



MODELLING THE ANTECEDENTS AND CONSEQUENCES OF FOREST OWNERS' SATISFACTION IN TIMBER-SALES TRANSACTIONS

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ABSTRACT

The antecedents and consequences of non-industrial, private forest (NIPF) owners' satisfaction concerning the functioning of timber procurement organizations in matters pertaining to the timber buying were depicted and modelled in view of constructing the model base of a Satisfaction Decision Support System (SatDSS). Individual background variables alone explained only poorly the overall expectation (EXP), perceived performance (PERF), and satisfaction (SAT) levels, as well as the behavioural intentions of timber sellers. The background features, however, together with single expectation attributes, explained significantly the overall PERF levels. Further, the background variables together with the single performance attributes gave the statistical degrees of determination for the multiple regression models of overall SAT, and the canonical discriminant functions of the timber sellers' intentions. In order that the NIPF owners' satisfaction and loyalty could be reliably managed by the proposed SatDSS, regular surveys of the twelve performance attributes of timber sellers connected to timber buying are required. These performance features were introduced in this study.

Keywords: Decision Support System (DSS), modelling, non-industrial private forest (NIPF) owner, satisfaction, timber trade.



INTRODUCTION

Traditionally, studies in the field of forest economics have predicted the timber-selling behaviour of forest owners mainly by using stumpage prices, tax and interest rates, and various owner- and forest-related variables, e.g. age, gender, education, occupation, exogenous income, living outside the farm, size of forest land possession, and period of ownership (Binkley, 1981; Järveläinen, 1981; Loikkanen *et al.*, 1986; Dennis, 1989; Hyberg & Holthausen, 1989; Carlén, 1990; Ollonqvist & Heikkinen, 1995; Kuuluvainen *et al.*, 1996). Alternatively, criticism has been levelled at the lack of examination of the various situational factors of the

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timber trade, and of the attitudes and preferences of timber sellers (Kuuluvainen & Ovaskainen, 1994). Kärhä (1998a; b) has proposed that managers in the service of major timber procurement organizations feel they need better tools with which to monitor the satisfaction of timber sellers, i.e. a Satisfaction Decision Support System (SatDSS).

Satisfaction with the performance of timber procurement companies can be regarded as an essential component of the timber trade since timber sellers' satisfaction can be assumed to considerably influence their willingness to sell timber to the same company again. In addition, timber sellers' unsatisfactory experiences associated with their most recent timber-sales transaction may lead them to refuse to participate in future timber-sales transactions (cf. Karpinen & Hänninen, 1990; Ihalainen, 1992). This being the case, good satisfaction and loyalty levels among timber sellers towards timber procurement companies can be considered a significant competitive advantage for procurement companies to be successful in the future timber procurement environment.

At present, there are no published scientific studies addressing timber sellers' satisfaction or dissatisfaction with timber procurement companies. However, there are numerous studies in the field of marketing science on the antecedents (expectations and perceived performance) of customer satisfaction. First of all, it has been shown that customer expectations consist of various elements, i.e. personal needs, past experiences, word-of-mouth communication, marketing mixes, and promises made by companies, perceived service alternatives, and situational factors (e.g. Grönroos, 1990; Zeithaml *et al.*, 1993). Most of the surveys in customer satisfaction research have defined customer expectations as predictions of perceived performance (e.g. Oliver, 1980; Bearden & Teel, 1983; Woodruff *et al.*, 1983; Swan, 1988).

Customer satisfaction is composed of the output of the customer's assessment process in the course of which the customer compares the balance of his/her perceived performance (outputs) concerning a specific transaction involving a product or service, and his/her expectations (inputs), and finding out the reasons for failure or success of

the outcomes (see the expectancy disconfirmation, equity, and attribution theories reviewed by Oliver & DeSarbo (1988)). In accordance with the disconfirmation theory, if the performance fails to meet the expectations with respect to a product/service (negative disconfirmation), it is argued that the customer is dissatisfied. Conversely, if the perceived performance level equals or exceeds the expectations (positive disconfirmation), it is said that the customer is satisfied. Satisfaction is expected to increase with increasing positive disconfirmation.

Several researchers have demonstrated that expectations have a positive influence on customer satisfaction (e.g. Prakash & Lounsbury, 1984; Cadotte *et al.*, 1987; Bolting & Woodruff, 1988). On the other hand, owing to the construction of disconfirmation, authors such as Tse & Wilton (1988) have found a negative relationship to exist between expectation and satisfaction levels. It has also been mentioned that perceived performance alone is the best predictor of satisfaction (e.g. Barbeau, 1985; Bolting & Woodruff, 1988; Bolton & Drew, 1991; Cronin & Taylor, 1992; Liljander & Strandvik, 1992; Anderson & Sullivan, 1993; Johnson *et al.*, 1996). Most surveys on the consequences of dis/satisfaction have measured customer intentions to purchase the same product or service again, and to recommend the product, service, or company to others. These studies have clearly shown a positive connection exists between customer satisfaction and the behavioural intentions of customers (e.g. LaBarbera & Mazursky, 1983; Woodside *et al.*, 1989; Singh, 1990; Bloemer & Lemmink, 1992; Tanner, 1996; Zeithaml *et al.*, 1996).

However, there is no clear consensus on the demographic or socio-economic characteristics of customers as determinants of the components of customer satisfaction: Kasper (1988) and Strandvik (1994) proposed that different background variables – particularly the socio-economic ones – have only minor effects on the satisfaction level and the intentions of customers. Nevertheless, some researchers (e.g. Wall *et al.*, 1978; Westbrook & Newman, 1978) have reported customer characteristics such as age and purchasing intensity to be related to dis/satisfaction. There are also some findings concerning the complaint behaviour of customers and the variables behind that: complainers have usually been described to be younger, more highly edu-

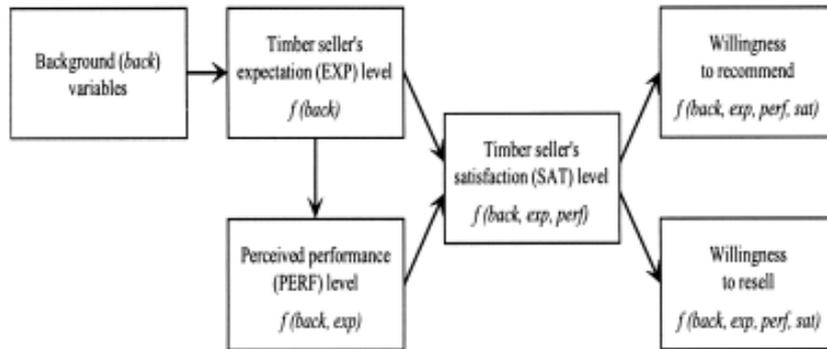


FIGURE 1. THE FRAMEWORK OF THE STUDY.

cated, having higher incomes, and to be more dependent on the product or service (e.g. Landon, 1977; Robinson & Berl, 1980; Singh, 1990).

In order that timber procurement companies might be able to serve timber sellers more effectively with fewer company personnel resources at their disposal under constantly changing procurement circumstances, they need better computer-assisted systems with which to forecast and manage timber sellers' harvesting behaviour. One potential approach to successfully meeting these challenges could be expressly to employ a Satisfaction Decision Support System (SatDSS). For such a SatDSS to be constructed, one needs relevant knowledge of the preferences and experiences of forest owners concerning the functioning of timber procurement organizations. The purpose of this paper is to depict the levels of satisfaction elements in the timber trade, and particularly to model the overall components of satisfaction in view of constructing of the model base of SatDSS. The framework of this study is illustrated in Figure 1.

MATERIAL AND METHODS

Questionnaire

The study undertaken was conducted in the form of a mail questionnaire. Finnish non-industrial, private forest (NIPF) owners involved in the survey were asked to report on matters connected to their timber-selling behaviour, especially regarding the background *to their most recent timber-*

sales transaction carried out during the past ten years (1987–1996), as well as some commonly-used, indicative variables on themselves and the woodlots they own – i.e. age, gender, socio-economic group, size of woodlot area, distance from home to woodlot, importance of forms of utilizing woodlot, timing of timber sales, share of forestry income, and so forth. Their expectations were determined using the importance attached by the subject to the various aspects of the timber trade (cf. Teas, 1993). The levels of forest owners' expectations (*exp*) and perceived performance (*perf*) were employed using a graduated scale of 4...10 (*exp*: 4 = Not at all important ... 10 = Extremely important; and *perf*: 4 = Terrible ... 10 = Excellent). The measurement scale (4...10) used may be considered valid in Finland where it is the scale used to grade pupils in the school system.

There were, in all, forty different characteristics of the timber procurement process in the questionnaire (Appendix 1). These were generated by keeping in mind the dimensions of quality of the service and of the product (Parasuraman *et al.*, 1985; Garvin, 1987). The behavioural intentions of forest owners were clarified using two indicators: (i) How willingly forest owners recommended the company they had most recently engaged with in a timber transaction, and (ii) How willingly they were prepared to sell again to the same company. Finally, the designed questionnaire was field-tested with the help of ten NIPF owners and ten procurement managers.

Sample and Number of Responses

There were four sample areas (Etelä-Savo, Häme-Uusimaa, Kainuu, and Kymi Forestry Centres (FCs)) – comprising nine local forest management associations (LFMAs). Characteristically, the procurement actions were carried out by all major timber procurement organizations prior to mergers (in 1995) in all the selected areas. NIPF owners were divided into four categories according to the size of their woodlots: 10–40 ha, 41–70 ha, 71–100 ha, and 100+ ha. Stratified random sampling was applied, with FCs and woodlot-size classes forming the strata. Eighty NIPF owners were selected from each FC to represent each of the aforementioned woodlot-size classes. Thus, 320 forest owners were selected from each of the four FCs for inclusion in this study.

The questionnaire forms were sent out to a total of 1280 NIPF owners in late August – early September of 1996. The addresses were obtained from databases maintained by the FCs and LFMAs. However, there was no information on the recency or frequency of forest owners' timber-sales transactions. Forest owners sent back 597 completed questionnaire forms. Owing to incorrectly filled forms, 72 of the responses had to be rejected. The number of acceptable responses was reduced to 525, giving a response percentage of 41% (varying between 36–45% among the FCs).

Data Analysis

First, the overall factors of satisfaction (expectation (*EXP*), perceived performance (*PERF*), and satisfaction (*SAT*)) were constructed from the average values of the forty single *exp*, *perf*, and *sat* ($sat = perf - exp$) features. The antecedents and consequences of satisfaction were analysed using percentage shares, mean values, standard deviations (*sd*), and Spearman's correlations (r_s). Following basic analyses, the overall *EXP*, *PERF*, and *SAT* levels were accounted for by various single background (*back*), *exp*, and *perf* features with a stepwise regression analysis (see Figure 1).

The timber sellers' behavioural intentions were estimated by applying a canonical discriminant analysis in which the different *back*, *exp*, *perf*, and *sat* features were independent variables. The differences among various seller segments were analysed using the Mann-Whitney's U-test and the Kruskal-Wallis' one-way ANOVA test. Non-parametric methods were applied because the circumstances (normal distribution of expectation and performance samples) for using parametric tests did not exist.

Information about Subjects and Their Timber-selling Behaviour

Eighty-nine per cent of the respondents were male and 11% female. The subjects' average age was 52 years ($sd=13.0$). Almost half of subjects (49%) were *farmers*, 24% were *pensioners*, 20% were *wage-earners*, and 7% were none of the above (*others*). The subjects lived at an average distance of 32 kilometres from their woodlots ($sd=93.6$), whose average size was 102 hectares ($sd=106.3$). They stated that wood production was the most important form of utilization of their woodlot (index=2.86 [maximum index value=3.00]);

second place went to recreational use (i.e. outdoor recreation, hunting) (1.22), collecting by-products (i.e. wild berries, mushrooms) (0.91), and conservation of forest nature and landscape (0.64).

During the past ten years, each respondent had, on an average, made 6.4 timber-sales transactions (sd=4.9), resulting in an average harvest of $3.1 \text{ m}^3 \text{ ha}^{-1} \text{ a}^{-1}$ (sd=2.7). The most recent timber-sales transaction's average size was 506 m^3 (sd=539.9). What may be referred to as regular sellers accounted for 19% of the subjects with the rest (81%) being occasional sellers. A subject was regarded to be a regular or constant seller if he/she had made at least four timber-sales transactions during the past ten years, and moreover that three quarters of his/her timber transactions had been made with the same company.

The subjects reckoned that the share of income obtained from forestry was ca. 29% in the 1990s (sd=23.7). Thirty-eight per cent of the most recent timber-sales transactions had been delivered sales, and 62% standing sales, 48% mainly thinning, and 52% regeneration felling. The respondents further reckoned that the foremost motives for their most recent timber-sales transactions had been the need for income from selling timber (index=1.76 [maximum index value=3.00]), silvicultural reasons (1.75), extensive, unused harvesting possibilities (0.80), good price paid for timber (0.71), and taxation reasons (0.32).

RESULTS

Antecedents of Satisfaction

The overall level of forest owners' *expectations* (*EXP*) was 8.77 (sd=0.73). Scale used was from 4 to 10 in the questionnaire. In terms of socio-economic classes, the *EXP* level of *pensioner* forest owners was significantly higher than those of the other groups – especially that of *farmers* (Table 1). In addition, those forest owners, who had sold their timber on the stump, and whose cutting areas were mainly composed of regeneration felling, appeared to have statistically higher *EXP* levels.

When the overall *EXP* level was estimated only in the light of statistically significant background variables, it was noticed that they explained poorly the *EXP* level in the

TABLE 1. OVERALL EXPECTATION (*EXP*), PERCEIVED PERFORMANCE (*PERF*), AND SATISFACTION (*SAT*) LEVELS OF SOME FOREST-OWNER GROUPS.

Variable group	<i>EXP</i> (4...10)	<i>PERF</i> (4...10)	<i>SAT</i>	Statistically significant differences among groups
	Mean ± sd			
Socio-economic group				
<i>Farmers</i> [1]	8.73 ± 0.68	8.51 ± 0.75	-0.22 ± 0.56	<i>EXP</i> : 1-2*
<i>Pensioners</i> [2]	8.89 ± 0.74	8.66 ± 0.80	-0.23 ± 0.49	<i>PERF</i> : 2-3*,
<i>Wage-earners</i> [3]	8.74 ± 0.81	8.37 ± 0.86	-0.37 ± 0.67	2-4*
<i>Others</i> [4]	8.65 ± 0.82	8.18 ± 1.00	-0.44 ± 0.97	
Selling method				
<i>Standing sale</i>	8.83 ± 0.70	8.53 ± 0.79	-0.30 ± 0.59	<i>EXP</i> *
<i>Delivery sale</i>	8.70 ± 0.73	8.47 ± 0.82	-0.23 ± 0.64	
Felling method				
<i>Regeneration felling</i>	8.84 ± 0.67	8.56 ± 0.78	-0.28 ± 0.58	<i>EXP</i> *
<i>Thinning</i>	8.70 ± 0.77	8.45 ± 0.83	-0.27 ± 0.64	
Permanence of relation				
<i>Regular seller</i>	8.90 ± 0.64	8.69 ± 0.75	-0.21 ± 0.62	<i>PERF</i> *
<i>Occasional seller</i>	8.74 ± 0.75	8.45 ± 0.82	-0.29 ± 0.60	

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

whole sample (Model 1 in Table 2). On the other hand, when the socio-economic groups – except for the group *others* – were used as the strata, the independent background variables gave the 14–40 per cent of degrees of determination for the calculated *EXP* models (Models 2–4 in Table 2). The motives for the most recent timber transaction of forest owner, selling method, size of the transaction, timing of timber transactions, and relative importance of recreational function of utilizing the woodlot were the most meaningful elements explaining the overall expectations. The other strata (e.g. felling / thinning sellers) failed to yield better degrees of determination.

The overall level of *perceived performance* (*PERF*) from the viewpoint of forest owners was 8.50 (sd=0.81). When investigating the observed performance levels of the various socio-economic groups, it was found that *wage-earners* and the group *others* experienced the lowest *PERF* levels of all (Table 1). Correspondingly, *pensioners*, who demonstrated relatively high *EXP* levels, also had the highest *PERF* lev-

TABLE 2. REGRESSION MODELS FOR ESTIMATING OVERALL EXP LEVELS. In whole sample (Model 1), and among the socio-economic groups (Model 2 = Farmers; Model 3 = Pensioners; Model 4 = Wage-earners).

Independent variable	Model 1	Model 2	Model 3	Model 4
	Coefficients			
Background features				
<i>exp</i> ^{Need for income from timber sale, index}				0.027*
<i>Silvicultural reason for timber sale, index</i>	-0.084*			
<i>exp</i> ^{Taxation reason for timber sale, index}			-0.397*	
<i>Standing sale, dummy variable [1/0]</i>		0.493**		
<i>Size of most recent timber sale, m³</i>		-3.961×10 ⁻⁴ *		
<i>Size of most recent timber sale², m³</i>				-1.380×10 ⁻⁶ **
<i>Number of transactions (during past ten years), unit</i>		0.044*		
<i>Importance of recreational use², index</i>				0.134*
(Constant)	8.875***	8.302***	9.404***	8.347***
R ²	.02	.14	.20	.40
Std. error of estimate	0.641	0.616	0.554	(0.553)
F	3.75*	4.89**	6.17*	6.07**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

els. Moreover, regular timber sellers registered statistically higher *PERF* levels than occasional sellers.

The results illustrated that when a timber seller evaluates the performance of a timber procurement organization in terms of his/her timber-sales transaction, he/she frequently compares performance to what was expected. This is supported by the good ability of expectation features to account for the overall *PERF* levels (Table 3). When the most significant background variables were added to the *PERF* models, the degrees of determination were at the level of 71–89% for each a socio-economic segment (Tables 3 and 4).

Of the background variables, the motives for timber seller's transaction were again one of the most indicative components explaining the antecedents of timber sellers' satisfaction (Table 4). In terms of the expectation attributes in

TABLE 3. DEGREES OF DETERMINATION OF REGRESSION MODELS.

Dependent variables (overall expectation (EXP), perceived performance (PERF), and satisfaction (SAT) levels); independent variables (background (back), exp, and perf features) used in regression analyses; and the degrees of determination in the whole sample and in the socio-economic strata (except for the group Others) are shown in parentheses.

Dependent variable	Independent variable	Degree of determination, %	
EXP	back	2.2	(14.3 – 40.3)
PERF	back	5.3	(12.4 – 14.6)
	exp	45.6	(52.9 – 69.4)
	back, exp	51.8	(71.3 – 88.5)
SAT	back	10.0	(17.5 – 43.0)
	exp	15.3	(22.4 – 23.4)
	back, exp	47.7	(41.8 – 98.7)
	perf	49.0	(35.6 – 50.0)
	back, perf	65.1	(82.7 – 95.7)
	back, exp, perf	95.6	(96.7 – 99.4)

Models 6–8, shown in Table 4, particularly many of the service dimensions of the timber trade process (i.e. access, competence, reliability, and empathy) became emphasized. As well, there were some points concerning logging – such *Slight ruts along strip roads*, *Not much stemwood left as logging residues*, and *No logging in biodiversity areas*.

Overall Satisfaction Index

The calculated overall satisfaction index (SAT) (difference between perceived performance and expectation levels) was -0.27 ($sd=0.61$). Sixty-four per cent of timber sellers had negative SATs, i.e. they were dissatisfied. The rest of the subjects (36%) had positive SATs. There were no statistical differences connected to the overall SAT levels among the various forest-owner groups (Table 1). However, the result showed that both EXP and PERF levels have a powerful impact on the overall satisfaction index: the higher the level of EXP, the lower the SAT level ($r_s=-0.248$; $p<0.001$). Vice versa, the higher the PERF level, the higher the SAT level ($r_s=0.507$; $p<0.001$).

TABLE 4. REGRESSION MODELS FOR ESTIMATING OVERALL *PERF* LEVELS. In the whole sample (Model 5), and among the socio-economic groups (Model 6 = Farmers; Model 7 = Pensioners; Model 8 = Wage-earners).

Independent variable	Model 5	Model 6	Model 7	Model 8
	Coefficient			
Background features				
<i>exp</i> ^{Need for income from timber sale, index}		-0.038***		
Unused harvesting possibilities for timber sale ² , index	-0.054*			
Unused harvesting possibilities for timber sale ^{0.5} , index			-0.174*	
Taxation reason for timber sale ^{0.5} , index		-0.364***		
Felling method is thinning, dummy variable [1/0]				-0.323*
Regular seller, dummy variable [1/0]	0.369**			
Expectation features, index				
Accessibility of company personnel ²	0.012***	0.018***		
Competence of company personnel ^{0.5}	1.205**	1.001*		
Reliability of company personnel			0.157**	
Understanding needs of timber seller			0.143*	0.297***
Purchase all timber grades			0.226***	
Intensity of harvesting complies with contract ²	0.011**			
Slight ruts along strip roads			0.113**	
Not much stemwood left as logging residues		0.269***		
No logging in biodiversity areas			0.190***	0.458***
Feedback easy to give to company ²				0.008*
Business-like attitude of company personnel concerning complaints	0.146*			
(Constant)	1.705	2.250	1.320*	1.224
R ²	.52	.75	.71	.89
Standard error of estimate	0.483	0.357	0.370	0.216
F	13.08***	21.26***	26.08***	22.98***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 5. REGRESSION MODELS FOR ESTIMATING OVERALL SAT LEVELS. In whole sample (Model 9), and among the socio-economic groups (Model 10 = Farmers; Model 11 = Pensioners; Model 12 = Wage-earners).

Independent variable	Model 9	Model 10	Model 11	Model 12
	Coefficient			
Background features				
<i>Need for income from timber sale, index</i>				0.421***
<i>exp</i> <i>Need for income from timber sale, index</i>	-0.021***			-0.073***
<i>exp</i> <i>Silvicultural reason for timber sale, index</i>			0.033***	
<i>Taxation reason for timber sale², index</i>		-0.074***		
<i>exp</i> <i>Taxation reason for timber sale, index</i>	-0.028**			
<i>Number of transactions (during the past ten years)⁻², unit</i>	-0.674*		-0.638**	
<i>Importance of conservation of forest nature, index</i>		-0.520*		
<i>Importance of conservation of forest nature^{0.5}, index</i>		0.879*		
<i>Importance of recreational use^{0.5}, index</i>				-0.331*
<i>Average distance from home to woodlot², km</i>			-8.080×10 ⁻⁴ **	
Performance features, index				
<i>Accessibility of company personnel²</i>	0.007*			
<i>Positive and interested attitude of company personnel^{0.5}</i>	0.693*	0.903**		
<i>Competitive price level</i>	0.093*			
<i>Speediness of service provided²</i>		-0.016***		0.022***
<i>Information about start of harvesting to timber seller²</i>			0.016***	
<i>Intensity of harvesting complies with contract</i>				0.088*
<i>Slight damage to residual stands</i>	0.091*	0.248***		
<i>Not much stemwood left as logging residues^{0.5}</i>	0.420*	0.674***		
<i>Proven quality of company as timber buyer</i>		0.165*		
<i>Constant</i>	-5.176***	-7.323***	-1.399***	-2.223***
R ²	.65	.83	.96	.94
Standard error of estimate	0.359	0.265	0.158	0.126
F	15.38***	17.32***	45.56***	35.33***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The expectation features, together with the most significant background variables, explained well the overall SAT level: e.g. the degree of determination of *pensioners'* SAT model was 0.987 (see Table 3). In contrast, the degree of determination was only 0.418 in the similar SAT model of *farmers*. The performance features, together with the most indicative background variables, expounded the SAT levels of timber sellers with the degrees of determination of 83–96% (Models 10–12 in Table 5). Similarly, as with the *PERF* models of Table 4, the motives for the most recent timber sale, and also the relative importances of various objectives for woodlots, emerged from the SAT models.

With regard to the independent performance attributes of the Models 10–12, there were once more evident service features (i.e. *Positive and interested attitude of company personnel*, *Speediness of service provided*, and *Information about start of harvesting to timber seller*), and the determinants of harvesting performance (i.e. *Intensity of harvesting complies with contract*, *Slight damage to residual stands*, and *Not much stemwood left as logging residues*). Finally, when the *back* variables and the *exp* and *perf* features were independent variables in the SAT models, the degrees of determination were the highest of all (97–99%) (Table 3).

Consequences of Satisfaction

Eight per cent of the timber sellers felt that they were not in a position to recommend to others the company with which they had made their most recent timber-sales transaction. Still, most forest owners reported that they could recommend the company to other forest owners. There was no statistically significant difference between the *EXP* levels of timber sellers inclined to recommend a company and those non-inclined to recommend (Table 6). Instead, both perceived performance and satisfaction levels of the “inclined to recommend” timber sellers were statistically higher than those of “non-inclined to recommend” timber sellers.

Using canonical discriminant analysis, the “*non-inclined to recommend*” [1] and “*inclined to recommend*” [2] sellers could be separated from each other with a weighted accuracy of 80% by a canonical discriminant function (unstandardized coefficients of $CDF_{\text{Recommend}}$) in which the evaluated

TABLE 6. WILLINGNESS TO RECOMMEND.

Forest owners' overall expectation (EXP), perceived performance (PERF), and satisfaction (SAT) levels connected to their willingness to recommend to others the company.

Variable	Non-inclined to-recommend seller (n=39) [1]	Inclined-to- recommend seller (n=452) [2]	Stat. significant differences among groups
	Mean ± sd		
EXP (4...10)	8.49 ± 1.16	8.81 ± 0.65	
PERF (4...10)	7.86 ± 1.20	8.58 ± 0.72	***
SAT	-0.63 ± 0.86	-0.24 ± 0.58	*

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

group centroids were: [1]: -1.31; and [2]: 0.11 (Table 7). The willingness to give favourable reports of the company to which they had most recently sold timber to others seemed to be the greater, the younger a timber seller was, the more frequently he/she had entered into timber transactions, and the better performance (i.e. *Reliability of company personnel, Positive and interested attitude of company personnel, Understanding needs of timber seller, Feedback easy to give to company, and Business-like attitude of company personnel concerning complaints*) he/she had met with.

Only three per cent of the timber sellers indicated that their willingness to sell timber again to the same company had been reduced. Almost three quarters (72%) of the respondents did, however, point out that their last timber-sales transaction had not affected their selling intentions. One quarter of the timber sellers were of the opinion that their last timber-sales transaction increased their willingness to resell to the same company in the future. There were statistically significant differences among all three groups with regard to their overall expectation, perceived performance, and satisfaction levels (Table 8).

When processing a discriminant analysis with three reselling groups, these segments could not be separated very well (weighted accuracy of 56%). It could be observed especially that there was no evident difference between the "no-change-in-willingness" [2] and "willingness-increased" [3] timber sellers. Therefore, the "no-change-in-willingness" [2] and "willingness-increased" [3] segments were linked to-

TABLE 7. CANONICAL DISCRIMINANT FUNCTION OF RECOMMENDATION.
 Variables of the canonical discriminant function related to the willingness of timber seller to recommend the company.

Variable	F-ratio	Standardized coefficient	Correlation	Unstandardized coefficient
Background features				
<i>Number of transactions (during past ten years), unit</i>	5.40*	0.232	0.293	0.048
<i>Age, a</i>	4.81*	-0.312	-0.277	-0.025
Performance features, index				
<i>Reliability of company personnel</i>	40.72***	0.515	0.806	0.448
<i>Positive and interested attitude of company personnel</i>	26.12***	0.146	0.646	0.131
<i>Understanding needs of timber seller</i>	29.00***	0.089	0.680	0.077
<i>Feedback easy to give to company</i>	19.55***	0.103	0.559	0.077
<i>Business-like attitude of company personnel concerning complaints</i>	34.08***	0.296	0.747	0.259
<i>(Constant)</i>				-7.678

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

gether. Following this, a new canonical discriminant function (unstandardized coefficients of CDF_{Resell}) parted these two ([1]; and the linked [2] & [3]) groups with a weighted accuracy of 94%, the estimated group centroids being: [1]: -2.60; and [2] & [3]: 0.11 (Table 9). The CDF_{Resell} function suggested that those timber sellers, who had made larger timber transactions and had suffered – in their view – some bad experiences, are not willing to sell to the same company in the future.

DISCUSSION AND CONCLUSIONS

The present research represents a new approach in the form of satisfaction components in surveying timber-selling behaviour. When examining the prediction of timber sellers' satisfaction level, the best models consisted of some back-

TABLE 8. WILLINGNESS TO RESELL.

Forest owners' overall expectation (EXP), perceived performance (PERF), and satisfaction (SAT) levels connected to their willingness to resell to the same timber buyer.

Variable	Willingness reduced (n=17)	No change in willingness (n=373)	Willingness increased (n=127)	Stat. significant differences among groups (1 ... 3)
	[1]	[2]	[3]	
Mean ± sd				
EXP (4...10)	8.05 ± 1.22	8.75 ± 0.71	8.94 ± 0.62	1-2*, 1-3**, 2-3*
PERF (4...10)	7.14 ± 0.88	8.45 ± 0.78	8.84 ± 0.68	1-2***, 1-3***, 2-3***
SAT	-1.05 ± 0.89	-0.29 ± 0.60	-0.10 ± 0.53	1-2***, 1-3***, 2-3**

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

ground variables, and the features of expectation and perceived performance (Table 3). It can be seen, nevertheless, that the continuous observation of both expectation and performance features could be very arduous. Thus, perhaps a more suitable measuring procedure would comprise only some background variables and the most indicative performance features (Table 5). Accordingly, procurement

TABLE 9. CANONICAL DISCRIMINANT FUNCTION OF RE-SELLING.

Variables of the canonical discriminant function related to the willingness of timber seller to resell to the same company in the future.

Variable	F-ratio	Standardized coefficient	Correlation	Unstandardized coefficient
Background feature				
Size of most recent timber sale, m ³	15.31***	-0.456	-0.445	-7.780×10 ⁻⁴
Performance features, index				
Reliability of company personnel	53.35***	0.645	0.831	0.572
Understanding needs of timber seller	23.99***	0.095	0.557	0.087
Timber buyer is solvent	12.12***	0.112	0.396	0.180
Slight damage to residual stands	18.15***	0.231	0.485	0.197
Business-like attitude of company personnel concerning complaints	22.69***	0.096	0.542	0.086
(Constant)				-9.406

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

organizations should ask timber sellers about the level of the performance attributes of Models 10–12 (i.e. *Positive and interested attitude of company personnel, Speediness of service provided, Information about start of harvesting to timber seller, Intensity of harvesting complies with contract, Slight damage to residual stands, Not much stemwood left as logging residues, and Proven quality of company as timber buyer*).

In order to monitor indirectly the timber sellers' intentions, procurement organizations have to also inquire as to the five performance features in addition to the mentioned (in *italics*) performance attributes of the SAT models (i.e. *Reliability of company personnel, Understanding needs of timber seller, Timber buyer is solvent, Feedback easy to give to company, and Business-like attitude of company personnel concerning complaints*). Procurement organizations can also ask directly, for instance, how satisfied the timber seller is generally with the performance of their organization, or how willing the timber seller is to sell again to their organization. The weakness in such direct inquiry is that organizations cannot discover possible unsuccessful operations in the timber trade process. Therefore, indirect measurement of the satisfaction and loyalty of timber seller can be considered to be a better survey method. As a result of these inquiries, and of course of using the presented models and functions, organizations can then find the dissatisfied sellers and further contact them by way of an after-service process, for example, and finally have less-dissatisfied sellers, who would otherwise tell negative things about their organization or switch to dealing with other companies (cf. Gengler & Popkowski Leszczyc, 1997).

The results also indicated that segmenting of NIPF owners is a necessary phase in constructing models for estimating expectation, performance, and satisfaction levels. There were noticeably higher degrees of determination in the used socio-economic segments (Models 2–4, 6–8, and 10–12) than in the entire sample (Models 1, 5, and 9). The reasons for the better degrees of determination in the calculated models can be searched for in naturally more homogenous segments. But the group *farmers*, for instance, could have been segmented further into smaller clusters than was done, since the degree of determination of *farmers'* calculated SAT model was lower than those of *pensioners* or *wage-earners* (see Table 5).

The response rate to this survey was 41 per cent. This is not a very low percentage in comparison to previous postal questionnaire surveys focusing on customer satisfaction (cf. Goodman *et al.*, 1996). In the present study, over 10 per cent of the returned responses had to be rejected. The main reason for this was that the respondents had not filled in the actualised performance section on the questionnaire, i.e. there was every likelihood that he/she had not sold timber at all during the study period. For instance, in the studies by Karppinen & Hänninen (1990) and Ihalainen (1992), more than a quarter of the subjects had not sold timber during the study period (the past five years).

Karppinen *et al.*, (1994) have researched the dilemma of non-respondents, and reported that non-response does not constitute a large bias in the mail inquiry. The authors state that non-respondent forest owners resembled the respondents except that they were younger and better educated. The average age of the subjects was 52 years in this study, and 54 years in the interview study by Karppinen *et al.*, (1994). Hence, lots of young forest owners participated the present survey owing, presumably, to their greater tendency to sell timber (cf. Ripatti 1995). Moreover, farmers recounted for a high proportion of respondents due to their generally greater interest in timber-sales transaction matters, and due to their larger woodlots (cf. Ollonqvist & Heikkinen, 1995; Ripatti, 1995).

To conclude, although the present study introduced the models of NIPF owners' satisfaction and behavioural intentions for a Satisfaction DSS, the issue of the influence of NIPF owners' satisfaction on actualised selling behaviour was not examined in the study. This matter offers an interesting topic for future research.

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APPENDIX 1

List of forty characteristics of the timber procurement process in the questionnaire

Clarity of timber-sales contract documents
Purchase all timber grades
Competitive price level
Ease of conducting timber-sales transaction
Accessibility of company personnel
Professional guidance in matters concerning timber-sales transaction
Competence of company personnel
Reliability of company personnel
Speediness of service provided
Positive and interested attitude of company personnel
Understanding needs of timber seller
Constant keeping in contact with timber seller (also after transaction)
Activeness and self-initiative of company personnel
Courtesy of company personnel
Possibility for conducting business with familiar person
Meticulousness of company personnel
Business-like attitude of company personnel concerning complaints
Flexibility of company in timber-sales matters (e.g. in organizing payments)
Proven quality of company as timber buyer
Timber buyer is solvent
Feedback easy to give to company
Information about start of harvesting to timber seller
Checking the situation with a company representative in the stand marked for harvesting before felling
Timber measurement is accurate
Cross-cutting of stems for sawlogs
Harvesting takes place soon after signing of timber-sales contract
Logging schedule (e.g. summer / winter) of timber seller realized
Possibility to choose harvesting method (motor-manual / mechanized)
Slight ruts along strip roads
Strip road network according to recommendations
Slight damage to residual stands
Intensity of harvesting complies with contract
No logging residues on paths and in ditches
No litter left in cutting area after harvesting operation
Short stumps
Not much stemwood left as logging residues
Border and shape of cutting area complies with contract
Buffer belts of trees left around lakes, rivers, and stream systems
Appropriate number of living and dead trees retained
No logging in biodiversity areas

