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The use of forest information in timber sales planning – a case study in a Swedish forest-owning company

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ABSTRACT

Interactions between value-creating activities are vital to increasing product value. Information sharing is a cornerstone of such interactions. For a forest-owning company with the primary objective to be leading in selling roundwood to forest industries, it appears therefore crucial that the sales people within a forest company have up-to-date knowledge about the forest in planning their sales, and that the forest knowledge is presented in a format that is suitable for them. To investigate if this is the case, a study was conducted at Sveaskog, a large Swedish forest-owning company. Semi-structured interviews were conducted with respondents from different levels in the organization. The results show that most sales managers did not directly use the knowledge about the forests when planning their sales; instead, they relied on historical data and had low trust in the knowledge presented in the tactical forest plan. The study pinpoints the organizational obstacles for using forest information in sales planning. These obstacles need to be addressed if more sophisticated information made available through new technology is to be utilized.

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Introduction

In Sweden, forest companies (including Sveaskog) perform harvesting operations each year on average on 245,000 ha of their own land, harvesting on average 35.4 million m³ (Anon 2014). Effective utilization of information is therefore important as it improves cost-efficiency of operations and increases competitiveness of companies (Alavi & Leidner 2001). Investigations, if this is the case in forestry, are especially timely as the technological development of data acquisition methods (in particular remote sensing) has drastically increased the availability of reliable data for spatial assessment of the forest with a considerable reduction of costs (McRoberts et al. 2010). With airborne laser scanning, individual characteristics of forest stands can be assessed cost-efficiently (Eid et al. 2004) with an accuracy that exceeds the conventional methods of field measurements or aerial-photo interpretation (Næsset 2007). Not only do we have technically access to better forest information, but the sawmilling industry has today much more stringent criteria on logs' dimensions and tree species (Hugosson & McCluskey 2008) which should spur to use forest information effectively.

In Swedish forest companies, forest information is created in the forest planning processes. The process consists of three main stages: strategic planning (focus on silvicultural policies and harvest scheduling; a planning horizon of approximately 100 years), tactical planning (focus on harvest site selection and road upgrading; a time horizon of 3–10 years), and operational planning (focus on scheduling harvest sites and crews; a time horizon of 0.5–12 months) (Söderholm

2002). In addition to the forest planning system there is a two-step sales planning system with a long-term plan with a time horizon of 3–5 years that concerns which customers to target and a short-term sales plan with a time horizon of 1 year that targets what volumes to contract for a specific buyer (Nilsson et al. 2013). Basic business theory would predict that matching what is inventoried and prepared for in the tactical forest plan with current and potential customers would be essential. Few studies have addressed the actual use of information about the forest in large-scale forest operations. Exceptions are represented by Laamanen and Kangas (2011) that analyzed information needs in the operational stage of planning and Nilsson et al. (2013) that studied strategic and tactical forest planning. Thus, there is no knowledge on how forest and sales planning relate to each other at the tactical level and, consequently, what prerequisites would have to be met to make use of the forest information effectively.

The purpose of this study was therefore to describe and understand the way in which a large forest-owning company currently uses forest information in sales planning and to analyze what changes in the forest information provided by the forest planning process would be desirable. The research questions addressed are to what extent and how forest information in the tactical plan is used for sales planning, what information gaps exist according to the sales planners in the present tactical forest plan and what obstacles may need to be addressed to improve the effectiveness of forest information in sales planning.

Knowledge management was used as a framework for the study. Knowledge management theories concern how

organizations process data into information and subsequently into knowledge. It is also concerned with how knowledge is distributed and used in organizations (Alavi & Leidner 2001). The study was conducted as a case study in the largest forest-owning company in Sweden, Sveaskog, which has as its primary objective to be the leading company in selling roundwood to the forest industry. In the following section, details are given of the company and the methods used for collecting data from interviewees about forest planning and sales planning. The section also presents the concepts of knowledge management central to this study. Next, the results are described; they show how tactical forest planning is done and how forest knowledge is used in the sales planning. Finally, the results are discussed basically from a knowledge management perspective and focusing on reasons why forest information is either not used or not considered useful in some cases as a basis for identifying potential improvements.

Materials and methods

The Sveaskog company

A case study was conducted in 2009/2010 at Sveaskog AB, the largest forest-owning company in Sweden. Sveaskog is owned by the Swedish state and its purpose as stated by the Swedish Parliament is to “be an independent player in the market with forestry as its core business” (Sveaskog 2011). Sveaskog owns 4.2 million hectares of forest, of which 3.3 million hectares are productive forest land. These holdings represent 14% of the productive forest land in Sweden. The annual growth of these forests is approximately 10.8 million cubic meters of forest ($\text{m}^3 \text{fo}$) and in recent years, 60–70% of this growth has been extracted. The holdings are located all over Sweden but are concentrated in the north of the country (Sveaskog 2014).

While the company used to own a number of mills, it has undergone a transition from being a supply-based organization delivering materials to in-house industrial facilities to a forest-owning organization whose value resides in its capacity to generate primary forest products: timber, pulpwood, and biofuel. The forest and sales planning in the company is conducted in several units within the organization. At the time of

the case study, the company was organized into three divisions: forest, production, and market (Figure 1). The production division was responsible for planning the management of the forested holdings, while the market division was responsible for sales planning. Long-term planning was conducted at the central level of the organization in the forest division. The operational activities of the company were divided across five geographical areas known as market areas (MOs). Each of these five parallel operational units had a forest planning process and a timber sales planning process. All five MOs were subdivided into smaller areas known as harvesting manager areas, which were further subdivided into multiple planning areas.

In addition to the wooden products produced on their own land, the company purchases timber, pulpwood, and biofuel from other sources. These sources include other companies, private forest owners in Sweden, and importation from other countries. Each sales manager handles products from all these sources. In recent years, timber produced in the company's own forests has accounted for slightly less than half its total sales (Sveaskog 2012).

Data acquisition

Interviews were conducted with employees with a focus on sawlog sales since sawlogs are the most valuable product delivered by forestry. To obtain understanding of the use of forest information for sales planning it is necessary to trace the sales planning process where this information could fit in. To be able to give insights on what can be done to improve the applicability of forest information one must understand how the forest data are produced. Furthermore, knowledge of forest data production serves as background information to gain additional understanding of how forest information is perceived by sales planners; the sales planners are of course not unaware of the forest data formation process. It also serves to corroborate the propositions of sales personnel, or to help evaluate the nature of their sayings. Thus, all divisional leaders at the central level were interviewed as well as employees at different MOs who are responsible for making the tactical forest plans and the sales plans. The interviewees were therefore selected by purposive sampling. In total, nine individuals were interviewed, four of whom worked at the central level in the divisions and five at the MO level. Four of the interviewed employees worked in the production division (2 at the central level and 2 at the MO level), four in the market division (1 at the central level and 3 at the MO level), and one at the central level in the forest division. All, but one, interviewees were men. One of the interviewed sales managers was responsible for the two northernmost MOs.

Semi-structured interview guides were used to ensure that all interviews would cover equivalent subjects. This type of interview has the advantage that it offers a balance between structure and flexibility (Gillham 2005). The guides divided the interview process into four stages: the plan and the planning (with questions about the process of the different plans, what the critical issues were in these processes, and who is involved), data (with questions on the type of data,

Figure 1. The organization of Sveaskog. The three processes of market, production, and forest are found in all the five geographical MOs (market areas) (Sveaskog 2012).

how they were gathered, where they were stored, and how they were made available), communication, and finally follow-up. For each stage, a list of support subjects had been made to guide the interviewer in making sure that the all steps in the planning processes had been covered and comparisons between interviews could be made. Before the actual interview, the interviewees were contacted by phone to explain the purpose of the study and to request their participation. Upon agreement to participate an appointment for the actual interview was made. The interviewees were asked to explain the forest management and sales planning activities in their own words. Particular consideration was given to the relationship between the tactical forest planning conducted by the production division and the sales planning conducted by the market division. One person in the forest division was interviewed since the forest division is responsible for strategic forest planning and it was expected that he would provide useful insights into the forest planning process. Interviews were conducted both by phone (three interviews) and in person (five interviews); a single two-person interview aside, only one-person interviews were conducted. The interviewees who were interviewed in person had the opportunity to use pens and a piece of paper to explain or expand on their answers. Telephone interviews lasted for approximately 30–40 minutes, while interviews in person lasted for 1.5–2 hours. All interviews were made by the same researcher.

All interviews were recorded and completely transcribed. All transcribed interviews as well as the drawings made by the interviewees were read and interpreted by two researchers individually. For each interview the two researchers jointly established a cognitive map by coding the patterns that were found in the interviews (Miles & Huberman 1994). After that, the interview transcripts were read again by the two researchers and compared to the maps to ensure that the maps represented the processes and the opinions of the interviewees correctly. The maps were compared to determine possible inconsistencies and subsequently merged into congregate maps (Bougon 1992) for each planning process to obtain a comprehensive overview of the two planning situations. The information in the congregate maps was then described in text with the help of the interview material using the meaning condensation method (Kvale 2007) which implies that from the spoken interview text the essential content was extracted and the dominating themes in the spoken

text were determined. These themes and essential content were thereafter described in a condensed text. This text was then sent to all authors and in a joint meeting analyzed using the knowledge management theory, in terms of whether the company currently makes use of forest information from the forest plans in sales planning and whether or not the company's representatives believe that obtaining new or better forest information would be useful to them. Notes were taken during the meeting, which were used in the writing of the manuscript which all authors reviewed and commented upon. One researcher reviewed the technological development literature and analyzed how the forest planning process might be adapted alternatively what technological development is desirable.

Knowledge management theory

The theory of knowledge management defines four key processes: knowledge creation, knowledge storage and retrieving, knowledge transfer, and knowledge application (Alavi & Leidner 2001). Focus is given here to knowledge transfer for understanding how knowledge created in one planning process affects another planning process.

The key elements of a knowledge-transfer process are a message, a sender, a coding scheme, a channel, transmission through the channel, a decoding scheme, a receiver, and the assignment of meaning to the decoded message (Gupta & Govindarajan 2000). Furthermore Gupta and Govindarajan (2000) identified five key aspects of inter-personal knowledge flow: the value of the source unit's knowledge stock; the motivational disposition of the source unit; the existence and richness of transmission channels; the motivational disposition of the target unit; and the absorptive capacity of the target unit. For this study, this means that the forest planners (the senders) need to know which parts of the forest are to be harvested and what kind of trees are to be found in these stands (the message). Individuals engaged in forest planning also need to have a desire to share their knowledge with the sales team and a useful way to do this (typically, this would be done using IT, the channel, and the transmission). The sales people (the receivers) need to have proper tools to record and exploit it (the decoding scheme) and assign meaning to the forest information by using this forest knowledge. The key aspects for inter-personal knowledge flow were used to analyze the problems identified in the knowledge-transfer process.

Figure 2. The timeline for the tactical forest plan.

Results

Producing the tactical forest plan

In Sveaskog, the tactical plan is made at the MO level. It builds on the strategic plan that specifies the volume that can be cut in the coming 10 years. The tactical plan consists of two registers; stands in the stand register (that contains data on all stands) marked to be in the tactical plan and the register of tracts to be harvested in the near future. The total volume of the stands and tracts of the tactical plan corresponds roughly to the volume given by the strategic plan. As it is

described in the interviews the two registers together form the structure of the tactical forest plan as shown in [Figure 2](#). Years are numbered 0, 1, 2, and so on where year zero refers to the current year. While activities may be planned for a given year, this is not binding; a tract may very well stay for an extended period of time because other stands have entered the plan and taken their place.

The stands in the stage furthest away from year zero have been selected for treatment in the first 10 years of the long-term forest plan but should not be subject to harvest within the next few years. One reason can be silvicultural management procedures such as fertilization whose growth effect should be fully exploited. The volume of this stage is replenished as compartments are selected to go to the next stage. Stands to enter the next stage are selected on their economic priority and their contribution to geographic concentration of harvest activities like road building and costs of transporting machinery. In this phase suitable harvesting unit are formed called tracks. Tracks whose cutting will require consultation with other stakeholders (such as local Sami people or the county administrative board) are identified and consultations are performed. Tracks that do not pass the consultations are removed from the plan. Among the tracks that remain eligible for cutting after the consultation or for which no consultation is necessary the harvesting planners then select tracks to be inventoried. During this inventory, the tracks are delineated (i.e. the borders and restrictions of the site are defined and marked) and the trees are measured (the mean tree diameter and height are recorded, along with species and total volume of the compartment). The interviews with forest planners reveal that the sales planning system indirectly has an influence on the content of the tract bank through the deliveries following sales; the content of the tract bank is often discussed between forest planners and harvesting managers in order to secure delivery plans. The inventoried tracts are now moved to the tract bank register. The sum of the volumes of all the tracks in the tract bank is supposed to correspond to the cut volume for the 1.5–2 years following January 1 of year zero. The tract bank forms the basis for the harvesting manager to schedule tracts for harvesting in the operational plan.

Producing the sales plans

The Sveaskog sales planning is completed in two steps: a long-term plan (3–5 years) made at the central level and a short-term plan (1 year) at the MO level. The Senior Vice President Market is responsible for producing the long-term sales plan, but it has to be approved by the CEO. The long-term sales plan is reviewed every year and adjusted if needed. If large changes have occurred, the entire plan is redrafted. The interviews clarify that the sales manager at each MO makes a short-term sales plan that concerns what is to be sold to which buyer. This plan is based on the long-term sales plan and is made before the negotiations with the buyers for the coming year are initiated. This plan contains the expected volume and type of product to be sold to each buyer. The principal structure of the sales planning system is different to the tactical forest planning. The forest plan is continuously updated while the long-term sales plan

is replaced at regular intervals. The short-term sales plan is more of a temporary plan; it only exists for a brief period when allocating the timber to be produced over the coming year. As the sales contracts are signed, the short-term sales plan is transformed into a delivery plan.

The company's long-term sales plan must, according to the interviewees at the central level of the market division, account for long-standing relationships with customers. Its construction is informed by a range of inputs, including business information, predictions about competitors and buyers, and predictions about changes in the market. The production of this long-term sales plan involves several persons from the market division, along with people from other divisions and groups. The company's strengths and weaknesses and the state of the company's forests are also important considerations in the planning process. The outcome of the long-term sales plan is a set of plans that analyze each product group in relation to its buyers.

As will become apparent below, the genesis of the short-term sales plans is less standardized than the creation of the long-term plan.

Use and non-use of forest data

We will here report aspects related to, firstly, the motivation to supply information that can also be used for sales planning, secondly, the use of forest information for sales planning and conditions surrounding that use and, thirdly, what has been perceived as good or problematic properties of the data.

The role of forest data for the long-term sales planning activities is emphasized at the central level. The interviews among employees at the central level of Sveaskog express an ambition to deliver a good tactical forest plan to the market process. One interviewee says: "A well-functioning tactical plan is most important for the Market division. They're the people who make sure that we get money." Several interviewees at the market division stress the plans' importance toward the accomplishments of company objectives. The respondent at the central level says: "We don't do this [forest planning] for the sake of forest management. We're supposed to make money. That's our job." Another interviewee from the production division notes that "today, it is quite clear that [they] have to be good at making deals, and prices must be set at roadside. That's the only thing that counts." One of the interviewees at the central level of the market division concludes: "The more we know about what we have and when it will be accessible, the better deals we can make." Decisions about which products will have to be purchased from external suppliers are based on the knowledge of the buyers' demands and the output of the company's own forests. Better information on what is available in one's own forest will therefore improve the input for the timber procurement process, according to the interviewee.

Investigating the use of forest information and beginning with the long-term sales plan we can only find one instance in which reference is made to these data. In the description of the planning process the interviewee from the market division at the central level remarks that the output from the tactical forest plans is used to provide an overview of the state of

the company's forests. No further remarks on the properties of this information were made with references to this planning phase.

Turning to the short-term sales plan the responses from and reasoning by the interviewees make it clear that forest information in this case refers to the data in the tract bank register. The interviews reveal that preparations of this plan are performed differently within different MOs. One sales manager at the MO level said:

We do a lot of analyses and simulations of scenarios ... what will happen in one case or another. Then we re-run the analyses again and again. So we have a pretty good picture of our ability to deliver in different areas and what will happen if one customer's demand increases and another decrease. After enough of these exercises, we have a good understanding of what will happen. We don't always simulate all the changes, but most of them are still there in the back of my mind.

For this sales manager, the tactical plan is an input variable for his planning. Another sales manager says "Otherwise, our standard routine for operative planning [short term sales planning] is based on an even (historical) volume, given the bigger suppliers we have had and the volumes we can manage from smaller forest owners." This statement reflects the reliance of historic information for all but one of the MO sales managers.

Several references are made to market conditions that could, wholly or partly, explain the reasons for the procedures reported in the previous paragraph. One person at the MO level explains that at the time of the study, the demand exceeded the supply, and so planning is about prioritizing different clients' demands while seeking out buyers for unusual products. "Well, of course there's a customer-oriented part, but we also have our own areas to take care of ... they're both our responsibility ... so when different assortments show up we have to find buyers for all of them." Another aspect brought forward by one of the sales managers at the MO level:

Sure it's possible to juggle a few percent here and there, maybe 5 or 10 ... But adjusting by 25–30% means a lot of work. If, for example the market is down for 2–3 years, we may run at a 30% lower volume. Then we've gone from 100 to 70. And after that, we have to go from 70 back up to 130. That won't be easy.

One sales manager describes a situation that might occur, which shows how the planned sales volume for a year might differ from the realized delivery:

We never look back but we coordinate all the time ... We assume that we're going to deliver 10 000 cubic meters to a customer [before negotiation] and then we start delivering. Then we start price negotiations. If we don't quite agree we say we'll only deliver 7000. OK ... and then we deliver the 7000, and then the volume is already wrong. And then we come to new years and check back again. It's back to the table and now they say they want a little bit more and are willing to pay. That's the way it is all the time. We never look back to compare to the original plan.

One of the sales managers claims that his planning has been made harder by the introduction of the tactical forest plan. His experience was that the application of tactical forest planning made the flow of timber assortments from final felling and thinning to vary from one year to the next and hard to predict.

With reference to market conditions one interviewee from the market division at the MO level thinks that the uncertainties of the future make it unimportant to have exact measurements of the trees, saying: "We already know quite a bit about it [the forest and trees], but I'm not sure we need to raise the bar much higher than it is today. There are a lot of other uncertainties in the equation."

A problem indicated by the forest planners is that, although the structure stipulates that the tract bank should hold a cut volume of 1.5–2 years, it is rather uncommon to have a tract bank of that size on January 1. Additionally, they suggest that certain compartments remain in the tract bank for a long time because the harvesting manager may be reluctant to choose compartments for instance because of their location, ground conditions, or wood quality. One planning manager says: "maybe half a year of these [compartments in the tract bank] are compartments that are left there." This means that while the nominal size of the tract bank may satisfy the goal, in reality the size is much smaller. One interviewee who works in the production division comments that:

In the same way, I think that we tend to cut an easier stand with good accessibility in preference to one on soft ground. So there's a definite risk that we'll end up with only a few shitty stands left.

Another problem mentioned in the interviews is the discrepancy between the noted sizes of trees in the tactical plan/tract bank and the outcome when harvested. One interviewee at the market division states:

We used to have a very high degree of variation at the compartment level. The difference between the estimated and actual volumes were sometimes as big as 30%, which is obviously too much at the stand level, even after allowing for over- and under-estimates. It's just too high; we have to get down to around 10%.

Another employee at the market division expresses views that also deal with the precision of the data: "I don't think we have enough information to make good estimates [of volumes] per assortment such as sawlogs, especially when it comes to big vs. small sawlogs." Another staff at the market division at MO level believes that his work could benefit from better data of the trees. He says: "The tactical plan doesn't really matter to me unless it shows the variation in tree size and assortments." He adds that if the information were such that he could be sure of the output from each assortment, he would be happy to believe its predictions over longer time-scales. Despite these perceived deficiencies the intention of having an updated and correct tactical forest plan was widely recognized by all interviewees in the production process. A comparison seems to be made between the volume planned for harvesting and the actual harvested volume for each tract, but the interviews did not reveal any further follow-up on the tactical plan.

In several interviews a lack of trust in the data in the tract bank is expressed. Several reasons for this are given. One is that the inventories have not been conducted with enough sample intensity or that updates rely on projections by growth models or that data are not updated adequately or not at all after activities in the stand, for instance after a thinning.

Discussion

Forestry is peculiar in the way that what the enterprise has in storage and what will or can be retrieved from it is far from a trivial issue. Much research is directed toward finding methods to appraise this stock and to link it into planning processes. The focus of this study is how this information links to the sales efforts of a major forest-owning company.

The interviews revealed that it is customer relations, i.e. the market, that largely determine the long-term sales plan rather than knowledge of what the forest has in stock. Information in the tactical forest plan is to some extent used for the development of the long-term sales plan. In case own forest resources cannot meet the demand, the company buys timber from external sources which consists of more than half of the timber delivered to customers. Thus, at this stage there are still considerable degrees of freedom as to how to satisfy expected customer demands. As long as timber procurement of that size is regarded profitable by the company one may question how valuable the forest information is for the long-term sales planning process (Gupta & Govindarajan 2000). This may explain the lack of complaints on forest data quality at this planning stage in contrast to what surfaces in the short-term planning. It also questions the need for better information although staff at the market division argue that better forecasts of assortments could lead to better deals.

Among the sales managers at the MO level, there are differences in the use of the tactical forest plan in the short-term sales plan. There appear to be two modes of forest data use: as input for simulation of different scenarios (practiced by one sales manager) and not to use the tactical plan and instead rely on historical sales data (practiced by the other sales managers). In the former case, forest information evolves into knowledge about the resources and its interactions with the industry. The information is more for learning how the system works than as input for a specific sales plan. This indicates that more exact information in the tract bank could be of little value. Better information could potentially give rise to better simulations, but this does not seem to be a priority for the sales manager. This resembles the situation in long-term sales planning as regards information needs, i.e. the value of better knowledge can be questioned.

The latter case can be analyzed along two lines; either the forest data register would be consulted if it held more reliable and valid data or it has no value whatsoever for the sales managers. The former line of reasoning gets support from the complaints on the reliability of the data, i.e. that the error is too large. The averages presented in the tract bank do not always seem valid, i.e. the variation in terms of sizes and assortments need to be there. This also relates to reliability; if already the average is uncertain the values along the distribution will be even more uncertain. Another deficiency of the tract bank data, observed by the forest planners, is that the operational size is smaller than the formal size. Thus, the register may not reflect what will actually be available over the next year, and that the sales managers are aware of this; a study by Nilsson et al. (2013) reveals that it is not uncommon that the tract bank is bypassed and other harvesting objects selected to meet the delivery plan.

The case where tactical forest plan data seem to have no or very little relevance seems to be associated first of all with market factors. The volatility of the market, manifested in varying demands from customers in the short term, makes it less relevant to gear contracts against what is in the tract bank. The short-term sales plan seldom matches the actual volume that was delivered. The short-term sales plan is a temporary plan that the sales managers use as a framework in which they coordinate their subsequent deals. More detailed forest information may improve this situation but it seems not to be first priority of sales managers. Another reason not to rely on forest data is that it is the seller's market (at least at the time of interviews); what you cut you can sell. This means that what other volumes fall out of the harvests besides what you need to satisfy contacts you can sell. Instead of the forest data, planning relies on statistics of past harvests and deliveries. A third reason has perhaps less to do with the market and more with the production process. The tactical forest plan assumes the total volume to be distributed over the planned years. Thus a substantial increase or decrease in volumes one year would be very difficult to balance in the subsequent years according to the sales managers. In all these cases sales managers turned to historical sales data rather than forest information, whether this is the most reliable source or if it is most convenient to turn to or a combination of both. The motivation of the recipient to take part of the information appears therefore limited.

To summarize the use of the tactical forest plan data it seems limited to the long-term sales planning and to preparatory work with the short-term sales plan. In terms of the key aspects for inter-personal knowledge flow (Gupta & Govindarajan 2000), the motivational disposition of the target unit is low as no definite requests for improvement in connection with these applications are brought forward. The value of the source unit's knowledge stock is considered low by the target unit as the use for developing the concrete plan appears limited. To some extent this is explained by the use of data over past performance. The other explanation is that the quality of the available information is experienced as too poor; the tract bank is seen as too small, and it is felt to be unreliable and/or invalid. Still, the other elements for successful transmission of knowledge all seem to be there: motivational disposition of the source unit (there is an ambition at both the MO level and above to deliver data to the sales managers); existence and richness of transmission channels (sales planners can easily retrieve the information); and absorptive capacity of the target unit (the sales managers have not reported any problem interpreting the information in the forest tactical plan).

The fact that some non-use is attributed to poor data indicates that if the information could be improved in the way requested by the sales managers it may become valuable. This is not an easy feat since the information that the MO sales managers consult is in the tract bank. This means, assuming that the inventory has been made in a proper way, that it is the result of a new inventory and not data based on projections of old stand register data or missed updates after thinning. If the data are still not satisfactory it is probably not deemed profitable to allocate more resources

to this activity. It cannot be attributed that it is new procedures; it is routines that has been implemented many years ago (Söderholm 2002). Thus, the seemingly only way to improve information quality is with new technology. Much hope is dedicated to high-resolution airborne laser scanning. It has the potential to yield information on individual trees or microstands (Holmgren & Lindberg 2013) that would suffice to project the outcome in terms of the distribution on assortments.

The results of this study suggest that it may anyway be wise to be cautious when investing in better data for sales planning. This study clearly suggests that it is satisfactory as it is and that it is unlikely that it will not be used whatever quality is achieved. The reasons for improving quality of tract bank data are probably easier to motivate out of the demands from operational planning of harvests and logistics (Laamanen & Kangas 2011).

The study was conducted as a case study in one company and therefore generalization of the results to other forest-owning companies must be considered with great care. The general procedure of the forest planning process as it is described in this paper is common in other Swedish forest-owning companies (Söderholm 2002; Nilsson et al. 2013). The difference between Sveaskog and other companies lies in the fact that Sveaskog is more independent and subsequently more dependent on its sales activities. The general trend seems to go in the direction of separating forestry and industry, thus loosening up the old vertical integration of forest companies.

The results are based on interviews with nine persons. This may seem a limited number; however they were the key persons involved in the processes that were the subject of our study. Therefore the reliability of this study should be good. The limited number of potential key persons made it difficult to test the interview guide before the actual interviews. The interviewer had been employed by the company for several years at the time of the interviews and was well-familiar with the organization's culture and internal language which strengthen the validity of the results.

The study focused exclusively on the interaction between sales planning and the tactical forest plan and timber production from the company's own forest holdings. Sales of other products such as pulp wood and biofuel were not considered and neither were the planning and interaction between the sales and production of these three products. The interaction between the two activities at the operational level was not considered and neither was that with purchasing trends. These subjects would merit investigation of how the purchasing department determines what to buy. The focus on forest information and sales planning also means that the usefulness of better data and knowledge about the forest for other parts of the organization were not examined. There is a balance between the cost of collecting and handling more data and the gain of possessing the knowledge. This study was not intended to examine this balance or other aspects of costs and benefits. There is still a lot to investigate to increase the value of new information sources.

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