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Resource Usage Decisions and Business Success: A Case Study of Finnish Large- and Medium-sized Sawmills

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ABSTRACT

This case study provides an operationalization of the resource-based view (RBV) by empirically analyzing the strategic resource usage decisions made in 16 Finnish large- and medium-sized (LM) sawmills, and by modeling their impact on the financial performance of these firms during the first decade of 2000. The perceived relative values of five tangible and six intangible resources for the operation of LM sawmills were evaluated using the multi-criteria decision-making analysis method that was combined with firm-level financial performance analysis. Based on the regression results, four intangible resource classes ("personnel", "collaboration", "technological know-how", and "reputation and services") and two tangible resource classes ("raw material" and "geographic location") were found to be significant in explaining the business success of the 16 case sawmills. Although wood raw material is a basic resource, alone it does not create a basis for a sustained competitive advantage within the case companies. In sustaining business success, other resources are crucial, too.

Keywords: resource-based view, resource assessment, multi-criteria decision-making method, business performance, sawmill industry

Introduction

The competitiveness of a firm is affected by the conditions of the external business environment and the internal strategic choices made within a firm (Hawawini et al. 2003, McGahan and Porter 2002, Spanos and Lioukas 2001, Mauri and Michaels 1998). In a competitive firm, there is a match between the requirements mandated by the external environment and the firm-level strategy that is built on internal resources and capabilities (Veliyath and Fitzgerald 2000).

Business performance measures are used as indicators of the success of a firm in achieving its stated strategies, objectives, and critical success factors (Hass et al. 2005). Performance assessments may be based on primary sources, i.e., data gathered directly from the target organizations, or they can be based on external secondary sources such as statistical databases. Data may be grounded in

established information gathering systems (objective data) or judgments made by executives (subjective data) (Venkatraman and Ramanujam 1987).

The choice of a data source and the performance assessment method is affected by, for example, research questions, the disciplinary focus, data availability, and the level of analysis (Kihn 2005, Venkatraman and Ramanujam 1987). Compared to other approaches, applying financial performance measures that are based on accounting information and gathered with established systems from primary sources are, for example, precise, applicable for various comparisons, appropriate to both macro- and micro-levels of analysis, and suitable for short-, medium-, and long-term performance assessments (Kihn 2005).

Strategic decisions made within sawmills have been a salient point of interest when seeking to sustain their competitiveness in the rapidly changing business environment (e.g., Toppinen et al. 2006). Manufacturing value-added products and improving customer service have been emphasized as important strategic choices and crucial for business success of the lumber producers located in higher cost countries in Europe and North America, especially in the 2000s (e.g., Hansen et al. 2006, Toivonen et al. 2005, Smith et al. 2004, Hansen et al. 2002). Yet, the effects of these strategic choices on the actual business performance of sawmills have not been empirically studied (Lähtinen 2007).

The few empirical studies conducted on resource usage issues in the forest-based industry include the works of Siitonen (2003), Korhonen and Niemelä (2004, 2005), Korhonen (2006), and Bull and Ferguson (2006). In a recent article, Bonsi et al. (2008) point out that prior research has mainly examined external factors and largely neglected the role of firm resources and capabilities in creating and sustaining a competitive advantage. Strategic resource usage decisions made in sawmills to enhance competitiveness have thus far been addressed only in a few studies (Lähtinen 2007), although some results of the relative importance of different resources in the business operations of sawmills have been introduced in Lähtinen et al. (2008). Information on the financial performance evaluations of sawmills is even more scarce, comprising the studies by Cohen and Sinclair (1992), Roos et al. (2001), and Lähtinen and Toppinen (2008).

The goal of this study was to introduce a methodological framework that enables the assessment of the linkages between resource usage decisions and business success at the firm-level. In the previous studies conducted within the forest-based industry, resource usage decisions have not been combined with financial performance assessments. In addition, firm-level resource examinations and business performance measurements have seldom been combined in other industrial sectors (e.g., Armstrong and Shimizu 2007). The methodological framework of this study combined two different data sources which are analyzed separately and then linked together by using a multiple regression analysis. To this end, the relative importance of the different resources is first assessed with a pairwise comparison technique that is based on in-depth personal interviews within a multi-criteria decision analysis (MCDA) technique. Second, the business performance of the large- and medium-sized (LM) sawmills is evaluated with measures derived from their firm-level financial statement analysis. Third, the results received with MCDA techniques are employed as explanatory variables in modeling the business performance of LM sawmills. In addition to the methodological contribution, the results of this case study provide new preliminary information of the factors of competitiveness of Finnish sawmills that are not owned by multinational forest companies.

Theoretical Background

In the resource-based view (RBV) (e.g., Barney 2001, 1991, 1986; Conner 1991; Wernerfelt 1984), tangible and intangible firm-level resources and the capability to coordinate those assets or inputs of production in a strategically successful way (Helfat and Peteraf 2003) are considered to form the basis for competitiveness in the dynamic business environment (Brown and Blackmon 2005). In order to create a competitive advantage, firms should focus on those firm-specific resources that are valuable, rare, imperfectly imitable, and not substitutable (VRIN) (Barney 1991, Grant 1991, Barney 1986).

Strategic decisions concerning the resources that are chosen to be exploited, developed, and protected (Dierickx and Cool 1989), as well as potential competitiveness, are largely dictated by the company managers' perceptions of the external business environment (Fahy 2002). The sustainability of a firm's relative resource position (benchmarked by managers) (Ray et al. 2004, Grant 1991) is dependent on the degree to which it is open to the imitation of competitors (Dierickx and Cool 1989). A temporary competitive advantage is built on the resources that add value to a company and that are not heterogeneously distributed across competing firms. In order to create a sustained competitive advantage, a firm must also possess imperfectly mobile resources (e.g., Mata et al. 1995).

The competitive advantage of a firm is defined as the degree to which it outperforms the competitors in the performance measures chosen to be benchmarked (Villalonga 2004). In assessing the drivers of competitive advantage assumed by the RBV, existing accounting and reporting systems pose a challenge by failing to recognize, in the financial statements, a significant proportion of the intangible resources and capabilities possessed by firms (e.g., Powell 2003). These are, for example, investments that improve product and process design, increase the customer base, and enhance the information technology. Investment in knowledge-based human resources is typically not distinguished from operating expenditures, such as labor and material costs (Kanodia et al. 2004).

The challenge of identifying strategically important internal resources and their effects on firm-level business success has also been discussed in empirical RBV studies (e.g., Armstrong and Shimizu 2007). These challenges are, for example, the result of flaws in selecting data and suitable research methodologies (e.g., Rouse and Daellenbach 1999). When empirically studying the factors of competitiveness assumed by the RBV, the sample should be homogeneous in characteristics other than those whose effects on business success are being studied (e.g., Lockett and Thompson 2001). In this sense, the most critical data are derived from firms that operate in multiple businesses and compete in several industries (e.g., Camelo-Ordaz et al. 2003, Armstrong and Shimizu 2007). In order to increase the applicability of empirical RBV studies, resources should be operationalized at an adequately detailed level (Silverman 1999) and the data should be gathered from clearly defined industries (e.g., Mathews 2002). In addition, it has been pointed out that the analyses should be based on the internal perspective of companies and detailed, fieldwork-based comparisons of carefully selected firms (Rouse and Daellenbach 1999).

From the viewpoint of LM sawmills, there are some potential candidates for strategic resources which might support achieving a sustained competitive advantage. The availability and the price of sawlogs are crucial operational preconditions for them, since costs of raw materials make up 60 to 70 percent of the total costs in Finnish sawmills (StatFin 2009). The acquisition of good quality sawlogs (hereafter referred to as raw material) of the right types of species and dimensions at moderate costs

brings value, which affects either firm revenues, costs or both (Lähtinen and Toppinen 2008). Raw material, however, is a basic resource possessed by all of the woodworking firms, and it can be readily purchased from the markets. Because of this, although some sawmills might temporarily be at a better competitive position with respect to raw material acquisition or costs, it does not necessarily create a basis for a sustainable competitive advantage.

Thorough knowledge of customers and firm reputation are valuable, rare, imperfectly imitable, and not substitutable resources for woodworking firms (Korhonen 2006). The main goal of creating brands and trademarks is to develop customer relationships, which form a basis for a firm growth (Tokarczyk and Hansen 2006). In a successful collaboration, firms create value and may gain competitive advantage as a consequence of integrating complementary resources and learning new networking skills (Ireland et al. 2002). Intangible collaboration resources, such as collective learning, are valuable, rare, imperfectly imitable, and not substitutable (Foss 1999). The benefits of collaboration between woodworking firms include, for example, increased reliability of supplies, superior service provision, increased sales, and decreased costs (Lewin and Johnston 1997). A successful collaboration between woodworking firms is largely characterized by adding value to products and services instead of merely seeking cost efficiency (Human and Provan 2000).

Technological know-how and innovativeness affect the ability of a sawmill to adopt and create new processes and business systems, as well as the capability to develop new products (Knowles et al. 2008). In woodworking industries, firm growth is affected by the ability to nurture the flow of innovativeness and the competence of supporting existing technological capabilities, as well as creating new ones (Korhonen 2006). Similarly, in the sawmill industry, innovativeness and technological capabilities have been found to have a positive impact on turnover growth and gross profit (Knowles et al. 2008).

The benefits achieved by geographic location (relating to natural resources, subsidies, and tariffs) may not generate sustainable competitive advantages, since competitors may gain access to the same basic location resources (Fahy 2002). On the other hand, Porter (1998), for example, has referred to geographic location as a factor of competitiveness when there are other forestry-based firms in close proximity.

In this study, the selection of resources with a potential strategic importance in forest-based industries was based on a literature review by Lähtinen (2007), in which the factors of production of woodworking industries were synthesized and empirically linked to the RBV setting in detail (**Tables 1 and 2**). Some changes, however, have been made in this study to the following resource classifications in order to make the names and contents of the classes more appropriate for an empirical resource assessment. First, the resource classes named “financial capital” in **Table 1** and “organizational capital”, “technological capital”, and “relational capital” in **Table 2** have been renamed “finance and strategy”, “organization culture”, “technological know-how”, and “reputation and services”, respectively. Second, two previously separate resource classes named “plant” and “machinery” (which are closely linked) have now been combined into one resource class named “factory and machinery.” Third, since “human capital” comprises distinct sub-categories linked to manager expertise, employee know-how and external relationships, it has been reclassified into three separate resource classes called “management”, “personnel”, and “collaboration.”

Table 1. Tangible resource classifications within the RBV (adapted from Barney 1991, Grant 2005, Fernández et al. 2000, Galbreath 2005) and linkages to the factors of production in woodworking industries (Lähtinen 2007).

Tangible resource cited in RBV literature	Tangible factor of production cited in woodworking industry literature	Author(s) of woodworking industry literature
Geographic location	Proximity of forest cluster branches	Porter (1998)
Raw material	Wood quality and dimensions	Kivinen et al. (2005)
	Wood price and availability	Zhou & Buongiorno (2005)
Labor	Availability of educated and trained labor	Vlosky et al. (1998)
	Labor productivity	Roos et al. (2001)
Plant	Productivity unit sizes	Roos et al. (2001)
Machinery	Process automation	Sinclair & Cohen (1992)
	Fiber usage efficiency	Lee et al. (1999)
	Production technology levels	Nyrud & Baardsen (2003)
	Appropriate production technologies	Bull & Ferguson (2006)
Financial capital	Allocation of scarce financial resources to alternative needs	Cohen & Sinclair (1990)

Table 2. Intangible resource classifications within the RBV (adapted from Fernández et al. 2000, Galbreath 2005) and linkages to the factors of production in woodworking industries (Lähtinen 2007).

Intangible resource cited in RBV literature	Intangible factor of production cited in wood processing industry literature	Author(s) of woodworking industry literature
Human capital – Capabilities		
Manager expertise	Business and production management skills	Vlosky et al. (1998)
	Leadership and management skills	Michael & Leschinsky (2003)
	Ability to define the scope of business and innovation capabilities	Hovgaard & Hansen (2004)
	Capability to bring new and innovative knowledge into processes and products	Van Horne et al. (2006)
Employee know-how	Expertise in manufacturing	Vlosky et al. (1998)
	Judgment and control of technology for adding production value and flexibility	Lee et al. (1999)
	Ideas for innovations	Hovgaard & Hansen (2004)
External relationships	Buyer-seller relationship forms	Simpson & Wren (1997)
	Vertical collaboration in manufacturing	Syme & Duke (1994)
	Information flow between firms and between firms and public organizations	Van Horne et al. (2006)
Organizational capital		
Databases	Product and customer databases	Toivonen (1999)
Organization routines	Governance structure	Bull & Ferguson (2005)
	Marketing structures and functions	Niemelä (1993)
Corporate culture	Learning culture	Bull & Ferguson (2005)
Co-operation agreements	Joint venture arrangements	Nyrud & Bergseng (2002)
	Contracts with wood suppliers	Helstad (2006)
Norms and guidelines		--
Technological capital		

Secret technology	Improvements in raw material utilization, computer-aided manufacturing, machinery customizing	Hovgaard & Hansen (2004)
Patents and trademarks	Timber treatment methods	Yang et al. (2004)
	Engineered wood products	Davis & Claisse (2000)
Designs	Timber component building systems	Bergström & Stehn (2005)
Industrial models and drawings, copyrights		--
Relational capital		
Operational reputation	Customer services	Niemelä & Smith (1997)
	Reliability of deliveries	Toivonen et al. (2005)
Product reputation	Product quality	Bush et al. (1991)
	Product-related services	Toivonen et. al (2005)
Brands	Green labeling	Niemelä & Smith (1997)
	Certification labeling	Owari et al. (2006)
	Quality assurance labels	Kozak & Maness (2001)
Long-term relationships	Close personal customer relationships	Idassi et al. (1994)
	Establishing close and long-term relationships with suppliers	Helstad (2006)
Commercial name		--

Methods

Interview Data and Financial Accounting Information

To meet the objectives of this case study, both interview information and financial data of firms operating in Finland in sawmilling, planing, and impegration of wood (NACE class DD.20.10) were collected (European Commission 2006). The Finnish sawmill industry comprises both multinational enterprises listed on stock exchanges, as well as smaller, non-integrated firms. In non-integrated sawmills, sawnwood manufacturing is the core business, while in large, multinational forest companies, it is often a means to produce high-quality chips for pulp and paper mills (e.g., Kallio 2001). In order to generate as homogeneous a sample as possible (e.g., Armstrong and Shimitzu 2007), the focus of the study is on sawmills that are not part of multinational forest corporations and focus only on sawnwood production. These businesses play an important role in the Finnish sawmill industry in terms of turnover, production, and employment.

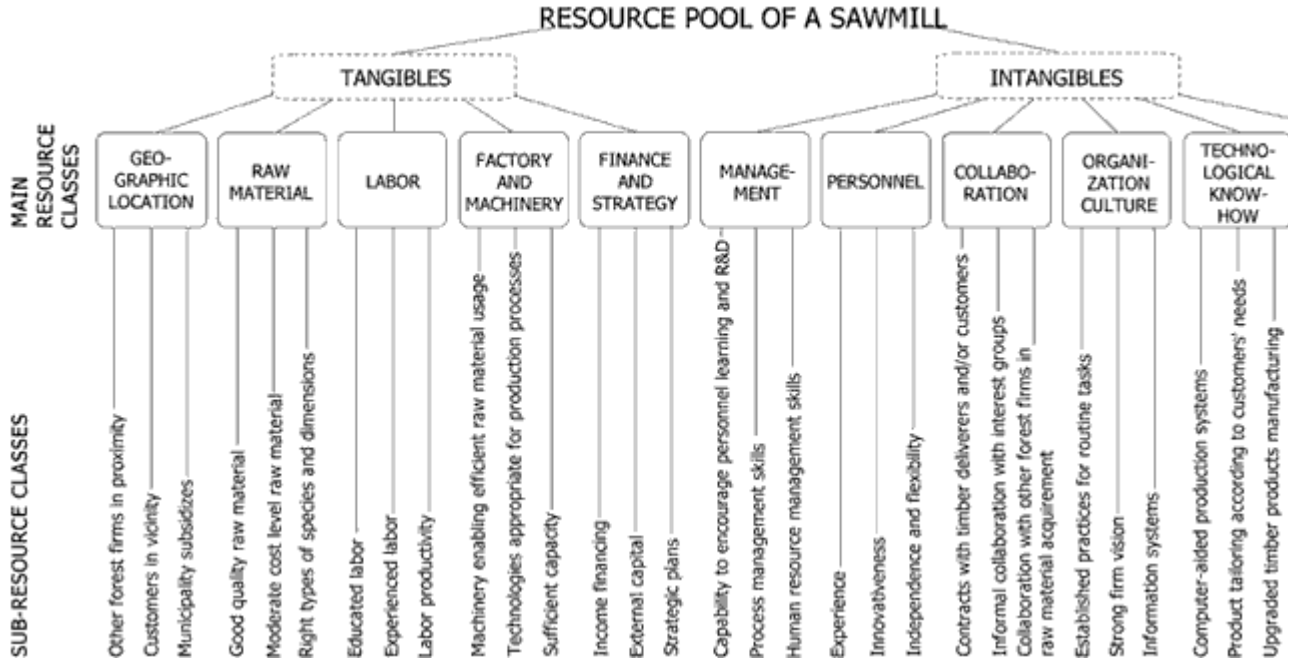
The selection of the sample companies for the case study data was based on the reports of Balance Consulting (2005) made of Finnish firms belonging to NACE class DD.20.10. In these reports, sawnwood manufacturers are categorized as LM sawmills in terms of their financial and employment values. In addition, the list of 27 LM sawmills based on Balance Consulting's reports (e.g., Lähtinen and Toppinen 2008) was supplemented by the views of sawmilling experts. As a result of the two-phased selection procedure, the study sample comprised 33 LM, non-integrated sawmills. In terms of turnover, production volume, and employment, they represented approximately one-quarter of Finnish sawmill industry in 2005 (StatFin 2008, FAO 2008, Finnish Sawmills Association 2008). If the sawnwood production of multinational forest industry companies operating in several branches of forest industries are excluded, the 33 sample sawmills produced over half of the sawnwood manufactured in Finland in 2005.

The interview data were gathered with structured questionnaires during on-site visits in January–March 2007. In the first phase of data gathering, the 33 sample firms were contacted by telephone. This was done in order to provide information about the study and to inquire whether their chief executives or other managers responsible for firm-level strategic decision-making were interested in filling in the structured questionnaire during a 1 to 1.5 hour session. After the phone inquiries, 22 company executives were willing to participate in the study. In the 11 non-respondent sawmills, the reasons for refusal were the lack of time of the directors or a policy of the firm to decline to provide information on its internal affairs.

In the interviews, the chief executives or other upper-level managers responsible for implementing firm-level strategic decisions were asked to compare (using a pairwise approach) the relative importance of a group of tangible and intangible resources for the business operations in the 2000s. The resource comparisons comprised 11 main resource classes ("geographic location", "raw material", "labor", "factory and machinery", "finance and strategy", "management", "personnel", "collaboration", "organization culture", "technological know-how", and "reputation and services"), each of which were composed of three sub-resources (**Fig. 1**). The sub-resources were used as finer-grade indicators (Armstrong and Shimizu 2007) of the main resource classes.

The pairwise resource comparison tasks were presented to the respondents in the form of statements. For example, in the case of "geographic location", the following propositions were presented as a series of sub-resource comparisons: 'The public sector has supported entrepreneurship in the municipality' versus 'There have also been other forestry sector companies in the municipality or in the neighboring municipalities'. The respondents made the comparisons with a numerical ratio scale and the order of the pairs to be compared were randomized in order to guarantee independent comparisons between pairs (Alho et al. 2001). The final resource assessment data comprised 55 pairwise comparisons (i.e., 22 between main resource classes and 33 between sub-resources within the main resource classes) from each of the sawmill respondents. In all, 19 of the 22 sawmill managers were able to complete the questionnaire, which yielded a final response rate of 57.5 percent for the interviews.

Figure 1. Tangible and intangible resources included in the pairwise comparisons implemented by sawmill managers in the structured questionnaires.



The financial accounting data of the companies are based on performance measures derived from official accounting information, which was analyzed by Balance Consulting (2007, 2006, 2005) according to the principles of the Committee for Corporate Analysis (2000). The financial information comprises performance measures describing long-term financial performance in terms of profitability (return on investment, ROI-%) and turnover growth (–%), which can be interpreted to be indicative of future competitiveness (e.g., Lähtinen and Toppinen 2008). In addition, a multi-dimensional performance measure (Balance Consulting 2006) that describes the average short- and long-term financial performance among a sample of sawmills (n = 100) and within a sample of Finnish companies representing various business branches (n = 12,000) was employed as an indicator of the relative competitive positions (Balance Consulting 2006).

The different indicators included in the multi-dimensional performance measure are growth (turnover growth-%), profitability (ROI-%), cash flow (net result-%), liquidity (current ratio), solvency (equity ratio-%), and obligations (payback period of debts). Cash-flow and liquidity describe the business performance by assessing the financial adequacy of a firm in the short-term. Solvency and obligations are longer-term measures, describing the sufficiency of company equity. Profitability comprises the longest time-scale and assesses the returns on capital invested in a company.

Financial data were available for 16 of the 19 LM sawmills that were represented in the interviews. Thus, based on both interview data and financial accounting information, the total response rate of this case study is 48 percent. Due to the data availability, financial performance measures are used in the form of annual averages between years 2004–2006 (for measuring ROI-% and turnover growth-%) and 2002–2006 (for measuring multi-dimensional performance). A detailed description of the contents of the financial performance measures is available in the Committee of Corporate Analysis (2000).

Assessing the Effects of Resource Usage Decisions on Financial Performance

The resource comparisons made by the LM sawmill managers in the interviews were analyzed statistically within the MCDA framework (e.g., Leskinen and Kangas 2005, Kangas et al. 2000, Leskinen and Kangas 1998) in order to receive the relative value of each resource as compared to other resources (**Fig. 1**). For the sake of simplicity, the priority estimates obtained from the pairwise comparisons data were taken as deterministic, although in reality they were estimated from the data with uncertainty (e.g., Alho and Kangas 1997). The final interview data that comprise 55 pairwise comparisons from each of LM sawmill respondent were analyzed within the MCDA framework by employing STEPS software (Haara and Leskinen 2007). A detailed description of the employment of the MCDA techniques and sawmill interview data can be found in Lähtinen et al. (2008), where the relative importance different resources for LM sawmill operations were studied.

The effects of the resource usage choices on the financial performance of the sawmills were modelled with a standard multiple linear regression analysis. In the models, the relative importance of the resources received by using the MCDA techniques were employed as the explanatory variables and the financial performance measures were used as the dependent variables. The relative values of each resource as compared to other resources were scaled to sum to one, and to avoid singularity, one of the resource groups was left out from the models. After preliminary testing, labor was omitted from the model because it had the lowest priority in pairwise comparisons and no explanatory power over any of the dependent variables.

In the standard multiple regression models, the effects of resource usage decisions on the financial performance values were tested with a number of resource combinations and a number of resources. The model estimation results with the highest explanatory power were selected by iteratively testing their sensitivities to changes in the combinations of the resources used as independent variables. After stepwise testing, non-significant variables were omitted from the reported final models, following the principle of parsimony.

Results

The average financial performance of the 16 LM sawmills that comprised the case study companies was benchmarked against both the corresponding values of the 14 non-respondent sawmills within the original study sample and the entire Finnish sawmill industry. Compared to the entire Finnish sawmill industry, the case sawmills outperformed the entire industry in 2004–2006 (**Table 3**). Their average ROI-% was 9.4 percent, compared to 2.6 percent for the entire industry. Similarly, in terms of average turnover growth-%, the case sawmills (6.1%) outperformed the entire industry (1.5%). The non-respondent sawmills placed between the 16 case sawmills and the entire Finnish sawmill industry when measured against average profitability (4.5%) and turnover growth (2.2%). With regard to business success, both the case sawmills and the non-respondent sawmills showed superior performance within the Finnish sawmill industry during the observation period, with the case sawmills being the more successful ones.

Table 3. Comparison of the case sawmills, non-respondent sawmills and Finnish sawmill industry in terms of profitability and turnover growth in 2004–2006 (Balance Consulting 2007, 2006, 2005; StatFin 2008).

	2004	2005	2006	Average
ROI-%				
Case sawmills	7.1	4.9	16.2	9.4
Non-respondent sawmills	1.1	4.0	8.4	4.5
The entire sawmill industry	1.9	1.7	4.2	2.6
Turnover growth (%)				
Case sawmills	3.1	4.1	11.1	6.1
Non-respondent sawmills	−6.3	−2.5	15.3	2.2
The entire sawmill industry	−0.3	−3.6	8.3	1.5

Prior to the regression analyses, the existence of collinearity between the independent variables was examined with Pearson correlations (**Table 4**). Outside of the statistically significant correlations between “geographic location” and “finance and strategy” (−0.55) and “personnel” and “collaboration” (0.57) indications of such problems did not appear. Although the statistically significant correlations were not extremely high, the relationships between the independent variables were noted in case their regression coefficients fluctuated drastically in the regression model estimations.

Table 4. Two-tailed Pearson correlations between the independent variables. Levels of statisti denoted with ** for 1%, and with * for 5%.

	Geographic location	Raw material	Labor	Factory and machinery	Finance and strategy	Management	Personnel	Collaboration	Organizati culture
Geographic location	1.00								
Raw material	0.13	1.00							
Labor	0.27	−0.02	1.00						
Factory and machinery	−0.25	−0.28	0.14	1.00					
Finance and strategy	−0.55*	−0.48	−0.45	−0.06	1.00				
Management	−0.01	0.22	−0.37	−0.42	0.02	1.00			
Personnel	0.04	−0.14	0.17	−0.33	−0.23	−0.23	1.00		
Collaboration	0.48	−0.14	0.17	−0.10	−0.33	−0.29	0.57*	1.00	
Organization culture	0.15	−0.03	0.01	−0.22	−0.09	0.02	−0.09	−0.23	1.00
Technological know-how	0.01	−0.39	−0.01	0.08	−0.09	−0.29	0.24	−0.06	0.18
Reputation and services	0.43	−0.25	0.18	−0.11	−0.36	0.30	0.12	0.09	−0.04

The assumptions necessary for linear regression analysis are normality, homoscedasticity, and independence of error (e.g., Berenson et al. 2001). Since the number of annual observations was too low for standard normality tests to be reliable, the data characteristics were checked with Q-Q plots of model residuals. As a result of this, both the assumptions of normality and homoscedasticity were expected to be fulfilled in all of the models. With respect to the independence of errors, employing the financial performance measures as averages of sequential accounting periods removed the risk of serial correlation between dependent variables. Since the assumptions of normality, homoscedasticity, and independence of error were met in the data, the parameters of the linear regression equations were estimated by the ordinary least squares (OLS) method.

The regression model for the development of the average profitability (ROI-%) of 2004–2006 can be seen in **Table 5**. The results indicate that emphasizing the importance of "raw material", "collaboration", as well as "reputation and services" impacted positively on the profitability of the case sawmills. Contrary to these three main resource classes, "geographic location" and "personnel" showed negative impacts on ROI-%.

Table 5. Estimation results for testing the effects of different tangible and intangible resource usages on ROI-% in 2004–2006.

	Coefficient	Std. error	Sig.
Intercept	–0.558	2.753	0.843
Geographic location	–116.209	27.507	0.002
Raw material	39.445	7.366	0.000
Personnel	–53.115	17.533	0.013
Collaboration	98.366	28.919	0.007
Reputation and services	275.403	39.377	0.000
n	16		
R^2	0.84		
Adjusted R^2	0.76		

Since one of the case sawmills had an exceptionally high turnover growth during 2004–2006, it was left out of the growth model estimations. In regard to the average growth (turnover growth-%) in 2004–2006, there were two tangible and two intangible resources that showed a statistically significant influence on the case sawmills' turnover growth (**Table 6**). The effects of "raw material", "technological know-how", as well as "reputation and services" were positive on turnover growth. Like the ROI-% model, the importance of "geographic location" had a negative impact on the growth of the case companies.

Table 6. Estimation results for testing the effects of different tangible and intangible

resource usages on turnover growth-% in 2004–2006.

	Coefficient	Std. error	Sig.
Intercept	–13.434	4.527	0.014
Geographic location	–87.964	35.987	0.035
Raw material	58.629	12.177	0.001
Personnel	86.618	42.023	0.066
Collaboration	140.730	68.684	0.068
Reputation and services	15		
n	0.74		
R^2	0.63		
Adjusted R^2			

The estimation results for the average Balance Consulting's multi-dimensional performance measure of 2002–2006 can be seen in **Table 7**. Apart from the statistically non-significant impact of "geographic location", the results are parallel to the ROI-% model. Emphasizing the importance of "raw material", "collaboration", and "reputation and services" produced positive and statistically significant effects on the multi-dimensional performance measure, while the impact of emphasizing the role of "personnel" was negative and statistically significant.

Table 7. Estimation results for testing the effects of different tangible and intangible resource usages on multi-dimensional performance measure in 2002–2006.

	Coefficient	Std. error	Sig.
Intercept	23.994	8.324	0.015
Raw material	80.743	20.533	0.002
Personnel	–134.304	48.369	0.018
Collaboration	144.273	67.079	0.055
Reputation and services	389.569	97.925	0.002
n	16		
R^2	0.75		
Adjusted R^2	0.66		

In the linear regression models, six of the 11 main resource classes had a statistically significant impact on financial performance. Two of the strategically important main resource classes were tangible ("geographic location" and "raw material") and four of them were intangible ("personnel", "collaboration", "technological know-how", and "reputation and services"). In addition to reverse effects, three tangible main resource classes ("labor", "factory and machinery", and "finance and strategy") and two intangible resource classes ("management" and "organization culture") did not show any statistical significance in the regression models.

The adjusted coefficients of determination for the regression models were 0.76 (ROI-%), 0.66 (multi-dimensional performance), and 0.63 (turnover growth-%). Thus, by using the resource priorities alone as explanatory data, the explanatory power of the models became relatively high.

Discussion and Conclusions

The purpose of this case study was to introduce a new methodological framework that would enhance the practical applicability of the RBV in explaining firm-level business success. The results show that the MCDA method is a useful approach both for identifying the strategically important firm-level resources and capabilities and for quantitatively assessing their relative importance. In addition, the effects of resource usage decisions on financial performance can be well modeled by using financial accounting information in a multiple regression analysis. In relation to the practical application of the RBV, it is notable that the empirical use of the methodological framework presented is not necessarily limited to forest companies, but could also be employed in firms operating in other industries.

The challenges of using the MCDA approach together with financial accounting information and regression analysis are linked to the study design, interview data gathering, and the availability of financial accounting information. In order to maintain the consistency of the research questions, the questionnaire should be diligently built on the theoretical presuppositions of the RBV and MCDA techniques. In the questionnaires, the resources to be measured should be defined at an adequately detailed level and they should be relevant to the companies under study. Comparable financial statement information should also be available at the interviewed companies so that the effects of the resource usage decisions on the firms' business success can be assessed. Yet, resource assessments should not be too detailed in order to retain the respondents' workload within acceptable limits. Finally, the size of the dataset should be large enough for statistical modeling purposes and inference.

The original study sample of this case study comprised 33 LM sawmills that are not part of multinational forest corporations and focus on sawnwood production. These businesses play an important role in the Finnish sawmill industry in terms of turnover, production, and employment. In the mid-2000s, the case companies (the 16 LM sawmills that comprise 48% of the original sample of LM sawmills) represented 13 percent of the total Finnish sawnwood production and 30 percent of the sawnwood produced outside of multinational forest enterprises.

To assess the effects of strategic resource usage decisions on the business performance of the case sawmills, standard multiple regression models were built by testing a number of varying resource combinations and amounts. The model estimation results with the highest explanatory power were selected by iteratively testing their sensitivities to changes in the combinations of the resources used as independent variables. In the course of the iterative regression modeling, it became clear that the models were stable, but that only some of the resources may have potential strategic importance in supporting the case sawmills' competitiveness.

The resources employed as explanatory variables in the final estimation results frequently appeared to be statistically significant in the iterative regression modeling. Although the small number of observations may render the regression models unstable to some extent, the significant coefficients represent the strategic resource usage decisions that have driven the competitiveness of the case

companies, which have been among the most successful LM sawmills in Finland during the first decade of the 21st century.

The preliminary results of the case study based on the data obtained from the 16 LM sawmills indicate that both tangible and intangible resources have a role in their respective competitive positions in the 2000s. The analysis used 11 main resource classes (five tangibles and six intangibles), of which six (two tangibles and four intangibles) had statistically significant effects on the financial performance of the sawmills. The adjusted coefficients of determination of the models were reasonable (0.76 to 0.63). Thus, the methodology appears to provide an appropriate tool for assessing the effects of different strategic resource decisions on business success.

According to the estimation results, the perceived strategic emphasis on “raw material”, as well as “reputation and services”, had a positive effect on the overall competitiveness of the case sawmills with respect to ROI-%, turnover growth-%, and a multi-dimensional performance measure. Similarly, “collaboration” had a positive effect on profitability (ROI-%) and the multi-dimensional performance measure of Balance Consulting. In addition, the perceived value of “technological know-how” in sawmill operations had a positive impact on turnover growth-% of the case companies in the 2000s. In contrast to these positive effects, “geographic location” had significant negative effects on the case sawmills’ ROI-% and turnover growth-%, while an emphasis on “personnel” affected ROI-% and the multi-dimensional performance measure negatively.

A sustained competitive advantage is based on resources that add value by decreasing the costs or by increasing the revenues of a firm. In addition, these resources should not be possessed by many competing firms, and competitors should generally face significant challenges in acquiring, developing, and using them (Mata et al. 1995). Because of this, strategically important resources cannot usually be obtained by simply analyzing the firm’s external environment or markets (Barney 1986). Most of the resources that contribute to a sustained competitive advantage are intangible and invariably invisible (Bonsi et al. 2008).

Tangible resources, such as geographic location, access to raw material, and physical technology (e.g., Barney 1991), are often basic resources that a firm needs in order to operate, but do not ensure competitiveness (Bonsi et al. 2008). According to Fahy (2002), the relative importance of location resources have ceased along with the globalization (Fahy 2002). This has led to their erosion and a decrease in their strategic value (Dierickx and Cool 1989). In fact, after changes within the business environment, formerly valuable resources may result in a competitive disadvantage and negative impacts on financial performance (Armstrong and Shimizu 2007).

Since wood raw materials are a basic resource required by all of the woodworking firms, as such they do not create a basis for a sustained competitive advantage. The results of this study are congruent with this line of thought. Even if “raw material” had a positive effect on the competitiveness of the case sawmills in the 2000s, so did other resources. In general, from the standpoint of maintaining a sustained competitive advantage, “reputation and services”, as well as “collaboration”, seem to conform to two important requirements for LM sawmills. First, according to the empirical evidence of this study, both affected the financial performance of the case sawmills in the 2000s. “Reputation and services” had an effect on each of the financial performance measures assessed, while “collaboration”

affected profitability and multi-dimensional performance. Second, in contrast to “raw material”, both of these intangible main resource classes fulfill the VRIN (valuable, rare, imperfectly imitable, and not substitutable) prerequisites, which company resources should meet in order to create a basis for a sustained competitiveness according to the RBV.

The empirical evidence in this case study is also in line with the earlier findings of Korhonen (2006) and Knowles et al. (2008) on the relationships between technological capabilities and firm-level growth in the forest industry. In order to have more accurate information on the impacts of technological capabilities on a firm-level success, multiple performance measures should be employed (Coombs and Bierly 2006). According to the results of this study, although “technological know-how” had a positive impact on growth, it did not affect the profitability and multi-dimensional performance of the case sawmills. Thus, compared to “reputation and services”, and “collaboration”, the potential of “technological know-how” to become a factor for sustained competitive advantage within LM sawmills seems slightly more uncertain.

The findings of this case study are, to a large extent, coherent with earlier studies. According to Senge (1990), the core task of upper management in relating to manager and employer capabilities is to design learning processes that affect business success. Similarly, Barney and Wright (1998) have stressed the importance of skilled and motivated employees in creating business performance. In empirical studies done on forest-related industries, the crucial role of professional personnel and skillful management is often highlighted (e.g., Michael and Leschinsky 2003, Hovgaard and Hansen 2004, Bull and Ferguson 2006, Carpano et al. 2006, DeLong et al. 2007), but thus far without any quantitative assessment.

The empirical results of this case study also support the findings made in earlier studies (e.g., Armstrong and Shimizu 2007, Fahy 2002) on factors related to geographic location as a potential source of a sustainable competitive advantage. In the 2000s, a time of drastic changes in business environments as a result of globalization and tightening market competition, “geographic location” negatively impacted the profitability and multi-dimensional performance of the case sawmills.

With respect to the employment of accounting information in assessing the factors of competitiveness assumed by the RBV, there is a lack of a systematic framework to reliably quantify the stock of intangible assets in recognized financial reporting systems (Wyatt 2001). Thus, most of the intangible investments in, for example, knowledge, research, and development are expensed as costs in the income statement (Høegh-Krohn and Knivsflå 2000). Because of the financial reporting methods in place, it is impossible to separate short-term personnel expenses (e.g., manufacturing costs) from the personnel expenses that are made as intangible investments (e.g., education and training).

Capable personnel was one of the most valued resources in LM sawmills during the 2000s (Lähtinen et al. 2008). Despite this, the results of this study show that the strategic valuation of “personnel” caused negative impacts on profitability and multi-dimensional performance of the case LM sawmills. This may be caused by the financial reporting methods and the time-frame of the study and/or the characteristics of intangible human resource investments and the ability of the case sawmill managers to allocate investments to the most strategically relevant targets. It is possible that the positive effects of human resource investments made by the case sawmills were not captured in this

study. This may be due to the rather short time-frame of this study as relative to the temporal requirements of intangible asset accumulation (Dierixck and Cool 1989) or because investments made in personnel are reported as short-term costs, which serve to decrease profits of a given fiscal period. In addition, together with the potential of high returns, investing in intangible resources also bears high risks (Villalonga 2004). Thus, another explanation for the negative effect of "personnel" on financial performance is that the managers of the case sawmills may have actually made some strategic misjudgments by allocating financial resources to the wrong types of human resource investments.

The results of this case study are largely consistent with previous theoretical studies made within the RBV and provide further insight on existing empirical studies made on forest-based industries. Regarding the methodological framework introduced in this case study, the most substantial methodological challenge is linked to business performance measurements and the system of reporting the human resource investments in the accounting records as short-term costs. Because of this, at least a part of the strategic importance of human resource investments on the competitiveness of the case sawmills remains unresolved. According to Barney and Wright (1998), however, the most crucial issue in human resource development concerns developing skilled and motivated personnel who are able to deliver high-quality products and services. Since "reputation and services" positively affected the competitiveness of the case sawmills, it is fairly safe to assume that at least a part of the personnel expenses were devoted to intangible investments and put in place to better serve the customers.

In order to be able to generalize the results of this study to a larger population, interview data should be gathered from a larger number of firms and the time perspective of the financial performance assessments should be increased by looking at sequential accounting periods. Because the results of the multiple regression analysis are based on information received from the 16 case sawmills, the results of this study are considered preliminary. The focus of future research could also be redirected into other branches of the forest industry. In future interviews, an attempt should be made to supplement the deficient accounting data on human resource (HR) investments by asking for additional information from the company HR and development managers. In addition, the role of the strategic resource usage decisions in implementing different types of business strategies in relation to the external operational environment could also be studied.

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