A GDSS-based Approach to the Strategy Analysis of Forest Industries

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Abstract

In this paper, we present the results of a study where a GDSS-approach was used for a SWOT-based strategy analysis of the Finnish forest industries. Forest industries belong to the basic, strategic industries in the world, and they have a great importance for the Finnish economy. This study is the first part of a research program that aims at finding visions and alternative strategies in the field of forest industries, and at developing new scientific methods. The program is a learning process where one central tool is the GroupSystems-software. Thus, the contribution of the program is both methodological and gives new knowledge for forest industries. In this paper, the focus is on describing how the first part of the Finnish forest industries SWOT-analysis was conducted in a GDSS-laboratory by using the GroupSystems-tool. The study included the identification and prioritisation of the environmental change factors, i.e. threats and opportunities, faced by the Finnish forest industries in the future.

1. Introduction

The aim of this paper is to present the results of a study where a GDSS-approach was used for a SWOT-based strategy analysis. The study is the first part of a large research program that aims at finding visions and alternative strategies in the field of forest industries, and at developing new scientific methods. The program is a step-by-step ongoing learning process where one central tool is the GroupSystems-tool. Thus, the contribution of the program and this sub-study is both methodological and gives new knowledge for forest industries.

Forest industries as such belong to the basic, strategic industries in the world. Forest industries operate world wide, and their role in the economies of many countries is most essential. Of course, the importance of this industrial branch varies from country to country. In Finland we are particularly interested in what happens in these industries and how their future looks like. The share of forest products in Finnish total exports is 30 % and the share of printing and writing papers of the total world exports 25 % [1]. In addition, Finnish companies have become global and their cluster effects on metal, chemical, information, and etc. industries are substantial [2].

The products of forest industries are very strategic indeed, particularly paper which has been and is so far the most important carrier of information. Paper is the basis of modern civilisation and print has been the historical medium for mass communication. Thus it is more than justified to add knowledge of alternative and probable futures of forest industries by scientific methods.

The main objective of the research programme is to study visions of the forest industries. The concept "vision" refers in this connection to the state of the forest industries in the distant future covering a time span of more than 10 years. The aim is not to define a single vision for the industry, but more to explore the possible development paths the industry might face in the future. On the other hand, the future development paths are not accepted as they emerge as the aim is to define alternative strategies and action plans for steering the forest industries towards a successful future measured in terms of e.g. financial well being.

Another main objective of the research programme is to study and develop the applicability of group decision support systems in this area of research. This methodological development concerns especially the utilisation of the GroupSystems –software which is the main tool used in the research. In addition to gaining in-depth knowledge about the future development of forest industries, the research process and the achieved results are studied in terms of gaining experience and new ideas about the effective utilisation of group decision support tools.

2. The concept of forest industries

The industry area studied here is forest industries. As a concept it can be determined in several ways depending on the factors emphasised. Such factors are, e.g., certain sub-areas like paper industry or marketing or products.

In this study the scope is very large covering comprehensively the whole chain "from the stump to the customer" [3]. So, in this context, also some tasks of forestry

are included in the concept of forest industries, particularly as far as they are associated with wood supply. The concept "woodworking industry" refers to this aspect.

Also the plural form forest "industries", i.e. a comprehensive scope is applied here. The single term "industry" refers to pulp, paper, paperboard, sawn timber, plywood, fibreboard and particleboard, that is, the main product groups within the forest industries. However, it must be stated that also the singular form forest "industry" is very often used to cover all the parts of the area.

The following main features are characteristic of the forest industries and have to be taken into account in the strategic planning activity [3]: (a) dependence on one key raw material (wood or wooden fibre), (b) capital intensity, resulting to a need for high capacity utilisation rate, decisions with long-lasting effects, and planning prior to implementation by several months or even years, (c) benefits of large scale production, i.e. the importance of the so-called scale of economy-principle, used as a means for competitiveness, (d) technology as a driving force contributing to the development of this industrial branch, (e) standardised bulk products, (f) prices determined in international markets, (g) vulnerability of production to business fluctuations, (h) energy and, in particular, electricity intensity and (i) environmental aspects consequences of energy use and some process methods.

For describing characteristics of the global forest industries, some more statements can be put forward [1], [4]. The availability and price of wooden raw material are often primary success factors. This is due to the large share of manufacturing costs represented by wood in most forest products. The total raw material needed by forest industries in the mid 1990s was 320 Million tons dividing as follows: wood based material 176 Mt, recycled fibre 96 Mt, minerals and chemicals 38 Mt and non-wood fibre 10 Mt. The use of recycled fibre in the paper industry has increased considerably in the last 30 years from 20 % of the total furnish composition to over 30 %.

In forest industries, a major investment is an irreversible step. The size of the investment also restricts moves in other directions, even for many years. Related to investments very essential point is, that the size of new mills has increased constantly, e.g. in paper machines quadrupled in 25 years. The reasons for that have been the lower investment and manufacturing costs per output attained through bigger unit size, i.e. through economy of scale.

Progress in technology of forest industries has been enormous. The dramatic changes in the development of paper machine speeds and widths, of water consumption, and of the use of recovered fibre are good facts. E.g. water consumption in pulp production was in 1970 120 m^3/t and in 1995 only 15 m^3/t. The speed of newsprint machines was in 1960 around 200 m/min, and in 2000 it will be at the level of 1900 m/min. These and many other technological measures have had a strong effect on the structure and competitive position of forest industries. Behind these facts there are numerous innovations based on research work made in companies, universities and institutes.

The processes required for manufacturing forest industry products consume a great deal of energy, steam and electricity. This applies especially to paper, and even more so to the mechanical pulping of wood, where electricity consumption can be in excess of 2000 kWh per tonne. Energy is important, not only in the production process but it is present in all stages starting from forestry and wood supply, and ending with the delivery of products to customers. In actual fact, the significance of electricity has been constantly on the increase as a result of the growth in production and value-added, the introduction of new process concepts, the automation and digitisation of process control, and, paradoxically, energy conservation, and environmental protection as well.

3. Strategic planning in forest industries

3.1. The components of planning

Decisions concerning investments, research, marketing and other activities are precondition for corporate development. The decisions can, in principle, be either intuitive or based on planning in advance. Nowadays, the general view is that planning produces better decisions than what can be produced by mere intuition.

Implementation of planning makes it necessary to split overall planning into smaller tasks in one way or another. This leads to systematisation of planning. The systems have been abundantly developed at the theoretical and practical levels.

Ackoff [5], Ansoff [6], Argenti [7] and Steiner [8] are examples of academic pioneer scientists who have studied corporate planning and described in their own models how to divide planning into various categories. The concept and purpose of planning has been the background in these models affecting the contents. The models have been characterised by naming them according to the basic idea or task that they are suggested to carry. So, the terms "long range", "corporate" and "strategic" planning refer to different weights taken into account in the planning process. A great number of other concepts are involved, too, such as goal, objective, policy, tactics, program, budget, etc. In fact, planning is a world of schematics as Steiner pointed out as early as 1969. Planning procedures applied by business organisations are mostly more or less modified from academic models. In many cases the role of business consult-ants has been essential when an applicable system has been structured.

Despite the lack of uniformity in the field of planning as far as concepts, systems, and methods are concerned, it is possible to identify the core components, the most gen-

eral constituent parts as a basis for practical work. These components are analyses, objectives and means, which in the planning process are in a continuous loop [3].

The concept "strategy" means, in general terms, the definition of the long-term behaviour of the organisation concerned in respect to its environment, ordinarily at the responsibility of top management. When referring to the core components mentioned above strategy can be seen as a mix of overall objectives and means dictating the long-term direction of the organisation. In some cases strategy is defined only as a top-level main means, by which the organisation attempts to achieve its long-term objectives. Anyway, the precondition for formulating the optimal strategy is adequate knowledge of environment, and internal resources of the organisation concerned, i.e. analyses.

3.2. The planning areas

Planning, particularly so-called strategic planning, must be comprehensive. In principle, planning has to cover all the matters relevant for the present and future activities of the organisation. The choice of planning areas is as such a part of the planning task.

The starting points in the identification of planning areas are those general factors that have to be taken care of in order to succeed, and the special features that characterise the field of activity in question, i.e. in this study of forest industries.

Several lists, presented by scientists, are available for selecting general planning areas. E.g. Steiner [8] has suggested the following list: profitability, sales and markets, products, finance, stability, personnel and organisation, flexibility, research and development. Drucker´s [9] list differs from the previous by adding physical resources, productivity and public responsibility. It has to be noted that the described determinations do not follow the lines of groupings between marketing, production, etc. but cross the functional limits. Investments are in these classifications linked to all the mentioned areas.

By combining various general and scientific planning areas and taking into account the characteristics of forest industries we can end up with a complete area list applicable for the starting point in the present research program [3]: markets, market standing, products, wooden raw material, other raw materials, energy, technology, integration, human resources, finance, rates of exchange, logistics, innovations, productivity, environment and nature protection, social responsibilities, and profitability.

The previous areas can be divided into sub-areas, like for example as follows:

- contents of technology: contents of manufacturing methods; size and "speed" of manufacturing processes; and monitoring systems of processes,
- integration: economic and financial integration, which involves the ownership structure of industries; geographical integration covers cases in which either horizontally different products are produced in the same production unit, or efforts are made to result in a higher rate of processing vertically; integration related to supply of wood and/or other resources, such like energy.

3.3. The time span of planning

The problem concerning the right time span of planning is in forest industries particularly important. There are many aspects, such as capital intensity, the importance of structural analyses, etc., which suggest that planning activity should be expressly long-range planning. But what would be the exactly defined time span?

In principal, the following two criteria dictate the time span: how far into the future it is possible, or necessary to stretch the time span. The present study is visionary. When thinking of the question of time span, it means that efforts are made to look at the future as far as possible without binding it to any exact periods. E.g. in expert panel sessions this general principle is only recommended, and the practical application is left into consideration of each person.

3.4. The SWOT-analysis

Analyses, the first stage of planning, is very important when thinking of the results of planning, i.e. the quality of decisions. Well-performed analysis work gives a factual basis for selecting strategies.

The main grouping for the implementation of analyses can be based on the division between planning areas. Attempts should be made to distinguish between different types of changes: short-term and business fluctuations, and the long-range structural trends. In particular, in forest industries this aspect is very essential because of decisions with long-lasting effects.

The methods applicable in the analysis work are numerous, quantitative or qualitative, more or less sophisticated, based on time series, expert panels, etc. Apparently the commonest practical analytical tool for strategic planning is the so-called SWOT- (Strengths, Weaknesses, Opportunities, Threats) analysis. This procedure has been used for as long as thirty years. The core is to identify the contents of all four elements of the matrix. It was originally meant for evaluations of business corporations or profit centres. In this study it is applied to the whole industrial branch. Piercy & Giles [10] and particularly Weihrich [11] have brought very valuable additions to this procedure, i.e. how SWOT identification can be extended to the strategy forming level.

Piercy & Giles [10] have presented how we can use the SWOT-technique in a particularly powerful form. The focus is on matching our strengths to opportunities in the outside world. The logic here is that strengths, which do

not match to any opportunities, are of little value while highly ranked opportunities, for which we have no strength, are food for further thought. Conversion strategies are appropriate responses to weaknesses and threats. The goal is to convert these factors into strengths and opportunities.

In the procedure presented by Weihrich [11] a TOWS- (= SWOT) matrix is proposed as a conceptual framework for a very systematic development, evaluation and choice of strategies. The TOWS-matrix indicates four conceptually distinct alternative strategies (and tactics and actions, too). The Strengths-Opportunities -strategies maximise both strengths and opportunities. In the Strengths-Threats -strategies the aim is to maximise the strengths while minimising the threats in the environment, when, on the other hand, the Weaknesses-Opportunities -strategies attempt to minimise the weaknesses and to maximise the opportunities. The Weaknesses-Threats -position is one that any organisation will try to avoid. As a strategy it means the aim to minimise both weaknesses and threats.

The identification of all the relationships S-O, S-T, W-O and W-T may result in numerous combinations, which have different weights in terms of their potential. Therefore in each "strategy box" a careful interaction evaluation is needed to determine the best match in each row and in each column.

4. A GDSS-based swot-analysis of forest industries

4.1. Group decision support systems (GDSS)

In this section, we describe the concept GDSS and give some key definitions and benefits, see also Turban and Aronson [12] and Niederman et al. [13].

The term group refers to people whose mission is to perform some task and who act as one unit. The group can be permanent or temporary, the group can be in one or several locations, and it can meet concurrently or its members can work at different times. A group can be a committee, a review panel, a task force, an executive board, or permanent team. Potential benefits of group work are for example: (a) groups are better than individuals at understanding problems, (b) people are accountable for decisions in which they participate, (c) groups are better than individuals at catching errors, (d) a group has more knowledge than any one member, (e) groups can combine knowledge and create new knowledge resulting to more alternatives for problem solving and better solutions, (f) synergy during problem solving may be produced, and (g) working in a group may stimulate the participants and the process.

The GDSS consists of a set of software, hardware, language components, and procedures that support a group of people engaged in a decision-related meeting. The GDSS improves the decision making process and the outcomes of groups The GDSS is designed to encourage activities such as idea generation, conflict resolution, and freedom of expression. It contains built-in mechanisms that discourages development of negative group behaviors. The GDSS (a) supports parallel processing of information and idea generation by the participants, (b) helps participants to deal with the larger picture, (c) permits the group to use structured or unstructured techniques to perform the task, (d) offers rapid access to external information, (e) produces instant anonymous voting results, (f) enables several users to interact simultaneously, and (g) develops organisational memory.

The GDSS laboratory at the Lappeenranta University of Technology provides an effective setting for organising an expert panel session with max. ten participants: (1) the participants can work together by using computers that are connected to each other over a local area network, (2) different types of group decision support systems software are available in the laboratory, and (3) a video projector is used for showing the computer-processed results on the screen for supporting discussion. The software tool that is used in the expert panel session is called GroupSystems.

GroupSystems is electronic meeting support software that includes many tools for supporting group processes [14]. The software includes a collection of software tools that support group processes, such as brainstorming, information gathering, voting and consensus building. The members of the decision-making group use the tools interactively using separate workstations. The most important tools included in the GroupSystems software are the following: (1) agenda which is used for creating an outline of the tasks for the group session, (2) categorizer which is used for creating lists of ideas, commenting on ideas and categorising ideas, (3) electronic brainstorming which allows the group members to present their ideas anonymously and simultaneously, (4) group outliner which is used for creating and organising ideas in the form of a multi-level hierarchy, (5) topic commenter for commenting on separately defined subjects, and (6) vote which includes eight different voting tools for making decisions. GroupSystems includes six additional tools for supporting both communication between group members and individual working of the group members. GroupSystems has three characteristics that can make meetings more efficient and productive [14]: (1) participants in decision making session can enter their comments and ideas anonymously, (2) participants can enter their ideas simultaneously, and (3) full meeting documentation is available immediately after the meeting.

A prerequisite for utilising the GroupSystems is that the agenda of a meeting or an expert panel session is carefully planned in advance. Structuring the agenda means that the

steps to be taken in the meeting are defined, the total amount of time to be allocated to each step is determined and the specific GroupSystems-tool to be used is decided for each step. However, it is difficult to estimate e.g. the exact time needed for the various steps, and thus changes need to be made to the agenda during the course of the meeting.

4.2. The process used in the study

The objectives of the research programme have been described in the section 1. The study that is presented in this paper was started in September 1998. The aim was to conduct a study for testing and developing the GDSS-approach and the tools. The purpose of the study was to create a firm basis for the next parts in the research programme.

The focus of the study was determined to be on the Finnish forest industry. Furthermore, the Finnish forest industry is covered in the research as a whole covering both the chemical and mechanical parts. The main phases of the study are the following:

- **Phase 1:** Analysing the factors in the operating environment with an impact on the forest industries: The first phase includes analysing the operating environment of the Finnish forest industry and defining the factors in the operating environment that will have an impact on the development of the Finnish forest industry. Based on the estimated impact, the defined factors are then divided into threats and opportunities and their importance is estimated.

- **Phase 2**: Analysing the internal strengths and weaknesses of the Finnish forest industry: The second phase involves defining the internal factors, i.e. strengths and weaknesses, with an impact on the future development of the Finnish forest industry.

- **Phase 3:** Defining the strategies and actions needed to respond to the defined threats, opportunities, strengths and weaknesses: The aim of this phase is to determine the future strategies and actions that need to be taken by the Finnish forest industry in order to minimise the impact of the threats and to maximise the utilisation of the opportunities.

The first phase was conducted as a one-day expert panel session in the GDSS-laboratory of the Lappeenranta University of Technology. The phase two was carried out as an expert panel questionnaire through mail. The aim is to use the GDSS-approach again for the phase three. The expert panel consisted of seven persons that represented both Finnish forest industry companies and academic faculties involved in forest industry-related research.

In this paper, we focus on the first phase of the study where a GDSS-approach was applied. The steps included in this first phase were the following:

- **Step 1**: Mapping the factors in the operating environment with an impact on the Finnish forest industry. The first step is a brainstorming phase where as many factors as possible are identified. The GroupSystems-tool that was used for the first step was the Categorizer.
- **Step 2:** Grouping the defined factors. The second step involves gathering factors that are related to each other into major groups. The Categorizer-tool was again used for supporting this step.
- **Step 3:** Determining the importance of the factor groups. During the third step, the expert panel prioritises the factor groups based on the estimated impact on the Finnish forest industry. The GroupSystems-tool used in this step was Vote.
- **Step 4**: Determining the importance of the individual factors within the group. In this step, the individual factors within the major factor groups are prioritised based on their estimated impact. The Vote-tool was used for this step as well.
- **Step 5:** Determining the impact of the factors on the development of the Finnish forest industry. The fifth step involves analysing whether a certain factor has a positive or a negative impact and what the magnitude of the impact is. Based on this step, the environment change factors can be classified as opportunities or threats. The GroupSystems-tool used for this step was again Vote.

4.3. The results

In this section, the results of each step of the process are described.

Step 1: Mapping the environment change factors

The purpose of the first step was to have a brainstorming session concerning the factors in the operating environment that might have an impact on the Finnish forest industry in the future. The aim was to get as many suggestions as possible, and thus no limitations were set for the inflow of ideas. The GroupSystems-tool that was used for supporting this step was the Categorizer.

The brainstorming session resulted into 65 suggestions concerning the environment change factors. This can be considered a measure of the effectiveness of the expert panel as these 65 ideas were defined in a relatively short time. This also proved the user-friendliness of the GroupSystems software as only one of the expert panel members had experience on how to use the tool and still all members were able to use the tool without bigger problems.

Step 2: Grouping the defined factors

The second step of the expert panel session involved dividing the defined factors into major groups. Grouping was conducted by using the Categorizer tool as well. The

grouping process was done as follows: (1) the groups to be used were commonly agreed on, (2) each member of the expert panel was given the responsibility to gather together the factors belonging to one group, and (3) the results were discussed jointly and changes based on consensus were made, if needed.

The expert panel defined the following major groups into which the defined environment change factors were grouped: (1) the end-users of the forest industry products, (2) the resources used by the forest industry (timber, energy etc.), (3) customers, (4) research and development, (5) the forest industry cluster of the Finnish economy, (6) the general development of the markets, (7) the general structure of the Finnish forest industry, (8) technological development, and (9) the development of the society.

Step 3: Determining the importance of the factor groups

The aim of the third step of the expert panel session was to determine the importance of the groups defined during the previous step. The GroupSystems-tool that was used was the Vote with a rating scale ranging from 4 (not important) to 10 (very important). Each member of the expert panel gave a rating to each of the groups and the average of the ratings was calculated. The results of this step of the expert panel session are presented in Table 1.

As shown in Table 1, the end-users are the most important group of factors with an impact on the future of the Finnish forest industry. The importance of the resources and customers was evaluated to be very high as well, and all in all the differences between the groups are not very significant.

What is surprising, perhaps, is the position of technology in the ranking list. Production chains in forest industries are very technology-intensive. So it could be supposed that technological factors dictate very far the overall direction of the product mix, economy, etc. However, our expert panel voted group technology to take only the second last place in the priority list. One explanation could be that technological development is in the own hands of forest industries, and therefore not actually the "environment" factor. Technology has also been in-built in the research and development group, which was voted fourth by experts.

In the last few years the so-called "cluster"- concept has been regarded very essential when considering the competitiveness of a single country. A good example is Finland, where the forest cluster has historically been a key factor when explaining the success of Finnish forest industries. So, it is only natural that group cluster has earned an important position in the results.

As a whole, it must be emphasised that the grouping in the study was not fully successful. Single environmental change factors can be placed in several groups. This means that there is overlapping between factor groups. This fact also explains for its part the minor differences in rating averages. Also, the results can be interpreted so that all the groups are, in fact, nearly equally important. All the factor groups must be taken into account when planning activities for the future.

Factor group	Rating average
End-users	9,00
Resources	8,86
Customers	8,71
Research and development	8,43
Forest industry cluster	8,43
General development of the markets	8,29
Structure of the forest industry	8,14
Technology	7,71
Development of the society	7,43

Table 1. The importance of the environment change factor groups

Step 4: Determining the importance of the individual factors

The aim of the fourth step of the process was to determine the importance of the individual environment change factors within the groups. The Vote tool was used again with the same rating scale that was used in the previous step. The procedure used was very straightforward: the groups were handled one at the time, the expert panel members gave their ratings to the individual factors, the average value of the ratings was calculated and the results were discussed. As an example, the importance of the individual factors belonging to the group "end-users" is presented in Table 2.

Factor	Rating average
Competition between advertising media	9,29
End-user money and time usage	9,00
Impact of retail supply chain on packaging	8,67
Paper consumption increase due to information technology	8,57
Substitute products	8,29
Increase of the cost of material handling compared to information processing	8,00
Electronic media	7,71
Social impacts of media development	7,57
Paperless office	7,43

Table 2. The importance of the factors belonging to the group "end-users"

The results reflect the present market-economy society. Advertising, associated closely with media is more than essential for decision- makers. And also this applies to the persons deciding about the alternatives between printed and electronic data handling, in packaging, and in the building industry. The end-users are not necessarily those purchasing paper, board, sawn timber, and other forest industries products but those operating in the last stage of the chain such as in commercial advertising companies

and wholesale firms. Also societal activist movements, typically environmental organisations, have their role when the end-users make their decisions.

The behaviour of the end-users in the markets needs more scientific and applied studying. The results in present project are only very preliminary. There is obviously need for deepening the knowledge of the factors involved, their priority, etc.

Step 5: Determining the impact of the factors on the development of the Finnish forest industry

The last step of the process involved determining the impact of the environment change factors on the Finnish forest industry. The aim was to determine whether the impact of a factor is positive or negative on the development of the forest industry and what the magnitude of the impact is. For this purpose, the Vote tool was used again but this time with a rating scale ranging from –3 to +3. In this scale, -3 meant that a factor will have a major negative impact on the development of the forest industry and thus it is classified as a major threat. Correspondingly, a rating of +3 is given to a factor that represents a major opportunity for the Finnish forest industry. A rating of 0 means that a factor has no impact on the forest industry. The five major opportunities are presented in Table 3 and the five major threats in Table 4.

When thinking of the overall public discussion in newspapers, television, etc. the results of the expert voting are not surprising. It has been noted in many contexts that in the future the most important factor lies in "soft-ware" rather than in material items. In the future competition, those companies able to apply and to develop know-how, knowledge, and competence in their operations, are in a strong position.

It is also very natural that global population growth is at the top of the priority list . At least so far, e.g. the consumption of paper and board has had a very high correlation with population growth. Actually, the correlation factor has been more precisely gross national products in economies. So, the companies of forest industries have been and will be more interested in markets where the growth seems to be the greatest. But, another thing is that disadvantages appear in these markets in many cases concerning e.g.. local political conditions and financing.

What is interesting and perhaps should attract more attention, is the role of packaging in future societies. In forest industries, packaging materials have traditionally been in the shadow of printing papers. The present study shows that it would be useful to put more emphasis on the whole large area of packaging.

When looking at the threats and their ratings, the availability and cost of energy rises up clearly as the most serious item. The situation just now is paradoxical. In all central forest industries countries there is no shortage of energy and also the prices are quite reasonable, in some cases even low. So, it could be expected, and so many e.g. politicians think, indeed, that energy is no problem. But, as the expert panel has stated the future will not be so rosy. In almost all industrial countries there are dark clouds in the horizon. Especially, the availability of electricity to meet the need round the clock and round the year forest and other so-called basic industries will be in problem. The consumption of electricity and energy in general will certainly grow, and this calls for investments in energy production. How is this possible when the majority of politicians tend to reject all the alternatives coming to question.

Another thing of interest, and quite a recent, too, is the behaviour of investors. It has been seen that the time span investors are looking at is very short and especially short when thinking of the nature and needs of forest industries. The question how this factor is affecting the financing and investments possibilities is very critical and in any case requires careful consideration from now on.

Factor	Rating average
Development of overall competence	2,17
Global population growth	2,17
Co-operation with the customers	2,00
Role of packaging in advertising	1,83
Increasing consumption of paper due to information technology	1,83

Table 3. The major opportunities

Factor	Rating average
Availability and cost of energy	-2,17
Decreasing consumption of paper due to monitor technology	-1,50
Availability and cost of timber	-1,50
Increasing importance of the shareholder point of view	-1,33
Development of cheap sources of raw material	-1,17

Table 4. The major threats

5. Conclusions

The GDSS-approach proved to be successful in analysing the opportunities and threats of the Finnish forest industry. The GroupSystems-tool provided the platform for analysing the external environment in a structured way. The participants of the expert panel learned quickly how to use the tool, and they were able to generate a large number of ideas and to utilise the voting tools flexibly. Unfortunately, the large number of ideas created some problems for the expert panel session. For example, more time would have been needed and should have been allocated for discussing thoroughly what a certain idea really means as describing an idea accurately with just a couple of words is a difficult task.

The study provided many learning points. First, the focus should be on a very narrow area in a GroupSystems session, i.e. too many topics should not be squeezed into a single session. It is better to analyse a problem in small parts, and the participants of the session should be given enough time to study and consider the results before proceeding to the next step of the decision process. Secondly, the GroupSystems session should be very carefully planned in advance. A carefully planned and structured session enables the participants to prepare them for the session as they know in advance what issues will be tackled. Furthermore, the focus and objectives should be made clear for all participants from the very beginning. However, the structure of a GDSS-session must not be cast in stone as needs to change the structure might arise as the session proceeds. Thirdly, enough time should be allocated for discussing the outcome achieved through using the GroupSystems-tool. Especially the brainstorming phases in a GDSS-session result to numerous ideas, but those ideas are normally explained by only one or two words. An open discussion is normally needed in order to create full understanding about the brainstorming results among the participants.

The analysis of threats and opportunities was followed by an analysis of strengths and weaknesses that was conducted as a mail questionnaire. The next phase of the study is to define the strategies that should be taken in order to respond to the defined threats and opportunities, to eliminate the weaknesses and to utilise the strengths. The GDSS-approach will be utilised for this phase.

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