or threat groups does not pinpoint the most significant group. In addition, SWOT includes no means of analytically determining the importance of factors or of assessing the fit between SWOT factors and decision alternatives. The further utilization of SWOT is, thus, mainly based on the qualitative analysis, capabilities and expertise of the persons participating in the planning process. As numerous criteria and interdependencies often complicate planning processes, it may be that the utilization of SWOT is insufficient. In their study, Hill and Westbrook (1997) found that none of the twenty case companies prioritized individual SWOT factors, one grouped factors further into subcategories, and only three companies used SWOT analysis as an input for a new mission statement.

In addition, the expression of individual factors was of a very general nature and brief. Thus, it can be concluded that the result of SWOT analysis is too often only a superficial and imprecise listing or an incomplete qualitative examination of internal and external factors.

Kurttila et. al. (1998) examined a new hybrid method for improving the usability of SWOT analysis, called A’WOT, in this paper. A commonly used decision analysis method, the Analytic Hierarchy Process (AHP), and its eigenvalue calculation framework were integrated with SWOT analysis. AHP’s connection to SWOT yields analytically determined priorities for the factors included in SWOT analysis and made them commensurable.

The present study deals with the A’WOT, which is used when analyzing the Finnish forest industry’s investment decisions in North America. As a result, a clearer picture, including quantitative information, of the factors affecting investment decisions of forest industry will be created.

A’WOT (AHP IN SWOT ANALYSIS)

When applying AHP, a hierarchical decision schema is constructed by decomposing the decision problem into its decision elements. The importance or preferences of the decision elements are compared in a pairwise manner with regard to the element preceding them in the hierarchy. Numerical techniques are used to derive quantitative values from verbal comparisons.

The advantages of AHP include its ability to make both qualitative and quantitative decision attributes commensurable, and its flexibility with regard to the setting of objectives (Kangas, 1992). Subjective preferences, expert knowledge and objective information can all be included in the one and the same decision analysis. AHP is easy to apply and understand, and thus, the reformulation of the decision problem and repeating of comparisons can be profitable and educational.

Basically, the results of an AHP analysis are the overall (global) priorities of decision alternatives. The idea in utilizing AHP within a SWOT framework is to systematically evaluate SWOT factors and commensurate their intensities. AHP’s advantages, i.e. systematic approach to decision problems and commensurateness, can be regarded to be valuable characteristics in SWOT analysis. Additional value from a SWOT analysis can be achieved by performing pairwise comparisons between SWOT factors and analyzing them by means of the eigenvalue technique as applied in AHP. This offers a good basis for examining the present or anticipated situation, or a new strategy alternative, more comprehensively.

In order to help in understanding of the A’WOT method, the following definitions need to be made at this point; SWOT groups refer to four entities (i.e. strengths, weaknesses, opportunities and threats) and SWOT factors refer to the individual factors underlying these groups. The method introduced proceeds as follows:

**Step 1. SWOT analysis is carried out.** The relevant factors of the external and internal environment are identified and included in SWOT analysis. When standard AHP is applied, it is recommended that the number of factors within a SWOT group should not exceed 10 because the number of pairwise
comparisons needed in the analysis increases rapidly (Saaty, 1980).

**Step 2. Pairwise comparisons between SWOT factors are carried out within every SWOT group.** When making the comparisons, the questions at stake are, 1) which of the two factors compared is a greater strength (opportunity, weakness or threat) and 2) how much greater. With these comparisons as the input, the relative local priorities of the factors are computed using the eigenvalue method (described below). These priorities reflect the decision-maker’s perception of the relative importance of the factors.

**Step 3. Pairwise comparisons are made between the four SWOT groups.** The factor with the highest local priority is chosen from each group to represent the group. These four factors are then compared and their relative priorities are calculated as in Step 2. These are the scaling factors of the four SWOT groups and they are used to calculate the overall (global) priorities of the independent factors within them. This is done by multiplying the factors’ local priorities (defined in Step 2) by the value of the corresponding scaling factor of the SWOT group. The global priorities of all the factors sum up to one.

**Step 4. The results are utilized in the strategy formulation and evaluation process.** The contribution to the strategic planning process comes in the form of numerical values for the factors. New goals may be set, strategies defined and such implementations planned as take into close consideration the foremost factors.

The common decision hierarchy of A’WOT is presented in Figure 1.

The construction of the SWOT framework was carried out by collecting information from numerous forest industry-related publications and by interviewing an experts in the case company. Following the construction of the SWOT framework, the priorities of the factors included in the SWOT analysis were estimated by pairwise comparisons following the steps presented above. In this analysis, the comparisons were carried out by one person, whose expertise concerns strategic planning process and development of forest industry’s international investment decisions.

Opportunities that are seen to exist in North America and strengths that are considered to be utilized in the market area are logically predominating (Figure 2). Customer and market orientated strategy highlights the vicinity of already existing and potential new customers and markets (Table). Going to new market area includes risks and the information is always insufficient and therefore evaluations of expected returns are exceptionally uncertain, which in this case, is the most important weakness. However, it is expected that by becoming established to the market area will, in the future, decrease remarkably some threats, e.g. understanding of local customers. The consistencies of the comparisons carried out in Steps 1 and 2 were satisfactory. Consistency ratios were larger than 0.10 in all but one case.

The results are utilized in the strategy formulation and evaluation process. The contribution to the strategic planning process comes in the form of numerical values for the factors. New goals may be set, strategies defined and such implementations planned as take into close consideration the foremost factors.

The common decision hierarchy of A’WOT is presented in Figure 1.

![Figure 1. Common structure of decision hierarchy.](image)

Table. Priorities and consistency ratios of comparisons of the SWOT groups and factors (the factor having greatest weight in each SWOT group is underlined). The overall priority of the factor is computed by multiplying the priority of the factor within the group by the priority of the group.
<table>
<thead>
<tr>
<th>SWOT group</th>
<th>priority of the group</th>
<th>SWOT factors</th>
<th>consistency ratio</th>
<th>priority of the factor within the group</th>
<th>overall priority of the factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strengths</td>
<td>0.223</td>
<td>Finnish cost efficiency</td>
<td>0.134</td>
<td>0.030</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>credibility</td>
<td>0.034</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finnish know-how</td>
<td>0.218</td>
<td>0.049</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finnish production technology</td>
<td>0.080</td>
<td>0.231</td>
<td>0.052</td>
</tr>
<tr>
<td></td>
<td></td>
<td>availability and price of timber</td>
<td>0.072</td>
<td>0.016</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>structure of capital resources</td>
<td>0.042</td>
<td>0.009</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>existing own marketing organization</td>
<td>0.203</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Finnish environmental know-how</td>
<td>0.063</td>
<td>0.014</td>
<td></td>
</tr>
<tr>
<td>Weaknesses</td>
<td>0.143</td>
<td>labour and energy prices</td>
<td>0.045</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>weak decision premises -&gt; problems to evaluate returns</td>
<td>0.102</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>management abilities</td>
<td>0.378</td>
<td>0.054</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>local knowledge</td>
<td>0.070</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>large investments needed</td>
<td>0.181</td>
<td>0.026</td>
<td></td>
</tr>
<tr>
<td>Opportunities</td>
<td>0.545</td>
<td>customers and markets near by</td>
<td>0.278</td>
<td>0.152</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>shifting of the know-how</td>
<td>0.082</td>
<td>0.045</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USA net importer of certain paper types</td>
<td>0.143</td>
<td>0.078</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>increasing credibility and recognition</td>
<td>0.173</td>
<td>0.176</td>
<td>0.096</td>
</tr>
<tr>
<td></td>
<td></td>
<td>global customers more easily reachable</td>
<td>0.111</td>
<td>0.060</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>stabilizing changes in economic trends and exchange rates</td>
<td>0.097</td>
<td>0.053</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>investment gap</td>
<td>0.112</td>
<td>0.061</td>
<td></td>
</tr>
<tr>
<td>Threats</td>
<td>0.088</td>
<td>possible trade war</td>
<td>0.044</td>
<td>0.004</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>cultural differences (at management level)</td>
<td>0.090</td>
<td>0.008</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USA's law regulation</td>
<td>0.054</td>
<td>0.005</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>environmental attitudes in USA</td>
<td>0.103</td>
<td>0.114</td>
<td>0.010</td>
</tr>
<tr>
<td></td>
<td></td>
<td>customer - producer engagement</td>
<td>0.268</td>
<td>0.024</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>inflexible labour use (at certain mills)</td>
<td>0.110</td>
<td>0.010</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>negative attitudes towards forest industry</td>
<td>0.071</td>
<td>0.006</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>insufficient understanding of local customers</td>
<td>0.247</td>
<td>0.022</td>
<td></td>
</tr>
</tbody>
</table>

The consistency ratio of the comparisons between four SWOT groups was 0.123.

**DISCUSSION**

Establishing of Finnish forest industry in North America is a logic development as a part of globalization of forest industry. If Finnish forest industry will participate that process, they have to get in the markets of North America, although USA and Canada are not countries of “great adventures” in that business compared to Asia, where will be great growth possibilities including also large risks.

The main goal of establishing is the client-orientedness of markets in North America. Consumers demand the local and quick service. Both the locality and the credibility of production strengthen the competition advantage of foreign company. Moreover, potential trade wars and tolls do not threat local companies. Also, North America is the net exporter only in the low extent of value added papers. Scandinavian cost-efficiency, know-how, and production technology are the strengths in the North American markets.

In this study, the investment strategies of Finnish forest industry in North America were explained by SWOT and the analysis was deepened by producing quantitative information from their importancies by utilizing characteristics of AHP. Although SWOT is in common use as a planning tool, it has some weaknesses. In this study a hybrid application A’WOT was used and some of weaknesses of SWOT could be avoided.
Due to its simplicity, effectiveness and ability to deal with qualitative as well as quantitative criteria (this was also indicated by the results of this study), AHP is well suited to dealing with the factors in SWOT analysis. One problem with SWOT analysis is in the uncertainty related to the future development and outcomes of different factors. This may complicate comparisons. However, AHP analysis is capable of handling decision-making situations with some uncertainties and inconsistencies.

The recommendation is that the number of factors within the strengths, weaknesses, opportunities or threats should be limited to ten, but this probably induces the user to avoid overlapping and carelessness when constructing SWOT lists. On the other hand, the limitation is not so strict, and the problem of having a large number of comparisons can be avoided by at least two different techniques. Firstly, by grouping the variables and adding a new level to the comparison hierarchy (Saaty, 1980). If, for example, the number of opportunities is large, they can be grouped into two or three subgroups. Opportunities, for example, may be divided into General Environmental Opportunities and Competitive Environmental Opportunities (Dess and Miller, 1993). Secondly, new data recording and analysis techniques offer possibilities to include more factors in decision analysis. For example, Alho and Kangas (1997) presented a regression version of AHP formulated in Bayesian terms. Their version can be developed and utilized so that not all comparisons need to be performed.

AHP provides quantitative priorities to be used in decision support. It does not, however, include statistical assessment of the uncertainty of the results. The measure of the consistency of the comparisons made, the consistency ratio, resulting from AHP calculations provides no direct information about the uncertainty of the priorities obtained. Other methods for analyzing uncertainties in pairwise comparisons have been presented. Alho et al. (1996) suggested a variance components modeling approach, where uncertainty or variation of the judgments in the case of multiple judges can be divided into three parts: 1) interpersonal variation around the population mean; 2) possible shared logical inconsistency of the judgments among the judges; and 3) residual uncertainty. Alho and Kangas (1997) extended that formulation to a multilevel, multiple-objective choice problem by using regression technique and the Bayesian approach. As a result, it was possible to attach probability to the resulting priorities. These techniques might also be used in the approach based on the combined use of SWOT and AHP.

Numerical results, the priorities of SWOT factors, are of use when formulating or choosing strategy. It is useful to compare the external possibilities in relation to the internal capabilities, because all factors are, at the same, on the numerical scale. For example, when it is observed that one single weakness is bigger than all the strengths, the strategy chosen could perhaps be aimed at eliminating this weakness. Similarly, choosing a new strategy should probably not be based merely on the opportunities and omitting the existing threats if they are of same magnitude.

The results of our case study were presented in an illustrative way, which is often needed to clarify the interactions of numerous and contradictory factors. In strategic planning, this is often implemented via matrixes or graphs. Well known examples of these instruments are the Boston Consulting Group’s Business Portfolio Matrix (business growth rate and relative competition position), General Electric’s approach (market attractiveness and competitive position), and Ansoff’s product-market expansion grid, and others (e.g. Ansoff, 1965; Hofer and Schendel, 1978; Dess and Miller, 1993).

The hybrid method presented here is suitable for many kinds of strategic planning situations. In the case study, the situation investigated was one where a new strategy option emerged. The method can also be used in situations where strategic options have not yet been created. After defining the priorities of the SWOT factors, new strategies can be constructed based partly on the information resulting from comparisons. A connection with Weirich’s (1982) and Proctor’s (1992) applications utilizing priorities to find out the most important factors when creating new strategies according to their suggestions is also possible.

In addition, it is possible to compare two or more strategic options and find out which one best match the SWOT factors. Adding strategy alternatives at the lowest level of the comparison hierarchy and comparing them with respect to each factor in the SWOT list can do this. The result is a quantitative value indicating the priority or preference of each strategy option.

One approach to dealing with the uncertainties involved in the assessment of future development might be the application of scenario modeling. In this approach, each possible future scenario would have its own SWOT analysis and AHP comparisons. Appraising the probabilities to scenarios and weighting the SWOT factors with them could yield a more comprehensive picture of the effects of the various future outcomes. Weirich (1982), too, proposed a dynamic SWOT analysis, where changes in internal and external factors over time are included by preparing TOWS matrixes at different points of time.
According to the experiences of this study, the results of the combined use of AHP and SWOT analysis were promising. Making pairwise comparisons forces the decision-maker to think over the weights of the factors and to analyze the situation more precisely and in more depth. The applicability of the method in participatory planning will be studied in future. Public participation could be implemented by allowing all participants to perform their own SWOT analysis and pairwise comparisons and then to proceed by summing up the separate results after weighting the participants by their individual importances. This would result in new alternatives from the participants’ viewpoints and probably include more creativity in the planning process.

It is evident that a lot of managerial decision making is based on intuition and subjective judgments instead of the outcomes of formal planning. Expanding the presented formulation to cover a wider range of decision-makers and experts to introduce their ideas and estimates could benefit the planning process. Interaction, learning and consensus can all be achieved by, for example, including the Delphi technique in the planning process (e.g. Kangas et al., 1996b).

The hybrid method A’WOT increases and improves the information basis of strategic planning processes. It provides an effective framework for learning in strategic decision support in numerous situations. It can also be used as a tool in communication and education in decision making processes where multiple decision-makers or judges are involved.

LITERATURE CITED

Ahola, J. 1995. Yrityksen strategiaprosessi; Lappeenrannan teknillinen korkeakoulu; Tieteellisiä julkaisuja no 44, Lappeenranta.


Pukkala, Pykäläinen, J., Kangas, J., Loikkanen, T., 1998. Interactive decision analysis in participatory strategic forest planning: Experiences from state owned boreal forests. Submitted manuscript.


