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SMALL SAWMILLS AS ENTERPRISES: A BEHAVIOURAL INVESTIGATION OF DEVELOPMENT POTENTIAL

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Tutkimus piensahojen yrittäjyydestä

J. Ashley Selby & Leena Petäjistö

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The investigation examines the development potential of small sawmills in rural Finland. Development is defined with a qualitative bias, given small sawmills' limited possibilities for large-sale investments. Potential is defined in terms of the behavioural limitations to development. The investigation assumes that small sawmill entrepreneurial behaviour is essentially satisficing, and that the concept of bounded rationality is applicable.

The empirical material concerns a random sample of 399 sawmills from all regions in Finland collected in connection with the 1990 small sawmill inventory.

Three sets of enterprise/entrepreneurial attributes are constructed using principal component analyses: i) entrepreneurial skills & organization, ii) small sawmill outlets, and iii) information attributes. Development potential is measured by employing discriminant analyses to test these attributes against four *a priori* sawmill classifications: i) sawmill production structure, ii) entrepreneurial development intentions, iii) sawmill operating environments, and iv) sawmilling as a livelihood. Each of these analyses contributes to an understanding of the entrepreneur–enterprise dialectic.

Based on the use of Pred's behavioural matrix, small sawmill entrepreneurs' quantity & quality of information and their ability to use information are examined with respect to sawmill typologies. In this way, the entrepreneur–enterprise dialectic is given a third dimension, that of the entrepreneurs' partial space. The analysis is therefore able to examine development potential from the standpoint of an entrepreneur–enterprise–environment (partial space) trialectic.

Tutkimuksessa selvitettiin piensahojen kehittämismahdollisuuksia. Kehittämismahdollisuuksilla tarkoitetaan edellytyksiä kehittää toimintaa sekä laadullisesti että määrällisesti. Kerättty aineisto käsitti 399 piensahaa, joiden omistajia haastateltiin piensahojen inventoinnin yhteydessä.

Menetelmänä käytettiin pääasiallisesti Predin käyttäytymismatriisia. Käyttäytymismatriisilla pyritään selvittämään vuorovaikutuksia, jotka vallitsevat yrityksen informaation ja kyvyn käyttää sitä hyväksi sekä yrityksen toiminnan välillä.

Koska yrittäjien suhtautuminen yritystoimintaa koskevaa informaatiota kohtaan osoittautui passiiviseksi, tulisi erityisesti neuvonantojärjestelmää kehittää sekä aktivoida mm. virkamiehiä jakamaan yritystoimintaa koskevaa informaatiota.

Keywords: bounded rationality, behavioural matrix, development potential, entrepreneurial partial space, human geography, information, phenomenological existentialism, satisficer, small sawmills.
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Preface

The present investigation was conducted at the Department of Forest Resources of the Finnish Forest Research Institute as part of a series of investigations concerning small sawmills in rural areas. Inventories of sawmills too small to be included in the Industrial Statistics and the assessment of their saw log consumption are carried out by the Department at ten year intervals. The material for the present investigation was collected in connection with the 1990 inventory (Siekkinen & Pajuoja 1992).

An investigation of small sawmill entrepreneurs in North Karelia (Selby 1987, 1989), based on an humanistic rather than an economic frame of reference, provided interesting but empirically limited results. The present investigation extends the methodology employed in the earlier investigation and uses empirical material concerning the whole country. In particular, the methodology has been developed in order to assess qualitative and quantitative aspects of the development potential of small sawmills in rural areas. The structural and behavioural preconditions for small sawmill development are also addressed in a Finnish language monograph (Petäjistö & Selby 1992) to which Chapters 4 & 5 of the present investigation make detailed reference.

The authors gratefully acknowledge the generous financial support of the Rural Development Project (*Maaseudun kehittämisprojekti*), to which we hope our results make a useful contribution. Acknowledgements are also extended to those representatives of interested organizations who formed a supporting forum for our investigation.

Ashley Selby & Leena Petäjistö

1 Introduction

1.1 The problem and its setting

The investigation seeks to identify small sawmills, or types of sawmills, which possess development potential. The problem is oriented to the need to sustain economic and social life in rural areas, where small sawmills have long been a part of the socio-economic structure. While their number has declined rather sharply during the past two decades, the amount of saw logs consumed by small sawmills has not declined, indicating a structural change within the industry (see e.g. Huttunen 1981, Siekkinen & Pajuoja 1992).

The majority of small sawmills are associated with the agricultural sector which itself has undergone considerable structural change since the 1970s. Further, the traditional agricultural support system is under considerable pressure to change. The international political and commercial environment also continues to change rapidly – a process which will intensify irrespective of whether or not Finland joins the European Community. The outcome of these changes is uncertain, but will, in any case, result in considerable changes in the primary sector which has always been the mainstay of the rural economy (see e.g. Maatilahallitus 1991a, 1991b).

Consequent upon the changes noted above, alternative employment and ancillary enterprises are becoming an increasing necessity in the countryside. The recently introduced Rural Livelihoods Act (*Maaseutuelinkeinolaki 1295/1990*) aims to encourage such a development. Similarly, a recently published "Rural Development Programme" (Sisäasiainministeriö 1991) seeks to create the basis for such development. The present investigation contributes to this discussion.

The small sawmill development potential project being undertaken at the Finnish Forest Research Institute has had two basic aims. The first has been to continue the series of small sawmill inventories which have been carried out systematically every ten years. The inventories have concentrated on the number of small sawmills, their technology and their use of saw logs. This part of the investigation has already been published (Siekkinen & Pajuoja 1992). The second part of the investigation, which is the subject of this paper, concerns the small sawmill entrepreneurship.

Petäjistö & Selby (1992) modelled certain aspects of entrepreneurial attributes and use these attributes to estimate the number of small sawmills in the sample in question which possessed development potential. Among other things, the results supported an earlier investigation into small sawmills (Selby 1989) by revealing the passive nature of many entrepreneurs with respect to information and ability to use information. The present paper examines this problem in more detail, and returns to the question of the very nature of small-scale entrepreneurship in rural areas, and the concept of entrepreneurial space is again empirically examined by means of the behavioural matrix (Selby 1987, 1989).

The frame of reference for the present investigation, discussed in chapter 2, is derived from Selby (1989), and sets out an epistemology for handling the natures of small-scale entrepreneurs and their enterprises. The rural, and often peripheral location of the enterprises creates a specific contextual problem which is given special attention. Consequently, the frame of reference is rather detailed; the aim being to assist the reader to i) appreciate the nature of small-scale rural entrepreneurs, and ii) orientate to the somewhat unorthodox approach to the investigation, which is a corollary of i). Chapter 3 discusses the technical nature of the material employed as well as the analytical approaches selected. Chapter 4 presents a set of multi-variate analysis which identifies sets of attributes pertaining to the small sawmill owners and their firms; the main attributes being entrepreneurial skill & organization, small sawmill outlets, and information-related attributes. Chapter 5 examines these entrepreneurial attributes with respect to certain *a priori* classifications designed to reveal aspects of development potential, i.e. sawmill production structure, entrepreneurial intentions, sawmills' operational environments, and sawmilling as a livelihood. Chapters 4 and 5 are based on Petäjistö & Selby (1992). Chapter 6 returns to the concept of entrepreneurial space and the realization of the behavioural matrix (Pred 1967, 1969, Selby 1987, 1989), which is constructed on the basis of entrepreneurs' quantity and quality of information, and their ability

to use information. Small sawmill development potential is examined with reference to the position of each small sawmill on a behavioural matrix.

1.2 The definition of development potential

Given the nature of small sawmills (three out of every four are attached to farms), development is not taken to mean that small sawmills are considered to be capable of becoming large enterprises. Rather, development is taken to mean that the small scale enterprise may improve the use of its means of production through activities that are not necessarily dependent upon large investments. "Appropriate development" is the activity in question, as it is important that a small enterprise does not develop beyond its means, i.e. beyond the ability of the entrepreneur to cope. Development is therefore seen as a behavioural concept. Indeed, given that the investigation concerns entrepreneurship, the development concept is more behavioural than physical.

The definition of the term potential is problematic because, as discussed in section 2.1, small-scale entrepreneurs – and especially small sawmill entrepreneurs – are considered to be satisficers. Potential for development will therefore be further limited by behavioural considerations, and will form a direct relationship with the nature of the "development" in question. The potential that is being sought is that which will place the small sawmill enterprise on a more secure footing, perhaps enabling the entrepreneur to place greater weight and reliance on sawmilling incomes than agricultural incomes, or where the sawmill is already operationally independent of agriculture, to secure greater value added and better awareness of market potentials.

2 Epistemological premises and frame of reference

2.1 Behavioural assumptions

It is common in economic theory, and theory of the firm, to consider the entrepreneur to be entirely rational and in possession of single and restricted goals, such as profit maximization and cost minimization. However, any empirical review of small sawmill activities will clearly demonstrate the inappropriateness of such a standpoint. Indeed, even in the normative schools of social science such views are increasingly placed under severe critique, not least the concepts of *Homo economicus*, and perfect rationality. For example, Katona (1951), Simon (1957a, 1957b, 1959), Wolpert (1964), Pred (1967) and Earl (1983) provide theoretical and empirical evidence to bear on the critique. Accordingly, one of the central motives ascribed to economic man, profit maximization, is criticized as being a subjective concept, logically out of step with positivistic thinking, and for being incompatible with empirical findings.

Following such critique, there has been a growing application in behavioural theory of concepts which aim to replace the global rationality of economic man "with a kind of rational behaviour that is compatible with the access to information and the computational capacities that are actually processed by organisms, including man, in the kinds of environments in which such organisms exist" (Simon 1957a; 24). One such behavioural concept which replaces that of perfect rationality is the principle of *intended* or *bounded rationality* according to which, man is intendedly rational with respect to his own perception of reality, but this perceived reality only approximately relates to the real world (see Brinkmann 1935, Simon 1957b; 241–260, Earl 1983; 64–72). The principle takes into account the influence of entrepreneurs' personal qualities upon, for example, the location of production.

Whereas Brinkmann accepted the profit maximizing assumption, Simon (1959; 262) rejects it by observing that the entrepreneur "may not care to maximize, but may simply want to earn a return that he regards as satisfactory". This has been referred to as the *satisficing principle* (Simon 1959, Earl 1983; 78–81). Simon (1957b; 246) suggests that "in the absence of evidence that the classical concepts do describe the decision-making process it seems reasonable to examine the possibility that the actual process is quite different from the one the rules describe". What is invariably missing from "the rules" are psychological factors, which, in turn, have received considerable attention from Katona (1951) in his pioneering work *Psychological Analysis of Economic Behavior*. He notes (1951; 204) that there are usually diverse psychological forces driving individuals towards different aims. Some may conflict and some may reinforce each other.

Over and above basic biological survival, Katona (1951; 204–206) notes several factors which affect the motivation of businessmen. One is relief from anxiety which "may lead to a striving for security". Katona observes that one way to reduce anxiety is to make money, but notes that other factors are involved, including striving for continuous, regular income rather than short-term maximum profits. He recognizes (1951; 206–207) that decisions resulting from the interplay of diverse motivational forces must be assumed to vary greatly under different circumstances. Different conditions will cause different motives to play a leading role in the decision-making process (the man–environment dialectic in a decision making context – see section 2.3).

Thus at different stages of development the entrepreneur has different priorities and certainly perceives his business environment in different terms: initially hostile, perhaps, leading to increased awareness of environmental potential, and finally being able to place goals in directions other than mere survival. *Such a progression is considered to be relevant to the hierarchical small sawmill classifications employed in the present investigation* (see section 3.3).

2.2 Phenomenological man

Consequent upon the rejection of the normative concept of economic man, and the acceptance of the behavioural assumptions of bounded rationality and satisficing, an epistemology is required which permits the examination of the dialectic relationship between the sawmillers and their environments from the standpoint of the entrepreneurs' own perceived world, rather than that of an *a priori* model of the world imposed upon them.

Given that the majority of the small sawmills are part-time enterprises, supplementing agricultural incomes, it is not possible to consider them in terms of normative location theory or theory of the firm. An approach constructed within a positivistic framework is therefore considered to be inappropriate. A rejection of the positivistic approach requires that the normative assumptions of human behaviour be modified. Phenomenology, and especially existential phenomenology provides a philosophical basis for examining the behaviours of real-world small-scale entrepreneurs.

Phenomenology and existentialist phenomenology have become central to the post-positive approaches in several social sciences. Both emphasize the need to reveal actual lived experience rather than to defend the abstract conceptualizations and objective pretensions of positivism (Smith, 1979; 365, Buttimer 1976; 291, Relph 1976; preface). Existential phenomenology, in particular, is considered to be the philosophy of man's alienation in his world, and his efforts to combat that alienation. Existentialism is therefore often characterized by the tenet that "man makes himself". As in phenomenology, man is considered to create his own reality, i.e. reality is created by the free acts of human agents. Thus, quoting Grene (1959, cited by Johnston 1983; 65) "The self that existentialism seeks is each person's individual self, which he must forge for himself out of such senseless circumstances, such meaningless limitations, as are given him. This self-creation – the making of one's essence from mere existence – is demanded of each of us because there is no *single* essence of humanity." The natures of small-scale entrepreneurs are clearly discernible in this position.

Existential geography (the current investigation is seen in geographical terms) is contended to be concerned with the understanding of *shared contexts*, and it is for this reason alone the epistemology is relevant to the problem of small-scale rural entrepreneurs. Personal actions and meanings are rarely private (Ley 1977; 505), especially in related close-knit traditional (rural) societies – in which the great majority of small sawmills are located.

Ley & Samuels (1978; 12) have argued that "reality is a social construction...that acts back upon its subjects, sometimes in ways that remain unseen and taken for granted". This is an interesting argument, and one which complements the concept of bounded rationality outlined above. In other words, to what extent are the "perceived world" and "real world" really different? Ley (1978; 52) argues that there is a synthesis which can account for "the dialectic relation between the structural realities and the human enterprise of constructing reality". Similarly, Duncan (1978, citing Berger & Luckmann

1966) argues that "man produces a world both of abstraction – that is, ideas values, norms of conduct – and of real concrete objects, which, although they are his own product, he nevertheless permits to dominate him as objective, unchanging (facts)".

Ley (1977; 505) contends that individual actions "are intentional and purposive, they have meaning, but access to this meaning requires knowledge of the motives and perceptions of the actor, his definition of the situation". As already noted, meanings behind actions are rarely private, but are shared and reinforced in peer group action: a most important point from the standpoint of entrepreneurship in rural areas.

Thus, phenomenological man, as opposed to economic man, can be regarded as being *unavowedly social*: "His lifeworld is an intersubjective one of share meanings, of *fellow men* with whom he engages in face-to-face *we-relationships*. These relationships are entered into by choice and show...the familiar pattern of selective interaction between like-minded individuals..." (Ley, ibid.). Nonetheless, some individuals will be *adapters*, readily reacting to changes in the environment and grasping new opportunities, whereas others will be *adopters*, copying the successful acts of adapters (Alchian 1950). These concepts will be discussed further in section 25.

2.3 The man–environment dialectic

The man–environment dialectic partly depends upon the perceptive powers of the individual, i.e. on the extent of his *being aware*. An individual's power of perception is, however, a multidimensional product of cultural background, education and experience, as well as the psycho-philosophical constitution of the individual. In other words, the man–environment dialectic is by no means a simple process.

While the individual clearly plays a creative role in forming the society in which he lives, the dialectic process creates a feedback to which the individual is not immune. Thus, again citing Ley (1977; 505), "Each individual has a history and a geography which imposes constrains within his life-world; so begins the dialectic between creativity and determinism, charisma and institution, a dialectic which for the geographer becomes that between man and place... A second, and often more binding, set of constraints upon action in everyday life are forces internal to the life-world of the individual and group. In the process of group consolidation, its collective view of the world become more telling on the individual, as he becomes successively more 'included' in it. So, too, his actions become identified with group norms... The phenomenological model of man is one of a life-world with a group-centred reality." Such as position is certainly attributable to rural entrepreneurs, as demonstrated empirically for small sawmill entrepreneurs by Selby (1989).

What, then, is the affect of the social environment on small-scale entrepreneurs? It can be expected that in traditional societies, which are often characteristic of rural areas – even in industrialized countries, the social norms, the restricted division of labour, etc., do not create, for dialectic reasons, the ideal environment for cultivating entrepreneurship. Support for such a view is given by Pred (1969; 51 following Hagen 1962; 8–9) who notes that the imprint of traditional societies on personality types may well discourage innovating behaviour in the entrepreneurial population, thereby preventing any increase in the flow of entrepreneurial information: a view also given empirical support by Selby (1989).

Pred (1967; 90) also points out that psychological *ties to place*, desire for social approval and other personal and non-economic reasons are frequently decision determinants of consequence. Localities, according to Pred, become *change resistant*. Thus, the "authoritarian personality of a traditional society which is not undergoing a transition to economic growth, is uncreative, and also unwilling to undertake any pioneering innovational action (locational or otherwise) that will serve as a model to others" (Pred 1967; 51). This is a condition which must not be underestimated when dealing with entrepreneurs in rural areas, as it can and will act to restrict the emergence of adapters.

Thus, by implication, cultural background plays a significant role in determining the life philosophies and value systems of individuals. These create psychological needs in the individual – needs which he attempts to satisfy. The individual's awareness of these needs is prompted by the cultural environment. Similarly, in fulfilling his needs within the framework of his cultural environment and being subject to the man–environment dialectic, the individual finds that a unique personal "space" is created: unique, but nevertheless interacting. The individual's lifeworld reacts with the lifeworlds of his/her peers. In this way, existential *partial space* is created[1].

2.4 Entrepreneurial partial space

As already implied, the existential epistemology is particularly concerned with space. However, it is to be stressed that existential space is *anthropocentric*; it is realized *through* the individual. Places are a link, i.e. they are the reference points in personal projections (Samuels 1978a; 31). Thus, Samuels (ibid. following Jaspers 1969) contends that since the assignment of place is an act of reference by someone, then "the places of objects and all spatial configurations are contingent upon whoever makes the assignment." Consequently, the only centre of concern is the one occupied by the existing individual. This situation is what each individual starts from and to which each returns, because nothing else is real and present; the situation itself becomes clear only when each individual thinks with reference to the objective being of the world (Jaspers 1969; 176).

The term *partial space* has been given to these reference situations (Samuels 1978a; 31–32). The partial space is the net of relations between man and the world. It is partial in the sense that it has bias or subjectivity and is incomplete. Indeed, it clearly relates to the behavioural concept of intended or bounded rationality discussed earlier. The *reference situations* are defined as the historic conditions within which the assignment of space (or place) takes place. Partial space is, therefore, an *existential space*. This space is not a space in which all objects are equally important and enjoy the same right to existence, but rather it is a partial space and constitutes a second space which is ceaselessly imposed by the individual's way of projecting the world. This partial space is the way man orders his world in terms of space perceptions, or in a narrower connotation, it is the way in which he orders entrepreneurial activities and events. Thus, while the broader network of social relations on which the concept partial space is based are not examined empirically in the present paper, small sawmill entrepreneurs are assumed, nevertheless, to perceive a partial space which is relevant to their environment for business, and as such it is termed *entrepreneurial space*.

Entrepreneurs' creation of and interaction with their entrepreneurial partial space can be expected to find expression in the nature and structure of their enterprises. Entrepreneurs who create and interact with a relatively abundant partial space can be expected, if they are intendedly rational, to develop their firms to take advantage of the perceived opportunities offered by the entrepreneurial space. Entrepreneurs whose partial space is restricted will perceive fewer opportunities and their firms will not be fully developed. The man–environment dialectic which influences the formation of the entrepreneurial partial space therefore becomes a trialectic: man–environment–enterprise.

2.5 Information, ability and entrepreneurial space

So far in this theoretical and empirical discussion of small sawmill entrepreneurs' behaviours, we have examined the man–environment dialectic from the standpoint of the formation of attitudes and the social environment of the individual and the dialectic relation between the entrepreneurs' perceived business environments and their business activities. The discussion has lead to a position where it can be argued that each entrepreneur creates his own "partial space" towards which he is intendedly rational, but the intended rationality and the creation of partial space form a dialectic which place constraints on the entrepreneur. The role of information, or rather attitudes towards information, are a factor in this dialectic.

It has already been noted that learning, both formal and informal (via reference groups and social norms) are of importance in the entrepreneurial process (see e.g. Ullrich 1972). Similarly, it has been noted that each individual as a personal history which imposes constraints upon his life world, and which also affects the creation of personal "partial space". This is one part of the man–environment dialectic. From this epistemological standpoint, an empirical analysis will be made of certain aspects of entrepreneurial behaviour – behaviour in the context of each entrepreneur's personal "entrepreneurial space"; namely, their acquisition of business-related information and their ability to use that information.

A behavioural location model – the "beha-

[1] Readers interested in the exploration of mental and social space are referred to Henri Lefevre's The Production of Space (Blackwell, Oxford 1991).

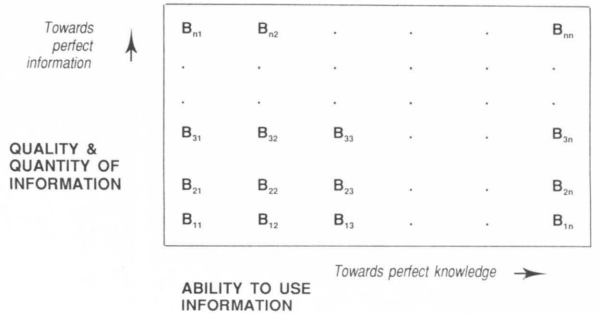

Fig. 1. The behavioural matrix (after Pred 1967).

vioural matrix" – introduced by Pred (1967) offers a suitable theoretical starting point for examining the relationships between the *quantity & quality of information*, and the *ability to use information*, i.e. the two constructs employed in the behavioural matrix (Fig. 1). The matrix, together with sawmill typological classifications, are employed in this investigation to define entrepreneurial partial space.

The behavioural matrix consists of two orthogonally constructed concepts, or parameters, the first being the quantity and quality of information possessed by the entrepreneur, the second being his ability to use that information. Thus, position B_{11} on the matrix (very little or no information, very little or no ability to use information) is largely theoretical, as in such circumstances enterprise is hardly likely to occur. Similarly, position B_{nn} on the matrix is unlikely, as it is not in the nature of human beings to possess near perfect and near absolute information, and to possess perfect ability to use that information. All other locations on the matrix are more or less realistic. The matrix therefore presents a conceptual tool for analyzing real firms and real entrepreneurs, with respect to whom normative assumptions are irrelevant. Further, the method is clearly anthropocentric, i.e. places the entrepreneur in the centre of his life-world, and is consequently conceptually appropriate with respect to the humanistic (phenomenological) epistemology established at the outset.

From an analytical standpoint, an advantage of the matrix format is that an indefinite number of undefined classes can be located along each axis. Each decision-making unit or individual can be allocated to a cell (B_{11}, B_{12}...B_{nn}, in Fig. 1). "The ability to imaginarily sort (individuals or units) into different categories (cells) will ... prove highly convenient when it becomes necessary to link the behavior matrix with maps representing economic-geographic distributions" (Pred 1967; 25).

Thus, at any given point in time, each decision-making unit or entrepreneur is considered to have "a real spatial attribute (site and situation, land use or path of movement) that is conveyable on a map, and behavioural qualities that can be hypothetically located in the behavior matrix" (Pred 1967; 24). In the present investigation, the spatial element is replaced by a structural element, i.e. the small sawmill structural typology (reflecting the man–environment dialectic), which might be termed "entrepreneurial space". The method is, therefore, concerned with the individual, i.e. it is anthropocentric, and does not deal with aggregates of individuals. As such, it is well suited to the epistemological frame, a suitability strengthened from both a phenomenological and existentialist viewpoint by being "spatial".

The advantage of Pred's model is that it is dynamic and allows for changes with time. Disturbances or innovations in the business environment may cause the parameters of the matrix to shift. The individual entrepreneur may therefore be suddenly relocated on the behavioural matrix. Pred calls such a shift a "parametric shock". The parametric shock may be advantageous or disadvantageous to the individual, i.e. the entrepreneur, in the new position, may find himself with more or less information and/or more or less ability to use that information. An example (Fig. 2) shows the (perhaps) more normal situation where the direction of the parametric shock leads to a deterioration in the position

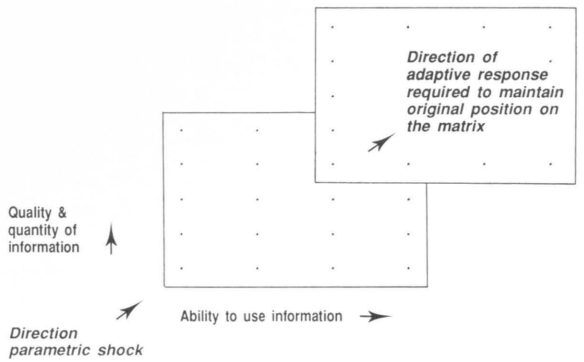

Fig. 2. Adaptive response required of an entrepreneur to maintain his position on the behavioural matrix in the face of a changing business environment (parametric shock).

on the matrix. In a constantly, and often rapidly, changing environment for business, this is the condition faced by most firms.

Concerning the realization of small sawmill development potential, it is necessary to ensure that, at the very least, small sawmill entrepreneurs' maintain their position on the matrix as parametric "shocks" take place. The means for maintaining a position on the matrix is to keep abreast of developments by way of information, as well as learning to cope with new types of information. For a sawmill entrepreneur to "develop", he must ideally seek information and abilities that not only maintain his position on the matrix, but improves it, despite changing parameters.

The behavioural matrix has the ability to plot all cases in the same behavioural space. This space, defined by its orthogonal axes, forms a basis for understanding the location of the individual in the context of the behaviour space as a whole. This being so, it should be possible to identify the dialectic between each entrepreneur's behavioural space which can be considered to be part of his partial, or entrepreneurial space, and the nature of his firm.

Pred observes that a problem in the use of the matrix is the systematizing of its contents for the purpose of analysis. A suggested solution is based on the *adaptive–adoptive* dichotomy of Alchian (1950), according to which location decisions are hypothetically sorted into two polar classes. One class maintains that economic activities rationally *adapt* themselves to the conditions of the society in which they exist (individuals and units make well thought-out locational decisions based on relevant information); the other class assumes that activities react to their environment in relative ignorance, with the "lucky ones" being *adopted* by the system (individuals and units make haphazard decisions grounded on inadequate or irrelevant information, and only by chance become successful or profit-making operations). Spatial survival "does not require proper motivation but may rather be the result of fortuitous circumstances" (Pred 1967; 22).

Pred (1967; 25) modifies the adaptive–adoptive dichotomy into a four-fold classification that can be interpreted with reference to the behavioural matrix (Fig. 3). Thus, all the decision makers falling into the upper right-hand quadrant of the matrix (large and accurate quantities of information/good ability to use information) correspond to *successful adapters*; all the decision makers in the upper left-hand quadrant of the matrix (large and accurate quantities of information/poor ability to use) correspond to *unsuccessful adapters*. All decision makers falling within the lower right-hand quadrant of the matrix (small and imperfect quantities of information/good ability to use) correspond to *successful adopters*; and all decision makers in the lower left-hand quadrant (small and imperfect quantities of information/poor ability to use) correspond to *unsuccessful adopters*.

This matrix is not without its critics, not least because of the subjective nature of the terms

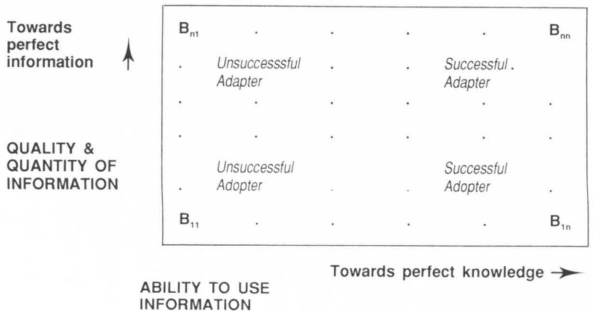

Fig. 3. Adapter-adopter classes and the behavioural matrix (after Alchian 1950, Pred 1967).

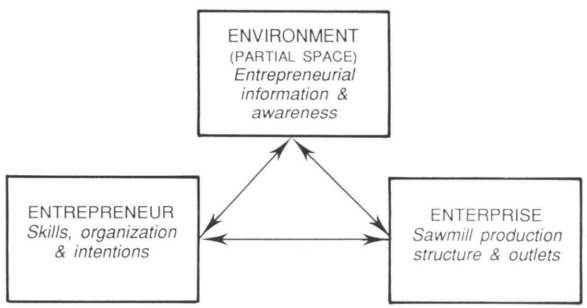

Fig. 4. The entrepreneur–enterprise–environment trialectic forming the structure of the investigation.

successful and *unsuccessful*. Certainly, an empirical application of the behavioural matrix to small sawmill entrepreneurs (Selby 1987, 1989), supported the criticism: it was difficult to call a sixty year old contracting sawmill which was located in the lower left hand quadrant of the matrix "unsuccessful"! However, the principle of the classification has utility.

2.6 The analytical framework

The discussion presented in this chapter has concerned the behavioural assumptions of bounded rationality and satisficing; epistemological premises, especially the existential concept of partial space and the man–environment dialectic; and the formation of entrepreneurial space via the behavioural matrix. A framework for the analysis of entrepreneurial aspects of small sawmill development potential is as follows (Fig. 4): i) entrepreneurial information and awareness, ii) entrepreneurial skills and organization, iii) sawmill production structure and markets, and iv) entrepreneurial intentions. Each are considered to effect the development potential of the sawmill enterprise. On the basis of the above discussion, each of these four sets of entrepreneurial attributes are considered to be interrelated with each other, i.e. by means of the entrepreneur–enterprise–environment (partial space) trialectic. The extent to which the relationships are realized depends largely on entrepreneurial ability. Ability is, however, a complex attribute which is partly dependent upon motivation, which is again strongly related to the satisficing principle.

3 Material and analytical methods

3.1 Material

The material for the investigation was collected during the summer of 1990 by interviewing a sample of 465 sawmill owners in communes selected to represent forest management associations. The greater part of the interview material concerned the inventory of sawmill technology and their use of saw logs, in line with the small sawmill inventories made earlier, as noted in chapter 1. The sampling method and its application is discussed by Siekkinen (1991). With respect to the present investigation, the sample was representative of the c. 4000 small sawmills in Finland. The sample also proved to be regionally representative when the distribution of types of communes in the sample were compared with the structure of the distribution of commune types throughout the whole country. The comparison was made using the restricted classification of Varmola (1987) (see Petäjistö & Selby 1992).

The interview material included a number of questions designed for the present investigation. Certain questions which would ideally have been asked had to be omitted because of time and budget considerations.

Initial analyses revealed that small sawmills which fulfilled only household requirements (i.e. not even contract sawmilling) were extremely heterogeneous, and by definition were devoid of development potential (Petäjistö & Selby 1992). These sawmills were eliminated from the subsequent analyses, making the number of small sawmills remaining in the sample 399. Compound attributes were constructed by principal components analysis and added to the data matrix.

Sawmill and sawmill entrepreneurial attributes are represented by 74 original (untransformed) variables of which 32 were finally employed in the investigation (Appendix 1). Initial analysis revealed a strong positive correlation between a variable describing sawmill owner's age, and variable x_7, below, describing the length of ownership. Subsequent analyses revealed variable x_7 to be both more reliable and more versatile, and so the owner's age variable was dropped from the analyses. The accepted variables represent the following attributes:

Ownership attributes
- x_7 = Length of ownership
- x_9 = Entrepreneur's basic education

Location attributes
- x_2 = Grouping variable – sawmill operational environment

Management attributes
- x_4 = Grouping variable – sawmilling as a livelihood
- x_5 = Form of enterprise
- x_6 = Firm's management structure

Production attributes
- x_1 = Grouping variable – sawmill production structure
- x_{25} = Percentage of production for own use (other than manufacturing)
- x_{26} = Percentage of production to agriculture
- x_{27} = Percentage of production to other enterprises
- x_{28} = Percentage of production to the construction industry
- x_{29} = Percentage of production to joinery industry
- x_{30} = Percentage of production to large woodworking industries
- x_{31} = Percentage of production for export
- x_{32} = Yearly production of sawn timber (Cu.m./1989–90)

Marketing attributes
- x_8 = Active salesmanship
- x_{14} = Average activity range (km)

Information attributes
- x_{10} = Attendance at technical courses
- x_{11} = Attendance at marketing courses
- x_{12} = Attendance at management courses
- x_{15} = Information from radio & tv
- x_{16} = Information from daily paper
- x_{17} = Information from specialist papers and magazines
- x_{18} = Information from trade fairs and other special promotions
- x_{19} = Information from other entrepreneurs
- x_{20} = Information from financier
- x_{21} = Information from institutional officials
- x_{22} = Information from marketing studies
- x_{23} = Information from statistics
- x_{24} = Other information sources

Entrepreneurial skill attributes

x_{10} = Attendance at technical courses
x_{11} = Attendance at marketing courses
x_{12} = Attendance at management courses
x_{13} = Number of professional services employed

Sawmill development intentions

x_3 = grouping variable – entrepreneurial intentions

3.2 The determination of entrepreneurial attributes

It is the nature of socio-economic and behavioural attributes that they are often strongly interrelated, i.e. complex, and it is often the case that simple variables do not sufficiently represent a construct or attribute which has been defined in the theoretical frame. "Entrepreneurial ability" is a good example of such a concept. Compound variables are therefore required for the representation of such complex concepts and attributes. In the present investigation, principal components analyses are employed to create compound variables from the matrix of simple variables. Component scores are calculated for each sawmill, and are then added to the data matrix.

The compound variables represent three sets of attributes: i) entrepreneurial skills & organization, ii) production structure & market orientation, and iii) information & awareness (see Fig. 4). The models are presented in Chapter 4.

3.3 Enterprise classifications and development potential

To give the concept of development potential an empirical expression, four *a priori* classifications are employed: i) Development intentions, ii) Production typology, iii) Operational environment, and iv) Sawmilling as a livelihood.

i) *Entrepreneurs development intentions* – this classification is intended to reveal the entrepreneurs' motivations. A sawmill entrepreneur who is intending to reduce production or cease operations in the near future can naturally be expected to have a low level of aspiration. Conversely, the intention to maintain production levels or to expand in the near future is assumed to reveal greater motivation. However, intentions to maintain or expand operations are considered to be subjective; the intention is not necessarily based on objective criteria, i.e. the entrepreneur may wish to expand, but he may lack the ability to do so. The intention to reduce or cease operations, on the other hand, can be readily achieved and is seen as an objective intention. Theoretically, it is to be expected that entrepreneurs who seek to expand should possess more information and more ability than entrepreneurs with lower aspirations.

ii) *Sawmill production typology* – this classification is entirely objective, and represents a hierarchy of enterprise: contract sawmills which only sell their services but not sawn timber can theoretically be seen as *adopters*; commercial sawmills which only sell their products but not services should possesses *adapter* attributes, while contract-commercial sawmills which sell sawing services and sawn timber can be considered, as least theoretically, to be successful adopters.

iii) *The operational environment* – this classification is considered to be a further indication of entrepreneurial motivation. Thus, sawmills supplementary to agriculture are considered to be at the lower end of the entrepreneurial hierarchy, whereas sawmills operating independently or associated with a more complex woodworking environment, i.e. sawmills with further manufacturing, represent in this classification the highest degree of entrepreneurship. Theoretically, sawmills supplementary to agriculture do not necessarily depend upon a considerable amount of information, or ability to use that information, and are consequently likely to be adopters. Independent sawmills, especially those related to the joinery industry, can be expected to be based on adequate supplies of information and the ability to use that information, i.e. they can be expected to be adapters.

iv) *Sawmilling as a livelihood* – Whether or not the sawmill is the principle means of livelihood is, perhaps, the simplest means of classifying entrepreneurs. The assumption in this case is that sawmill entrepreneurs who rely entirely on sawmill incomes should be prompted to improve their ability to use information and to seek better quality information, i.e. they should be adapters.

3.4 Estimating development potential

Using the *a priori* classifications outlined in section 3.3, discriminant analysis was employed to examine which compound variables most successfully differentiate the sawmills into classes. With three sets of attributes and four *a priori* classifications, twelve discriminant models were constructed on the basis of which attributes significant to the discrimination of classes could be identified. These models are presented in detail elsewhere (Petäjistö & Selby 1992).

Having identified the most significant attributes, these could then be entered together in "combined" models, one for each *a priori* classification. In this way, each discriminant function possess variables representing the three main sets of attributes.

In discriminant analysis the main aim is to secure the minimum within-group variance and the maximum between-group variance (ultimately expressed as a table of correct and incorrect classifications). The determination of development potential is achieved by assessing the *misclassifications*. The combined discriminant analyses and the interpretation of development potential based upon them are presented in Chapter 5. The basic hypothesis in each model is that, as each classification is hierarchical, those sawmills which are misclassified to a *higher class* possess attributes which are more typical of the higher class than their own class lower in the hierarchy. For example, a contract sawmill might be misclassified on the basis of its entrepreneurial skill & organization attributes as a commercial sawmill. In such a case, the entrepreneur is not fulfilling his entrepreneurial potential.

3.5 Empirical realization of the behavioural matrix

The five compound variables (components) representing "entrepreneurial skills & organization", and the five compound variables representing "information & awareness" form a ready basis for constructing Pred's behavioural matrix. Each set of attributes being constructed by principle components, the correlation between the variables in each set are, conveniently, zero. Following the method initially used by Selby (1987, 1989), entrepreneurial skill component scores were summed to realize the *ability to use information* parameter of the matrix. Similarly, the information component scores were summed to realize the *quality & quantity of information* parameter. Correlation between the realized parameters was avoided by only using components which were free of interpretationally similar variables, which otherwise would have been suspect of technical correlation.

4 Constructing entrepreneurial attributes

4.1 Entrepreneurial skills and organization

As described in section 3.2, principal components analysis has been employed to construct compound variables describing entrepreneurial attributes from the data matrix of "original" variables. The need for compound variables results from the fact that socio-economic and behavioural attributes are invariably complex, and single variables are therefore insufficiently representative.

The first principal component model (Table 1) describes firm organization, the entrepreneurs' relationship to customers, the use of services and the attendance of skill-improving courses. Theoretically, and interpretationally, each variable possesses a positive relationship with the concept of "development" (i.e. "good" entrepreneurial skills and organization).

The components are interpreted as follows:

Es1 – Strong commercial orientation

As the component strengthens

- the activity range of the enterprise increases (x_{14});
- the firm has a higher status, and is less likely to be supplementary to agriculture (x_5);
- the enterprise/entrepreneur uses more profession services (x_{13});
- the entrepreneur is more likely to have attended a management course (x_{12});
- the firm/entrepreneur is more likely to engage in active selling (x_8).

These variables are all strongly and positively loaded on the component. The weak but positive loading of the variable describing the firm's management structure (x_5) further supports the interpretation. The component points clearly to well organized and active small sawmills with a propensity to commercialism.

Table 1. Rotated principal components model of entrepreneurial skills & organization. Loadings less than .20 are replaced by * for the sake of clarity.

Variable	Es1	Es2	Es3	Es4	Es5
x_{14}	0.78	*	*	– *	– *
x_5	0.60	– *	– *	– *	0.35
x_{13}	0.58	*	– *	*	0.32
x_{12}	0.52	*	*	0.40	*
x_7	– *	–0.84	– *	*	*
x_9	– *	0.72	– *	0.21	0.39
x_{10}	*	*	0.92	*	*
x_{11}	*	– *	– *	0.92	– *
x_6	*	*	*	– *	0.85
x_8	0.48	0.28	–0.36	*	*
Variance explained	1.89	1.35	1.06	1.11	1.17
%	18.93	13.52	10.64	11.12	11.78

Where:

Principal components
Es1 = Strong commercial orientation
Es2 = Rejuvination
Es3 = Technical skill orientation
Es4 = Entrepreneurial skill orientation
Es5 = Organization orientation

Original variables
x_5 = Form of enterprise
x_6 = Firm's management structure
x_7 = Length of ownership
x_8 = Active salesmanship
x_9 = Entrepreneur's basic education
x_{10} = Participation in technical course(s)
x_{11} = Participation in marketing course(s)
x_{12} = Participation in management course(s)
x_{13} = Number of professional services employed
x_{14} = Average activity range (km)

Es2 – Rejuvenation
As the component strengthens
- the length of present ownership decreases (x_7);
- the entrepreneur's level of basic education increases (x_9);
- their is a weak but definite propensity for active selling (x_8).

The loadings are logical. The short length of ownership infers a generation transfer or other ownership "rejuvenation" process, which is supported by the high loading of the basic education variable (a younger generation can be expected to have received a longer education). The rejuvenation process is supported by the presence of active marketing, which also points to a renewal process in management.

Es3 – Technical skill orientation
As the component strengthens
- the entrepreneur is more likely to have attended a technical course (x_{10});
- active marketing decreases (x_8).

The negative loading of variable x_8 suggests that as the component strengthens, there is less likely to be active marketing. While this would seem to contradict the weak but positive loading of the activity range variable, this is not necessarily the case. The technical skills sought by the entrepreneur (x_{10}) suggests that simple production is in question, as in contract sawing, which is often a supplementary livelihood. The entrepreneur is interested in the physical production activity of small sawmilling, but is passive or disinterested with respect to marketing.

Es4 – Entrepreneurial skill orientation
As the component strengthens
- the entrepreneur is more likely to have attended a marketing course (x_{11});
- the entrepreneur is more likely to have attended a management course (x_{12});
- the entrepreneur's level of basic education increases (x_9).

The component is clearly education oriented, with stress on management and selling rather than technical considerations. A higher level of basic education (weakly but positively loaded) associates with the propensity for further education.

Es5 – Organization orientation
As the component strengthens
- the organization of the enterprise is likely to become more complex (x_6);
- the entrepreneur's level of basic education increases (x_9);
- the enterprise is more likely to be independent of agriculture (x_5);
- there is a propensity to use professional services (x_{13}).

The very strong loading of the organization variable dictates the interpretation of the component, which clearly concerns the entrepreneurs' propensity for "rational" organization.

4.2 Small sawmill outlets

The outlet network served by the small sawmills has long been considered to be their *raison d'être*. Their small scale, production flexibility, and contact with local conditions provide, theoretically at least, justification for this belief. Evidence from earlier sawmill investigations (e.g. Huttunen 1981 and Siekkinen & Pajuoja 1992) provide further support. Thus, the small sawmills are able to satisfy local demands, whereas the medium and large scale sawmills are oriented towards export markets. Indeed, the whole question of entrepreneurship in the small sawmill industry is based on the extent to which the entrepreneur is aware of and takes advantage of local demand. As already discussed in sections 2.3 and 2.4, the dialectic relationship between the entrepreneur, his environmental awareness and firm structure are interdependent, each interacting with the other.

While a number of variables were available for examining outlets, their very number and heterogeneity of the material in general, made it very difficult to draw any logical conclusions. For this reason, principal components analysis was once again relied upon to examine the structure of the outlet system. In this way it was hoped to find tendencies or orientations towards certain markets or outlets. It has to be admitted that the modelling was experimental; the only task was to discover groupings. The analysis was not guided by theory, other than the intuitive expectation that market orientations would exist.

The principal component model (Table 2) receives the following interpretation.

Table 2. Rotated principal components model of sawmill product outlets. Loadings less than .20 are replaced by * for the sake of clarity.

Variable	Mkt1	Mkt2	Mkt3	Mkt4	Mkt5
x_{30}	0.76	*	–0.23	– *	– *
x_{32}	0.69	*	*	0.33	0.31
x_{28}	0.55	–0.22	*	– *	*
x_{26}	–0.20	0.94	– *	– *	– *
x_{25}	–0.37	–0.63	–0.60	– *	– *
x_{27}	– *	– *	0.94	– *	– *
x_{31}	*	– *	– *	0.97	– *
x_{29}	*	– *	– *	*	0.95
Variance explained	1.57	1.35	1.37	1.08	1.10
%	19.62	16.91	17.21	13.52	13.86

Where:

Principal components
Mkt1 = Supplier to industry & construction
Mkt2 = Supplier to agriculture
Mkt3 = Supplier to other enterprises
Mkt4 = Specialist exporter
Mkt5 = Supplier to joinery industry

Original variables
x_{25} = Percentage of production for own use (other than manufacturing)
x_{26} = Percentage of production to agriculture
x_{27} = Percentage of production to other enterprises
x_{28} = Percentage of production to construction & industry
x_{29} = Percentage of production to joinery industry
x_{30} = Percentage of production to large woodworking industries
x_{31} = Percentage of production for export
x_{32} = Yearly production of sawn timber (Cu.m./1989–90)

Mkt1 – Supplier to industry & construction
As the component strengthens, large scale woodworking industries (x_{30}) and the construction industry (x_{28}) are of increasing importance as outlets, whereas production for own use (x_{25}) or for agriculture (x_{26}) are negatively loaded and therefore decrease in importance as the component strengthens. The main outlets are therefore large scale consumers, and the scale of operations is supported by the strong positive loading of the variable for production quantity on this component.

Mkt2 – Supplier to agriculture
As this component strengthens, supplies to agricultural increase (x_{26}), and sawn timber for own use (x_{25}) also increase. The weak but positive loading of (x_{28}) indicates a minor role played by outlets to the construction industry.

Mkt3 – Supplier to other enterprises
This component is dominated by the very strong loading of supplies to other enterprises (x_{27}). The fact that both sawn timber for own use (x_{25}) and for the construction industry (x_{28}) are negatively loaded can be interpreted to indicate a narrow specialization, strongly suggesting subcontracting.

Mkt4 – Specialist exporter
The only two significant loadings on this component are for the proportion of production exported (x_{31}), and production per year (x_{32}), both of the same sign. Such sawmills strongly oriented towards exports, which in the case of small sawmills means product specialization.

Mkt5 – Supplier to the joinery industry
The structure of the component is virtually identical to component *Mkt4*, but with the joinery industry (x_{29}) replacing exports as the main outlet.

The principal component analysis therefore provided logical and serviceable groupings of outlets for the products of small sawmills. This is

not to say that these are the only outlets, or their only combinations. The outlets of the industry in question are extremely diversified, and the analysis by no means includes them all. Further, contracting sawmills, which have been included in the analysis, do not have "outlets" for sawn timber products, only for their services.

4.3 Information attributes

The quality and quantity of information available to the firm is considered to be of considerable importance, for it is through information that the entrepreneur forms and maintains his perception of his entrepreneurial environment, i.e. these form essential parameters of his entrepreneurial space.

Table 3. Rotated principal components model of enterprise-related information. Loadings less than .20 are replaced by * for the sake of clarity.

Variable	Inf1	Inf2	Inf3	Inf4
x_{20}	0.73	– *	– *	0.35
x_{15}	0.62	– *	0.29	– *
x_{21}	0.61	*	– *	0.34
x_{16}	0.56	0.27	*	–0.23
x_{18}	– *	0.68	*	*
x_{17}	0.25	0.67	*	*
x_{10}	*	0.64	– *	*
x_{22}	*	– *	0.73	– *
x_{23}	0.34	*	0.63	*
x_{9}	– *	*	0.58	0.20
x_{11}	– *	*	– *	0.67
x_{12}	0.24	– *	*	0.55
x_{24}	– *	0.20	0.34	0.47
x_{19}	0.40	0.29	0.24	*
Variance explained	2.04	1.59	1.66	1.34
%	14.63	11.37	11.91	9.61

Where:

x_{10} = Attendance at technical courses
x_{11} = Attendance at marketing courses
x_{12} = Attendance at management courses
x_{15} = Information from radio & TV
x_{16} = Information from daily papers
x_{17} = Information from specialist papers and magazines
x_{18} = Information from trade fairs and other special promotions
x_{19} = Information from other entrepreneurs
x_{20} = Information from financiers
x_{21} = Information from institutional officials
x_{22} = Information from marketing studies
x_{23} = Information from statistics
x_{24} = Other information sources

In the present investigation, a number of variables were available concerning the type of information available to small sawmill entrepreneurs as well as the main sources of enterprise-related information.

Again employing principal components analysis, the simple variables concerning enterprise-related information were used to create compound variables – again for the reason that simple variables are often too simple to adequately represent information attributes, and are therefore unsuitable for analytical purposes.

The model (Table 3) accounts for 47.52% of the total variance, which is considered to be acceptable.

Inf1 – Management-related & general information
As this component strengthens the following sources of information are of increasing importance:
- information from financiers(x_{20});
- information via radio & tv (x_{15});
- information from institutional officials (x_{21});
- information from daily papers (x_{16});
- information from contact with other entrepreneurs (x_{19});
- information from statistics (x_{23});
- information from specialized magazines (x_{17}).

The entrepreneur receiving high scores for this component is therefore an active information seeker, with a strong tendency to seek information from banking and other institutional officials. The fairly strong loading of x_{19} (other entrepreneurs) adds to the above to suggest that this type of entrepreneur is oriented to management-related information. The weak but positive loading of specialist magazines (x_{17}) and attendance at management courses (x_{12}) further support the interpretation.

Inf2 – Specialized technical-related information
As this component strengthens, the following sources of information are of increasing importance:
- trade fairs and promotions (x_{18});
- specialized magazines (x_{17});
- technical courses (x_{10});
- other entrepreneurs (x_{19});
- other unspecified sources (x_{24}).

The strong loadings of the first three sources define the nature of this component. Trade fairs (predominantly agricultural shows) with their wealth of machinery and technically-related information, specialized magazines (mainly technically oriented) and attendance at technical courses all point in the same direction. Other information and other entrepreneurs play only a minor role.

Inf3 – Official information
This component brings together formal reports (x_{22} – marketing studies and x_{23} – statistics) together with a fairly strong loading on level of education (x_9). Information from other information (x_{24}) and other entrepreneurs (x_{19}) are weakly but positively loaded on the component. The three strong loadings therefore indicate an orientation towards "formal" information.

Inf4 – Course-oriented practical information
As this component strengthens, the following sources of information gain in importance:
- marketing courses (x_{11});
- management courses (x_{12});
- other information (x_{24});
- information from financers (x_{20});
- information from officials (x_{21}).

The strong orientation towards management courses (x_{12}) and marketing courses (x_{11}) suggests a practical approach to information. Professional courses are invariably down-to-earth and practically oriented. The seeking after practical information gains support from the loading of both financers (x_{20}) and officials (x_{21}) on this component, as these sources also deal with very practical issues. The component can be considered to be management-related, and in this sense complements component Es1.

4.4 Statistical restrictions in the use of the compound variables

Principal components analyses resulted in the construction of 14 compound variables to describe small sawmill entrepreneurial attributes. It is the nature of principal components analysis that the components in any single model are not correlated. However, as the components of three different models are in question, and as some duplication in the use of original variables took place, it is necessary to check the new variable matrix for technical correlation. This occurred in the following pairs of components and so prevent their simultaneous use in the discriminant analyses which form the next stage of the analysis.

Components	Corr.	Common variable
Inf4/Es1	.36	x_{12} – management course
Es2/Inf3	.45	x_9 – basic education
Es4/Inf4	.75	x_{11} – marketing course
Inf2/Es3	.61	x_{10} – technical course

Which variable of each pair remained in each subsequent discriminant analysis was determined by the F-test; the variable with the lower F-value being rejected. A strong correlation between components Mkt1 and Es1 (.51) was not due to technical correlation and so both components remained as variables in the analyses.

5 Entrepreneurial attributes and development potential

5.1 Development potential by enterprise classifications

In Chapter 2, it was contended that a trialectic exists between the entrepreneur, his enterprise, and his environment. The entrepreneur–enterprise dialectic can be partially revealed by the structure of the enterprise; the trialectic by the addition of its working environment. These and other serviceable classifications have been presented in section 3.3.

Following the analytical procedure outlined in section 3.4, and employing as variables the attributes constructed in the previous chapter (i.e. entrepreneurial skill & organization, information & awareness, and outlets), discriminant analyses are now employed to examine the entrepreneur/enterprise dialectic in its various manifestations by employing the classifications referred to above.

5.2 Sawmill production structure and development potential

After testing for technical correlations, and estimating F-values (Appendix 2), nine variables form the discriminant function for sawmill production structure. The strongest discriminating qualities are agricultural supplier (Mkt2), enter-

prise supplier (Mkt3), technical skill orientation (Es3), and organization orientation (Es5). All variables are significant at less than 1 % risk.

As expected, contract sawmills are characterized by negative coefficients for commercial orientation (Es1), Rejuvination (Es2) Information seeking (Inf1 & Inf4) and supplies of sawn timber to the joinery industry (Mkt5). Positive coefficients are nonetheless achieved for technical skill orientation (Es3), as well as supplies to agriculture (Mkt2) and other enterprises (Mkt3). (Note that "supply" in this context is the supply of services.) The contract sawmills are therefore characterized by aging, and a lack of interest in organization or information. On the other hand, the sawmill owner is interested in maintaining technical skills.

Contract-commercial sawmills, as noted earlier, are sawmills which sell both sawmilling services and sawn timber. They are no longer contract sawmills selling only their services, nor are they fully commercial. The grouping coefficients reveal this position. The only negative coefficient is for organization orientation (Es5), which suggests a managerial approach closer to the contract sawmill type than the commercial type; an interpretation supported by the weak coefficient for commercial orientation (Es1). The contract-commercial sawmills also remain fairly strong suppliers to agriculture (Mkt2) and other enterprises (Mkt3), again suggestive of the contract sawmills.

The commercial sawmills, on the other hand, receive a very strong positive coefficients for organizational orientation (Es5), and positive coefficients for management-related information (Inf1), commercial orientation (Es1), rejuvenation (Es2) and supplies to joineries (Mkt5). Other attributes, e.g. technical skill orientation (Es3) and supplies to agriculture (Mkt2) obtain negative coefficients. The result suggests that technical skills are less important (presumably because they are in order) and that the firms seek long-term, reliable outlets.

On the basis of this combined model, a 61 % discrimination by sawmill types is achieved (Table 4).

The poorest discrimination occurs for the contract-commercial sawmills, as expected, given that this is an intermediate class. The discrimination for contract sawmill types and commercial types is rather good.

From the development potential standpoint, the model suggests that c.23 % of the contract sawmills could be located in a higher class,

Table 4. Allocations to groups by the discriminant function for sawmill production structure.

Class	Con	Con-comm	Comm	Total	%
Contract	**98**	26	4	128	76.5
Contract-commercial	74	**68**	34	176	38.6
Commercial	2	14	**79**	95	83.1
Total	174	108	117	399	**61.4**

Table 5. Allocations to groups by the discriminant function for entrepreneurial intentions.

Class	Term	Decr	Same	Devp	Total	%
Terminate	**4**	5	3	1	13	30.7
Decrease	7	**8**	1	5	21	38.0
Same	60	59	**58**	70	247	23.4
Develop	10	9	25	**74**	118	62.7
Total	81	81	87	150	399	**36.0**

notably as contract-commercial sawmills. Similarly, c. 20 % of the contract-commercial sawmills are misclassified into the higher "commercial" class; although over 40 % are misclassified as contract sawmills, which is to be expected given the heterogeneous nature of the class.

The 83 % correct classifications for commercial sawmills is satisfactory, but indicates that at least c.16 % of them could be deficient of the skills, information and outlet-structure that warrants their survival. They are probably capable of development.

5.3 Entrepreneurial intentions and development potential

After testing for technical correlations and estimating F-values, six variables proved to be significant. Rejuvenation of management (Es2) and management-related and general information (Inf1) obtain the strongest F-values, but all variables are significant at less than 2 % risk (Appendix 3).

Entrepreneurs intending to terminate their sawmill activities receive negative coefficients of discrimination for all variables in the model, which logically confirms expectations (Appendix 3). Entrepreneurs intending to decline also receive predominantly negative coefficients, but retain residual interest in information concerning the technical aspects of sawmilling (positive coefficient for Inf2). Those intending to maintain present production levels receive predominantly negative coefficients, but obtain positive coefficients for supplies to industry & construction (Mkt1), and supplies to other entrepreneurs (Mkt3). Finally, and perhaps most importantly, those entrepreneurs intending to expand receive positive coefficients for all attributes in question, of which the strongest are for rejuvenation (Es2), and management-related information (Inf1).

The model achieves a rather low discrimination (Table 5). However, the most successful classification takes place for entrepreneurs with intentions to develop (62 % correctly classified). Also important, are the c.28 % sawmill entrepreneurs who are misclassified from the "production unchanged" group to the "intention to develop" group. This suggests risk aversion or satisficing behaviours, but it may also suggest an unawareness of their potential for development.

5.4 Sawmills' operational environments and development potential

Again after checking for technical correlations, and a preliminary F-test, ten variables were included in the discriminant function (Appendix 4). Commercial orientation (Es1), supplies to industry & construction (Mkt1), management-related information (Inf1), and organizational orientation (Es5) gain the highest F-values, but all variables are significant at less than 1 % risk. The group classification function coefficients are presented in Appendix 4.

Sawmilling in the farm environment is characterized by negative coefficients for all the attributes in the model, including supplies to agriculture! In contrast, the independent sawmills obtain positive coefficients for all attributes, with commercial orientation (Es1) and organizational orientation (Es5) receiving the strongest coefficients.

The sawmills associated with further manufacturing gain strong positive coefficients for commercial orientation (Es1), organizational orientation (Es5), practical information (Inf4), management-related information (Inf1) sources and for the share of production exported (Mkt4). Supplies to joineries (Mkt5) and other enterprises (Mkt3) gain weak but negative coefficients.

Table 6. Allocations to groups by the discriminant function for sawmill operating environments.

Class	Farm	Indep	Manuf	Other	Total	%
Farm	**247**	23	4	22	296	83.4
Independent	30	**25**	22	13	90	27.7
Manufacturing	0	1	**7**	0	8	87.5
Other	1	0	0	**4**	5	80.0
Total	278	49	33	39	399	**70.9**

Finally, the other (institutional) small sawmills reflect the farm-based sawmills, except for the strong positive coefficient for commercial orientation(Es1), and the weak positive coefficients for outlets to joineries (Mkt5) and other enterprises (Mkt3), suggesting sub-contracting work. Thus, the institutional- and farm-related sawmills share subsidiary production-line characteristics, but with stronger commercialism and better organized outlets typifying the institution-based sawmills.

This combined model produced the best results of all the analyses: 70 % of the sawmills are correctly allocated to their respective groups (Table 6).

The weakest grouping was, as in earlier analyses, the independent group, which is misclassified into all other groups. It is by definition a heterogeneous group, which partially explains the result. Nonetheless, 24 % of the independent sawmills are misclassified into the manufacturing sawmill group, thereby indicating considerable development potential.

The largest group, sawmills on farms, are successfully discriminated, but 9 % were misclassified upwards, notably to the "independent" group, and are therefore to be considered as having development potential. The institution-oriented "other" group, which possesses many characteristics reminiscent of the farm sawmills, was successfully discriminated, with the only misclassification being to the "farm" class. Given the nature of these sawmills, their development potential is not a relevant question.

Turning to the manufacturing sawmills, in an earlier investigation (Selby 1989) sawmills with further manufacturing were considered to be the most adaptive. It is consequently reassuring to note the high accuracy of the discrimination of the manufacturing sawmill group in the present analysis. On the basis of the attributes in the

discriminant model, it can be assumed that the commercial credentials of these sawmills are more or less in order. Their further development depends upon how they react to exogenous factors.

5.5 Sawmilling as a livelihood and development potential

The fourth and last *a priori* classification of small sawmills is dichotomous, based on whether the small sawmills were operated as the main livelihood, or whether they were supplementary to another profession.

Following the now established routine, the compound variables were tested for technical correlation and subjected to the F-test, on the basis of which seven variables formed the discriminant function. The group classification functions are entirely positive for main-profession sawmills, and entirely negative for supplementary-profession sawmills (Appendix 5).

Table 7. Allocations to groups by the discriminant function for sawmilling as a livelihood.

Class	Supplem.	Main	Total	%
Supplementary	**274**	41	315	86.9
Main	25	**59**	84	70.2
Total	299	100	399	**83.5**

The discriminant analysis (Table 7) correctly assigns 83 % of the sawmills to their respective groups. However, 41 (13 %) of the supplementary profession sawmills are misclassified as main-profession sawmills on the basis of the discriminant function. In other words, they have development potential and could apparently operate as main-profession enterprises.

6 Entrepreneurial space and development potential

6.1 Realizing the behavioural matrix

The principle of the behavioural matrix has been summarized in section 2.5, above. Attempts to empirically realize the behavioural matrix have been surprisingly few given its valid theoretical premises. Selby (1989) materialized the matrix for 63 small sawmills in North Karelia, Finland employing inadequate material. Given the restricted nature of the material the results were acceptable and possessed logical consistency when compared with the structure of the small sawmills. Elsewhere, the behavioural matrix has been criticized as being inoperable on the grounds that the parameters cannot be realized (Harvey 1969). Given the limited success of the North Karelian experiment, the behavioural matrix is again realized using the larger sample represented in the present investigation.

The starting point for the realization is the two principal component analyses introduced earlier; one for entrepreneurial skills & organization (section 4.1) which is employed to materialize the ability parameter of the matrix, and the other for information & awareness (section 4.3) which is used to materialize the information parameter of the matrix.

The "information" parameter has been materialized by summing the component scores of official information (Inf3), management-related information (Inf1) and technical-related information (Inf2). The "ability" parameter has been materialized by summing the components describing entrepreneurial skill (Es4) and organizational skill (Es5).

While components of any single principal components solution are totally uncorrelated, components of different models may be correlated. If a model contains variables which are either identical with, or in technical correlation with, variables in the other model, correlation between the respective components will exist. Such is the case in the present analysis, and for this reason the components scores of each model cannot be simply summed; which is why only three information components and two ability components were summed. The correlation between the summed components was non-significant at 5 % risk.

The behavioural matrix realized for the 399 small sawmills in this investigation is presented in Fig. 5. As expected by the very nature of the small sawmills in question, the largest number of sawmills (n = 159, c. 40 %) are located in the

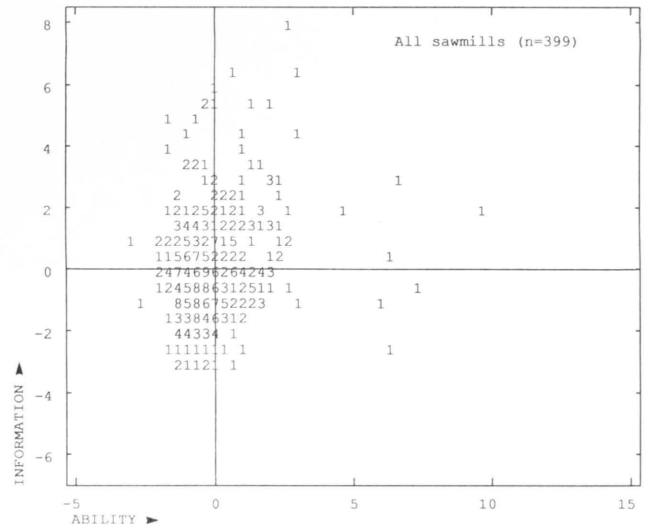

Fig. 5. The behavioural matrix realized for 399 small sawmills.

unsuccessful adopter class (little information/low ability). The next largest class (n = 87, 22 %) is that of unsuccessful adapter (much information/poor ability), while the two "successful classes are evenly populated. Successful adopters (little information/good ability) account for 75 (18.8 %) of the sawmills, while successful adapters (much information/good ability) account for 78 (19.5 %) of the sawmills.

If the small sawmill entrepreneurs are operating under the principles of the theory of the firm, they should be aiming to optimize their location on the behavioural matrix, i.e. they should be striving to possess both perfect information and perfect ability; in which case they would be located in the upper right hand quadrant of the matrix as *successful adapters*. Of the 399 sawmills, 321 (80 %) are located on the matrix sub-optimally, i.e. in other than the successful adapter quadrant (not that the sawmills located as successful adapters are even approximately optimal in absolute terms!).

Again according to the theory of the firm, those entrepreneurs employing poor information and who possess poor ability to use information should, according to the harsh laws of positive economics, be slowly removed from the landscape . However, it is clear from the average age of the small sawmills in question (24 years) and the average length of present ownership (15 years) that small sawmills are *not* ephemeral features on the landscape. The high average age of the small sawmills implies that they are acting in a boundedly rational way, while nevertheless operating sub-optimally with respect to the theory of the firm. Their entrepreneurial behaviour is intendedly rational (they obviously try to stay in business) but because of poor information or poor ability, or both, they are constrained by their entrepreneurial limitations. No feeling of failure or lack of success is involved, as satisficing behaviour maintains the balance between aspiration and achievement. *Thus, the result supports the theoretical demands for an epistemology which take into consideration real-world rather than theoretical behaviours.*

6.2 Enterprise and the behavioural matrix

6.2.1 Sawmill production structure

Several *a priori* sawmill classifications have been employed during this investigation. The idea being that by constructing complementary

Table 8. Sawmill production structure by adapter-adopter classes, %.

Class	Con	Con-Comm	Comm	n
Successful adapter	15	21	23	78
Successful adopter	15	13	34	75
Unsuccessful adapter	22	29	7	87
Unsuccessful adopter	47	37	36	159
Total	100	100	100	399
n	128	176	95	

Pearson Chi-square = 32.86; d.f. 6; p. = 0.00.

Table 9. Sawmill development intentions by adapter-adopter classes, %.

Class	Term	Decl	Same	Devp	n
Successful adapter	33	14	9	8	78
Successful adopter	9	23	19	23	75
Unsuccessful adapter	31	19	14	0	87
Unsuccessful adopter	26	43	57	69	159
Total	100	100	100	100	399
n	13	21	247	118	

Pearson Chi-square = 44.10; d.f. 9; p.= 0.00.

hierarchical classifications for the small sawmills, various aspects of the entrepreneur/enterprise/environment (partial space) trialectic can be represented. Given the existence of these classifications, it is of interest to examine how they are positioned on the behavioural matrix.

With respect to sawmill production structure, there are three classes: contract sawing, contract-commercial sawing and commercial sawing. Their distribution on the behavioural matrix (Table 8) lends cautious support to the trialectic.

Thus, of the highest class in the hierarchy, commercial sawmills, c.57 % are found in the *successful* quadrants of the matrix, i.e. they possess good ability but have more or less information. The remaining 43 % have less ability. Of concern, at least on the theoretical grounds, is the fairly large proportion of commercial sawmills (c.36 %) located in the *unsuccessful adopter* class (little information, poor ability). Their commercialism would not seem to be well founded, and it could be argued that they may not survive in a competitive environment.

At the other end of the hierarchy, contracting sawmills are clustered (70 %) in the *unsuccessful* quadrants (poor ability/more or less information), with the greatest proportion being *unsuccessful adopters* (poor ability/little information).

The central group of sawmills (contract-commercial) fall mainly into the *unsuccessful* quadrants (66 %), with the peak occurring in the *unsuccessful adopter* class (36.9 %), as with contract sawmills. However, the contract-commercial sawmills are divided 50: 50 between the adapter and adopter classes, whereas nearly two-thirds of the contract sawmills are located in adopter classes. The result reveals a strong entrepreneurial element in the contract-commercial sawmills. *The result suggests that contract-commercial sawmills possess development potential.*

6.2.2 Sawmill development intentions

It is to be expected that sawmill owners who intend to decrease or terminate production no longer exhibit a keen interest in the operation of their firm. Such an assumption is fully supported by the location of these entrepreneurs on the behavioural matrix (Table 9). Over half of the "declining" sawmills, and over two thirds of the "terminating" sawmills are located in the *unsuccessful adopter* quadrant (little information/poor ability).

The largest group in this classification are those entrepreneurs not intending to make changes. These largely correspond to farm-located, supplementary income sawmills, and it is typical of this group that they are largely *adopters* (66.4 %, of which the majority are unsuccessful adopters).

The most interesting group from the standpoint of development potential are those entrepreneurs who intend to develop their enterprise. First, it is to be noted that the sawmill entrepreneurs who intend to develop constitute half of the *successful adapter* class and over 40 % of the *unsuccessful adapter* class (Fig. 5). The result lends support for the adapter/adopter classification as the majority of the "developers" are located in the *adapter* quadrants of the matrix. On the other hand, 31 % of the "developing" sawmills are located in the *unsuccessful adapter* class (Table 9), which indicates that these sawmills would benefit from ability-improving extension activities.

Not all the entrepreneurs who intend to develop their firms base their intentions on sound premises, as noted in chapter 4. Indeed, nearly one fifth of the *unsuccessful adopters* are intending "developers" (Fig. 5), while over one quarter of the intending developers are classified as *unsuccessful adopters* (Table 9).

Thus, while the majority of sawmills intending to develop would appear to be making judgements on sound premises, a large number are making speculative judgements.

Table 10. Sawmill operating environments by adapter-adopter classes, %.

Class	Other	Manuf	Indep	Farm	n
Successful adapter	0	75	35	13	78
Successful adopter	40	25	17	19	75
Unsuccessful adapter	20	0	20	23	87
Unsuccessful adopter	40	0	28	44	159
Total	100	100	100	100	399
n	5	8	90	296	

Pearson Chi-square = 42.67; d.f. 9; p.= 0.00.

Table 11. Sawmilling as a livelihood by adapter-adopter classes, %.

Class	Supp	Main	n
Successful adapter	15	37	78
Successful adopter	21	9	75
Unsuccessful adapter	21	26	87
Unsuccessful adopter	43	27	159
Total	100	100	399
n	315	84	

Pearson Chi-square = 26.35; d.f. 3; p.= 0.00.

6.2.3 Sawmill operational environments

If it is assumed that the environment in which the sawmill operates is one expression of the *man–environment* dialectic discussed in section 23, then can be expected that as the operating environment improves, the level of enterprise will also improve, and *vice versa*. It is therefore to be expected that sawmills operating in the farming environment, because of their supplementary nature, will be more likely to be located as adopters. In the event, nearly two-thirds of the sawmillers operating in the farm environment are adopters, with the majority being *unsuccessful adopters* (Table 10).

Independent sawmillers, on the other hand, can be expected to form the greater part of their income from their sawmilling activities, and should therefore be in possession of more information and greater skills if they are to survive. Of the 90 independent sawmills investigated, over half (56 %) were located in adapter classes, suggesting boundedly rational behaviours on the parts of the entrepreneurs. Nonetheless, over one quarter of the independent sawmill entrepreneurs were classified as *unsuccessful adopters*.

The highest class is considered to be the sawmills associated with further manufacturing. The more industrial operational environment is assumed to put greater demands on efficient organization, but also the greater value added derived from manufacturing places this type of sawmill in a higher class. Thus, the entrepreneur, if he is boundedly rational, should posses good information and the ability to use that information. Of the sawmill entrepreneurs in a manufacturing environment, 75 % exhibit *successful adapter* qualities, while the remainder are *successful adopters* (Table 10). The result suggests that the latter entrepreneurs should seek guidance on aspects of management and the use of information.

The class of "other" operating environments, as explained in section 33, mainly concerns small sawmills with institutional functions. They are supplementary activities, and as such often resemble sawmills in the farming environment.

6.2.4 Sawmilling as a livelihood

Finally, the dichotomous class concerning entrepreneurs' dependence upon sawmilling as a livelihood is examined with respect to the behavioural matrix (Table 11). To be boundedly rational, the decision to depend upon sawmilling incomes should be based on reasonable amounts of information and reasonable ability to use that information. Thus, the entrepreneur depending on sawmilling as his main livelihood should be an *adapter*, preferably a *successful adapter*. In the event, over one third of the "main profession" entrepreneurs are located on the matrix as *successful adapters*, and over one quarter as *unsuccessful adapters*. The latter group require

to improve their ability to use information if their potential is to be fully realized. Of the remaining 36 % of the "main profession" sawmills, 10 % are classified as *successful adopters*, which means that while ability is above average, the quantity and/or quality of information is poor. Finally, over one quarter (27 %) possess poor information and poor ability. The longevity of these sawmills in a rapidly changing environment might seriously be questioned.

Nearly two-thirds of the entrepreneurs whose sawmilling forms a supplementary income are located on the matrix as *adopters* (Table 11). The result is logically consistent. However, over one third are located as *adapters* (15 % successful, 21 % unsuccessful), and are thus in possession of good ability, but have more or less information at their disposal (recall that most sawmill entrepreneurs are passive with respect to information!). It would seem that these sawmills are capable of development, and could possibly become the main livelihood of the entrepreneur.

6.3 Quantitative and qualitative aspects of small sawmill development potential

6.3.1 A quartile approach to the behavioural matrix

In the previous section, the materialized behavioural matrix was examined with reference not only to the adapter/adopter classes inherent in the matrix concept, but also with respect to *a priori* sawmill classifications. There is, however, another way of approaching the concept of development potential within the frame of the behavioural matrix. The approach, based on quartile analysis, has the advantage of simplifying the use of the adapter/adopter classification and provides an assessment of the qualitative and quantitative aspects of advisory activities which would be required to improve the positions on the behavioural matrix of the sawmills with the greatest development potential. In other words, the aim is to maximize the number of successful adapters.

In quartile analysis, the data set is ranked by some central attribute, and divided into quartiles which can then be analyzed individually. In the present case, the ranking was based on the sum of the information and ability variables employed in the materialization of the matrix: in other words, a temporary "information + ability" index was created. Ranked, this index was then divided into three equal quartiles of 100 sawmills, with the upper quartile possessing 99 sawmills. From the standpoint of development potential, undoubtedly the most important quartiles are the upper two; after all, the sawmills in these two quartiles are, by definition, the most competent.

6.3.2 Development assessments by quartiles

The upper quartile

Of the 99 sawmills located in the upper quartile (Fig. 6) two-thirds are successful adapters. Similarly, it is no surprise that 86 % of the successful adapters are found in the upper quartile. However, unsuccessful adapters and successful adopters (20 % and 12 % respectively) are also found in the upper quartile. The result suggests that these sawmills are very close to attaining successful adapter status. The means to achieve their "improvement" follows from their position on the behavioural matrix. *The unsuccessful adapters require to participate in extension activities aimed at improving their ability to use the information they already appear to possess.* On the other hand, *the successful adopters require more information.* As the passivity of small sawmill entrepreneurs with respect to information gathering has already been demonstrated (Selby 1984, 1989, Petäjistö & Selby 1992), *it is important that information should be transmitted by means likely to reach the entrepreneurs in question.*

The importance of such extension work is emphasized by the fact that 46 % of the sawmills in the upper quartile have expressed the intention to develop their activities in the near future. Indeed, 39 % of all those sawmill entrepreneurs who declared an intention to develop their enterprise are located in the upper quartile. On the basis of *adapter* criteria, it is just these 39 % whose intention to develop their enterprise is justified, i.e. they possess sound information and ability.

All the sawmills in the "manufacturing" operational environment are located in the upper quartile, as are 34 % of the "independent" sawmills. Perhaps surprisingly, nearly one fifth of the farm-related sawmills are also found in the upper quartile.

The upper-middle quartile

One hundred sawmills are located in the upper-

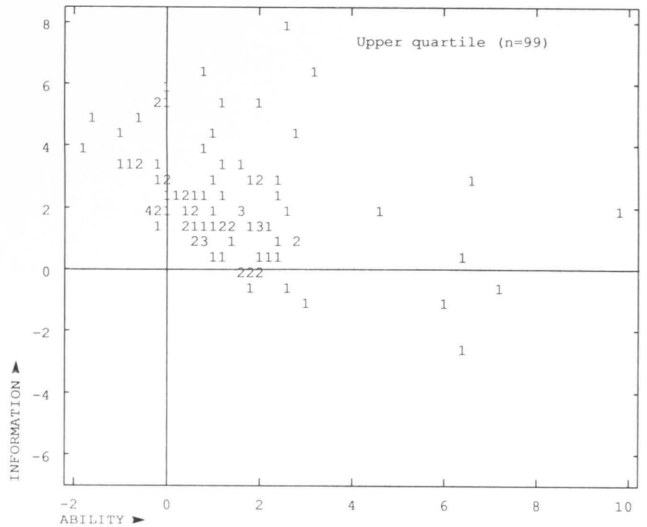

Fig. 6. Upper quartile sawmills on the behavioural matrix.

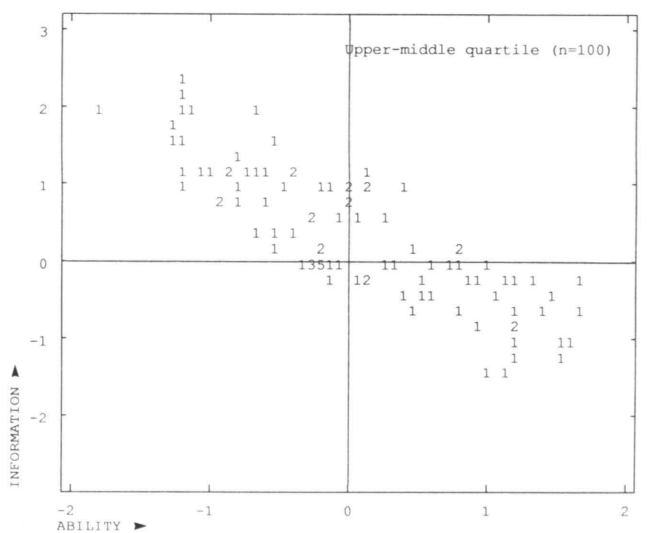

Fig. 7. Upper-middle quartile sawmills on the behavioural matrix.

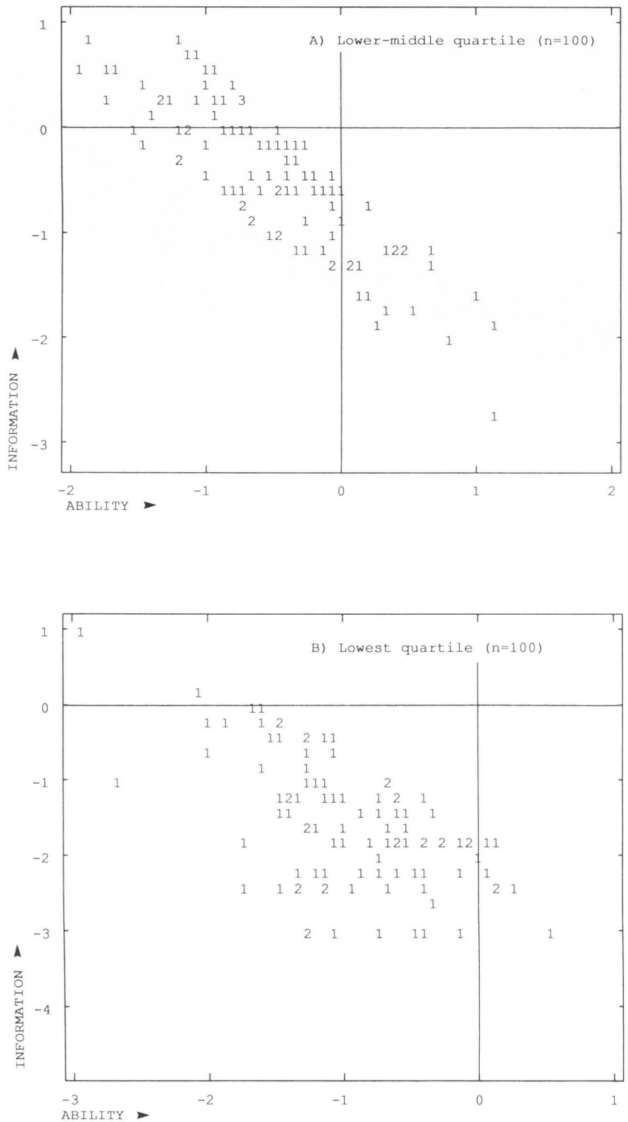

Fig. 8. Lower-middle quartile (A) and lowest quartile (B) sawmills on the behavioural matrix.

middle quartile, of which 11 % are successful adapters (Fig. 7). Unsuccessful adapters form the largest class (41 %) closely followed by successful adopters (36 %). Twelve percent of the sawmills located in the quartile are unsuccessful adopters. Thus, again assuming that the successful adapters are *relatively optimal* and not in immediate need of advisory support, 77 % of the sawmills in the middle-upper quartile would benefit from advisory activities relating to information and ability to use information aimed at raising their status to that of *successful adapters*.

Nearly one third of the sawmill entrepreneurs in the upper-middle quartile expressed the intention to develop, i.e. 26 % of all sawmills with development intentions. It is less likely that the decisions of these entrepreneurs to develop are based on sound information and ability. The intention is far more "subjective", i.e. *adopter* behaviour is clearly in question.

The lower quartiles

The lower two quartiles contain, by definition, one half of the sawmills in the investigation. None of them fall into the successful adapter class, although approximately one quarter of both the unsuccessful adapters and successful adopters are located in the lower-middle quartile (Fig. 8a & b). A fifth of the sawmills in both quartiles are entrepreneurs intending to develop their activities, i.e. one third of all entrepreneurs intending to develop their firms, but it is arguable whether such intentions are realistic, especially given that 91 % of the sawmills in the lowest quartile are *unsuccessful adopters* – and therefore by definition possess little information and poor ability to use information.

7 Summary and discussion

7.1 Summary of the investigation

The aim of the investigation has been to attempt to identify types of small sawmills which would appear to possess development potential. The problem has been framed within the context of the Rural Development Act which provides for extension activities in rural professions. With the likelihood that the role of agriculture in the countryside will substantially change during the next decade or two, the viability of the countryside will increasingly rest on the development of alternative sources of employment and income.

It was pointed out in Chapter 1 that *development* does not necessarily depend upon large-scale investments. It is considered to be the placing of the small sawmill on a more secure entrepreneurial footing. It is a behavioural as much as a physical concept. The *potential* concept is seen to be entirely behavioural. The aim is to try and determine to what extent entrepreneurs are not fully responding to their current environment.

In order to examine the behavioural aspects of the small sawmill enterprises in the investigation, a non-positivistic epistemology closely related to existential phenomenology is adopted (Chapter 2). The entrepreneur is considered to be the creator of his own world, but constrained by both doubts and social norms. In this way, his enterprise structure and his entrepreneurship form a dialectic. Similarly, his network of cognitive relationships to his surroundings, via information and learning, creates an entrepreneur–environmental dialectic, thereby creating an entrepreneur–enterprise–environment trialectic. The investigation also assumes that the entrepreneur possesses bounded rationality, and has satisficing motives.

Development is therefore seen rather as a strengthening of the entrepreneur–enterprise–environment (partial space) trialectic brought about by improved information concerning the business environment and opportunities for business, and an increased ability to use that information. In other words, a better perception of opportunities, and an expansion of (behavioural) entrepreneurial space.

Chapter 2 also examines the theoretical concept of the *behavioural matrix* which offers a suitable frame for approaching the empirical analysis.

Chapter 3 reviews the material and methods used in the investigation, and also presents *a priori* sawmill classifications which the method necessitates. These classifications concern i) sawmill production structure, ii) entrepreneurial

intentions, iii) activity environment, and iv) sawmilling as a livelihood.

The so-called original variables, simple variables derived from interviews are not in themselves suitable for representing complex socio-economic and behavioural constructs, and in Chapter 4 a set of principal component models are employed to construct compound variables more appropriate for the analytical task of estimating development potential. The models presented in Chapter 4 concern i) entrepreneurial skill & organization (five components), ii) entrepreneurial information and awareness (four components), and iii) outlets of sawmill products (five components). The scores of these 14 components form new data which are added to the data-set.

Chapter 5 presents discriminant analyses based on the 14 compound variables (components) and the *a priori* sawmill classifications. On the basis of the discriminant analyses it is possible to estimate the number of sawmills in each class which would seem to possess development potential. The method aims to maximize the between-class variance and minimize the within-class variance based on the attributes which form the discriminant function. Of interest in the present analysis has been the misclassifications, especially those sawmills which have been misclassified to a higher class on the basis of their attributes. It is contended that it is these sawmills which possess development potential.

In Chapter 6, a different approach is taken to the estimation of development potential, one which more fully accords with the assumptions and philosophical premises of the frame of reference. The aim to examine the entrepreneurs' (existential) partial space, i.e. entrepreneurial space, by means of the behavioural matrix.

Using entrepreneurial ability and information variables constructed in Chapter 4, the behavioural matrix is realized for the 399 sawmills in the investigation. The locations of the sawmills on the matrix is then analyzed employing an adapter/adopter classification. "Adapters" have good ability to use information, but more or less information at their disposal. These entrepreneurs are assumed to have greater potential as they are more able to use their large entrepreneurial space. "Adopters" are not innovators, they copy the successful acts of adapters. They possess less ability, and more or less information. An "information/ability" index is employed to rank the small sawmill entrepreneurs and the ranking is then subject to quartile analysis, again employing the behavioural matrix and its "adapter/adopter" classification. The result of the quartile analysis is unambiguous. The upper quartile, i.e. the 99 "best" sawmills, are dominated by successful adapters with their relatively good information and their relatively good ability to use information.

7.2 Discussion

The investigation employs a similar approach to an earlier small sawmill investigation (Selby 1989); a study which experimentally employed the epistemology and methodology applied in the present work. It is therefore not surprising that the results are similar. A doubt was raised in the previous investigation (Selby 1989; 24) concerning the applicability of the results from such a limited number of small sawmills in a "problem" region to the wider spectrum of small sawmills throughout the country. It was also argued that the sawmilling environment in eastern Finland where that investigation was conducted was very different to that of western Finland where there is a long tradition of sawmilling. In the event, the present investigation does not support these criticisms. Neither Siekkinen & Pajuoja (1992) found significant regional variations in small sawmill activities. Further, Petäjistö & Selby (1992), using a degree of development classification constructed for the Rural Livelihood Project (Varmola 1987), found little evidence that any particular type of commune was better or worse for sawmilling. Similarly, the distribution by commune types of upper quartile sawmills (see Chapter 6) was almost identical to the distribution of all sawmills in the investigation.

Of significance to rural socio-economic development would appear to be the fact that small sawmill entrepreneurs classified as *adapters* tend to use greater quantities of (locally supplied) saw logs and employ more (local) labour than small sawmills in the *adopter* classes (Table 12). Improving the quantity and quality of sawmill owners' enterprise-related information, and improving entrepreneurs' abilities to use that information, thereby raising adopters to adapter status, would seem to imply direct regional socio-economic benefits.

Criticism has also been raised about the possibility of realizing the behavioural matrix. Given the provisional success of the previous realization for North Karelian small sawmills using inferior material, and the logically consistent results of the present realization, which uses a much larger sample and better data, the method should be recognized as having potential.

Table 12. Small sawmills' labour and saw log consumption, by adapter-adopter classes.

Class	n	Labour force x	Labour force s.d.	Saw logs m^3 x	Saw logs m^3 s.d.
Successful adapter	78	3.4	3.0	1486	1829
Unsuccessful adapter	87	2.1	1.5	1231	1559
Successful adopter	75	2.4	1.0	319	690
Unsuccessful adopter	159	1.8	0.9	647	924

Sawmills which fulfill the criteria of *successful adapters*, i.e. that are in possession of qualitatively and quantitatively satisfactory information and who have ability to use that information are in the strongest position with respect to future development. It is significant that the larger part of the upper quartile of sawmills were adapters. However, the upper middle quartile also possessed sawmills which, while performing unsatisfactorily with regard to either ability or information were sufficiently close to being successful adapters to make advisory activities both relevant and potentially beneficial.

The central obstacle to small sawmill development would appear to be a lack of information. Information forms the key to the entrepreneur–enterprise dialectic; *i.e.* to the formation of entrepreneurial space. As demonstrated by Selby (1989) and Petäjistö & Selby (1992) small sawmill entrepreneurs are very passive with respect to the acquisition of enterprise-related information; over three-quarters do not profess to actively seek enterprise-related information. Clearly, any advisory work which might be proposed for releasing the development potential of small sawmills has to cross this hurdle first. For example, information in the "passive" media might be increased[1]. A viscous circle is present here. The passivity toward information creates a higher threshold with respect to development activities because of the man–environment dialectic. Less information means, by definition, less understanding of the environment for business (which implies less ability): *i.e.* a restrictive entrepreneurial space.

The structure of the attributes constructed by principal components in Chapter 4, and test against the *a priori* sawmill classifications in Chapter 5 give some clues as to advisory procedures. For example the relationship between the better developed classes and larger saw timber purchasers, and the relationships between production and the joinery industry suggest that advisory activities might address the task of improving the relationships between production and markets. As noted in Chapter 1, such improvement activities may not require large investments[2].

Technical skills do not appear to be a problem in the small sawmill industry. Even sawmill owners planning to decrease or terminate production exhibited an interest in sawing technology (see also Petäjistö & Selby 1992). It is the nature of the small sawmill entrepreneurs that their enterprise is activity based, commercialism and practical administration of the firm do not concern the majority of these entrepreneurs. Nonetheless, ability to handle administrative matters might help raise the confidence and therefore aspirations of many enterprises with development potential. Again, advisory activities should encourage owners' interest in these aspects of enterprise. Indeed, a rudimentary analysis of small sawmill entrepreneurs perceived problems (Petäjistö & Selby 1992) clearly demonstrated a perceived absence of technical problems, while perceived problems with material supplies, labour, and officials, for example, increased markedly as the sawmills became more commercially oriented or development intentions strengthened.

Nonetheless, it has to be remembered that the evidence presented in this investigation supports the behavioural assumptions made at the outset; *i.e.* that small-scale entrepreneurs in rural areas have a strong propensity to be satisficers, and that they act, at best, in boundedly rational ways. Both behavioural attributes may prove to be real obstacles to the realization of the full potential of small sawmills in rural Finland. Advisory programmes should be fully aware of this fact.

[1] It should be stressed that even those sawmills located in the upper quartile by means of their relatively good performance with respect to information do not necessarily possess satisfactory levels of information in absolute terms. All positions on the behavioural matrix are relative.

[2] A simple practical example of how value-added can be increased by as much as 30 % is the sorting of sawn timber at the sawmill, rather than selling "job lots".

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A total of 84 references

Seloste

Tutkimus piensahojen yrittäjyydestä

Tutkimuksessa selvitettiin haastattelemalla 399 teollisuustilaston ulkopuolisen piensahan toimintaa, organisaatiota, yrittäjyyden luonnetta, yritystoimintaa koskevan informaation lähteitä, informaation hyväksikäyttöä ja sahatavaran markkinoita. Näiden tekijöiden perusteella arvioitiin sahojen kehittämisedellytyksiä ja kehittämisen mukanaan tuomia vaikutuksia työllisyyteen ja raakapuun käyttöön.

Menetelminä käytettiin pääkomponenttianalyysiä ja erotteluanalyysiä. Pääkomponenttianalyysiä käytettiin mm. muodostamaan Predin käyttäytymismatriisi. Käyttäytymismatriisilla pyrittiin selvittämään vuorovaikutuksia, jotka vallitsevat informaation ja kyvyn käyttää informaatiota hyväksi sekä yrityksen toiminnan välillä.

Sahaus piensahoilla oli useimmiten sivutoimista ja kausiluonteista. Päätoimenaan sivutoimisilla sahanomistajilla oli yleensä maa- ja metsätalous. Kaikista sahoista yli puolet oli yli 20 vuotta vanhoja. Myös sahojen omistajat olivat varsin iäkkäitä.

Sahoista noin 4 % aikoi lähitulevaisuudessa lopettaa toimintansa ja toimintaa aiottiin supistaa noin 5 %: lla sahoista. Neljänneksellä sahoista aiottiin kehittää toimintaa.

Kehittämisedellytysten arvioimiseksi selvitettiin sahojen toimintamuoto, tulevaisuuden suunnitelmat, toimintaympäristö ja sahauksen asema elinkeinona. Kehittämisedellytyksiä arvioitiin yrittäjyyden ja sahojen organisaation, sahatavaran markkinoiden ja yritystoimintaa koskevan informaation ja sen hyväksikäytön suhteen.

Yritystoimintaa koskevan informaation hankintaa ja sen hyväksikäyttöä tehostamalla kehittämisedellytykset paranisivat huomattavasti, koska sahat osoittautuivat passiivisiksi tässä suhteessa. Keskeinen ongelma tällä hetkellä onkin, kuinka passiiviset yrittäjät voitaisiin houkutella jo olemassa olevillekin kursseille tai hankimaan saatavilla olevaa tietoa yritystoiminnasta.

Appendix 1. Statistics of variables employed in the investigation.

Var	n	Minimum	Maximum	Range	Mean	S.D.
Original variables						
x_1	399	1.00	3.00	2.00	1.91	0.74
x_2	399	1.00	4.00	3.00	1.30	0.57
x_3	399	1.00	4.00	3.00	3.17	0.66
x_4	399	1.00	2.00	1.00	1.21	0.40
x_5	399	1.00	4.00	3.00	1.59	0.82
x_6	399	1.00	2.00	1.00	1.23	0.42
x_7	399	0.00	70.00	70.00	15.67	12.39
x_8	399	0.00	100.00	100.00	9.63	18.53
x_9	399	1.00	7.00	6.00	2.62	1.93
x_{10}	399	1.00	2.00	1.00	1.42	0.48
x_{11}	399	1.00	2.00	1.00	1.01	0.12
x_{12}	399	1.00	2.00	1.00	1.04	0.20
x_{13}	399	1.00	4.00	3.00	1.59	0.79
x_{14}	399	0.00	223.00	223.00	23.43	26.49
x_{15}	399	1.00	3.00	2.00	1.22	0.44
x_{16}	399	1.00	3.00	2.00	1.80	0.59
x_{17}	399	1.00	3.00	2.00	2.05	0.82
x_{18}	399	1.00	3.00	2.00	1.86	0.57
x_{19}	399	1.00	3.00	2.00	1.80	0.58
x_{20}	399	1.00	3.00	2.00	1.13	0.35
x_{22}	399	1.00	3.00	2.00	1.03	0.21
x_{23}	399	1.00	3.00	2.00	1.12	0.36
x_{24}	399	1.00	3.00	2.00	1.21	0.51
x_{25}	399	0.00	100.00	100.00	23.04	35.83
x_{26}	399	0.00	100.00	100.00	33.78	30.41
x_{27}	399	0.00	100.00	100.00	26.34	25.92
x_{28}	399	0.00	100.00	100.00	6.09	16.01
x_{29}	399	0.00	75.13	75.13	2.33	8.38
x_{30}	399	0.00	100.00	100.00	2.37	12.24
x_{31}	399	0.00	95.00	95.00	0.39	5.09
x_{32}[1]	399	–0.58	6.46	7.04	0.09	1.04
Principal components						
Es1	399	–1.92	6.60	8.52	–0.00	1.00
Es2	399	–3.25	2.30	5.55	0.00	1.00
Es3	399	–2.73	1.85	4.59	0.00	1.00
Es4	399	–1.22	8.30	9.52	–0.00	1.00
Es5	399	–1.73	3.97	5.71	–0.00	1.00
Inf1	399	–1.97	4.97	6.94	0.00	1.00
Inf2	399	–2.66	2.54	5.21	0.00	1.00
Inf3	399	–1.72	8.21	9.94	0.00	1.00
Inf4	399	–1.97	7.00	8.97	–0.00	1.00
Mkt1	399	–0.77	6.17	6.94	0.00	1.00
Mkt2	399	–1.47	2.07	3.54	–0.00	1.00
Mkt3	399	–2.26	2.60	4.86	0.00	1.00
Mkt4	399	–0.79	18.12	18.91	0.00	1.00
Mkt5	399	–2.30	8.21	10.52	0.00	1.00

Where:

Original variables

x_1 = grouping variable — sawmill production structure
x_2 = grouping variable — sawmill operational environment
x_3 = grouping variable — entrepreneurial intentions
x_4 = grouping variable — sawmilling as a livelihood
x_5 = Form of enterprise
x_6 = Firm's management structure
x_7 = Length of ownership
x_8 = Active salesmanship
x_9 = Entrepreneur's basic education
x_{10} = Attendance at technical courses
x_{11} = Attendance at marketing courses
x_{12} = Attendance at management courses
x_{13} = Number of professional services employed
x_{14} = Average activity range (km)
x_{15} = Information from radio & TV
x_{16} = Information from daily paper
x_{17} = Information from specialist papers and magazines
x_{18} = Information from trade fairs and other special promotions
x_{19} = Information from other entrepreneurs
x_{20} = Information from financier
x_{21} = Information from institutional officials
x_{22} = Information from marketing studies
x_{23} = Information from statistics
x_{24} = Other information sources
x_{25} = Percentage of production for own use (other than manufacturing)
x_{26} = Percentage of production to agriculture
x_{27} = Percentage of production to other enterprises
x_{28} = Percentage of production to the construction industry
x_{29} = Percentage of production to joinery industry
x_{30} = Percentage of production to large woodworking industries
x_{31} = Percentage of production for export
x_{32} = Yearly production of sawn timber (Cu.m./1989–90)

Principal components

Es1 = Strong commercial orientation
Es2 = Rejuvination
Es3 = Technical skill orientation
Es4 = Entrepreneurial skill orientation
Es5 = Organization orientation

Inf1 = Management-related & general information
Inf2 = Specialized technical-related information
Inf3 = Official information
Inf4 = Course-related practical information

Mkt1 = Supplier to industry & construction
Mkt2 = Supplier to agriculture
Mkt3 = Supplier to other enterprises
Mkt4 = Specialist exporter
Mkt5 = Supplier to joinery industry

Appendix 2. Summary of the discriminant analysis of sawmill production structure.

Univariate F tests:

Variable	ss	df	ms	f	p
Es1	11.51	2	5.75	5.89	0.00
Es2	7.01	2	3.50	3.55	0.03
Es3	41.95	2	20.97	23.33	0.00
Es5	30.85	2	15.42	16.63	0.00
Inf1	5.61	2	2.80	2.83	0.06
Inf4	4.80	2	2.40	2.42	0.09
Mkt2	148.46	2	74.23	117.80	0.00
Mkt3	58.26	2	29.13	33.95	0.00
Mkt5	6.51	2	3.25	3.29	0.03

Multivariate test statistics

Wilks' Lambda	= 0.40
F-statistic	= 20.03
Degrees of freedom	= 22,77
Probability	= 0.00

Where:
Es1 = Strong commercial orientation
Es2 = Rejuvination
Es3 = Technical skill orientation
Es5 = Organization orientation
Inf1 = Management-related & general information
Inf4 = Course-related practical information
Mkt2 = Supplier to agriculture
Mkt3 = Supplier to other enterprises
Mkt5 = Supplier to joinery industry

Canonical correlations:

1	2
0.752	0.238

Dependent variable canonical coefficients standardized by conditional (within groups) standard deviations:

	1	2
Es1	0.17	0.27
Es2	0.10	0.54
Es3	–0.14	0.20
Es5	0.30	–0.34
Inf1	0.11	0.25
Inf4	–0.03	0.31
Mkt2	–0.89	–0.20
Mkt3	–0.67	0.20
Mkt5	0.16	0.20

Canonical loadings (correlations between conditional dependent variables and dependent canonical factors):

	1	2
Es1	0.10	0.52
Es2	0.01	0.54
Es3	–0.29	0.21
Es5	0.24	–0.29
Inf1	0.06	0.36
Inf4	0.01	0.44
Mkt2	–0.67	–0.20
Mkt3	–0.35	0.41
Mkt5	0.09	0.29

Group classification function coefficients:

	contract sawmills	contract commercial	commercial
Es1	–0.26	0.03	0.29
Es2	–0.25	0.12	0.11
Es3	0.10	0.09	–0.31
Es5	–0.24	–0.17	0.66
Inf1	–0.18	0.03	0.18
Inf4	–0.04	0.09	–0.11
Mkt2	1.28	0.21	–2.12
Mkt3	0.73	0.24	–1.44
Mkt5	–0.22	0.01	0.28
Constants	–1.72	–1.16	–2.96

Appendix 3. Summary of the discriminant analysis of entrepreneurial development intentions.

Univariate F tests:

Variable	ss	df	ms	f	p
Es1	9.37	3	3.12	3.17	0.02
Es2	44.58	3	14.86	16.61	0.00
Inf1	20.90	3	6.97	7.30	0.00
Inf2	10.70	3	3.56	3.64	0.01
Mkt1	10.11	3	3.37	3.43	0.01
Mkt3	9.62	3	3.21	3.26	0.02

Multivariate test statistics

Wilks' Lambda	= 0.79
F-statistic	= 5.06
Degrees of freedom	= 18,1103
Prob.	= 0.00

Where:
Es1 = Strong commercial orientation
Es2 = Rejuvination
Inf1 = Management-related & general information
Inf2 = Specialized technical-related information
Mkt1 = Supplier to industry & construction
Mkt3 = Supplier to other enterprises

Canonical correlations:

1	2	3
0.42	0.13	0.07

Dependent variable canonical coefficients standardized by conditional (within groups) standard deviations:

	1	2	3
Es1	0.15	0.15	–0.07
Es2	0.77	0.07	0.00
Inf1	0.44	0.05	–0.72
inf2	0.20	0.80	0.40
Mkt1	0.08	–0.56	0.30
Mkt3	0.21	–0.61	0.55

Canonical loadings (correlations between conditional dependent variables and dependent canonical factors):

	1	2	3
Es1	0.32	–0.24	–0.13
Es2	0.75	0.11	0.09
Inf1	0.48	–0.12	–0.62
Inf2	0.28	0.66	0.53
Mkt1	0.32	–0.37	0.10
Mkt3	0.29	–0.47	0.51

Group classification function coefficients:

	Term	Decr	Same	Devp
Es1	–0.09	–0.02	–0.05	0.12
Es2	–0.53	–0.52	–0.20	0.57
Inf1	–0.03	–0.29	–0.13	0.33
Inf2	–0.35	0.29	–0.08	0.17
Mkt1	–0.11	–0.36	0.02	0.03
Mkt3	–0.28	–0.48	0.00	0.11
Constants	–1.667	–1.773	–1.418	–1.633

Where:
Term = Intention to terminate production
Decr = Intention to decrease production
Same = Intention to continue production unchanged
Devp = Intention to develop

Appendix 4. Summary of the discriminant analysis of sawmill operational environments.

Univariate F tests:

Variable	ss	df	ms	f	p
Es1	92.56	3	30.85	39.90	0.00
Es5	42.22	3	14.07	15.62	0.00
Inf1	43.07	3	14.35	15.97	0.00
Inf3	16.88	3	5.62	5.83	0.00
Inf4	15.30	3	5.10	5.26	0.00
Mkt1	62.58	3	20.86	24.56	0.00
Mkt2	6.25	3	2.08	2.10	0.09
Mkt4	9.28	3	3.09	3.14	0.02
Mkt3	6.56	3	2.19	2.21	0.08
Mkt5	12.14	3	4.05	4.14	0.00

Multivariate test statistics

Wilks' Lambda	= 0.57
F-statistic	= 7.88
Degrees of freedom	= 30,1164
Prob.	= 0.00

Where:
Es1 = Strong commercial orientation
Es5 = Organization orientation
Inf1 = Management-related and general information
Inf3 = Official information
Inf4 = Course-related practical information
Mkt1 = Industrial and construction supplier
Mkt2 = Agricultural supplier
Mkt3 = Supplier to other enterprises
Mkt4 = Specialist exporter
Mkt5 = Supplier to joinery industry

Canonical correlations:

1	2	3
0.60	0.26	0.16

Dependent variable canonical coefficients standardized by conditional (within groups) standard deviations:

	1	2	3
Es1	0.52	–0.38	0.55
Es5	0.50	0.43	0.33
Inf1	0.25	0.40	–0.33
Inf3	0.08	0.19	–0.24
Inf4	0.15	0.57	0.06
Mkt1	0.31	–0.26	–0.56
Mkt2	–0.02	–0.23	0.56
Mkt4	–0.23	–0.02	0.09
Mkt3	–0.13	0.21	0.25
Mkt5	–0.09	0.39	0.01

Canonical loadings (correlations between conditional dependent variables and dependent canonical factors):

	1	2	3
Es1	0.70	–0.43	0.16
Es5	0.41	0.49	0.30
Inf1	0.44	0.17	–0.28
Inf3	0.27	0.13	–0.14
Inf4	0.21	0.38	0.20
Mkt1	0.55	–0.30	–0.42
Mkt2	0.07	–0.13	0.63
Mkt4	–0.20	–0.06	0.08
Mkt3	–0.14	0.19	0.22
Mkt5	–0.19	0.36	–0.11

Group classification coefficients:

	Form	Indep	Manuf	Other
Es1	–0.27	0.67	1.39	1.57
Es5	–0.19	0.46	2.25	–0.08
Inf1	–0.09	0.26	1.10	–0.94
Inf3	–0.02	0.08	0.35	–0.55
Inf4	–0.03	0.05	1.23	–0.73
Mkt1	–0.16	0.52	0.18	–0.15
Mkt2	0.00	–0.05	–0.06	0.99
Mkt4	0.09	–0.27	–0.61	0.05
Mkt3	0.07	–0.23	0.05	–0.07
Mkt5	0.05	–0.18	0.28	–0.60
Constants	–1.47	–2.05	–6.15	–3.20

Where:
Form = Farm-related sawmill
Indep = Independent sawmill
Manuf = Sawmill with further manufacturing
Other = Other (e.g. institution) sawmill

Appendix 5. Summary of the discriminant analysis of sawmilling as a livelihood.

Univariate F tests:

Variable	ss	df	ms	f	p
Es1	84.87	1	84.87	107.61	0.00
Es5	4.84	1	4.84	4.89	0.02
Inf1	24.41	1	24.41	25.94	0.00
Mkt1	78.61	1	78.61	97.72	0.00
Mkt3	10.64	1	10.64	10.90	0.00
Mkt4	8.58	1	8.58	8.75	0.00
Mkt5	26.11	1	26.11	27.87	0.00

Multivariate test statistics

Wilks' Lambda	= 0.65
F-statistic	= 29,805
degrees of freedom	= 7.39
prob.	= 0.00

Where:
Es1 = Strong commercial orientation
Es5 = Organization orientation
Inf1 = Management-related and general information
Mkt1 = Industrial and construction supplier
Mkt3 = Supplier to other enterprises
Mkt4 = Specialist exporter
Mkt5 = Supplier to joinery industry

Canonical correlations:

0.59

Dependent variable canonical coefficients standardized by conditional (within groups) standard deviations:

Es1	0.38
Es5	0.16
Inf1	0.08
Mkt1	0.60
Mkt3	0.28
Mkt4	0.27
Mkt5	0.40

Canonical loadings (correlations between conditional dependent variables and dependent canonical factors):

Es1	0.71
Es5	0.15
Inf1	0.35
Mkt1	0.67
Mkt3	0.22
Mkt4	0.20
Mkt5	0.36

Group classification function coefficients:

	Supp	Main
Es1	–0.16	0.60
Es5	–0.06	0.22
Inf1	–0.03	0.11
Mkt1	–0.25	0.94
Mkt3	–0.10	0.40
Mkt4	–0.10	0.38
Mkt5	–0.15	0.59
Constants	–0.76	–1.68

Where:
Supp = Sawmilling as a supplementary livelihood
Main = Sawmilling as a main livelihood

Instructions to authors — Ohjeita kirjoittajille

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